3600-Plus Review Questions for Anatomy & Physiology

Volume 1

R. Michael Anson, Ph.D.

This work was previously published under a different title:
1700+ Review Questions for Anatomy and Physiology I

Edition History for '1700+ Review Questions for Anatomy and Physiology I'
(renamed from 4th edition onward to:
"3600 + Review Questions for Anatomy and Physiology: Volume 1")

August, 2005, R. Michael Anson: First edition.

The questions were written one topic at a time during the summer of 2005. Students in a class which I was teaching were given access to them, and the positive feedback led me to the decision to compile them into this document at the end of the course. I would be happy to receive feedback, positive or negative, or to learn of errors that may be present: my email address is anson@jhu.edu .

November, 2005, R. Michael Anson: Second edition.

A 'note to the student' was added to the preamble, explaining basic study skills relevant to the use of this question bank.

A 'Study Skills' section was added as an introduction to the use of this question bank.

Language of Anatomy

#6: answer changed from 'microscopic' to 'microscopic anatomy'

Changed all limb-related questions which had 'proximal' as an answer to read 'proximal (or superior).'

Changed all limb-related questions which had 'distal' as an answer to read 'distal (or inferior).'

Appendicular and Axial Skeleton

Moved questions 87 and 88 from appendicular skeleton to axial (they were misclassified in original placement, as they dealt with the development of the spine).

Cell Overview

Inserted missing figure on question 76.

The Axial Skeleton

Questions 90 and 91: 'thoracic' was a typo, and has been replaced by 'lumbar.'

The Appendicular Skeleton

Corrected a spelling error in question 11 (corocoid --> coracoid).

Corrected a spelling error in question 22 (to --> two).

Muscles

This section was completely revised to emphasize the prime movers in each motion, and the section renamed to reflect this change.

Nervous Tissue

Corrected the answer to #84.

CNS

Modified question 45 to include a reference to the corpus callosum.

April, 2006, R. Michael Anson: Third edition.

Bones and Skeletal Tissue

Corrected the answer to question 32 to be 'dense irregular connective tissue'

Appendicular Skeleton

Question 23 was corrected to read, 'The medial bone of the forearm is the _____.'

Joints

The answer to #85 was corrected to read, 'bursae.'

Muscles: Prime Movers

Corrected a misspelling in the answer to question 63.

Corrected a misspelling in question 65.

Nervous Tissue

Deleted questions 126 - 129 in Nervous Tissue, which were essentially trivial, and re-numbered those remaining.

Special Senses

A clear distinction is now made between receptor cells and receptor proteins.

Question 106 was corrected to refer to the middle, rather than inner, ear.

July, 2009, R. Michael Anson: Fourth Edition

Changed title to “3600 + Review Questions for Anatomy and Physiology: Volume 1”

In addition to the correction of many minor typographical errors (capitalization errors, etc.), the following changes were made:

Changed the original numbers to “unique ID” codes (UIDs).

Purpose: UIDs are needed by teachers who wish to correlate test banks in various formats (fill in the blank, multiple choice, T/F, etc.) with the original question. Initially, the original question number was used as the UID, but these created reader confusion as deleted questions resulted in “missing” numbers, etc.

To generate UIDs, the first letter of each major word in the section was used as a prefix the original question number, and “a,” “b,” etc., used as a suffix when changes are necessary.

Questions numbers from this edition forward are arbitrary and refer only to the position of a particular question within the particular edition being used.

A table correlating the question number in a particular edition with the UIDs will be provided as an appendix.

Language of Anatomy:

Deleted: 123, 126, 134

Added:

Tissues

Deleted: 20, 55, 76, 77, 78, 79

Added: T20a, T55a

Bones and Skeletal Tissue

Deleted: 3, 72

Added: BST3a, BST72a

Skin

Renamed entire section to "Integumentary System"

Deleted: 62

Added: InS62a

Axial Skeleton

Deleted: 62, 64, 119

Added: AxS62a, AxS 64a, AxS119a, AxS122

Appendicular Skeleton

Deleted: 64, 83

Added: ApS64a, ApS83a

Joints

Deleted: 21, 43, 68

Added J21a, J43a

Muscle Tissue

Deleted: 9, 38, 62, 70

Added: MT9a, MT38a, MT62a, MT70a

Muscles - Prime Movers

Deleted: 47, 48, 59, 75, 105.

Added: MPM47a, MPM48a, MPM48b, MPM59a, MPM75a, MPM105a.

Nervous Tissue

Deleted: 72, 85, 121, 122, 123, 124

Added: NT72a, NT85a

CNS

Deleted: 3, 5, 18, 21, 23, 28, 60, 76, 83, 84, 89, 114, v123, 126, 132, 139

Added: CNS3a, CNS5a, CNS5b, CNS18a, CNS18b, CNS18c, CNS18d, CNS20a, CNS21a, CNS23a, CNS28a, CNS33a, CNS59a, CNS60a, CNS60b, CNS76a, CNS83a, CNS84a, CNS89a, CNS114a, CNS123a, CNS124a, CNS126a, CNS130a, CNS130b, CNS130c, CNS132a, CNS132b, CNS133a, CNS139a

PNS

Deleted: 41, 80 - 85, 90

Added: PNS41a, PNS90a

ANS

Deleted 11, 17, 24, 25, 26, 27, 59, 60

Added: ANS11a, ANS17a, ANS20a, ANS24a, ANS25a, ANS25b, ANS26a, ANS27a, ANS53a, ANS53b, ANS59a

Special Senses

In prior editions, the reference point for questions 36 - 38 was the center of the head, rather than the center of the eye. This was an unintentional change in reference point from the prior questions, in which it was the center of the eye, and it has been corrected in this edition.

Deleted: 35, 36, 37,38, 39, 55, 59, 61, 63, 82, 92, 93, 94, 95, 96, 113, 121, 123, 128, 132, 133

Added: SS19b, SS35a, SS36a, SS37a, SS38a, SS39a, SS39b, SS55a, SS55b, SS59a, SS59b, SS59c, SS59d, SS61a, SS63a, SS82a, SS92a, SS93a, SS93b, SS94a, SS95a, SS96a, SS123a, SS128a, SS128b, SS133a, SS133b

Endocrine System

Deleted: 12, 13, 14, 35, 52, 67

Added: ES40a, ES52a, ES100

A note to the student:

Memorization is easiest if questions are answered out loud and in writing. This means that it is a good idea to have a plentiful supply of scrap paper handy as you study! (As for the out loud aspect of study, well, in some situations - on a bus, for example - this may not be wise. Thinking an answer is better than not studying at all, of course!)

If you encounter a word you do not understand while studying this question bank, you should look it up! Memorizing random, meaningless sounds or letter combinations is much harder than memorizing words and concepts which you understand, and information you understand is retained longer! (You will find this especially important on cumulative exams.)

If a question (or an answer) involves something visual (for example: 'After studying hard for hours, sometimes my ____ hurts,' where the answer is 'head'), be sure that you can picture it in your imagination. Refer to textbooks, etc., if you cannot. In this way, by studying the review questions, you are at the same time studying for your laboratory exams. More importantly, you will gain a greater understanding of the material and this will help you to use it and to remember it on exams and in your future career.

While you study, don't try to swallow an entire topic in one huge gulp. The first step to learn new material by using this question bank is to read four or at most five questions. Once theseare familiar, but before the answers are well-known, hide the answers and try to fill in the blank for each question. Don't just do it in your head: write each answer down on scrap paper, and if you're alone, say it out loud. This simple trick can double or triple your learning speed!

Once you've mastered a set of four or five questions completely, don't simply rush to newer material: consolidate the older material by going back and reviewing the questions that came before the ones you just mastered. This will help it to move into long-term memory.

Once you have mastered the questions in a section in order, review them by answering every fifth one until you can answer them all in that way also. (The number five is arbitrary: the key is to review them out of order.)

Once you know an entire set, you will be surprised at how quickly you can review it. Don't put it aside completely: spend an hour or so each week reviewing topics you've already mastered, and midterms and finals will seem easy! (Ok, well, let's be accurate - ***easier***.)

Memorization is not the end of your learning process, it is the beginning. Once you have the facts, you must learn to use them! This is beyond the scope of this question bank, but is a fact you'll probably become familiar with during your lectures or laboratory sessions. Good luck with your studies!

R. Michael Anson
23-Nov-05

A note to my fellow educators:

The memorization of factual information and the application of information using critical thinking have in recent years come to be viewed by many educators as antithetical. This assumption has led to arguments against the teaching of factual knowledge at all, and those of us who suggest that students should commit factual information to memory, perhaps by using flashcards, are often treated to the sneers and jeers of our colleagues.

Nonetheless, it is my firm belief that a period of memorization prior to exercises in application accelerates the learning process dramatically. A student who has no prior knowledge in a field, when presented with a problem in critical thinking, is faced with several hours of flipping through the indices of various texts to find all of the facts which may be relevant and useful. While the material learned will be well-retained due to the effort expended, the use of time is inefficient at best. In contrast, a student who has been guided in the memorization of some basic factual information, when presented with the same problem, may flip through the mental indices in seconds or minutes, and the 'aha!' moment is the more dramatic and satisfying for its speed.

With that in mind, this collection of questions was prepared. The questions are essentially exercises in active reading. Once the students are sufficiently familiar with the topics, they will find that they can read the questions fairly quickly, rapidly replacing the blanks with the correct word or phrase. At that point, they have the facts at hand which will allow them to solve many problems with which they might be presented in anatomy and physiology. Should the serious student stop after memorizing the material, and never use it, never apply it to problems? Clearly not. It is hoped that this information will simply be the foundation on which a solid set of problem solving skills will be built.

R. Michael Anson
26-Aug-05

Table of Contents

1. Memorization is easiest if questions are answered _____ and _____. This means that it is a good idea to have a plentiful supply of _____ handy as you study!	out loud; in writing; scrap paper
2. If you encounter a word you do not understand while studying this question bank, you should _____.	look it up!
3. If a question (or an answer) involves something visual (for example: 'After studying hard for hours, sometimes my ____ hurts,' where the answer is 'head'), be sure that you can _____. Refer to textbooks, etc., if you cannot.	picture it in your imagination
4. To use these questions to study for a lab, look up a(n) _____ of anything you can't easily imagine, as you study.	picture
5. The first step to learn new material by using this question bank is to _____.	read four or five questions questions
6. Once the current batch or four to five questions is familiar, but before the answers are well-known, the best way to study this question bank is to _____ the answers.	hide
7. Only after _____ questions have been mastered should you proceed to the next few questions.	four or five
8. Once you've mastered a set of four or five questions completely, you should _____ before you move forward.	go back and review the last set
9. Once you have mastered the questions in a section in order, review them by _____ until you can answer them all in that way also.	answering every fifth one
10. Once you know an entire set, you will be surprised at how quickly you can _____. Don't put it aside completely: spend an hour or so each week _____, and midterms and finals will seem easy!	review it; reviewing topics you've already mastered

1. Anatomy is the study of the _____ of the body, while physiology is the study of its _____.	structure; function
2. The study of large body structures is called _____ anatomy.	gross
3. The study of a body area such as the foot is called _____ anatomy.	regional
4. The study of an organ system's structure is called _____ anatomy.	systemic
5. The study of the relationship between internal structure and surface features of the body is called _____ anatomy.	surface
6. _____ is the study of small body structures, often too small to be seen with the naked eye.	Microscopic anatomy
7. _____ is the study of tissues, and _____ is the study of cells.	Histology; cytology
8. The study of changes in the body's structure over time is called _____ anatomy: a specialized sub-field that deals with such changes prior to birth is called _____.	developmental; embryology
9. One common way to organize physiological knowledge is to classify it by _____.	organ system
10. Physiology is the study of the body's function, often at the _____ or _____ level.	cellular; molecular
11. The principle which allows us to (in many cases) infer the function of a component of the body based on its structure, and vice versa, is the _____.	Principle of Complementarity
12. Atoms combine to form _____.	molecules
13. Tissues consist of _____ <a phrase is appropriate as the answer, rather than a single word>.	similar types of cells
14. An organ is made of several types of _____.	tissue
15. Organs working together on a common task form an _____.	organ system
16. The _____ system forms the external body covering.	integumentary
17. The _____ system protects deeper tissues from injury.	integumentary
18. The _____ system synthesizes vitamin D.	integumentary

19. The _____ system is the primary site of pressure and pain receptors, as well as sweat and oil glands.	integumentary
20. The _____ system protects and supports body organs.	skeletal
21. The _____ system provides a framework and leverage so that muscles can cause movement.	skeletal
22. The _____ system houses the blood-forming cells of the body.	skeletal
23. The _____ system stores minerals which may be used as needed.	skeletal
24. The _____ system allows us to move objects in the environment, as well as to move our own bodies.	muscular
25. The _____ system is a major source of heat (allowing us to maintain body temperature).	muscular
26. The _____ system is the fastest-acting control system of the body, activating muscles and glands as needed.	nervous
27. Organs of the _____ system secrete chemicals called hormones into the blood.	endocrine
28. The _____ system regulates processes such as growth, reproduction, and nutrient use.	endocrine
29. The _____ system transports oxygen, carbon dioxide, nutrients, and wastes throughout the body, in the blood.	cardiovascular
30. The _____ system picks up fluid 'leaked' from the blood vessels and returns it to the blood.	lymphatic
31. The _____ system attacks foreign substances within the body.	immune
32. The _____ system keeps blood supplied with oxygen and disposes of unwanted carbon dioxide.	respiratory
33. The _____ system breaks food down into chemicals which can enter the blood for distribution to the body's cells.	digestive
34. The _____ system disposes of items which have been eaten, but which lack nutrient value.	digestive
35. The _____ system eliminates excess nitrogen from the body.	urinary
36. The _____ system regulates water and electrolyte levels and (to some extent) the pH of the blood.	urinary

37. The _____ system produces sperm or eggs and sex hormones.	reproductive
38. The mammary glands (breasts) are a part of the _____ system.	reproductive
39. To live, an organism must separate the _____ and _____ environments.	internal; external
40. Living organisms must be able to _____ items; often themselves, but at the least, molecules and subdivisions within themselves.	move
41. To live, an organism must be able to _____ and _____ changes in the environment.	sense; respond to
42. Organisms that ingest other organisms must _____ these items to capture energy and raw materials.	digest
43. _____ refers to the entire set of chemical reactions which occur within an organism.	Metabolism
44. _____ refers to chemical reactions which lead to the production of complex molecules or structures within an organism.	Anabolism
45. _____ refers to chemical reactions which degrade or destroy complex molecules or structures within an organism in order to capture energy or raw materials.	Catabolism
46. Life forms must dispose of unneeded items, which is done in a process called _____.	excretion
47. Since no organism is immortal, any life form existing now must have had ancestors which were capable of _____.	reproduction
48. To avoid a reduction in size from one generation to the next, living organisms must be able to _____.	grow
49. In order to survive, humans (and human cells) require _____ for raw materials and energy, _____ to allow aerobic respiration (one of the major metabolic reactions), and _____ to dissolve all of the chemicals of life so that reactions can occur.	nutrients; oxygen; water
50. When a constant, dynamic equilibrium is maintained despite changes in the environment (for example, our ability to maintain a constant body temperature), this is called _____.	homeostasis
51. To maintain homeostasis, a(n) _____ must monitor the internal or external environment to detect changes.	receptor
52. To maintain homeostasis, a(n) _____ must respond to signals indicating that a change has occurred by triggering events which will influence the change.	control center
53. To maintain homeostasis, a(n) _____ must be capable of altering the condition that is being maintained.	effector
54. The three components of a system which maintains homeostasis are a(n) _____, a(n) _____ and a(n) _____.	receptor; control center; effector

55. In a(n) _____ feedback system, a change in a condition is sensed and amplified.	positive
56. In a(n) _____ feedback system, a change in a condition is sensed and returned toward its previous level.	negative
57. When equilibrium of a bodily system fails, this is described as _____.	homeostatic imbalance
58. In anatomical terms, the relative position of the head and the heels during a somersault is _____, because such descriptions assume that the body is in the _____.	unchanged; anatomical position
59. The knees are _____ to the ankles.	proximal (or superior)
60. The spine is _____ to the breastbone.	posterior
61. The pinky fingers are _____ to the thumbs.	medial
62. The eyes are _____ to the bridge of the nose.	lateral
63. The nose is _____ to the mouth	superior
64. The mouth is _____ to the forehead.	inferior
65. The genitals are _____ to the hips.	medial
66. The lips are _____ and _____ to the ears.	anterior and inferior
67. The lower back is _____ to the navel.	posterior
68. The hips are _____ to the ribcage.	inferior
69. The thumbs are _____ to the pinky fingers.	lateral
70. The chest is _____ to the shoulder blades.	anterior
71. The hands are _____ to the elbows.	distal (or inferior)
72. The navel is _____ to the lower back.	anterior

73. The shoulder blades are _____ to the chest.	posterior
74. The neck is _____ to the chest.	superior
75. The pelvis is _____ to the ribs.	inferior
76. The breasts are _____ to the lungs.	anterior
77. The intestines are _____ to the neck.	inferior
78. The elbows are _____ to the wrists.	proximal (or superior)
79. The calf is _____ to the shin.	posterior
80. The heart is _____ to the ribcage.	deep
81. The ankles are _____ to the shins.	distal (or inferior)
82. The nipples are _____ to the knees.	superior
83. The brain is _____ to the skull.	deep
84. The thighs are _____ to the feet.	proximal (or superior)
85. The ribcage is _____ to the lungs.	superficial
86. The skin is _____ to the muscles.	superficial
87. "Nasal" refers to the _____.	nose
88. "Oral" refers to the _____.	mouth
89. "Cervical" refers to the _____.	neck
90. "Acromial" refers to the _____.	point of the shoulder

91. "Axillary" refers to the _____. — armpit

92. "Abdominal" refers to the _____. — abdomen (the "abs")

93. "Brachial" refers to the _____. — arm

94. "Antecubital" refers to the _____. — front of the elbow

95. "Antebrachial" refers to the _____. — forearm

96. "Pelvic" refers to the _____. — pelvis (the 'basin' at base of trunk)

97. "Carpal" refers to the _____. — wrists

98. "Pollex" refers to the _____. — thumb

99. "Palmar" refers to the _____. — palm

100. "Digital" refers to the _____. — fingers or toes

101. "Pubic" refers to the _____. — genital region

102. "Patellar" refers to the _____. — front of the knee

103. "Crural" refers to the _____. — leg

104. "Pedal" refers to the _____. — foot

105. "Tarsal" refers to the _____. — ankle

106. "Frontal" refers to the _____. — forehead

107. "Orbital" refers to the _____. — eye

108. "Buccal" refers to the _____. — cheek

109. "Mental" refers to the _____.	chin
110. "Sternal" refers to the _____.	breastbone
111. "Thoracic" refers to the _____.	chest
112. "Mammary" refers to the _____.	breast
113. "Umbilical" refers to the _____.	navel (belly button)
114. "Coxal" refers to the _____.	hip
115. "Inguinal" refers to the _____.	groin
116. "Femoral" refers to the _____.	thigh
117. 'Fibular" or "peroneal" refers to the _____.	lateral side of the leg
118. "Hallux" refers to the _____.	great toe
119. "Cephalic" refers to the _____.	head
120. "Otic" refers to the _____.	ear
121. "Occipital" refers to the _____.	back of head
122. "Manus" refers to the _____.	hand
123. "Vertebral" refers to the _____.	spine
124. "Scapular" refers to the _____.	shoulder blade
125. "Upper And Lower Extremeties" refers to the _____.	arms and legs
126. "Dorsum Or Dorsal" refers to the _____.	back

127. "Olecranal" refers to the _____.	back of the elbow
128. "Lumbar" refers to the _____.	loin (lower back, on either side of spine)
129. "Sacral" refers to the _____.	area between the hips
130. "Gluteal" refers to the _____.	buttock
131. "Perineal" refers to the _____.	region between the anus and genitals
132. "Popliteal" refers to the _____.	back of the knee
133. "Sural" refers to the _____.	calf
134. "Calcaneal" refers to the _____.	heel of the foot
135. "Plantar" refers to the _____.	sole of the foot
136. The _____ or _____ plane separates the anterior and posterior portions of an object.	frontal; coronal
137. The _____ or _____ plane separates the superior and inferior portions of an object.	horizontal; transverse
138. The _____ or _____ plane separates the left lateral and the right lateral portions of an object at the midline.	median; mid-sagittal
139. The cranial cavity is within the _____ cavity.	dorsal
140. The spinal or vertebral cavity is within the _____ cavity.	dorsal
141. The thoracic cavity is within the _____ cavity.	ventral
142. The abdominopelvic cavity is within the _____ cavity.	ventral
143. The brain is found in the _____ cavity. (Use the most specific, ie smallest, cavity that is appropriate.)	cranial
144. The spinal cord is found in the _____ cavity. (Use the most specific, ie smallest, cavity that is appropriate.)	spinal or vertebral

145. The lungs and heart are found in the _____ cavity. (Use the most specific, ie smallest, cavity that is appropriate.)	thoracic
146. The heart is found in the _____ cavity. (Use the most specific, ie smallest, cavity that is appropriate.)	pericardial
147. The bladder, some reproductive organs, and rectum are found in the _____ cavity. (Use the most specific, ie smallest, cavity that is appropriate.)	pelvic
148. The digestive organs are found in the _____ cavity. (Use the most specific, ie smallest, cavity that is appropriate.)	abdominal
149. The heart, trachea and esophagus are found in the _____ (cavity). (Use the most specific, ie smallest, cavity that is appropriate.)	mediastinum
150. The mediastinum is within the _____ cavity, which is in turn within the _____ cavity.	thoracic, ventral
151. The pelvic cavity is within the _____ cavity, which is within the _____ cavity.	abdominopelvic; ventral
152. The lungs are found in the _____ cavity. (Use the most specific, ie smallest, cavity that is appropriate.)	pleural
153. The pericardial cavity is within the _____, which is within the _____ cavity, which is within the _____ cavity.	mediastinum; thoracic; ventral
154. The _____ separates the abdominopelvic and thoracic cavities.	diaphragm
155. Organs in the ventral body cavity are surrounded by double-layered membranes called _____ membranes. The layer closest to the organ is the _____ membrane, and that which lines the body wall is called the _____ membrane. The layers are separated by	serous; visceral; parietal; serous
156. The _____ region of the abdomen is superior to the umbilical region of the abdomen.	epigastric
157. The _____ region of the abdomen is superior and left lateral to the umbilical region of the abdomen.	left hypochondriac
158. The _____ region of the abdomen is superior and right lateral to the umbilical region of the abdomen.	right hypochondriac
159. The _____ region of the abdomen is right lateral to the umbilical region of the abdomen.	right lumbar
160. The _____ region of the abdomen is left lateral to the umbilical region of the abdomen.	left lumbar
161. The _____ region of the abdomen is inferior to the umbilical region of the abdomen.	hypogastric or pubic
162. The _____ region of the abdomen is inferior and left lateral to the umbilical region of the abdomen.	left iliac or inguinal

163. The _____ region of the abdomen is inferior and right lateral to the umbilical region of the abdomen.	right iliac or inguinal
164. In humans, "_____" is a synonym for "superior," but in four-legged animals, it means, "anterior," because it literally means, "toward the mouth."	rostral
165. In humans, "_____" is a synonym for "inferior," but in four-legged animals, it means, "posterior," because it literally means, "toward the tail."	caudal
166. '_____' refers to two structures on the same side of the body's midline (such as the left arm and left leg).	Ipsilateral
167. '_____' refers to two structures which are on the opposite side of the body's midline (such as the left arm and right leg).	Contralateral

1. In general, energy can exist in two major forms: _____ (action, or motion) and _____ (stored).	kinetic energy; potential energy
2. Chemical energy is stored in the _____ of chemical substances.	electrons which form the bonds
3. When energy is converted from one form to another (eg, from kinetic to potential), some is always converted into _____.	heat
4. Atoms are composed of _____, _____, and _____.	protons, neutrons, electrons
5. The nucleus of an atom consists of approximately, but not always exactly, equal numbers of _____ and _____.	protons; neutrons
6. Electrons have a mass of approximately _____ amu, while protons and neutrons both have a mass of _____ amu. ('amu' means _____)	0; 1; atomic mass unit
7. What is the atomic number of an atom with 5 protons and 6 neutrons? <Note: understand the concept, different numbers may be encountered on test questions.>	5
8. What is the atomic mass, or 'mass number,' of an atom with 5 protons and 6 neutrons? <Note: understand the concept, different numbers may be encountered on test questions.>	5 + 6 = 11
9. If an element is a mixture of equal numbers of atoms whose atomic mass is either 12 or 14, what is the atomic weight? <Note: understand the concept, different numbers may be encountered on test questions.>	13 (atomic weight is the average mass of all the atoms present)
10. If atom 'A' has 5 protons and 6 neutrons, atom 'B' has 5 protons and 7 neutrons, and atom 'C' has 6 protons and 6 neutrons: ... _____ and _____ are isotopes of the same element. ... _____ is the atom that is most likely to be radioactive. <Note: understand the concept, different numbers may be encountered on test questions.>	atom A and atom B (same number of protons = same element); atom B (most unequal number of protons and neutrons = most unstable)
11. If one isotope of an element is radioactive, it is called a(n) _____.	radioisotope
12. The four most abundant elements in the human body are _____, _____, _____, _____.	CHON (Carbon, Hydrogen, Oxygen, Nitrogen)
13. When two or more atoms are held together by a chemical bond, the resulting particle is called a(n) _____. (If the atoms are not all the same element, the particle is also called a(n) _____.)	molecule; compound
14. If two types of atoms or molecules are present in the same solution but are not chemically bonded, the solution is a(n) _____.	mixture
15. Solutions have two components: the substance that is dissolved, called the _____, and the liquid in which it is dissolved, called the _____.	solute; solvent
16. (Pick the correct choice within each set of brackets.) In a [mixture/compound], no chemical bonding occurs.	mixture
17. (Pick the correct choice within each set of brackets.) [Mixture/Compound] can be separated by physical (not chemical) methods: heating, spinning, filtering, etc.	mixture

18. A(n) _____ mixture varies from place to place in terms of the concentrations of one or more components, while a(n) _____ mixture is the same throughout.	heterogeneous; homogenous
19. _____, _____, and amu all refer to the atomic mass of a particle.	Da (daltons); u (universal amu)
20. If a particle weighs 5 Da, a mole of such particles would weigh _____ grams. <Note: understand the concept, different numbers may be encountered on test questions.>	5
21. (Pick the correct choice within each set of brackets.) Particles in a [colloid/suspension] will settle to the bottom of the container over time.	suspension
22. Except for the electron energy level closest to the nucleus, which is full with only _____ electrons, a pair of atoms will interact to allow both to have _____ electrons in their valence shell	2; 8
23. Based on the octet rule, oxygen, which has 6 valence electrons, will form bonds in such a way that it acquires _____ more. (Note: understand the concept. A test question could use a different element.)	2
24. _____ bonds form by the transfer of an electron, while _____ are formed when electrons are shared by two atoms.	Ionic; covalent
25. Two atoms that share three pairs of electrons are said to be joined by a(n) _____ bond.	triple (or triple covalent)
26. (Pick the correct choice within each set of brackets.) If one atom of two covalently bonded atoms is more electronegative than the other, which means that it pulls electrons toward itself, the bond is [polar/non-polar].	polar
27. The 3D shape of proteins, and correct base pairing of DNA, depends on the fact that _____ bonds are linear.	hydrogen
28. -O-H \ What is wrong with the hydrogen bond shown at the left? N -	It should be linear.
29. C + H → CH4 What is wrong with this reaction?	It needs to be balanced: C + 4H → CH4
30. (Pick the correct choice within each set of brackets.) An atom that donates an electron to another atom is said to be [reduced/oxidized].	oxidized
31. (Pick the correct choice within each set of brackets.) Increasing the temperature of a reaction causes it to occur [faster/slower].	faster
32. (Pick the correct choice within each set of brackets.) Small particles can react [faster/slower] than large ones.	faster
33. (Pick the correct choice within each set of brackets.) Increasing the concentration of reactants causes the reaction to occur [faster/slower].	faster
34. (Pick the correct choice within each set of brackets.) A catalyst [is/is not] a type of reactant, and so [is/is not] changed during a chemical reaction.	is not; is not
35. Biological catalysts are called _____.	enzymes

36. A reaction in which the products have less potential energy than the reactants is an [exergonic/endergonic] reaction.	exergonic
37. energy + A + B --> C (Pick the correct choice within each set of brackets.) This reaction is [exergonic/endergonic].	endergonic
38. (Pick the correct choice within each set of brackets.) If energy or products are lost from a system, the reaction becomes [reversible/irreversible].	irreversible
39. Organic compounds all contain _____.	carbon
40. Inorganic compounds usually do not contain _____.	carbon
41. Water is a [polar/non-polar] solvent.	polar
42. Ions are often called _____, because they can carry an electric current.	electrolytes
43. A solution of pH 3 has _____ moles H+ per liter. (Note: understand the concept. A test question could use a different pH.)	1/1000
44. A solution of pH 2 has _____ times as many hydrogen ions in solution as one of pH 3. (Note: understand the concept. A test question could use different pH values.)	(1/1000) x 10 = (1/100) Thus, 10 times as many.
45. (Pick the correct choice within each set of brackets.) The more hydrogen ions there are in solution, the more [acidic/basic] the solution is.	acidic
46. A substance that decreases the pH of a solution is a(n) _____, while one which increases the pH of a solution is a(n) _____.	acid; base
47. In completely pure water, the concentration of hydrogen cations (H+) is [less than/the same as/greater than] the concentration of hydroxide (OH-).	the same as
48. (Pick the correct choice within each set of brackets.) A solution of pH 8 is [more/less] acidic than one of pH 7. (Note: understand the concept. A test question could use different pH values.)	less
49. (Pick the correct choice within each set of brackets.) A solution of pH 8 is [more/less] basic than one of pH 7. (Note: understand the concept. A test question could use different pH values.)	more
50. When the concentration of hydrogen cations (H+) in a solution is the same as the concentration of hydroxide (OH-), the pH is _____.	7
51. The pH scale goes from _____ to _____.	0; 14
52. A substance that stabilizes pH is called a(n) _____.	buffer
53. Carbon dioxide reacts with water to form carbonic acid. The ability of carbonic acid to donate or accept a hydrogen ion is important, because this system is the main buffer in the _____.	blood

54. The four major classes of macromolecule are _____, _____, _____ and _____.	(in any order) proteins, lipids, carbohydrates, nucleic acids
55. Macromolecules are formed in _____ reactions, in which two hydrogens and an oxygen (H2O) are removed from the reactants.	dehydration (or dehydration synthesis)
56. When a macromolecule is broken down into smaller molecules, a molecule of _____ is added and the reaction is called _____.	water; hydrolysis
57. Carbohydrates are made from which atoms?	C, H, O ('carbo' = carbon, 'hydrate' = water)
58. A(n) _____ is a simple, single-ring sugar; a(n) _____ is formed when two of these link together, and a(n) _____ is formed when many of them link together.	monosaccharide; disaccharide; polysaccharide
59. Triglycerides consist of three _____ joined to a molecule of _____.	fatty acids; glycerol
60. A(n) _____ is formed by replacing one fatty acid in a triglyceride with a phosphorous-containing molecule.	phospholipid
61. Steroids are _____ with _____ rings.	lipids; four
62. Eicosanoids are _____ that contain _____ carbons.	lipids; 20
63. Proteins are made of _____, joined together in a chain.	amino acids
64. All amino acids have a(n) _____ group, a(n) _____ group, and a(n) _____.	amine (or amino); carboxyl (or carboxylic acid); side chain
65. The bonds between the subunits in a protein are called _____ bonds.	peptide
66. The _____ structure of a protein refers to the actual sequence of its subunits.	primary
67. The _____ structure of a protein refers to the folding caused by hydrogen bonding between amino and carboxyl groups within the same molecule, and usually leads to the formation of beta-pleated-sheets and alpha-helices.	secondary
68. The _____ structure of a protein refers to the complex folding caused by interactions between the side chains of the subunits with each other and with the solvent.	tertiary
69. The _____ structure of a protein refers to the interaction of two separate protein molecules to form a single functional unit.	quaternary
70. When a protein unfolds, its function is lost: this process is called _____.	denaturation
71. A shift in pH or temperature can cause a protein to _____.	denature or unfold

72. Special proteins (enzymes) called _____ help to guide the folding of other proteins.	chaperones or chaperonins
73. If a protein has to get through a membrane, it has to be unfolded and threaded through, like thread through the eye of a needle. The enzymes that assist in this process and make sure that the protein refolds correctly after passing through the membrane are called _____.	chaperones or chaperonins
74. Most enzymes are _____ <two words>.	globular proteins
75. If a word ends in -ase, it probably refers to a(n) _____.	enzyme
76. A(n) _____ is an enzyme that has all of the components needed for activity, and no others.	holoenzyme
77. Energy that is required to start a reaction is called _____ energy.	activation
78. Enzymes and other catalysts work by lowering _____ energy.	activation
79. If a reaction is catalyzed by an enzyme, the reactants are usually called _____.	substrates
80. The subunits of nucleic acids are _____.	nucleotides
81. Nucleotides consist of three parts: _____, _____ and _____.	(in any order) phosphate, five-carbon (pentose) sugar, nitrogen-containing base
82. The two major types of nucleic acid are _____ and _____.	DNA; RNA
83. The five common bases in nucleic acids are _____, _____, _____, _____ and _____.	(in any order) adenine, guanine, cytosine, thymine, uracil
84. The 'blueprint' for humans (and many other species) is made of _____.	DNA
85. In human cells, most of the DNA is found in the _____.	nucleus
86. When two single strands of DNA bind to form double stranded DNA, the two strands are _____ <orientation to one another>.	anti-parallel
87. _____ is a nucleic acid that is usually single-stranded.	RNA
88. In DNA, the four bases that are found are _____, _____, _____, and _____.	(in any order) A; T; C; G
89. In RNA, the base _____ is used instead of the base _____.	U; T

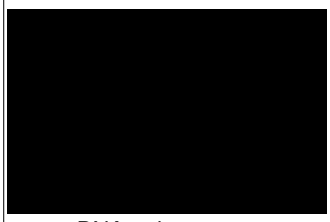
90. The three most abundant types of RNA are _____, _____, and _____ RNA.	(in any order) messenger; transfer; ribosomal
91. The primary molecule used by the cell to supply small amounts of energy when needed is _____, which is also one of the four nucleotides used to make _____. The energy in this nucleotide is stored in the _____.	ATP; RNA; phosphate (or phosphate's bonds, or phosphate bonds)

1. The smallest unit that scientists agree is alive is the _____.	cell
2. The region in a human cell that houses the bulk of the genetic material is the _____.	nucleus or nuclear region
3. Most of the cellular machinery in human cells is in the _____.	cytoplasm or cytoplasmic region
4. Cellular interactions with the environment are controlled by which region of the cell?	membrane or membrane-associated region
5. The basic structure of a cell's membrane is a(n) _____ bilayer with associated proteins that can be either _____ or _____.	phospholipid; integral; peripheral
6. Receptors in the cell's surface tend to be made of _____.	protein
7. The molecules that allow cells to join and adhere to one another and or objects are made of _____.	protein
8. When a cell is attached to a substrate, the cell's membrane is protected from ripping by _____ which pass the external forces from the exterior to the interior of the cell.	membrane proteins
9. _____ are membrane junctions which prevent passage of materials between two cells.	Tight junctions
10. _____ are membrane junctions which allow force to be passed from cell to cell without separation of, or damage to, the cellular membranes.	Desmosomes
11. _____ are membrane junctions which contain hollow channels within them that allow ions to pass through from cell to cell.	Gap junctions
12. When a molecule moves from an area of high concentration to an area of low concentration, the process is called _____.	diffusion
13. Molecules can passively diffuse through the plasma membrane with the aid of _____ proteins, which form a tunnel that specific molecules can travel, and _____ proteins, which bind to a molecule and change shape so that un-binding occurs on the opposite side of the membrane.	channel; carrier
14. If a molecule can only pass through a membrane with the assistance of a membrane protein, but the direction of its travel is controlled only by its concentration, the process is called _____ diffusion.	facilitated
15. When water moves from an area where there is more water to an area where there is less, the process is called _____.	osmosis
16. _____ is the diffusion of water molecules.	Osmosis
17. When a cell is surrounded by solution of equivalent solute concentration, the solution is said to be _____ to the cell, and the net movement of water is _____.	isotonic; absent
18. When a cell is surrounded by solution of higher solute concentration, the solution is said to be _____ to the cell, and the net movement of water is _____.	hypertonic; out of the cell

19. When a cell is surrounded by solution of lower solute concentration, the solution is said to be _____ to the cell, and the net movement of water is _____.	hypotonic; into the cell
20. _____ is the passage of liquids and solutes through membranes due to differences in pressure, a process which is important in the kidney.	Filtration
21. When energy is being used to move a solute from low to high areas of concentration, the process is called _____.	active transport
22. The concentration of sodium is highest [outside / inside] the cell, while for potassium, the reverse is true.	outside
23. Sodium and potassium gradients are maintained by an active-transport protein called the sodium-potassium pump, which moves _____ sodiums out of the cell for every _____ potassium ions brought in.	3; 2
24. The energy to operate the sodium-potassium pump comes from the hydrolysis of _____, which transfers a(n) _____ to the transport protein.	ATP; phosphate bond or high-energy phosphate bond
25. In _____, interactions between vesicle proteins and plasma membrane proteins cause a vesicle to merge with the plasma membrane and discharge its contents to the cell's exterior.	exocytosis
26. In _____, clathrin-coated regions of the cell's exterior invaginate and form vesicles which bring a portion of the extracellular material into the cell.	clathrin-mediated endocytosis
27. When a vesicle is formed on one side of the cell to endocytose extracellular material, and actually traverses the cell to leave on the other side, the process is called _____. (This process is important in digestion.)	transcytosis
28. Endocytosis, exocytosis, and transcytosis are all examples of _____ transport.	active
29. A difference in the number of positive and negative charges on the two sides of a membrane is referred to as the _____.	membrane potential
30. The two factors that act in opposite ways to stabilize the resting membrane potential are _____ and _____.	(concentration gradients (or diffusion) and electrostatic attraction
31. The two major ions responsible for the membrane potential in human cells are _____ and _____.	sodium; potassium
32. The glycocalyx is composed of _____ molecules (a class of macromolecule) attached to proteins and lipids on the cell surface.	carbohydrate
33. Cells sense contact with other cells and with surfaces, and adhere to substrates and other cells, largely via the use of carbohydrate-rich macromolecules in the cell membrane which together compose the _____.	glycocalyx
34. The three major signal types recognized by membrane receptors are _____ signals, _____ signals, and _____.	chemical, electrical, contact
35. A common function of all _____ is to transmit an external event, as a signal, into the cell to allow the cell to respond.	membrane receptors
36. The entire region between the cellular nucleus and the membrane is called the _____, the liquid portion is called the _____, and the membrane-enclosed compartments in which specific functions are localized are called _____.	cytoplasm; cytosol; organelles

37. If a particle in the cell's cytoplasm can be seen with light microscopy, it is called a(n) _____.	inclusion
38. Mitochondria have _____ (how many?) membranes, each of which is a bilayer.	two
39. The innermost membrane of mitochondria is folded, forming wrinkles called _____.	cristae
40. The major (not only) function of mitochondria is to completely oxidize fuels and to capture the energy in a molecule called _____.	ATP
41. _____ are huge macromolecules composed of RNA and protein, whose function is to synthesize protein.	Ribosomes
42. Cytosolic proteins are made by _____ ribosomes, while proteins destined for export, or use in membrane, are made by _____ ribosomes.	free; membrane bound (or ER bound)
43. The rough endoplasmic reticulum is distinguished by the presence of _____ on its surface, and is responsible for making integral membrane proteins, secreted proteins, and phospholipids.	ribosomes
44. Ribosomes become bound to the membrane of the rough ER after they have started making protein due to the presence of a(n) _____ on the newly made protein which binds to receptors called SRPs (Signal Recognition Particles) on the ER surface.	signal sequence
45. The function of the _____ ER varies greatly from cell type to cell type, and can include lipid metabolism, steroid synthesis, calcium storage and release, and others.	smooth
46. Proteins leaving the rough ER are transported to the _____ for modification, packaging, and transport to the appropriate location.	Golgi apparatus
47. The series of organelles that are able to exchange membrane components with one another are collectively known as the _____.	endomembrane system
48. The organelles within the cell whose main functions are digestion and hydrolysis are the _____.	lysosomes
49. The organelles which isolate hazardous chemical reactions within the cell, especially those producing free radicals, are called _____.	peroxisomes
50. The three principle components of the cytoskeleton are _____, _____, and _____.	microfilaments, intermediate filaments, and microtubules
51. The primary functions of _____ are to brace and strengthen the cell's surface and to attach to cellular adhesion molecules which allow binding to substrates and other cells. They also function in endocytosis and exocytosis.	microfilaments
52. The semi-permanent structural framework of the cell, which transmit force from one point in the membrane to others, allowing cells to spread a stretching force across a wide region and to other cells, are the _____.	intermediate filaments
53. The dynamic, hollow tubes which help to determine the overall shape of the cell and along which organelles move as if on a conveyor belt are the _____.	microtubules
54. The molecules which use energy from ATP to move organelles along certain components of the cytoskeleton are called _____.	motor molecules

55. The structures that organize and generate the microtubules for the mitotic spindle during mitosis and for cilia and flagella are called _____.	centrioles
56. Short, cellular projections that allow the cell to move through their environment, or for human cells, to move fluid across their surface, are called _____.	cilia
57. The cytoskeletal components that give cilia their mobility and structural strength are _____.	microtubules
58. The primary difference between cilia and flagella is _____.	length
59. The nuclear envelope consists of _____ (how many?) separate membrane bilayers?	two
60. The outer membrane of the nuclear envelope is continuous with the _____.	rough E.R.
61. The function of the _____ is to regulate which materials enter or leave the nucleus.	nuclear membrane
62. Large molecules are transported into or out of the nucleus through _____.	nuclear pores
63. Ribosomal RNA is produced in _____.	nucleoli
64. DNA wrapped around histones within the nucleus is called _____ because it could take up dyes and showed as a colored substance when a microscope was used.	chromatin
65. The cell cycle can be divided into two major phases, _____ and _____.	interphase; mitotic or mitosis
66. Interphase can be divided into three groups of events, _____, _____, and _____.	G1 (or gap 1); S (or synthesis); G2 (or gap 2)
67. DNA is made during the _____ phase of the cell cycle (be as specific as possible).	S or Synthesis
68. Cells that have permanently stopped dividing enter a phase of the cell cycle known as _____.	G0
69. Cell growth and preparation for cell division occur during the _____ and _____ phases, respectively.	G1; G2
70. Replication or division of the nucleus is called _____; once there are two nuclei, the cell itself may divide in a process called _____.	mitosis; cytokinesis
71. Mitosis consists of four phases. In order, they are _____, _____, _____, and _____.	prophase; metaphase; anaphase; telophase
72. During _____, the nuclear envelope dissolves and the chromatin condenses.	prophase
73. During _____, the individual chromosomes line up in the middle of the cell.	metaphase

74. In _____, the sister chromatids separate.	anaphase
75. In _____, a new nuclear envelope forms.	telophase
76. Using arrows, draw a cartoon of DNA replication. The arrow head should represent the 3' end. Show both parental strands, and also both daughter strands. Place the short, unjoined fragments of the lagging strand in the proper position.	
77. DNA is made by enzymes called _____.	DNA polymerases
78. During DNA synthesis, new nucleotides can only be added to the _____ end of the DNA.	3'
79. The structure of DNA is anti-parallel, meaning that the strands are _____.	parallel, but pointed in opposite directions
80. The _____ strand of DNA is made discontinuously (in small pieces).	lagging
81. DNA polymerases require a(n) _____, which in the cell is either a pre-existing piece of DNA, or a newly made piece of RNA.	primer
82. When RNA is removed from the lagging strand during DNA synthesis, it is replaced by DNA everywhere except at the _____ end of the strand. It cannot be replaced there, because there is no _____.	5'; primer
83. A hereditary nucleic acid sequence which contains the information needed to make a cellular component is called a(n) _____.	gene
84. Using a codon table, translate <AUGGCUUUU> into the correct amino acid. (Note: understand the principle. The exact sequence will not be the same on a test.)	methionine-alanine-phenylalanine
85. In humans, _____ is the chemical which contains the original sequence information encoding proteins and other cellular components, and which is the 'master copy' that is passed on to future generations.	DNA
86. In humans, _____ is a disposable copy of the nucleic acid sequence which contains the information encoding proteins and other cellular components. It is used by the ribosomes in the cytoplasm to create a protein with the correct amino acid sequence.	mRNA
87. _____ is a form of RNA that carries amino acids to the ribosome during protein synthesis.	TRNA
88. _____ is a form of RNA that is a physical component of the ribosome.	RRNA
89. During _____, the sequence of the DNA is copied into RNA. During _____, the ribosome uses the nucleotide sequence to create a protein with the correct amino acid sequence.	transcription; translation
90. Codons are found in _____ RNA, while anticodons are found in _____ RNA.	messenger or m; transfer or t

91. Translation occurs in which part of the cell?	Cytoplasm.
92. Non-functional organelles are degraded by _____.	lysosomes
93. Proteins which are no longer functional are marked for degradation by the addition of _____.	ubiquitin
94. The _____ is an organized, extracellular mesh of varying density in which cells are found.	extracellular matrix
95. At the DNA level, the difference between a liver cell and a brain cell, is that they _____, although they have the same _____.	have different genes active; DNA
96. The development of specific and distinctive features in a cell (example, when a cell becomes a liver or a brain cell) is called _____.	differentiation or cell differentiation
97. In organisms that age, repair of damage is _____.	imperfect
98. In organisms that _____, unrepaired, damaged parts are not replaced.	age
99. In organisms that _____, life processes which have short term benefits but which have negative effects in the long term are allowed to occur.	age
100. One way to delay the effects of aging on some organ systems (those few for which this is possible) is to engage in activities, such as weightlifting, which induce _____.	repair

1. All tissues in the body are classified as _____, _____, _____ or _____.	epithelia; connective; muscle; nervous
2. The defining characteristic of epithelial tissue is that it forms a(n) _____.	surface
3. The two major attributes that are used in classifying epithelial tissue are cell _____ and cell _____.	arrangement; shape
4. Epithelia whose cells are arranged into a single layer of cells is classified as _____, whereas multiple layer epithelia are classified as _____.	simple; stratified
5. _____ cells are flat, like a fried egg.	Squamous
6. _____ cells are round or square.	Cuboidal
7. _____ cells are moderately long and slender.	Columnar
8. A(n) _____ is nonliving material in which something is embedded.	matrix
9. _____' means 'at the top.'	Apical
10. A non-cellular, adhesive supporting layer made up of glycoproteins secreted by epithelial cells is called a(n) _____.	basal lamina
11. _____' means, 'containing no blood vessels.'	Avascular
12. _____' means, 'supplied by nerve fibers.'	Innervated
13. True or false: epithelial tissue is highly cellular, that is, contains very little extracellular matrix.	TRUE
14. The cells of epithelial tissue are joined by _____ or _____.	tight junctions or desmosomes
15. True or false: the apical and basal surfaces of epithelial tissue are identical.	FALSE
16. Epithelial tissue is supported on one side by _____ tissue. (This is called, depending on exact type and location, either the _____ lamina or the _____ lamina.)	connective; reticular; basal
17. True or false: most epithelial tissue contains blood vessels.	FALSE
18. True or false: nerves can be found within epithelial tissue.	TRUE

19. True or false: all epithelial cells are non-dividing.	FALSE
20. _____ is a tissue which consists of a single layer of flattened cells which control passage of materials from one side to the other, but provide no protection.	Simple squamous epithelium
21. _____ is a tissue which consists of a single layer of roughly round or cubical cells with large, spherical nuclei in the center of each, and which secrete or absorb substances into or from their exposed surface.	Simple cuboidal epithelium
22. _____ is a tissue which consists of a single layer of tall cells with round or oval nuclei, all in a row. It absorbs substances and secretes mucous from its exposed surface.	Simple columnar epithelia
23. _____ is a tissue which consists of a single layer of tall cells with round or oval nuclei, some of which are near the basal lamina and some of which are near the apical surface. It secretes mucous from its exposed surface.	Pseudostratified columnar epithelia
24. _____ is a tissue which consists of several layers of cells which separate an open space from a basal or reticular lamina. The surface cells are flat, the basal cells are rounded, square, or tall.	Stratified squamous epithelia
25. The apical cells of stratified squamous epithelia are dead, and the nucleus and organelles have been replaced by keratin, if the tissue is _____.	dry (or 'the epidermis')
26. The apical cells of stratified squamous epithelia are alive if the tissue is _____.	moist (or wet, etc.)
27. _____ is a tissue which consists of two layers of round or square cells which separate an open space from a basal or reticular lamina. While most tissue types are found throughout the body, this one is rare and is only seen in sweat and mammary glands.	Stratified cuboidal epithelia
28. _____ is a tissue which consists of two layers of tall cells which separate an open space from a basal or reticular lamina.	Stratified columnar epithelia
29. _____ is a tissue which is easily stretched. It consists of several layers of cells which separate an open space from a basal or reticular lamina, and the surface cells are usually dome shaped if the tissue is not stretched at the time of fixation.	Transitional epithelia
30. A(n) _____ is one or more cells that makes and secretes an aqueous fluid.	gland
31. _____ glands are ductless, that is, their products are released directly from the cells into the bloodstream.	Endocrine
32. _____ glands produce hormones.	Endocrine
33. _____ glands have a duct through which their products are secreted onto the body's surface or into body cavities.	Exocrine
34. Mucous, sweat, oil, and salivary glands are all _____ glands.	exocrine
35. Most glands are multicellular. The only important one that is not is the _____, which produces mucous.	goblet cell
36. An exocrine gland whose duct does not branch is _____.	simple

37. An exocrine gland whose duct branches is _____.	compound
38. An exocrine gland whose secretory units are round is _____.	alveolar
39. An exocrine gland whose secretory units are elongated is _____.	tubular
40. _____ exocrine glands secrete substances: that is, the substance is exocytosed into the duct.	Merocrine
41. _____ exocrine glands become filled with their product, then rupture, spilling their contents into the duct.	Holocrine
42. Cells in _____ tissue are surrounded by a complex extracellular matrix.	connective
43. _____ is the embryonic tissue type that gives rise to all connective tissue in the adult body.	Mesenchyme
44. The unstructured portion of the matrix that fills the space between cells in connective tissue is called the _____.	ground substance
45. In addition to fibers, the matrix in connective tissue contains fluid, adhesion proteins, and cushioning molecules called proteoglycans: together, these non-fibrous components are called the _____.	ground substance
46. _____ is a tough, extremely strong fibrous protein which gives connective tissue strength.	Collagen
47. _____ are fibrous proteins in connective tissue that, when stretched, snaps back to its original length.	Elastin or elastic fibers
48. _____ are fibrous proteins in connective tissue that branch and cross-connect to provide a flexible but form-holding framework in which cells reside.	Reticular fibers
49. The major matrix producing cells in connective tissue proper are called _____.	fibroblasts
50. The major matrix producing cells in cartilage are called _____.	chondroblasts
51. The major matrix producing cells in bone are called _____.	osteoblasts
52. The four major classes of connective tissue are _____, _____, _____ and _____.	connective tissue proper; cartilage; bone (or osseous tissue); blood
53. Connective tissue proper can be sub-classified as either _____ or _____.	loose; dense
54. The three types of loose connective tissue are _____, _____ and _____.	areolar; adipose; reticular

55. The two types of dense connective tissue are _____, _____, which can be made of _____ or _____ fibers.	regular; irregular; elastic; collagen
56. The three types of cartilage are _____, _____ and _____.	hyaline; fibrocartilage; elastic
57. The two types of bone are _____ and _____.	compact; spongy (or cancellous)
58. _____ connective tissue is usually found under epithelia.	Areolar
59. _____ connective tissue contains many cells whose nucleus has been pushed aside by the large volumes of material that each cell stores.	Adipose
60. _____ connective tissue forms a soft internal skeleton that supports other cell types.	Reticular
61. _____ connective tissue attaches muscle to bone, and is very strong along one axis.	Regular
62. _____ connective tissue is strong when pulled from any direction, and tends to form tough but flexible enclosures for joints, organs, etc.	Irregular
63. _____ is a very strong and resilient cartilage which forms parts of the skeleton and joints.	Hyaline cartilage
64. _____ is a very strong and resilient cartilage which is extremely flexible, and will spring back to its original shape after bending.	Elastic
65. _____ is a cartilage that can resist both decompression (stretch or pulling) and compression.	Fibrocartilage
66. _____ is a hard connective tissue composed of calcium and other minerals surrounding reinforcing protein fibers.	Bone (or osseous tissue)
67. The epithelial membrane that encloses the entire body is called the _____ membrane.	cutaneous
68. The epithelial membranes which line body cavities which are open to the exterior are called _____ membranes.	mucous
69. The double-layered epithelial membranes which line unexposed body cavities, preventing friction between organs, are called _____ membranes.	serous
70. _____ tissue is characterized by large cells with long processes which carry electrical signals, surrounded by smaller supporting cells.	Nervous
71. Striations (stripes) are characteristic of _____ and _____ muscle fibers.	skeletal (or voluntary); cardiac
72. Having multiple nuclei, all pushed to the periphery of the cell, is a characteristic of _____ muscle cells.	skeletal (or voluntary)

73. Two defining characteristics of cardiac muscle include _____ and _____; the latter contain gap junctions which allow ions to move between cells.	branches; intercalated disks
74. _____ muscle cells lack striations and have only one nucleus.	Smooth (or involuntary)
75. During wound healing, cells of the _____ tissues divide to fully regenerate the original tissue, while cells of damaged _____ tissue build a new framework which is unlike the original and is essentially just a patch.	epithelial; connective
76. In advanced age, the extracellular matrix of the skin becomes _____ and the number and quality of the _____ fibers decreases.	disorganized; elastic
77. In advanced age, the balance between tissue breakdown and tissue rebuilding during tissue remodeling often shifts to favor _____.	breakdown
78. In advanced age, the proteins of the extracellular matrix often become _____ to one another.	cross-linked or linked
79. In advanced age, genes often ____ or change their normal pattern of _____.	mutate; expression
80. In advanced age, many cells become _____ to their environment.	insensitive

1. The skin contains three layers: from deep to superficial, they are the _____, the _____, and the _____.	hypodermis; dermis; epidermis
2. The epidermis is composed of _____.	squamous epithelial tissue
3. The dermis is composed of _____ and _____.	areolar connective tissue; dense irregular connective tissue
4. The hypodermis is composed of _____ and _____.	areolar connective tissue; adipose connective tissue
5. The layer of the epidermis that contains dividing cells (which produce the more superficial layers) is the _____.	stratum basale (or stratum germinativum)
6. The deepest layer of the epidermis is the _____.	stratum basale (or stratum germinativum)
7. The majority of the cells of the epidermis are _____, so-called because they make _____.	keratinocytes; keratin
8. Melanocytes in the _____ (which layer?) produce two versions of the pigment, melanin.	stratum basale (or stratum germinativum)
9. Melanin can be decorative, but its major function in skin is to _____.	shield DNA from UV light
10. Most of the melanin in skin is in _____ (what cell type).	keratinocytes
11. Our most superficial touch receptors are the _____, found in the _____ of the epidermis.	Merkel cells; stratum basale (or stratum germinativum)
12. Cells in the _____ layer of the epidermis are joined by tight junctions and desmosomes which give the epidermis its strength.	stratum spinosum
13. Immune cells in the stratum spinosum which protect against invaders are the _____.	Langerhans' cells (or dendritic cells)
14. The keratinocytes in the _____ of the epidermis degrade some toxic chemicals, if they have been absorbed by the skin.	stratum spinosum
15. In the _____ of the epidermis, keratinocytes begin to accumulate keratohyaline, which is necessary for keratin production, and to degrade their nuclei and organelles in their final living actions.	stratum granulosum
16. Unlike in the skin, the outermost cells of epithelia that are not exposed to air (and so remain wet or moist) are _____.	alive
17. Keratinocytes in the _____ of the epidermis produce lamellated granules filled with a water-proofing glycolipid. <Note: if you can't figure out the meaning of the word - or any other word in these review questions - you should look them up!>	stratum granulosum
18. A very thin layer called the _____ is in the epidermis but is visible only in thick skin: it is just superficial to the stratum granulosum.	stratum lucidum

19. Keratin cross-linking begins in the _____ of the epidermis, and continues as the cells are pushed outward, until each cell is filled with a large, cross-linked mass.	stratum lucidum
20. The most superficial layer of the epidermis is called the _____, and forms a waterproof shell around the body.	stratum corneum
21. Three quarters of the epidermal thickness is accounted for by the _____.	stratum corneum
22. The first level of protection against abrasion and toxic chemicals at the body's surface is provided by the _____.	stratum corneum
23. The dermis consists of two layers: the _____, which is characterized by a dimpled interface with the epidermis, and the _____, which accounts for 80% of the skin's thickness.	papillary layer; reticular layer
24. The two major fibers found in the dermis are _____ fibers, which provide its strength, and _____ fibers, which allow it to resume its original shape after stress or stretch.	collagen; elastic
25. Many of the molecules in the dermis bind _____, which give it a resilient, shock-absorbing quality.	water
26. The _____ of the dermis contains capillary loops from which nutrients diffuse to nourish the epidermis.	papillary layer
27. The papillary layer of the dermis contains _____ and _____ to sense gentle contact with objects in the environment.	Meissner's corpuscles; free nerve endings
28. The reticular layer of the dermis contains _____ and _____ to sense firm pressure.	Pacinian corpuscles; Ruffini's corpuscles
29. True or false: the dermis has a rich blood supply.	TRUE
30. Three pigments contribute to skin color: two types of _____ and, to a lesser degree, _____.	melanin; carotene
31. In addition to skin pigments, _____ also contributes to skin color, especially in fair-skinned individuals.	hemoglobin
32. A yellow complexion, including a yellow tone to the whites of the eyes, is called _____ and is due to a build up of _____ in the blood following liver malfunction.	jaundice; bile
33. Lack of circulation or low levels of hemoglobin cause _____, in which non-pigmented areas of the skin look white.	pallor
34. Excessive dilation of the surface blood vessels or binding of carbon monoxide to hemoglobin (which causes it to look oxygenated, even when it is not) cause _____, in which non-pigmented areas of skin look red.	flushing
35. Poor blood oxygenation causes _____, in which non-pigmented areas of skin look blue.	cyanosis
36. Apocrine and eccrine glands are both _____ (sweat) glands.	sudoriferous

37. Sudoriferous glands are _____ glands, meaning that their products enter the duct via exocytosis.	merocrine
38. 99% of the volume secreted by _____ (a type of sweat gland), is water.	eccrine glands
39. _____ glands are sudoriferous glands that are found in the axillary and anogenital regions of adults, and which secrete a nutrient broth for bacteria.	Apocrine
40. The ducts of _____ (a type of sweat gland) open into hair follicles, rather than directly onto the skin's surface.	apocrine
41. _____ glands are modified apocrine glands which produce a waxy substance to protect the ear canal from dust, small insects, etc.	Ceruminous
42. _____ are modified sweat glands which produce milk.	Mammary glands
43. _____ glands secrete an anti-bacterial oil onto the hair shafts and skin.	Sebacious
44. Sebacious glands are _____ glands, which means that the cells rupture in order to spill their contents into the duct.	holocrine
45. Sebacious glands are found on all skin, except for the _____ and _____.	palms; soles
46. The portion of the hair that is above the surface of the skin is called the _____.	hair shaft
47. The sub-surface portion of the hair is called the _____.	root
48. The origin of the hair shaft, deep within the dermis, is called the _____.	hair bulb
49. The sheath in which a hair is held is called a(n) _____.	follicle
50. The hair follicle is composed of cells from the _____ (which tissue layer in general?), but deep within the follicle, at the hair matrix, only cells of the _____ (which layer, specifically?) are present.	epidermis; stratum basale
51. In hair, cell division occurs only in the _____.	hair matrix
52. In the hair, pigment is made by melanocytes and exported to keratinocytes in the _____, within the hair bulb.	hair matrix
53. The _____ is a sensory nerve cluster that wraps each hair bulb, allowing the hair to serve as a sensitive touch receptor.	root hair plexus
54. The length of a hair's growth cycle determines the _____ of the hair.	length

55. The muscles that allow hairs to 'stand on end' (and which cause goose bumps) are the _____.	arrector pili
56. Pale, fine hair like that found on the face of a child is _____ hair.	vellus
57. Coarse hair, such as the hair of the head, a man's beard, etc., is called _____ hair.	terminal
58. Loss or thinning of hair is called _____.	alopecia
59. The growth of finger- and toenails occurs in the _____.	nail matrix
60. Finger- and toenails are composed of _____.	dead, keratinized cells
61. Excess heat can be removed from the body by [dilation/constriction] of blood vessels in the skin.	dilation
62. Vitamin D can be manufactured by blood vessels in the _____, if the area is exposed to _____ (from sunlight, usually).	dermis; UV light
63. The least malignant and most common skin cancer is _____.	basal cell carcinoma
64. _____ results from transformation of cells of the stratum basale leading to invasive, uncontrolled growth.	Basal cell carcinoma
65. _____ results from transformation of cells in the stratum spinosum leading to invasive, uncontrolled growth.	Squamous cell carcinoma
66. Squamous cell carcinomas _____ and _____ if not removed.	grow rapidly; metastasize
67. Squamous cell carcinomas are found most frequently on the _____, _____, and _____.	scalp, ears, lower lip
68. _____ is the most dangerous type of skin cancer. It can be cured easily by excision until it metastisizes, after which the prognosis is poor.	Melanoma
69. Melanomas can often be spotted by application of the ABCD(E) rule. The letters refer to: _____, _____, _____, _____ and _____.	asymmetry, borders that are irregular, color variations, diameter over 6 mm, and elevation above the surface
70. In a(n) _____ burn, only the epidermis is damaged.	first degree
71. In a(n) _____ burn, the epidermis and upper region of the dermis are damaged. Blistering is common.	second degree
72. In a(n) _____ burn, the entire thickness of the skin (and possibly underlying tissue) is damaged.	third degree

73. Burns are considered critical if over _____ of the body has second degree burns.	25%
74. Burns are considered critical if over _____ of the body has third degree burns.	10%
75. Burns are considered critical if there are third degree burns on the _____.	face, hands or feet
76. The area of a body covered by a burn is estimated using _____, which divides the body into regions each containing a defined amount of the total body area.	the rule of nines
77. In advanced age, there are _____ dermal papillae.	fewer and/or smaller
78. In advanced age, the amount of dermal _____ decreases, and the fibers become thicker and disorganized.	elastin (or elastic fibers)
79. In advanced age, some cells in the skin will have responded to DNA damage by arresting _____ and altering gene expression, while others may be _____.	growth; pre-cancerous

1. True / False: Nutrients for cells within skeletal cartilage are not delivered directly to the cells by the blood, but must instead diffuse from a remote region.	TRUE
2. True / False: Skeletal cartilage is avascular.	TRUE
3. True / False: Skeletal cartilage is innervated.	FALSE
4. Skeletal cartilage is enclosed by the _____, which is made of _____, so that it can resist outward expansion.	perichondrium; dense irregular connective tissue
5. _____ cartilage covers ends of long bones.	Articular
6. _____ cartilage connects the ribs to the sternum.	Costal
7. _____ cartilage makes up the larynx and reinforces air passages.	Respiratory
8. _____ cartilage supports the nose.	Nasal
9. Articular cartilage is composed of _____.	hyaline cartilage
10. Costal cartilage is composed of _____.	hyaline cartilage
11. Respiratory cartilage is composed of _____.	hyaline cartilage
12. Nasal cartilage is composed of _____.	hyaline cartilage
13. _____ cartilage is strong, moderately flexible, and resilient, but does not stretch or bend very far.	Hyaline
14. _____ cartilage is fairly strong, very flexible, and somewhat stretchable.	Elastic
15. _____ <which type of cartilage?> is very strong and extremely resistant to compression, but does not stretch or bend.	Fibrocartilage
16. The external ear and epiglottis are made of _____ cartilage.	elastic
17. The shock-absorbing cartilage in the knee and between the vertebral disks is made of _____.	fibrocartilage
18. In _____ growth, cells in the perichondrium secrete matrix against the external face of existing cartilage.	appositional
19. In _____ growth, lacunae-bound chondrocytes divide and secrete new matrix.	interstitial

20. Calcification (in which cartilage becomes bone) occurs at two times: _____ and (less desirably) _____.	during bone growth; in old age
21. The bones of the skull, rib cage, and vertebral column make up the _____ skeleton.	axial
22. The bones of the limbs, shoulders, and hips make up the _____ skeleton.	appendicular
23. Bones are classified by shape as being _____, _____, _____ or _____.	long, short, flat, irregular
24. Bones provide support, protection, and leverage for movement: in addition, they serve two other purposes, _____ and _____.	mineral storage; blood formation
25. The tubular shaft that forms the axis of long bones is called the _____, which is composed of _____ bone surrounding a central _____.	diaphysis; compact; cavity
26. _____ is found in the central (medullary) cavity of an adult's long bones, and is composed of fat.	Yellow marrow
27. The _____ are the expanded ends of long bones: The exterior is _____ bone, and the interior is _____ bone.	epiphyses; compact; spongy (or cancellous)
28. Cancellous bone is found in the _____ of long bones.	epiphyses
29. The exterior surface of the epiphyses of long bones is covered with _____ cartilage.	articular or hyaline
30. The line that separates the diaphysis from the epiphysis in a long bone is called the _____.	epiphyseal line
31. The perimeter of the bone is covered with a two-layered membrane called the _____.	periosteum
32. The periosteum's outer layer is composed of _____.	dense irregular connective tissue
33. The periosteum's inner layer is composed of _____ whose job is to remodel the surface of the bone.	osteoblasts and osteoclasts
34. True / False: The periosteum has an extensive vasculature.	TRUE
35. True / False: The periosteum is highly innervated.	TRUE
36. True / False: The periosteum lacks lymphatic vessels.	FALSE
37. The periosteum is held to the bone by _____ fibers.	Sharpey's or perforating
38. The inner surface of the bone, where it meets the marrow, is covered by a delicate membrane called the _____.	endosteum

39. Flat bones contain bone marrow between the _____ (bony bridges of spongy bone).	trabeculae
40. Flat bones are thin plates of periosteum-covered compact bone on the outside with endosteum-covered _____ called _____ on the inside.	spongy bone; diploë
41. In infants, red marrow, which makes blood cells, is found in the _____ and _____.	medullary cavity; all areas of spongy bone
42. In adults, red marrow is found in the _____, _____ and _____. The rest has been replaced by yellow marrow.	diploë of flat bones; head of the femur; head of the humerus
43. A canal is also a(n) _____.	passage or opening through a bone
44. On a bone, a(n) _____ is a structure which protrudes from a bone. These are often named for what they protrude toward.	process
45. On a bone, a(n) _____ is similar to a process, but is usually named for the bone on which it is found.	protuberance
46. On a bone, a(n) _____ is also similar to a process, but is one which articulates with another bone and allows motion between them.	condyle
47. On a bone, a(n) _____ is a narrow ridge. A(n) _____ is a smaller version.	crest; line
48. On a bone, a(n) _____ is a deep groove or notch.	fissure
49. On a bone, a(n) _____ is a large, rounded projection. A small, rounded projection is called a(n) _____.	tuberosity; tubercle
50. On the femur, a(n) _____ refers to a large, blunt, unevenly shaped process.	trochanter
51. A raised area on a condyle is called a(n) _____.	epicondyle
52. A sharp, axe-like or needle-like projection on a bone is called a(n) _____.	spine
53. A bony bulb or structure on a narrow neck is called a(n) _____.	head
54. The flat, smooth face on a bone where it meets another bone is called a(n) _____.	facet
55. Compact bone consists of long, multi-layered cylinders called _____, surrounding a central, blood-vessel and nerve-containing canal called the _____.	osteons (or the Haversian systems); Haversian canal
56. Blood vessels and nerves may move from one Haversian canal to another by detouring through a(n) _____.	perforating (or Volkmann's) canal
57. Osteocytes in lacunae within an osteon maintain contact with one another by extending processes through _____.	canaliculi

58. Bone-building cells are called _____.	osteoblasts
59. Cells that dissolve bone are called _____.	osteoclasts
60. Young, dividing cells usually have names that end in _____; mature cells usually have names that end in _____.	blast; cyte
61. Mature bone cells are called _____.	osteocytes
62. The unmineralized, organic substances which makes up roughly 1/3 of the bone matrix is called _____.	osteoid
63. _____ in bone serves several purposes: it provides flexibility, stretch and twist resistance, and - since neighboring molecules are connected by bonds that can break and re-form - shock resistance.	Collagen
64. The fibers in adjacent lamella within an osteon spiral in _____ to provide resistance to twisting forces.	different directions
65. _____ is responsible for bone hardness and its resistance to compression.	Hydroxyapatite (or 'calcium phosphate and other mineral salts')
66. The body's main reserve store of calcium and phosphate buffer is _____.	bone
67. When, during development, bone forms within a fibrous membrane, the process is called _____.	intramembranous ossification
68. Most bone is formed by calcification of hyaline cartilage, a process called _____.	endochondral ossification
69. During long bone formation, calcification of the _____ begins before any other region of the bone.	diaphysis
70. Long bone growth involves two major processes _____ and _____.	growth; remodeling (or resorption)
71. Long bones get thicker in a process called _____ growth, which is the task of the osteoblasts in the _____.	appositional; periosteum
72. The length of long bones is increased by calcification of cartilage within each epiphysis, on the cartilage surface that is [closest to / farthest from] the diaphysis.	closest to
73. A 'remodeling unit' in a bone consists of an adjacent _____ and _____.	osteoblast; osteoclast
74. Remodeling units are found at the _____ and _____ surfaces.	periosteal; endosteal
75. Resorption involves osteoclast secretion of _____ that convert calcium salts into soluble forms and _____ that digest the organic matrix (collagen, etc.).	acids; lysosomal enzymes
76. In children, long bone growth occurs primarily at the _____.	epiphyseal plate

77. The epiphyseal plate is replaced by bone to form the epiphyseal line under the influence of _____.	sex hormones (or testosterone or estrogen)
78. Formation of gender-specific skeletal structures (wide hips in female, etc.) are triggered by _____.	sex hormones (or testosterone or estrogen)
79. Two types of signal induce bone remodeling: _____ and _____.	chemical or hormonal; physical or mechanical or flexion
80. Spongy bone is completely replaced every _____; compact bone, every _____ or so.	3-4 yrs; 10 years
81. The two opposing hormones which are the primary controls of bone calcification or decalcification are _____ (which pulls calcium from bone) and _____ (which adds calcium to bone).	PTH (or parathyroid hormone); calcitonin
82. The fact that a bone will thicken and strengthen in response to the stress placed upon it is called _____.	Wolff's Law
83. A bone break that shatters the bone into several pieces is a(n) _____ fracture.	comminuted
84. A crushing injury to a bone is a(n) _____ fracture.	compression
85. A fracture resulting from twisting is a(n) _____ fracture.	spiral
86. Separation of the diaphysis and epiphysis is a(n) _____ fracture (and occurs in children).	epiphyseal
87. A blow to the head often results in a(n) _____ fracture.	depression
88. An incomplete break is called a(n) _____ fracture.	greenstick
89. Put the following events of fracture repair in the correct order: (A) spongy bone formation (B) bone remodeling (C) hemotoma formation (D) fibrocartilage deposition and capillary formation <Note: do not memorize the letter-order in the answer to this question, know the events!>	C, D, A, B
90. _____ is due to improper bone calcification, and leads to soft, weak bones. It is usually due to a dietary deficiency.	Osteomalacia
91. _____ results from over-active bone remodeling. The result is too much spongy bone (and too little compact bone) and bone deformities due to the formation of new structures.	Paget's disease
92. In _____, bone resorption outpaces deposition. It leads to extremely brittle bones and is very common in advanced old age.	osteoporosis
93. True / False: Drugs have been developed which can prevent osteoporosis if it is caught early.	TRUE
94. True / False: Endurance exercise is more effective than weight-lifting in the prevention of osteoporosis.	FALSE

95. True / False: Ossification of the skeleton occurs in such a predictable pattern that it can be used to determine fetal age.	TRUE

1. _____ are formed by the articulation of two cranial bones.	Sutures
2. Sutures are formed <when?> _____.	within a year or two of birth
3. Prior to suture formation, the cartilage-filled spaces between cranial bones are called _____.	fontanels
4. The _____ is formed by the top and sides of the cranium.	cranial vault
5. A sinus is a(n) _____.	cavity inside a bone
6. A fossa is _____.	a depression or indentation
7. The cranial fossae are _____.	depressions in the floor of the cranium
8. A foramen (pl. foramina) is _____.	a passage or opening through a bone
9. A septum is _____.	a dividing wall or structure
10. The _____ forms the forehead.	frontal bone
11. The _____ forms the superior aspect of each orbit (eye socket).	frontal bone
12. The _____ forms the anterior cranial fossa.	frontal bone
13. The _____ articulates posteriorly with the parietal bones via the coronal suture	frontal bone
14. In the region just deep to the eyebrows, _____ are present which allow nerves and arteries to pass.	supraorbital foramina
15. The _____ bone contains the frontal sinus.	frontal
16. The area of bone <where?> _____ is called the glabella.	just above the bridge of the nose
17. The two mirror-image bones which form much of the superior & lateral portions of the skull are the _____ bones.	parietal
18. The coronal suture is formed by articulation of <which bones>?	parietal and frontal bones

19. The sagittal suture is formed by articulation of <which two bones>?	the two parietal bones
20. The lambdoid suture is formed by articulation of <which bones>?	occipital and parietal bones
21. The squamosal suture is formed by articulation of <which two bones>?	parietal and temporal bones
22. The _____ suture is formed by articulation of the parietal and frontal bones.	coronal
23. The _____ suture is formed by articulation of the two parietal bones.	sagittal
24. The _____ suture is formed by articulation of the occipital and parietal bones.	lambdoid
25. The _____ suture is formed by articulation of the parietal and temporal bones.	squamosal
26. The posterior and base of the skull is formed by the _____ bone.	occipital
27. The foramen magnum is the _____ <physiology, not anatomy>.	passageway through which the spinal cord leaves the skull
28. The foramen magnum is the _____ <anatomy, not physiology>.	largest opening in the occipital bone
29. Cranial nerve XII leaves the skull via small openings immediately lateral to the foramen magnum which are called the _____.	hypoglossal canals
30. The function of the occipital condyles is to _____.	articulate with C1 (the first vertebra) to allow the head to nod
31. The external occipital protuberance and crest and the nuchal lines are _____ <physiology, not anatomy>.	sites of muscle and ligament attachment
32. The two mirror-image bones which form the inferolateral aspect of skull and part of the middle cranial fossa are the _____ bones.	temporal
33. The _____ of the _____ bone forms the posterior section of the zygomatic arch.	zygomatic process; temporal
34. The mandible articulates with the _____ of the temporal bone.	mandibular fossa
35. The external acoustic meatus is the _____ in the _____ bone.	canal leading to the eardrum; temporal
36. The hyoid bone is attached by ligaments to the _____ of the _____ bone.	styloid process; temporal

37. The facial nerve leaves the cranial cavity through the _____ in the _____ bone.	stylomastoid foramen; temporal
38. The _____, which are passages for the optic nerve and ophthalmic arteries, are found in the _____ bone.	optic canals; sphenoid
39. The hypophyseal fossa, a depression in a region of the _____ bone called the _____, is the seat for the pituitary gland.	sphenoid; sella turcica
40. The anterior clinoid process of the _____ bone serves as _____.	sphenoid; anchoring point for the brain
41. The foramen rotundum of the _____ bone serves as _____.	sphenoid; passageway for the nerves innervating the maxillary region of the face
42. The _____ bone forms part of the anterior cranial fossa, the superior portion of the nasal septum, the lateral walls and roof of nasal cavity, and part of the medial wall of the orbits.	ethmoid
43. The crista galli is <physiology> _____.	an attachment point for the meninges
44. The crista galli is a small crest on the _____ bone.	ethmoid
45. The cribriform plate is a surface filled with small foramina on the _____ bone.	ethmoid
46. The cribriform plate contains <physiology> _____.	passages for nerve filaments of the olfactory (sense of smell) nerves
47. The superior and middle nasal concha are regions of the _____ bone.	ethmoid
48. The nasal concha create _____, which increases the ability of the nose to trap dust, preventing it from reaching the lungs.	turbulence
49. The temporalis muscle, which helps close the jaw, attaches to the _____ of the mandible.	coronoid process
50. The _____ of the mandible articulate with the temporal bone.	mandibular condyles
51. During development, the two halves of the mandible fuse to form the _____.	mandibular symphysis
52. Mandibular alveoli serve as _____.	sockets for the teeth
53. The inferior alveolar nerves (which innervate the teeth of the lower jaw) travel through the _____ of the mandible.	mandibular foramina
54. Blood vessels and nerves reach the chin and lower lip through the _____ of the mandible.	mental foramina

55. The _____ bones are found deep to the upper lip; they form part of the 'cheekbone' and the lateral aspects of the bridge of the nose.	maxilla
56. The maxilla includes a canal for the passage of nerves and blood vessels whose entrance, the _____, is found in the roof of the mouth.	incisive fossa
57. The _____ of each _____bone form the anterior portion of the hard palate (the bony part of the roof of the mouth).	palatine processes; maxilla
58. In each orbit, the _____, whose inferior edge is formed by the maxilla, provides a passageway for nerves and blood vessels.	inferior orbital fissure
59. There is a(n) _____ on each maxilla, inferior to the orbit, to allow passage for nerves and blood vessels to the face.	infraorbital foramen
60. The _____ bone, together with the temporal bone and maxilla, forms the bony part of each cheek.	zygomatic
61. The mirror-image bones that form the anterior aspect of the bridge of the nose are the _____ bones.	nasal
62. Each orbit is formed, in part, by a small bone called the _____ bone, which contains tunnels leading into the nose called the _____ to allow tear drainage.	lacrimal; nasolacrimal canals
63. The L-shaped palatine bones form the _____.	posterior of the hard palate
64. The palitine bones have a process which extends all the way to the _____.	orbits
65. The bones of the skull which contain one or more sinuses are the _____, _____, _____ and _____ bones.	frontal, ethmoid, sphenoid, maxilla
66. The hyoid is unusual because it is the only bone in the body that _____.	doesn't articulate with another bone
67. The hyoid is fastened to the _____ of the _____ by ligaments.	styloid processes; temporal bones
68. The hyoid plays a role in _____ and _____.	swallowing; speech
69. There are _____ cervical vertebrae, _____ thoracic vertebrae, and _____ lumbar vertebrae.	7; 12; 5
70. All of the thoracic vertebrae articulate with _____.	ribs
71. The laminae and pedicles of each vertebra makes up the _____.	vertebral arch
72. The spinal cord passes through the _____ of each vertebra.	vertebral foramen

73. The _____ region of the vertebrae is called the body or centrum.	weight-bearing
74. Vertebrae articulate with one another via projections from their upper and lower surface called _____ and _____, respectively.	superior articular processes; inferior articular processes
75. The _____ are formed by notched areas on two articulated vertebrae, and provide passages through which spinal nerves to leave the spinal cord.	intervertebral foramina
76. Distinguishing features of the cervical vertebrae include the _____, which provide a bony channel for blood vessels supplying the brain.	transverse foramen
77. The first cervical vertebra is called _____; the superior surfaces of the lateral masses articulate with the _____ of the skull.	the atlas; occipital condyles
78. The articulation between C1 and the skull allows <what motion>?	nodding of the head
79. The unusual feature that makes identification of C2 easy is _____.	the dens (or odontoid process)
80. The function of the odontoid process is to _____.	serve as a pivot during side to side head-shaking
81. The vertebral foramina of cervical vertebrae are _____ <what shape?>.	triangular
82. The body of a cervical vertebra is _____ <what shape?>.	oval
83. The spinous processes of most cervical vertebrae are _____.	forked
84. The vertebral foramina of thoracic vertebrae are _____ <what shape?>.	round
85. The spinous processes on _____ are long, thin, blade-like structures.	thoracic vertebrae
86. Inter-vertebral articulation of thoracic vertebrae allows _____ <what motion(s)>.	rotation
87. Inter-vertebral articulation of thoracic vertebrae does **not** allow _____ <what motion(s)>.	flexion and extension
88. Superior articular processes on thoracic vertebrae have the facet facing in a(n) _____ direction.	posterior
89. Inferior articular processes on thoracic vertebrae have the facet facing in a(n) _____ direction.	anterior
90. Superior articular processes on lumbar vertebrae have the facet facing in a(n) _____ direction.	medial

91. Inferior articular processes on lumbar vertebrae have the facet facing in a(n) _____ direction.	lateral
92. Inter-vertebral articulation of lumbar vertebrae allows _____ <what motion(s)>.	flexion and extension
93. Inter-vertebral articulation of lumbar vertebrae does not allow _____ <what motion(s)>.	rotation
94. The spinous processes on _____ are short and flat, like an axe blade.	lumbar vertebrae
95. The vertebral foramina of lumbar vertebrae are _____ <what shape?>.	oval or diamond
96. The sacrum consist of _____ vertebrae.	five fused
97. The _____ is inferior to the sacrum and articulates with it.	coccyx
98. Continuous bands of connective tissue which cover the front and back of the vertebral column are called the _____.	anterior and posterior longitudinal ligaments
99. The nucleus pulposus is the _____.	inner gelatinous core of an intervertebral disc
100. The annulus fibrosus is the _____.	outer, fibrocartilage layer of an intervertebral disc
101. The _____ is the inner gelatinous core of an intervertebral disc.	nucleus pulposus
102. The _____ is the outer, fibrocartilage layer of an intervertebral disc.	annulus fibrosus
103. An abnormal mediolateral curvature of the vertebral column is called _____.	scoliosis
104. An abnormal increase in the thoracic curvature of the vertebral column is called _____.	kyphosis
105. An abnormal increase in the lumbar curvature of the vertebral column is called _____.	lordosis
106. The thoracic cage is formed from the _____, _____, _____ and _____.	thoracic vertebrae, ribs, costal cartilages, and sternum
107. The sternum is formed by the fusion of three bones: the _____, _____, and _____.	manubrium, body, xiphoid process
108. The 'true ribs' are so-called because _____.	they are connected directly to the sternum

109. The 'false ribs' are so-called because _____.	they do not connect directly to the sternum
110. The two false ribs which do not have an anterior connection at all are the _____ ribs.	floating
111. Ribs _____ to _____ are the true ribs.	1; 7
112. The _____ and _____ of each rib articulates with one or more vertebrae.	head; tubercle
113. True / False An adult's skull has more bones than the infant's.	FALSE
114. At birth, sutures are not present and the bones of the fetal skull are connected by _____.	fontanels
115. The _____ fontanel is formed at the intersection formed by the two parietal bones and the two halves of the fetal frontal bone.	frontal or anterior
116. The _____ fontanel is formed at the intersection formed by the two parietal bones and the occipital bone.	posterior
117. The _____ fontanel is formed at the intersection of a parietal bone, the occipital bone, and a temporal bone.	mastoid
118. The _____ fontanel is formed at the intersection formed by a parietal bone, the frontal bone, a temporal bone, and the sphenoid bone.	sphenoid
119. The _____ and _____ in the fetal face are unfused.	mandible; maxilla
120. True / False Only the thoracic and sacral spinal curvatures are present in the newborn.	TRUE
121. True / False Only the lumbar and cervical spinal curvatures are present in the newborn.	FALSE
122. The _____ forms the lower part of the nasal septum and is also visible when the skull is viewed inferiorly.	vomer

1. The upper limbs are attached to the trunk by the _____.	pectoral girdle or shoulder girdle
2. The lower limbs are attached to the trunk by the _____.	pelvic girdle
3. The shoulder girdle consists of the _____ and the _____.	scapulae; clavicles
4. The lateral end of the clavicle articulates with the _____ of the _____.	acromion; scapula
5. The medial end of the clavicle articulates with the _____.	sternum (or manubrium)
6. Shoulder blade' is the common term for the _____.	scapula
7. The scapulae articulate with the _____ and the _____.	clavicle; humerus
8. The scapulae articulate only indirectly with the axial skeleton via the _____. Thus, they exhibit a large range of motion.	clavicle
9. The _____ of the scapula articlates with the clavicle.	acromion
10. The _____ of the scapula articulates with the humerus.	glenoid cavity
11. The _____ of the scapula serves as an attachment point for the biceps of the arm (the biceps brachii).	coracoid process
12. The suprascapular notch of the scapula is important because it _____.	serves as a nerve passageway
13. The upper limb consists of the arm (_____), forearm (_____), and hand (_____).	brachium; antebrachium; manus
14. The _____ is the only bone in the arm (using the word 'arm' in its anatomical sense, not in the common sense).	humerus
15. The humerus articulates with the _____, _____, and _____.	scapula; radius; ulna
16. The proximal end of the humerus includes the _____, which articulates with the scapula, and the greater and lesser _____, which serve as attachment points for muscles.	head; tubercles
17. The proximal end of the humerus includes a large groove called the _____, which guides a tendon of the biceps to its attachment site.	intertubercular groove
18. The large bump in the central region of the humerus is an attachment point for the major muscle of the shoulder, the deltoid, and is called the _____.	deltoid tuberosity

19. At the distal end of the humerus are two epicondyles which serve as attachment sites for ligaments and muscles. The _____ epicondyle is the larger of the two.	medial
20. The distal end of the humerus includes two condyles: one is the medial _____, which has an indentation in the center and which articulates with the ulna.	trochlea
21. The distal end of the humerus includes two condyles: one is the lateral _____, which looks like a ball in the anterior view and articulates with the radius.	capitulum
22. The distal end of the humerus includes two shallow indentations called the _____ and _____ fossae, which allow the ulna to move freely though a full range of motion.	coronoid; olecranon
23. The medial bone of the forearm is the _____.	ulna
24. The lateral bone of the forearm is the _____.	radius
25. The largest bone palpable in the posterior elbow is the _____ of the _____.	olecranon process; ulna
26. The _____ at the proximal end of the _____ articulates tightly with the trochlea of the humerus.	trochlear notch; ulna
27. At the distal end of the ulna is the sharp _____ of the _____, from which ligaments run to the wrist.	styloid process; ulna
28. The radius is widest at its _____ end.	distal
29. The superior surface of the _____ of the _____ articulates with the capitulum of the humerus.	head; radius
30. At the distal end of the radius is the somewhat rounded _____ of the _____ which is an attachment site for ligaments of the wrist.	styloid process; radius
31. At the proximal end of the radius is a bump called the _____ to which the biceps of the arm attaches.	radial tuberosity
32. The hand contains three types of bone: the _____ of the fingers, the _____ of the palm, and the _____ of the wrist.	phalanges; metacarpals; carpals
33. The scaphoid, lunate, triquetral, pisiform, trapezium, trapezoid, capitate, and hamate form the _____.	carpus (or wrist)
34. The five fingers are numbered so that the thumb is number _____.	1
35. The heads of the metacarpals articulate with the _____.	phalanges
36. The _____ does not contain a middle phalanx.	thumb (or pollex)

37. The hip bones are called the _____, and are actually formed by fusion of three bones: the _____, _____ and _____.	coxal bones (or os coxae); ischium; ilium; pubis
38. The _____ is formed by the two hip bones, the sacrum, and the coccyx.	pelvis
39. Three bones fuse to form each coxal bone. The superior portion of the coxal bone is formed by the _____.	ilium
40. The ilium is divided into two regions, the wing-like _____ at the top and the inferior _____.	ala; body
41. The _____ of the ilium articulates with the sacrum.	auricular surface
42. The _____, formed by all three bones that make up the coxal bone, articulates with the femur.	acetabulum
43. Two structures that on slender individuals can easily be seen as features of surface anatomy are the _____ and _____ of the ilium.	iliac crest; anterior superior iliac spine
44. The iliac spines serve as _____.	attachment points for muscles
45. The _____ forms part of the 'pelvic brim,' which marks the boundary between the lower 'true pelvis' and the upper 'false pelvis.'	arcuate line
46. The _____ forms the posteroinferior portion of the coxal bone.	ischium
47. The ischial spine serves as _____.	attachment points for muscles
48. The lesser sciatic notch of the _____ serves as a(n) _____.	ischium; passageway for nerves and blood vessels (to the anogenital region)
49. The _____ bears one's weight when one is sitting.	ischial tuberosity
50. The _____ forms the anteroinferior part of the coxal bone.	pubis
51. The _____ of the _____ is the articulation point for the two coxal bones.	pubic symphysis; pubis
52. The very large openings in each os coxa is called the _____. Its name means, 'closed.'	obturator foramen.
53. The cavity of the _____ in women is broad, to allow room for a baby's head during birth.	true pelvis
54. The _____ in the female pelvis is often moveable.	coccyx

55. The pubic arch in the _____ is wide and shallow.	female
56. True/False The thigh is a part of the anatomical 'leg.'	FALSE
57. The largest and strongest bone in the body is the _____.	femur
58. The femur articulates proximally with the _____ and distally with the _____.	hip (or coxal bone, os coxa, or acetabulum); tibia
59. The head of the femur is anchored to the acetabulum by a small ligament which attaches at the _____ of the femur's head.	fovea capitis
60. The phrase 'broken hip' usually refers to a fracture of the _____ of the _____.	neck; femur
61. Two prominent bumps which serves as attachment sites for muscles of the thigh and buttock are found on the proximal end of the femur, and are called _____.	the greater and lesser trochanters
62. The _____ and _____ of the femur articulate with the tibia.	lateral condyle; medial condyle
63. The _____ of the femur articulates with the 'knee cap.'	patellar surface
64. The _____ (knee cap) _____ and increases the _____.	patella; protects the knee; leverage of the quadriceps femoris
65. Which bones are found in the anatomical leg?	tibia; fibula
66. The tibia articulates with the _____, the _____, and the bones of the _____.	fibula; femur; ankle (or tarsus)
67. The weight-bearing bone of the leg is the _____.	tibia
68. The _____ side of the _____ condyle of the tibia articulates with the fibula.	inferolateral; lateral
69. The _____ of the tibia is the site at which the 'knee cap' is attached.	tibial tuberosity
70. The _____ of the tibia is the 'shinbone.'	anterior crest
71. The medial 'ankle bone' is actually the _____ of the _____.	medial malleolus; tibia
72. The notch on the distal end of the tibia is the _____, and is the site of articulation with the fibula.	fibular notch

73. The _____ of the fibula articulates with the proximal end of the tibia.	head
74. The lateral 'ankle bone' is actually the _____ of the _____.	lateral malleolus; fibula
75. The region of the fibula that articulates with the talus of the foot is the _____.	lateral malleolus
76. The foot is divided into three regions: the _____, _____, and _____.	toes; metatarsus; tarsus
77. The bones of the toes, like the bones of the fingers, are called _____.	phalanges
78. The talus, navicular, the three cuneiforms, the cuboid, and the calcaneus form the _____ and are collectively called the _____.	tarsus; tarsals
79. The major weight-bearing bones of the foot are the _____ and _____.	talus; calcaneus
80. The _____ of the foot articulates superiorly with the tibia and laterally with the fibula.	talus
81. The talus articulates inferiorly with the _____.	calcaneus
82. The digits of the foot, like those of the hand, are numbered from 1 to 5: the great toe is number _____.	1
83. The _____ and two _____ bones form the ball of the foot.	head of metatarsal 1; sesamoid
84. Each of the toes is composed of three phalanges except the _____.	hallux (or great toe, or first toe)
85. The three arches of the foot are the _____, _____, and _____.	lateral longitudinal; medial longitudinal; transverse
86. True / False A child's arms and legs grow more slowly than the head.	FALSE
87. One detrimental change in old age is that the costal cartilage (and other cartilage) may _____.	ossify (or calcify)
88. One detrimental change in old age is that bones lose _____.	mass (or density)
89. Bone loss due to age, in weight-bearing bones, can be delayed by _____ exercise (although recovery time between exercise sessions is crucial).	weight-bearing
90. Calcification of cartilage due to age can be delayed by _____ the cartilage regularly (although not frequently enough to cause irritation and inflammation).	flexing (or stretching, or using through full range of motion)

1. A(n) _____, or joint, is any site where two bones meet.	articulation
2. Joints are classified by two criteria: _____ and _____.	structure; function
3. The three structural classifications for joints are _____, _____, and _____.	fibrous; cartilaginous; synovial
4. The three functional classifications for joints are _____, _____, and _____.	synarthrotic; amphiarthrotic; diarthrotic
5. A joint that is immobile is a(n) _____ joint.	synarthrotic
6. A joint that allows only a small amount of movement is a(n) _____ joint.	amphiarthrotic
7. A freely movable joint is a(n) _____ joint.	diarthrotic
8. For _____ joints, there is no joint cavity and the joints themselves are synarthrotic or at most amphiarthrotic. The bones are joined by fibrous connective tissue and their function is more to prevent separation than to resist compression.	fibrous
9. Sutures are joints that are _____ (function) and _____ (structure).	synarthrotic; fibrous
10. If the fibrous connective tissue in a suture is lost and the bones completely fuse (as often happens in late adulthood), the joint is called a(n) _____ instead of a suture.	synostosis
11. If the connective tissue in any joint is lost and the bones fuse (as when a child stops growing and the ephyseal plate forms the epiphyseal line), the result is a(n) _____.	synostosis
12. _____ are fibrous joints that are either synarthrotic or amphiarthrotic: the bones are connected by a ligament. Examples include the articulations of the tibia with the fibula.	Syndesmoses
13. Articulations of the alveolar sockets of the mandible or maxilla with the teeth are _____.	gomphoses
14. Gomphoses are classified as _____ (function) and _____ (structure).	synarthrotic; fibrous
15. The ligament that connects a tooth to an alveolar socket is called a(n) _____ ligament.	periodontal
16. For _____ joints, there is no joint cavity and the bones are united by cartilage which functions to resist compression as well as prevent separation.	cartilaginous
17. When two bones are joined by hyaline cartilage which does not permit any movement to occur between them, the joint is called a(n) _____. An example would be the joints between the diaphyses and epiphyses of a child's long bones.	synchondrosis
18. In _____, hyaline cartilage covers the articulating surface of the bone and is fused to an intervening pad of fibrocartilage. As a result, the joint resists compression and separation while still allowing limited movement. The best examples are the _____.	symphyses; intervertebral joints

19. Most joints in the body are _____.	synovial
20. In synovial joints, the articulation of the bones is _____.	enclosed in a fluid-containing cavity
21. Synovial joints all include a layer of _____ covering the articulating bones, as well as a joint cavity filled with _____ and surrounded by a(n) _____. In addition, they are always strengthened by _____.	articular cartilage; synovial fluid; articular capsule; reinforcing ligaments
22. The stability of synovial joints is provided by _____, _____, and _____.	shape of the articular surface, ligaments, and muscle tone
23. _____ are flattened, fibrous sacs lined with synovial membranes and containing synovial fluid.	Bursae
24. _____ are common where ligaments, muscles, skin, tendons, or bones rub together, and allow for friction-free movement.	Bursae
25. A(n) _____ is an elongated bursa that wraps completely around a tendon, allowing it to slide and roll without friction and protecting it from damage due to contact with adjacent structures.	tendon sheath
26. The _____ of a muscle is its attachment to an immovable bone.	origin
27. The _____ of a muscle is its attachment to a bone that moves when the muscle is contracted.	insertion
28. Movements of synovial joints are classified according to way in which they move around a(n) _____.	axis
29. The joints of the wrist and ankle are _____: they are examples of the relatively few joints of this type that do not rotate around an axis, and so are classified as _____. They move by _____.	synovial; nonaxial; gliding
30. Bending the knee is _____ of the knee.	flexion
31. Straightening the knee is _____ of the knee.	extension
32. Moving the elbow dorsally is ____ of the shoulder.	extension
33. Moving the elbow ventrally is _____ of the shoulder.	flexion
34. Bending forward at the waist is _____ of the trunk.	flexion
35. Bending backward at the waist is _____ of the trunk.	hyperextension
36. Tilting the chin downward is _____ of the neck.	flexion

37. Tilting the chin upward is _____ of the neck.	hyperextension
38. Lifting the toes toward the back of the foot and the shin is _____ of the foot.	dorsiflexion
39. Extending the toes (e.g., tip-toeing) is _____ of the foot.	plantar flexion
40. Moving the limbs (or fingers) apart, away from the midline, is _____.	abduction
41. Moving the limbs (or fingers) together or toward the midline ('adding' them together, as it were) is _____.	adduction
42. Moving the hand or foot in a circular path, so that the outer surface of a cone is followed by the limb itself, is called _____.	circumduction
43. _____ rotation of the arm or leg so that the thumb or great toe moves toward the opposite limb.	Medial
44. _____ rotation moves the thumb or great toe to a position pointing away from the opposite limb.	Lateral
45. Shaking the head is an example of _____.	rotation
46. Turning the palm so that the radius and ulna are parallel (as you must do to hold, for example, a bowl of soup in the palm of your hand) is _____.	supination
47. Turning the palm so that the radius rotates over the ulna is _____.	pronation
48. To stand on the lateral edge of your foot, you would need to _____ your foot.	invert
49. To stand on the medial edge of your foot, you would need to _____ your foot.	evert
50. Closing your mouth and shrugging your shoulders are both examples of _____.	elevation
51. Opening your mouth or lowering your shoulders are both examples of _____.	depression
52. Jutting your jaw forward is an example of _____.	protraction
53. Pulling your jaw backward, toward the ear, is an example of _____.	retraction
54. Touching the thumb to a finger of the same hand is called _____.	opposition

55. Joints that allow nonaxial movements (gliding) are called _____ synovial joints. An example would be the wrist.	plane
56. A cylinder-in-trough joint structure is called a(n) _____ joint: a typical example is the elbow.	hinge
57. Movement of hinge joints is _____.	uniaxial
58. A joint in which the bone or one of its processes is in a sleeve or ring that allows rotations is called a(n) _____ joint. An example is the articulation of the dens (which is part of the axis) with the atlas.	pivot
59. A joint in which an oval projection on one bone fits into a concave surface of another is a(n) _____ joint. Movement of such joints is _____. (Good examples of such joints are the _____.)	condyloid (or ellipsoidal); multiaxial; proximal knuckles
60. A joint in which both bones have both convex and concave surfaces, so that one bone straddles the other and can rock back and forth or side to side, is a(n) _____ joint. The clearest example is the_____.	saddle; carpometacarpal joint at the base of the thumb
61. A joint in which a round head on one bone is actually held in a cup formed by the articulating bone, is called a(n) _____ joint. The best examples are the ____ and ____.	ball and socket; shoulder and hip joints
62. A(n) _____ connects a bone to a muscle, while a(n) _____ connects two bones or connects an organ to an anchoring point.	tendon; ligament
63. Which bone or bones articulate(s) with the distal end of the humerus?	Both the radius and ulna.
64. _____ prevent side to side movement in the elbow.	Ligaments
65. Much of the support for the elbow is supplied by _____ which cross and support the joint.	the tendons of several muscles
66. Stability of the elbow is provided by both _____ and _____.	muscles OR tendons; ligaments
67. Supination and pronation of the forearm are allowed by rotation of radial head within the _____.	annular ligament
68. At full extension, _____ resulting in a 'locked' knee that resists bending in the absence of muscle contraction.	the femur spins medially relative to tibia (or tibia spins laterally relative to femur)
69. The main movements that present a danger of knee injury are abnormal _____ or _____.	hyperextension; rotation
70. _____ are the main stabilizers of the knee.	Muscles
71. The glenoid fossa is very shallow. This has two effects: shoulder movement is _____, and the joint itself is _____.	maximized; destabilized or weakened or any synonym
72. While ligaments help to stabilize the shoulder, most stability is provided by _____.	tendons

73. The two groups of tendons which provide shoulder stability are the _____ and the four tendons which collectively are called the _____.	tendon of the biceps (brachii); rotator cuff
74. Most of the stability of the hip is due to _____.	(the shape of) the articular surfaces themselves
75. The second most important contributor to the stability of the hip is _____.	a group of ligaments which hold the femur into the acetabulum
76. The depth of the acetabulum is enhanced by _____.	a connective tissue rim OR the acetabular labrum
77. One of the ligaments of the hip is exceptionally important because _____.	it contains an artery which supplies blood to the head of the femur
78. A sprain is due to _____.	stretching or tearing of the ligaments of a joint
79. A torn ligament will repair itself _____ <when?>.	never
80. Cartilage damage is a problem because, since it is avascular, _____.	cartilage cannot support repair
81. Cartilage fragments created by damage can cause _____.	problems with joint mobility (or any synonymous phrase)
82. Most cartilage injuries must be treated with _____.	surgery
83. When two bones that normally articulate are separated forcibly, the injury is called a(n) _____. If the separation is incomplete (the bones resume their normal position in at least some angles of joint flexion), the disorder is called _____.	dislocation; subluxation
84. Bursitis is inflammation or irritation of the _____, which leads to mild to severe pain when the joint is flexed.	bursae
85. Tendinitis refers to inflammation of a(n) _____.	tendon
86. Tenosynovitis refers to inflammation of a(n) _____.	tendon sheath
87. When the joint itself becomes inflamed for any reason, the condition is called _____.	arthritis
88. The acute form of arthritis is usually caused by _____.	bacteria (or infection)
89. The chronic forms of arthritis are _____, which is a disease of overuse and age, _____, which is caused by a build up of uric acid crystals, and _____, which is an autoimmune disorder.	osteoarthritis; gout OR gouty arthritis; rheumatoid arthritis
90. The most common joint disease is _____.	osteoarthritis

91. The fundamental cause of osteoarthritis is that in aged or over-used cartilage, _____.	breakdown is faster than replacement or repair
92. The immune system's destruction of the body's joints is called _____.	rheumatoid arthritis
93. The first joint to be affected by gout in most affected individuals is _____.	the metatarsal-phalangeal joint of the great toe
94. In all forms of arthritis, lack of treatment presents the danger of _____.	joint fusion
95. To maximize joint health, activities that emphasize _____ and _____ are required.	full range of motion; recovery

1. The ability of a tissue or cell to receive and respond to stimuli is called _____ or _____.	excitability; irritability
2. The ability of a tissue or cell to forcefully shorten is called _____.	contractility
3. The ability of a tissue or cell to be stretched or extended is called _____; if it resumes its original shape or length afterward, the property which allows it to do so is called _____.	extensibility; elasticity
4. _____ muscle cells must be controlled independently, so that force can be modulated precisely to meet a need.	Skeletal (or voluntary)
5. Slow, sustained contractions are the specialty of _____ muscle.	smooth
6. Since _____ and _____ muscle cells can communicate with one another, not all of them must be individually supplied with instructions by a nerve.	smooth; cardiac
7. The most fatigue-resistant muscle cells are those of _____ muscle.	cardiac
8. Muscle cells are also called muscle _____.	fibers
9. Striations are seen in cardiac and skeletal muscle because the _____ are _____.	myofilaments; aligned
10. The myofibrils of _____ muscle are not aligned, so that the muscle appears to be _____.	smooth; smooth
11. Cardiac muscle fibers contain large numbers of _____, which allow them to have incredible endurance.	mitochondria
12. _____ muscle is found in hollow organs whose contents must be moved.	Smooth
13. Blood pressure is controlled by _____ muscle.	smooth
14. Much of the heat in the body is produced by _____ muscle.	skeletal (or voluntary)
15. (True/False) The biceps is considered to be a discrete organ. (Note: understand the concept, the muscle name could be different on a test.)	True (each muscle is a discrete organ)
16. A group of muscle fibers is called a muscle _____, which means 'bundle'.	fascicle
17. Within a skeletal muscle, a connective tissue membrane called the _____ surrounds each fascicle.	perimysium
18. _____ is a dense irregular connective tissue surrounding an entire skeletal muscle.	Epimysium

19. Each muscle fiber is enclosed in a delicate, areolar connective tissue sheath called the _____.	endomysium.
20. For many muscles, the connective tissue membranes within the muscle merge at the ends with a connective tissue 'rope' called a(n) _____.	tendon
21. A muscle's more mobile attachment is called the _____.	insertion
22. A muscle's more immobile attachment is called the _____.	origin
23. When a muscle attaches *directly* to a bone, rather than to a tendon which is attached to a bone, the _____ of the muscle fuses with the _____ of the bone.	epimysium; periosteum
24. A connective tissue structure that connects a muscle to a bone, and which is wide and flat, is called a(n) _____.	aponeurosis
25. A(n) _____ is a bundle of fibers (not muscle fibers) which carry electrochemical signals.	nerve
26. Each skeletal muscle is served by _____ nerve.	one
27. Each skeletal muscle is served by _____ artery and _____ vein.	one; more than one
28. A nerve or blood vessel usually enters a skeletal muscle in a(n) _____ location.	central
29. Place the following in order from small to large: myofibril, myofilament, muscle, fascicle, muscle fiber.	myofilament, myofibril, muscle fiber, fascicle, muscle
30. A(n) _____ is the smallest contractile unit of a skeletal muscle: it extends from one Z-disk to the next.	sarcomere
31. There are two types of _____, actin and myosin.	myofilament
32. Another name for 'thin myofilament' is _____.	actin
33. Another name for 'thick myofilament' is _____.	myosin
34. Skeletal muscle fibers are formed when several stem cells merge: as a result, skeletal muscle fibers have _____.	multiple nuclei
35. The nuclei of a skeletal muscle are located _____.	just beneath the plasma membrane (or 'just beneath the sarcolemma')
36. The plasma membrane of a skeletal muscle is called the _____.	sarcolemma

37. Skeletal muscle fibers are syncytiums, which means that _____.	they are formed by the fusion of several cells
38. Individual skeletal muscle cells can be _____ micrometers long, while smooth muscle fibers and cardiac fibers are _____ micrometers long.	over 10,000; much less than 1000
39. _____ is a molecule found in muscle cells. It is similar in some ways to hemoglobin, and its function is to _____.	Myoglobin; store oxygen for the muscle cell to use
40. Muscle cells store carbohydrates for use as fuel in the form of _____.	glycogen (or glycosomes)
41. The cytoplasm of a muscle cell is called _____.	sarcoplasm
42. The smooth endoplasmic reticulum (smooth ER) of muscle cells is called the _____.	sarcoplasmic reticulum
43. At the end of each sarcomere, the sarcoplasmic reticulum forms chambers which extend across the cell and are called the _____.	terminal cisternae
44. Between sarcomeres, _____ form channels running transversely through the skeletal muscle cell.	T tubules
45. The terminal cisternae of two adjacent sarcomeres, and the T tubules that separate them, are called a(n) _____.	triad
46. Dark striations called A bands are formed where _____.	actin and myosin overlap
47. Light striations called I bands are formed where only _____ is present.	actin
48. _____ are found at each end of the sarcomere.	Z disks
49. One end of each _____ is attached to a Z disk, and the other end is pulled past myosin. As a result, the Z disks move closer together.	actin microfilament
50. The major function of the smooth ER (sarcoplasmic reticulum) in muscle cells is to _____.	store and release calcium (or 'control calcium levels in the cell')
51. Action potentials that are carried deep into the cell by _____ signal the sarcoplasmic reticulum to _____.	T tubules; release calcium
52. In a skeletal muscle fiber, when ADP and inorganic phosphate are bound to myosin, _____.	the myosin is 'set' and can contract when the signal is given
53. The signal for a skeletal muscle to contract is calcium, which binds to troponin, causing _____ to _____.	tropomyosin; move out of myosin's way
54. In a skeletal muscle fiber, after tropomyosin shifts in response to calcium, _____ binds to actin.	myosin

55. Once myosin binds to actin, _____ changes shape, pulling the two filaments past one another.	myosin
56. As the two filaments (actin and myosin) slide past one another, _____ are released from the myosin.	ADP and inorganic phosphate
57. In order for myosin to release actin, it must bind _____.	ATP
58. Since a muscle will keep contracting if calcium and ATP are both present, and calcium is returned to the sarcoplasmic reticulum by active transport, ATP is needed _____.	both to start and to stop the contraction
59. A motor unit consists of a motor neuron and _____.	all of the muscle fibers that it innervates
60. All of the fibers in a motor unit contract _____.	at the same time
61. The first event in a muscle contraction is _____.	the arrival of the signal from the nerve
62. Muscle fibers are stimulated to contract in two phases: (1) _____ (2) _____.	the action potential phase; excitation-contraction coupling
63. After a nerve releases a chemical signal (the neurotransmitter _____), receptors on the muscle fiber, at the neuromuscular junction, _____.	acetylcholine; open to admit sodium ions
64. After a few sodium ions enter the skeletal muscle cell at the neuromuscular junction, nearby voltage-sensitive _____ respond to the increased positive charge and open to _____.	channel proteins; allow more sodium to enter
65. After many sodium ions have entered a cell in a given region, causing the membrane potential there to become positive, two things happen: (1) sodium's entry is _____, and (2) potassium channels _____, allowing _____.	blocked or stopped; open; potassium to leave the cell
66. In order to fully restore ion balance, the _____ must use energy to bring potassium into the cell, and push sodium out.	sodium potassium pump
67. The events which occur after the action potential travels through the muscle fiber's membrane and which cause the muscle to contract are called _____.	excitation-contraction coupling
68. The action potential traveling down the T-tubule triggers _____ by the _____.	calcium release; sarcoplasmic reticulum (or smooth ER)
69. After the action potential ends, contraction will eventually stop because _____ is constantly being _____.	calcium; transported back into the sarcoplasmic reticulum
70. The three phases of a muscle twitch are the _____, _____, and _____.	latent period; period of contraction; period of relaxation
71. The latent period in muscle contraction is the delay during which _____ occurs; the slowest step is believed to be _____ from the sarcoplasmic reticulum to tropomyosin.	excitation-contraction coupling; the movement of calcium
72. During the period of contraction, _____ form and the muscle fiber shortens.	actin-myosin crossbridges

73. Since calcium is either released by the sarcoplasmic reticulum in the innervated cells, or it is not, a motor unit cannot _____.	partially contract
74. A single stimulus to a muscle fiber results in _____.	a single twitch
75. The effect of frequent stimuli on a muscle fiber is to increase _____.	the force of the contraction
76. _____ refers to a single, constant muscle contraction.	tetanus
77. When a muscle is stimulated so rapidly that calcium re-uptake into the sarcoplasmic reticulum has no time to occur, the result is _____.	tetanus (or, 'a single, constant contraction')
78. Treppe refers to an increase in contraction intensity during several sequential contractions even though _____.	calcium levels return to baseline between contractions
79. The threshold stimulus is the stimulus strength at which _____ contracts.	one motor unit
80. _____ is the process in which more and more motor units are stimulated to create a combined force.	Recruitment
81. The maximal stimulus for a muscle is one which causes all _____ to _____.	motor units; reach tetanus
82. In a(n) _____ contraction, the distance between a muscle's origin and insertion does not change.	isometric
83. In a(n) _____ contraction, the force generation does not change.	isotonic
84. Three methods used by muscle cells to regenerate ATP are _____, _____ and _____.	direct phosphorylation; anaerobic respiration (or glycolysis); aerobic respiration
85. In direct phosphorylation, phospate from _____ is directly transferred to ATP.	creatine phosphate
86. In _____, a small amount of the energy in glucose is captured, very quickly, in ATP; the rest is exported in lactic acid.	anaerobic respiration (or glycolysis)
87. In _____, as much of the energy in glucose as possible is captured in ATP, but the process is slow and requires oxygen.	aerobic respiration
88. If ATP production in a muscle does not keep pace with ATP usage, the result will be _____.	muscle fatigue
89. If the supply of ATP in a muscle becomes severely limited, the result will be a(n) _____, which is a 'locked' muscle that cannot relax. (When this happens after death, the result is called _____.)	contracture; rigor mortis
90. The lactic acid 'burn' felt during intense anaerobic exercise will cause _____.	muscle fatigue

91. Muscle fatigue means that the muscle _____.	will not contract in response to a signal to do so
92. If the levels of calcium or potassium are too low in a muscle, or if sodium is too high, the result will be _____.	muscle fatigue
93. Recovery from fatigue due to intense, brief exercise is usually _____.	rapid
94. Recovery from fatigue due to prolonged exercise is usually _____.	slow
95. Fatigue caused by alterations in sodium and potassium balances in a muscle cell is usually caused by _____ exercise.	intense, brief
96. Fatigue caused by disruption of calcium regulation or glycogen depletion is usually caused by _____ exercise.	prolonged
97. Although muscle can contract anaerobically by relying on _____, _____ will be needed later for replacement of glycogen stores, metabolism of lactic acid, and restoration of creatine phosphate reserves.	glycolysis; oxygen
98. The need for oxygen to restore the body to its resting state after muscular activity has been completed is called _____.	oxygen debt
99. If the overlap between actin and myosin is minimized due to muscle stretch, the force of contraction _____.	will decrease
100. When actin and myosin in a muscle approach the point at which they are fully overlapping, the force of the contraction _____.	decreases
101. If the number of motor units stimulated increases, the force of the contraction will _____.	increase
102. If the number of fibers in each motor unit is _____, then each motor unit will produce more force than it would otherwise.	high
103. If the number of _____ in each fiber is high, the force exerted by the fiber will be high.	myofilaments
104. If the frequency of stimulation is raised, there is not time for tendons and connective tissue to stretch between contractions, and the overall force of the contraction _____.	will increase
105. If a muscle contains primarily glycolytic muscle fibers, its contractions will be _____.	rapid
106. If a muscle contains primarily fatigue-resistant muscle fibers which rely on oxygen for metabolism, its contractions will be _____.	slow
107. The speed of a muscle's contraction will be increased if the load is _____.	decreased (or light)
108. The duration of muscular effort will be increased if most fibers rely on _____ for generation of ATP.	aerobic respiration

109. The duration of muscular effort will be _____ if oxygen is not available.	decreased or low
110. Loads light enough to be moved by a small number of the available motor units increase the endurance of a muscle because _____.	each motor unit has time to rest
111. _____ can contract over and over for ages (a marathon).	Slow oxidative fibers
112. _____ can do hard work for a moderate length of time (100 yard dash).	Fast oxidative fibers
113. _____ can give a burst of power (that car is coming right for you! JUMP!).	Glycolytic fibers
114. _____ are red due to the presence of myoglobin, which holds a small amount of reserve oxygen.	Oxidative fibers (both slow and fast)
115. The major direct effects of aerobic exercise on muscle are to increase _____ and _____.	the blood supply; the number of mitochondria
116. The major indirect effect of aerobic exercise is to increase the efficiency (and health) of the _____ system.	cardiovascular
117. Recovery time between exercise sessions is important for two major reasons: it prevents _____ and allows _____.	overuse injuries; adaptation (or strengthening)
118. The two major direct effects of anaerobic (e.g., resistance) exercise on muscle are to increase the number of _____ and _____ in fast muscle cells.	myofilaments per myofibril; myofibrils per cell (or fiber)
119. In addition to adaptation in the muscle fibers, two other adaptations occur in order to allow an athlete to lift heavy weights: the _____ changes to maximize motor unit recruitment, and _____ thickens and strengthens.	nervous system; connective tissue
120. Smooth muscle is found primarily in _____.	the walls of hollow organs
121. In order to allow them to shorten or squeeze a tubular organ, the cells of smooth muscle are organized into _____ and _____ layers.	longitudinal; circular
122. Unlike skeletal muscle fibers, each of which is controlled by a nerve, smooth muscle lacks individual _____.	neuromuscular junctions
123. Nerves which control smooth muscles release neurotransmitters from bulbous regions in their axons called _____. These diffuse across the gap and may stimulate several smooth muscle cells.	varicosities
124. Calcium in smooth muscles is stored both in the _____ and _____.	sarcoplasmic reticulum; outside the cell
125. Instead of being evenly stacked, myofibrils in smooth muscle are arranged _____ along the cell's length.	diagonally (or in a criss-cross pattern, or in a diamond pattern, etc.)
126. Instead of pulling against Z disks as in skeletal muscle, myofilaments in smooth muscle pull against structures called _____.	dense bodies

127. When skeletal muscle is stretched, _____: when smooth muscle is stretched, however, this is not so.	it can no longer contract
128. Only _____ muscle fibers can divide.	smooth
129. In smooth muscle, _____ may be transmitted from cell to cell through _____, allowing entire sheets of cells to contract in response to a single signal.	action potentials; gap junctions
130. Smooth muscle that must contract regularly contains pacemaker cells that initiate contractions periodically, without needing _____.	a signal from a nerve (or 'an external signal')
131. Unlike in skeletal muscle, calcium in smooth muscle does not interact with _____, but instead indirectly triggers the phosphorylation of myosin.	troponin
132. The cells of _____ smooth muscle are coupled by gap junctions and contract as a group.	single unit
133. The cells of _____ smooth muscle are rarely coupled by gap junctions and contract individually.	multi-unit
134. One major difference between voluntary and involuntary muscle during development is that the cells of voluntary (skeletal) muscle _____, while those of smooth and cardiac muscle do not, often developing _____ at sites of contact instead.	fuse; gap junctions
135. Only one type of muscle, _____ muscle, has good regenerative capacity (since its cells can divide).	smooth
136. Muscular development depends on _____ and _____.	innervation; use
137. In the long term, both disuse and aging result in the replacement of muscle fibers with _____.	connective tissue

*The skeletal muscle fiber length cited above is based on Anat Rec. 2001 Mar 1;262(3):301-9.

1. The direction of a muscle's pull is determined by the direction of the _____.	fascicles or fibers
2. (True/False) A muscle cannot lengthen itself.	TRUE
3. (True/False) After a muscle contraction ends and the muscle relaxes, it automatically returns to its resting length.	FALSE
4. _____ provide the major force for producing a specific movement.	Prime movers
5. _____ are pairs of muscles which lengthen one another: e.g., extensors and flexors around a common joint.	Antagonists
6. _____ are muscles which assist in a particular movement by adding force, stability, or direction. They are not covered in this question bank in detail, but are involved in almost all movements.	Synergists
7. Synergists which stabilize a muscle's origin so that it does not move during contraction are called _____.	fixators
8. The _____ protract the jaw. (They provide the “front” motion in grinding while chewing - contracting one side at a time helps produce side to side grinding as well.)	pterygoids
9. The _____ pulls the coronoid process of the mandible toward the temple, deep to the zygomatic arch.	temporalis
10. The temporalis _____ the jaw and also _____ it.	retracts; elevates
11. The _____ is the prime mover in jaw elevation: it pulls the ramus of the mandible toward the zygomatic arch.	masseter
12. The _____ has two bellies held together by a tendon which runs through a fibrous loop on the hyoid.	digastric muscle
13. Contraction of the _____ pulls the mandible down toward the hyoid, if movement of the hyoid is prevented by contraction of the _____.	digastric muscle; infrahyoid muscles
14. The _____ (one on each side) pull the mastoid process of the skull toward the sternum and clavicle. When both contract together, they flex the neck.	sternocleidomastoid muscles
15. The _____ pull the mastoid process and transverse processes of C2 to C4 toward the spinous processes of C7 through T6. If the muscles on both sides of the body contract together, the neck is extended or hyperextended.	splenius muscles
16. If the scapulae are fixed, the _____ is also a powerful neck extensor.	trapezius
17. Contracting the _____ on one side and the _____ on the other side results in head rotation.	sternocleidomastoid; splenius
18. Unilateral contraction of the _____ rotates head away from contracting side.	sternocleidomastoid

19. Unilateral contraction of the _____ muscles rotates head toward the contracting side.	splenius
20. Contracting the _____ and the _____ on the same side results in tilting of the head toward that side.	sternocleidomastoid; splenius
21. Contracting the _____ on one side of the body and the _____ of the other rotates the thorax relative to the pelvis.	external oblique; internal oblique
22. The _____ pull posterior regions of the ribs toward the midline of the abdomen, the pubic crest, and relatively anterior portions of the iliac crest.	external obliques
23. Portions of the _____ pull the anterior ribcage toward relatively posterior portions of the iliac crest, and the lumbar fascia.	internal obliques
24. Most of the synergists for the internal and external obliques are fairly distant: they are found _____.	along the spine
25. The _____, a pair of segmented muscles, pulls the xiphoid process and costal cartilages of the ribs toward the pubic crest and symphysis, thereby flexing the lumbar vertebrae.	rectus abdominis
26. The _____ pull superior ribs and vertebral process toward relatively inferior vertebral processes and the dorsal iliac crests, extending the back. (There are several synergists nearby.) They are visible in the lumbar region: above this, they are deep to other muscles.	erector spinae
27. When the _____ and _____ on one side of the body contract together, rotation is prevented, and the lateral ribcage is pulled toward the iliac crest.	internal obliques; external obliques
28. Contraction of the entire _____ pulls a tuberosity of the humerus toward the clavicle and scapula.	deltoid
29. For abduction beyond horizontal (to bring arm above head) the _____ and _____ must raise and rotate the scapula, so that the glenoid cavity faces upward.	trapezius; serratus anterior
30. The _____ and _____ act together to pull the intertubercular groove of the humerus toward the ribcage: one pulls toward the front, and the other toward the back.	pectoralis major; latissimus dorsi
31. The ____ portion of the _____ is used to flex the shoulder from the adducted position by pulling the humerus upward, toward the clavicle.	anterior; deltoid
32. The _____ flexes the shoulder from the abducted position by pulling the intertubercular groove of the humerus toward the sternum.	pectoralis major
33. The _____ extends the shoulder by pulling the intertubercular groove of the humerus toward the vertebral column.	latissimus dorsi
34. The tendon connecting the _____ to its insertion (on the lesser tubercle of the humerus) wraps around the humerus from front toward back, so that contraction spins the humerus medially.	subscapularis
35. The tendons of the _____ and _____ wrap the humerus from back toward front, so that contraction rotates the humerus laterally.	teres minor; infraspinatus
36. The upper fascicles of the _____ allow us to shrug by pulling the scapula toward the cervical vertebrae.	trapezius

37. The _____ and the inferior fascicles of the _____ depress the shoulder.	rhomboids; trapezius
38. The _____ pulls the radial tuberosity of the radius toward the shoulder, flexing the elbow. Its leverage is reduced dramatically if the forearm is _____, since in this position the radial tuberosity faces away from the shoulder.	biceps brachii; pronated
39. The _____ pulls the coronoid process of the ulna toward the humerus, thus flexing the elbow.	brachialis
40. If the forearm is pronated, the _____ and _____ are the prime movers in elbow flexion: the biceps brachii cannot contribute much force.	brachioradialis; brachialis
41. The _____ extends the forearm by pulling the olecranon process toward the superior, posterior shaft of the humerus and toward the scapula.	triceps brachii
42. The _____ wraps around the radius, originating at the lateral epicondyle of the humerus. Contraction rotates the radius.	supinator
43. The _____ in the arm is also a powerful supinator, since its insertion (the radial tuberosity) is rotated to face the shoulder when this muscle contracts.	biceps brachii
44. The _____ pulls the front of the radius toward the front of the ulna.	pronator quadratus
45. The _____ pull the bones of the wrist and hand toward the medial epicondyle of the humerus.	flexor carpi radialis; flexor carpi ulnaris; flexor digitorum superficialis
46. The _____ pulls the posterior surfaces of several bones of the hand toward the lateral epicondyle of the humerus, resulting in both finger and wrist extension. (Other extensors also contribute to wrist extension.)	extensor digitorum
47. The flexor carpi radialis, extensor carpi radialis longus, extensor carpi radialis brevis and abductor pollicis longus all contribute to _____.	abduction of the wrist
48. The _____ and _____ contribute to adduction of the wrist.	flexor carpi ulnaris; extensor carpi ulnaris
49. The _____ and _____ both flex the fingers.	flexor digitorum superficialis; flexor digitorum profundus
50. The _____ flexes the pollex (thumb).	flexor pollicis longus
51. Flexors are on the _____ of the forearm.	anterior
52. The _____ and _____ extend the fingers.	extensor digitorum; extensor indicis
53. The _____ and _____ extend the pollex (thumb).	extensor pollicis longus; extensor pollicis brevis
54. Extensors are on the _____ of the forearm.	posterior

55. Abduction of the thumb is accomplished by the _____ in the forearm, as well as by several muscles _____.	abductor pollicis longus; in the hand itself
56. Abduction and adduction of the other fingers is accomplished by _____. (Details are beyond the scope of this question bank.)	muscles in the hand
57. The _____ pulls the femur toward the iliac crest, sacrum, and lumbar vertebrae, thus flexing the hip.	iliopsoas
58. The _____ pulls the femur toward the dorsal ilium, sacrum, and coccyx, extending the hip.	gluteus maximus
59. The _____ pull the fibula and tibia toward the ischial tuberosity of the os coxa; with the knee locked, this extends the hip.	hamstrings or biceps femoris, semimembranosus, and semitendinosus
60. The _____ pulls the greater trochanter of the femur toward the iliac crest, abducting the thigh.	gluteus medius
61. The _____, _____, and _____, together with the _____, pull the medial surface of the femur toward the pubis, thus adducting the thigh.	adductor longus; adductor brevis; adductor magnus; pectineus
62. The _____ pulls the medial surface of the tibia toward the pubis, thus adducting the thigh.	gracilis
63. Medial rotation is accomplished by the same muscles that _____ the thigh, together with the _____ and _____.	adduct; gluteus medius; gluteus minimus
64. A group of muscles in the posterior of the upper thigh and hip, the sartorius in the anterior thigh, and the popliteus in the back of the knee work together to _____.	laterally rotate the thigh
65. Prior to knee flexion, the _____ rotates the tibia medially relative to the femur, unlocking the knee.	popliteus
66. The _____, _____ and _____ flex the knee. Together, these three muscles are called the _____.	biceps femoris, semitendinosus, and semimembranosus; hamstrings
67. The _____, _____ and _____ pull the tibial tuberosity toward the proximal femur, extending the knee.	vastus lateralis; vastus intermedius; vastus medialis
68. The _____ pulls the tibial tuberosity toward the ilium, extending the knee.	rectus femoris
69. The four muscles which together constitute the quadriceps are the _____, _____, _____ and _____.	vastus lateralis; vastus intermedius; vastus medialis; rectus femoris
70. The _____ pulls the calcaneus toward the distal end of the femur, plantar flexing the ankle. It is most powerful when the knee is straight.	gastrocnemius
71. The _____ pulls the calcaneus toward the proximal ends of the tibia and fibula, plantar flexing the ankle.	soleus

72. Together, the gastrocnemius and soleus muscles are known as the _____.	triceps surae
73. The _____ pulls the foot toward the lateral tibial condyle and proximal tibia, dorsiflexing the ankle.	tibialis anterior
74. The _____ pulls the medial edge of the foot toward the superior tibia and fibula via a tendon adjacent to the medial malleolus, inverting the foot.	tibialis posterior
75. The _____, _____ and _____ pull the lateral edge of the foot toward the lateral surface of the fibula, everting the foot.	fibularis longus; fibularis brevis; fibularis tertius
76. The four smaller toes are flexed by the action of the _____, whose tendon passes through a fibrous band at the ankle which serves as a pulley before reaching the toes.	flexor digitorum longus
77. The hallux (great toe) is flexed by the _____, whose tendon passes through a fibrous band at the ankle which serves as a pulley before reaching the toes..	flexor hallucis longus
78. Several muscles in _____ also play a role in toe flexion.	the foot itself
79. The four smaller toes are extended by the action of the _____, whose tendon passes through a fibrous band at the ankle which serves as a pulley before reaching the toes.	extensor digitorum longus
80. The hallux (great toe) is extended by the _____, whose tendon passes through a fibrous band at the ankle which serves as a pulley before reaching the toes.	extensor hallucis longus
81. Abduction and adduction of the toes is accomplished by _____: although important, these are beyond the scope of this question bank.	muscles in the foot
82. The _____ raises the eyebrows.	epicranius (or frontalis)
83. The _____ pulls the eyebrows together into a frown.	corrugator supercilii
84. One winks, blinks, or squints by contracting the _____.	orbicularis oculi
85. The corners of the mouth are raised during a smile by the _____ and _____.	zygomaticus; risorius
86. We raise the upper lip to show the front teeth by contracting the _____.	levator labii superioris
87. To pout (push the lower lip down and out), we contract the _____ and _____.	depressor labii inferioris; mentalis
88. To pull the outer corners of the mouth down into a grimace, we contract the _____.	depressor anguli oris
89. To purse the lips when we want to kiss or whistle, we contract the _____.	orbicularis oris

90. To widen the mouth, or compress puffed cheeks, we contract the _____.	buccinator
91. The _____ pulls the mouth down, tensing the skin of the neck.	platysma
92. The prime mover for inspiration (breathing in) is the _____, which presses into the abdominal cavity, expanding the thoracic cavity as it does.	diaphragm
93. The _____ assist in inspiration.	external intercostals
94. The _____ draw ribs together during forced exhalation, but for forced expiration, the _____ are used to increase intra-abdominal pressure.	internal intercostals; abdominal muscles
95. The bulk of the crushing force applied by the jaw during mastication is provided by the _____.	masseter
96. In order to manipulate food, the shape of the mouth and position of the tongue must be _____.	changed continuously
97. The _____ pushes food from the cheek to the center of the mouth.	buccinator
98. The extrinsic tongue muscles (primarily the _____, _____ and _____) control the position of the tongue.	genioglossus, the styloglossus, and the hyoglossus
99. The _____ control the shape of the tongue.	intrinsic tongue muscles
100. The muscles used for mastication are also used for _____.	speaking
101. In the first stage of swallowing, the _____ widen the pharynx and close the larynx by pulling they hyoid bone forward and upward.	suprahyoid muscles
102. In the second stage of swallowing, the _____ and _____ close the nasal passage by elevating the soft palate.	tensor veli palatini; levator veli palatini muscles
103. In the third stage of swallowing, the _____ propel the food into the esophagus.	pharyngeal constrictor muscles
104. In the fourth stage of swallowing, the _____ pull the hyoid bone and larynx down to their original positions.	infrahyoid muscles
105. Intra-abdominal pressure is increased by contraction of the _____, the _____ and _____, the _____ and the _____.	rectus abdominis; internal; external obliques; transversus abdominis; diaphragm
106. If the breath is held and _____ is increased, the entire trunk serves as a supportive column many times stronger than the spine itself so that heavy weights can be lifted.	intra-abdominal pressure

107. Forced expulsion during childbirth, defecation, vomiting, and forced exhalation (e.g. coughing and sneezing) are all accomplished by increasing _____.	intra-abdominal pressure
108. If the bladder or anal sphincters are weak, involuntary “forced expulsion” of urine or feces may occur whenever _____ is increased.	intra-abdominal pressure
109. The _____ lifts the anal canal to resist intra-abdominal pressure (and prevent defecation, etc.).	levitor ani muscle
110. The _____ constricts the urethra and inhibits urination.	sphincter urethrae
111. The _____ constricts the anus and inhibits defecation.	external anal sphincter
112. The _____ and _____ retard blood drainage from the penis (male) or clitoris (female), allowing erection.	ischiocavernosus; bulbospongiosus
113. The _____ forms the lower muscular boundary to the abdominopelvic cavity: its two major muscles, the _____ and _____, contract to resist intra-abdominal pressure and to support the abdominal and pelvic organs.	pelvic diaphragm; levator ani; coccygeus
114. The most important function of the supraspinatus, infraspinatus, teres minor, and subscapularis is to prevent _____.	dislocation of the humerus
115. The glenoid cavity is so shallow and the range of motion so great that the shoulder is held together primarily by the tendons of the muscles that surround it. The four muscles whose tendons contribute the most stability are together called the _____.	rotator cuff
116. The four muscles which comprise the rotator cuff are the _____, _____, _____ and _____.	supraspinatus, infraspinatus; teres minor; subscapularis

1. A(n) _____ is a gland, muscle, etc., that responds to a signal by changing the internal or external environment in some way (altering secretions, contracting, etc.).	effector
2. Involuntary effectors control _____ reflexes.	autonomic
3. Nerve fibers that carry signals toward the brain are called _____ or _____ fibers.	afferent; sensory
4. Nerve fibers that carry signals from the brain are called _____ or _____ fibers.	motor; efferent
5. The brain and spinal cord make up the _____ nervous system. All other nerves are part of the _____ nervous system.	central; peripheral
6. The PNS has two major divisions: the _____ division and the _____ division.	sensory; motor (OR afferent; efferent)
7. There are two classes of motor nerves: _____ fibers, which control involuntary effectors, and _____ fibers, which control voluntary effectors (muscles).	visceral efferent; somatic efferent
8. The _____ nervous system receives signals and controls actions which are *not* consciously perceived or controlled.	autonomic (OR visceral)
9. The _____ nervous system receives signals and controls actions which *are* consciously perceived or controlled.	somatic
10. The two principal cell types of the nervous system are _____ and supporting cells called _____.	neurons; glial cells
11. _____ are excitable cells that transmit electrical signals.	Neurons
12. _____ are supporting cells that help neurons to function and thrive.	Glial cells
13. In the CNS, _____ are supporting cells which guide the migration of young neurons.	astrocytes
14. In the CNS, _____ are cells which line the fluid-filled cavities and which produce, transport, and circulate the fluid surrounding the brain and spinal cord.	ependymal cells
15. _____ are cells in the PNS which surround the cell bodies of neurons which are grouped in ganglia. They maintain the microenvironment and provide insulation.	Satellite cells
16. A(n) _____ is a coating wrapped around neuronal axons which insulates them and protects them.	myelin sheath
17. _____ are cells which produce the myelin sheath in the peripheral nervous system, but not in the central nervous system.	Schwann cells
18. _____ adjacent Schwann cells or oligodendrocytes are called 'nodes of Ranvier.'	Short, unmyelinated regions between

19. In the CNS, _____ are cells which are phagocytic: they defend against pathogens and ingest cellular debris.	microglia
20. In the CNS, _____ regulate the transport of nutrients and wastes to and from neurons and form part of the barrier which limits substances which may enter the CNS.	astrocytes
21. _____ are cells which produce the myelin sheath in the central nervous system, but not in the peripheral nervous system.	Oligodendrocytes
22. In the CNS, _____ are the glial cells which regulate the microenvironment (ion concentrations, etc.) surrounding the neuron.	astrocytes
23. In the CNS, _____ are the glial cells which anchor neurons to blood vessels.	astrocytes
24. An electrical impulse carried along the length of a neuron's axon is called a(n) _____.	action potential
25. (True/False) The strength of a single action potential is controlled by the strength of the stimulus.	FALSE
26. The rough ER and Golgi bodies in neurons, taken together, are called _____.	Nissl bodies
27. The function of the Nissl bodies is to produce _____.	neurotransmitters
28. Nissl bodies are found in the _____ of the cell.	body (or soma)
29. The cell body and dendrites of a neuron contain _____ which allow them to respond to neurotransmitters.	chemically gated ion channels
30. _____ are short, branching neuronal processes which receive stimuli from receptors or other neurons.	Dendrites
31. One of the main differences between an axon and a dendrite is that the axon contains _____ ion channels, while the dendrite contains _____ ion channels.	voltage gated; chemically gated
32. There is a secretory region at the distal end of each axon which releases _____.	neurotransmitters
33. A(n) _____ is a collection of neuronal cell bodies located inside of the CNS.	nucleus
34. A(n) _____ is a group of neuronal cell bodies located in the PNS.	ganglion
35. A(n) _____ is a collection of neuronal axons, blood vessels, and connective tissues in the PNS.	nerve
36. A(n) _____ is a collection of neuronal axons with a common origin and destination found in the CNS.	tract

37. One of the differences between a nerve and a tract is that a(n) _____ does not carry its own blood and lymphatic supply.	tract
38. The _____ functions to protect the axon and to electrically insulate axons from each other.	myelin sheath
39. One of the main functions of the myelin sheath is to increase the _____.	speed of signal transmission
40. In the PNS, the myelin sheath is formed by _____.	Schwann cells
41. In the PNS, a Schwann cell encloses the axon of a single neuron with an empty portion of its _____.	plasma membrane
42. The _____ is the nucleus and cytoplasm of a Schwann cell which is wrapped around an axon.	neurilemma
43. A single Schwann cell is capable of interacting with the axons of how many neurons?	one
44. The myelin sheath of axons in the CNS is formed by _____.	oligodendrocytes
45. An oligodendrocyte is capable of interacting with the axons of how many neurons?	several
46. During formation of a myelin sheath, the cytoplasm and nucleus of a(n) _____ remains free and does not form a neurilemma.	oligodendrocyte
47. Neurons can be classified functionally as _____, _____ or _____.	sensory, motor, interneurons (OR afferent, efferent, association neurons)
48. Neurons can be classified by structure according to the number of _____ extending directly from the _____.	processes; cell body
49. Action potentials in neurons are generated in the region called the _____.	trigger zone
50. Resting membrane potential in nerve cells is _____ millivolts.	-70
51. V_R is an abbreviation for _____.	resting membrane potential
52. The major ions which contribute to the resting membrane potential are _____ and _____.	sodium; potassium
53. There is _____ potassium inside of, than outside of, the cell.	more
54. There is _____ sodium inside of, than outside of, the cell.	less

55. Cells allow _____ to diffuse slowly but freely across the cell membrane to generate a membrane potential.	potassium
56. The concentrations of sodium and potassium inside of the cell are maintained by the _____.	sodium-potassium pump
57. Potassium tends to diffuse from the inside to the outside of a cell due to its _____.	concentration gradient
58. The amount of potassium which leaves the cell is limited by _____.	electrostatic attraction
59. An electrochemical gradient is the sum of the _____ and _____, both of which influence the motion of an ion across a membrane.	concentration gradient; electrostatic attraction
60. A change in membrane potential which is due to ion influx or efflux in a single region with the ions then diffusing away from that region is called a(n) _____.	graded potential
61. _____ potentials decrease in intensity as the distance from the site of generation increases.	Graded
62. The magnitude of a(n) _____ potential varies directly with the strength of the initial stimulus.	graded
63. In an action potential, the membrane potential of the neuron or muscle changes from _____ millivolts to _____ millivolts.	-70; +30
64. Another word or phrase used to refer to an action potential in a neuron is _____.	impulse (or 'nerve impulse')
65. Only two types of cells can generate action potentials: _____ cells and _____.	muscle; neurons (or nerve cells)
66. As the membrane potential near a voltage regulated sodium channel increases from -70 mV to -55 mV, the _____ of the voltage regulated sodium channel _____.	activation gate; opens to admit sodium
67. As the membrane potential near a voltage regulated sodium channel approaches +30 mV, the _____ begins to _____.	inactivation gate; close
68. As the membrane potential near a voltage regulated _____ channel approaches +30 mV, the channel opens.	potassium
69. In the resting state, before or long after an action potential occurs, the activation gates of voltage regulated sodium channels are _____, the inactivation gates of the voltage regulated sodium channels are _____, and the voltage regulated potassium channels are _____.	closed; open; closed
70. An influx of positive sodium ions causes opening of the activation gates of voltage regulated sodium channels resulting in a further influx of positive sodium ions, and thus the initial stages of an action potential are regulated by _____ feedback.	positive
71. An influx of positive sodium ions eventually causes closing of the inactivation gates of voltage regulated sodium channels, stopping the influx of positive sodium ions, and thus the final stages of an action potential are regulated by _____ feedback.	negative
72. During the _____ phase of an action potential, both gates of the voltage regulated sodium channels are open and the voltage regulated potassium channels are closed.	depolarization

73. During the _____ phase of an action potential, the membrane potential is greater than -70 mV but potassium is leaving the cell and sodium is no longer entering, so membrane potential is decreasing.	repolarization
74. During the _____ phase of an action potential, so much potassium has left the cell that the membrane potential is actually less than -70 mV.	hyperpolarization
75. During the _____ phase of an action potential, both the voltage regulated sodium channels and the voltage regulated potassium channels are relatively insensitive to voltage changes.	hyperpolarization
76. During an action potential, the intracellular concentration of sodium increases and of potassium, decreases. The normal concentrations must be restored by the _____.	sodium-potassium pump
77. While the inactivation gate is closed and the activation gate is open, sodium channels are _____.	inactive
78. During the _____ phase of an action potential, the voltage regulated sodium channels are open or inactive and voltage regulated potassium channels are open. During this time, the channels cannot respond to a voltage _____.	absolute refractory; increase
79. The relative refractory period occurs during the time when _____ channels are inactive.	many voltage regulated sodium
80. During the relative refractory period, action potentials require a(n) _____ stimulus.	stronger than normal
81. A change in the voltage near a voltage regulated sodium channel that is exactly sufficient to generate an action potential is called the _____.	threshold stimulus
82. The voltage required to cause action potentials to be generated so rapidly that their rate is controlled by the refractory period is called the _____.	maximal stimulus
83. A voltage greater than that which is required to cause action potentials to be generated so rapidly that their rate is controlled by the length of the refractory periods is called a(n) _____.	supramaximal stimulus
84. The narrower the diameter of the axon, the _____ the speed of the action potential.	slower
85. The speed of an action potential is greatest when it is traveling through an axon which is _____.	myelinated
86. In myelinated neuronal processes, ions enter during an action potential only _____.	at the nodes of Ranvier.
87. In _____ conduction, the change in membrane potential is caused by shifting and crowding of ions due to electrostatic repulsion, as opposed to ion diffusion.	saltatory
88. Saltatory conduction depends on the presence of _____, which are gaps through which ions in the extracellular fluid can reach the neuron's plasma membrane.	nodes of Ranvier
89. A(n) _____ is a junction between a neuron and another cell which allows the transfer of information.	synapse
90. The _____ neuron conducts the signal to a synapse, while the _____ cell responds or conducts a signal away from it.	presynaptic; postsynaptic
91. Synapses are named for the types of presynaptic and postsynaptic cell structures that are involved: for example, if the axon of a presynaptic cell meets the dendrite of a postsynaptic cell, it is a(n) _____ synapse.	axodendritic

92. The _____ is the fluid-filled space separating the pre- and postsynaptic cells.	synaptic cleft
93. (True/False) A presynaptic cell participating in a synaptic junction via a chemical synapse releases chemicals into the synaptic cleft.	TRUE
94. (True/False) A postsynaptic cell participating in a synaptic junction via a chemical synapse releases chemicals into the synaptic cleft.	FALSE
95. In a(n) _____ synapse, the pre- and postsynaptic cells are joined by gap junctions, and changes in the membrane potential of one cell are transmitted to the other.	electrical
96. _____ synapses provide a one-way transmission of signals, as opposed to _____ synapses, which transmit signals in both directions.	Chemical; electrical
97. When a nerve impulse reaches the axonal terminal of a presynaptic neuron, _____ channels open and ions enter the cell.	calcium
98. In response to the influx of calcium, presynaptic neuronal axon terminals release a(n) _____ into the synaptic cleft.	neurotransmitter
99. With only a very few exceptions, human synapses are _____ synapses.	chemical
100. When the postsynaptic cell is a neuron, it responds to the neurotransmitter by _____.	opening ion channels
101. The number of ions entering or leaving a neuron in response to a neurotransmitter depends on the _____ of the neurotransmitter and the _____ of the signal.	amount; duration
102. A(n) _____ postsynaptic potential (abbreviated _____) occurs when the neurotransmitter activates channels which allow positive ions to leave the cell or negative ions to enter.	inhibitory; IPSP
103. A(n) _____ postsynaptic potential (abbreviated _____) occurs when the neurotransmitter activates channels which allow positive ions to enter the cell.	excitatory; EPSP
104. An inhibitory postsynaptic potential results in a(n) _____ in membrane potential.	decrease
105. An excitatory postsynaptic potential results in a(n) _____ in membrane potential.	increase
106. Both excitatory and inhibitory postsynaptic potentials are _____ potentials, not _____ potentials.	graded; action
107. More than one EPSP is required to produce a(n) _____.	action potential
108. In temporal summation of postsynaptic potentials, several signals are received _____.	in a short time
109. In spatial summation of postsynaptic potentials, several signals are received _____.	from different presynaptic cells

110. _____ are chemicals used for neuronal communication with the body and the brain.	Neurotransmitters
111. Neurotransmitters are generally classified as _____ or _____, depending on their typical effect on cells having appropriate receptors.	excitatory; inhibitory (order is unimportant)
112. Whether a neurotransmitter is excitatory or inhibitory to a given cell is determined by the _____.	type of receptors expressed by the cell
113. In skeletal muscle, the neurotransmitter acetylcholine is _____.	excitatory
114. In cardiac muscle, the neurotransmitter acetylcholine is _____.	inhibitory
115. _____ neurotransmitters bind to ion channels and cause them to open.	Direct
116. ____ neurotransmitters cause membrane proteins to change shape, which activates second messengers within the cell.	Indirect
117. The response of cells to _____ neurotransmitters is much more rapid than their response to _____ neurotransmitters.	direct; indirect
118. A(n) _____ messenger is a molecule that carries a signal *to* the cell.	first
119. A(n) _____ is an intracellular molecule that carries a signal *within* a cell, allowing the cell to respond to an extracellular signal.	second messenger
120. Second messenger systems allow complex cellular responses, but their signaling is usually _____.	slow
121. Signaling from a neurotransmitter is ended by the _____, _____, or _____ of the neurotransmitter.	destruction; absorption; diffusion
122. _____ during development, or in the PNS after an injury, is guided by a scaffold of proteins, glial fibers, nerve growth factor, repulsion guiding molecules, and perhaps most importantly, nerve cell adhesion molecule (N-CAM).	Axonal growth
123. Absence of a guiding line of Schwann cells after axonal damage in the PNS _____.	prevents axonal regeneration

1. The _____ is the tube of ectoderm formed early in embryological development as the embryonic tissue folds longitudinally.	embryonic neural tube
2. The three primary brain vesicles are formed during the _____ week after conception.	4th
3. Between the fifth week post-conception and birth, the prosencephalon (aka _____) develops to produce the _____ and _____ of the adult brain.	forebrain; cerebrum; diencephalon
4. Between the fifth week post-conception and birth, the mesencephalon develops to produce the _____ of the adult brain.	midbrain
5. Between the fifth week post-conception and birth, the rhombencephalon (aka _____) develops to produce the _____, _____ and _____ of the adult brain.	hindbrain; pons; medulla; cerebellum
6. In an adult, the _____ are a functional unit and are called the brain stem.	midbrain, pons, and medulla oblongata
7. (True/False) The neural tube, initially hollow, remains filled with liquid in the adult.	TRUE
8. The shape and size of the skull causes the embryonic neural tube to _____ during development.	flex and fold
9. _____ form the gray matter of the CNS.	Neuron bodies and unmyelinated axons
10. White matter is composed of _____.	myelinated neuronal axons
11. _____ is found in the central region of all major CNS areas.	Gray matter
12. The outermost layer of an organ or structure (such as the cerebrum or kidney) is often referred to as the _____.	cortex
13. Gray matter is found in the cortex of the _____ and _____.	cerebrum; cerebellum
14. _____ surrounds the central core of gray matter in the CNS.	White matter
15. _____ are fluid-filled chambers within the brain.	Ventricles
16. _____ is the fluid which surrounds, and fills the hollow areas in, the CNS.	Cerebrospinal fluid
17. (True/False) The ventricles of the brain are connected to one another and to the space surrounding the brain and spinal cord.	TRUE
18. There are _____ (how many?) ventricles in the brain.	4

19. The folds and convolutions of the cerebral hemispheres are named for their three dimensional form. The ridges are called _____ (singular, _____).	gyri; gyrus
20. The folds and convolutions of the cerebral hemispheres are named for their three dimensional form. The shallow grooves are called _____ (singular, _____).	sulci; sulcus
21. The central sulcus is a deeper than average sulcus separating the _____ (it is often not clearly visible).	posterior and anterior portions of the cerebral cortex
22. The folds and convolutions of the cerebral hemispheres are named for their three dimensional form. The deep grooves between gyri or regions are called _____.	fissures
23. The two hemispheres of the brain are separated by a deep cleft called the _____.	longitudinal fissure
24. The cerebrum and cerebellum are separated by the _____.	transverse fissure
25. The cerebral cortex is divided conceptually and functionally into five lobes: the _____, _____, _____, _____ lobes, and a fifth, hidden lobe called the _____.	frontal; temporal; parietal; occipital; insula
26. One of the lobes of the cerebral cortex, the _____, is not visible unless the sides of the lateral fissure are separated.	insula
27. The _____ areas of the cerebral cortex control voluntary movement.	motor
28. The _____ areas of the cerebral cortex are responsible for conscious awareness of sensation.	sensory
29. The _____ areas of the cerebral cortex allow us to integrate and consider information.	association
30. The function of the primary motor cortex, which is located in the _____, is to _____.	precentral gyrus; control unrehearsed (novel) voluntary movements
31. The function of the pre-motor cortex, which is _____ to the primary motor cortex, is to _____.	anterior; control learned movements (typing, walking, etc.)
32. The left hemisphere contains Broca's area, which is responsible for _____, _____ and _____.	planning speech; thinking in words; writing
33. The _____ is responsible for bringing information regarding touch, surface temperature, etc., to conscious awareness. It is normally located in the _____.	primary somatosensory cortex; post-central gyrus
34. The _____ region of the brain is responsible for interpretation of physical sensations, after they have been sorted and integrated by the primary somatosensory cortex.	somatosensory association cortex
35. The visual cortex is responsible for sight, and is located in the _____.	occipital lobe
36. The _____ cortex, responsible for taste, is in the _____ lobes.	gustatory; parietal

37. The _____ cortex, responsible for our sense of smell, is located in the _____ lobes, superior and slightly posterior to the crista galli and cribriform plate.	olfactory; temporal
38. The _____ cortex allows us to maintain balance and is located in the _____.	vestibular; insula
39. The _____ cortex allows us to perceive sound, and is located in the _____ lobes.	auditory; temporal
40. Each small region of the motor and somatosensory cortices correspond to a particular body region. This is often represented by a cartoon human called a(n) _____.	homunculus
41. Areas responsible for the integration and analysis of information are located near the _____.	areas that receive the information
42. The _____ stores memories of sounds and allows identification of sounds.	auditory association area
43. A patient who is able to speak but who chooses words at random and is unable to connect thought to language is likely to have damage to _____ area, in the _____ hemisphere.	Wernicke's; left
44. A patient unable to speak despite having a clear concept of what is conceived (e.g., wanting coffee but unable to think of the word 'coffee') has most likely incurred damage to _____ area in the _____ hemisphere.	Broca's; left
45. The ability to interpret the connotation of speech (whether or not a speaker is angry, sarcastic, etc.) is the _____ area in the _____ hemisphere.	affective language; right
46. The ability to distinguish between (for example) a coin and a key by touch is localized in the _____ cortex.	somatosensory association
47. The fact that each hemisphere of the cerebrum has abilities not shared with its partner is referred to as _____.	lateralization
48. The _____ hemisphere usually controls math and logic.	left
49. The _____ hemisphere usually controls visual and spatial skills, emotion, and artistic skills.	right
50. Cerebral dominance refers to the hemisphere of the cerebrum that is _____.	dominant for language
51. _____ are axons which connect the corresponding gray areas of the two brain hemispheres. Most pass through (and form) the _____.	Commissural fibers; corpus callosum
52. _____ are axons which connect different parts of a single brain hemisphere.	Association fibers
53. _____ are nerve fibers which connect the hemispheres of the brain to the spinal cord and PNS.	Projection fibers
54. Masses of gray matter found deep within the cerebral white matter are called _____.	basal nuclei

55. For historical reasons, the basal nuclei are also known as the _____, a name whose use is discouraged.	basal ganglia
56. The correct timing and velocity of movements is controlled by the _____.	basal nuclei
57. A patient exhibiting spastic movements, tremors, slowness, rigidity, or difficulty initiating voluntary movement may well have damage to the _____.	basal nuclei
58. The _____ is the central core of the forebrain.	diencephalon
59. The thalamus, hypothalamus, and epithalamus constitute the _____.	diencephalon
60. Afferent impulses converge in the _____, where those of similar function are sorted and relayed on as a group.	thalamus
61. Blood pressure, rate and force of heartbeat, digestive tract motility, the rate and depth of breathing, and many other autonomic functions are controlled in the _____.	hypothalamus
62. Emotional responses to events are in part mediated by the _____.	hypothalamus
63. Body temperature is mediated by the _____.	hypothalamus
64. Appetite is mediated by the _____.	hypothalamus
65. Sleep and the sleep cycle are regulated by the _____.	hypothalamus
66. Much of the influence of the hypothalamus is due to the release of hormones which control the release of other hormones: appropriately enough, their names usually include the phrase, "_____".	releasing hormone
67. The pineal gland, habenula, and choroid plexus of the third ventricle constitute the _____.	epithalamus
68. The _____ connects the limbic system to the midbrain - it's physiological roles are still under active investigation.	habenula
69. The main product of the pineal gland is _____, which helps to control the sleep-wake cycle (and is sold in health food stores to alleviate 'jet lag').	melatonin
70. The continuation of automatic behaviors necessary for survival (e.g., breathing) is controlled by the _____.	brain stem
71. The _____ connects the brain to the spinal cord.	brain stem
72. Ten of the twelve pairs of cranial nerves originate in the _____.	brain stem

73. Auditory signals from the ears, and eye and head reflexes, are mediated by the corpora quadrigemina, a subdivision of the _____.	midbrain
74. The midbrain is a subdivision of the _____.	brain stem
75. Red, blood-rich neural centers called red nuclei assist in the unconscious regulation of motor activities and are found in the _____.	midbrain
76. Along with the corpus striatum (one of the basal nuclei), the substantia nigra regulates coordination of movement and is found in the _____. (Some authors consider it to be one of the basal nuclei.)	midbrain
77. The fear response, suppression of pain, and the motor nuclei for two of the cranial nerves which control eye movement, are found in the periaqueductal gray matter of the _____.	midbrain
78. The cerebral peduncles found on the ventral face of the _____, house the pyramidal fiber tracts and convey signals from the cerebral cortex to the spinal cord and PNS.	midbrain
79. Respiration is in part regulated by nuclei of the _____, the fibers of which are part of the brain stem.	pons
80. Fibers of the _____ relay impulses between the motor cortex and the cerebellum.	pons
81. The pons is a subdivision of the _____.	brain stem
82. The lowest portion of the brain stem is the _____.	medulla oblongata
83. The reverse-lateralization of hemispheric function (in which the right half of the body is controlled by the left hemisphere, etc.) is caused by crossover of long nerve tracts (the pyramidal tracts) on the ventral surface of the _____ at a point called the decussation of the pyramids.	medulla oblongata
84. Respiratory rate, heart rate, and blood pressure are primarily controlled by various nuclei in the _____ of the brain stem.	medulla oblongata
85. Coughing, sneezing, swallowing, and vomiting are controlled by nuclei found in the _____.	medulla oblongata
86. The gyri of the cerebellum are called _____.	folia
87. The _____ is the central region of the cerebellum.	vermis
88. The cerebellum is connected to the _____ by the superior peduncle, to the _____ by the middle peduncle, and to the _____ by the inferior peduncle.	midbrain, pons, medulla oblongata
89. Integration of impulses from the motor cortex and sensory pathways, and comparison of actual to intended motion, is the function of the _____.	cerebellum
90. The emotional interpretation of events (enjoyable/aversive, etc.) is controlled by the _____.	limbic system

91. The _____ is a group of nuclei and tracts which surround, and include several parts of, the diencephalon.	limbic system
92. The _____ is a bundle of nerve tracts linking structures in the limbic system to one another.	fornix
93. Interactions between the prefrontal lobes and the _____ allow our thoughts to influence our emotions and vice versa.	limbic system
94. Wakefulness and muscle tone are maintained by small clusters of nuclei called the _____, scattered throughout the brain stem.	reticular formation
95. The _____, scattered throughout the brain stem, allow us to filter out unimportant sensory information such as background noises.	reticular formation
96. A(n) _____ is a recording of the brain's electrical activity.	EEG or electroencephalogram
97. Alpha and beta brainwaves occur _____, while theta waves are more common in _____.	primarily in alert adults; children
98. Delta waves occur _____.	during deep sleep
99. During _____ sleep, skeletal muscle movement is inhibited and most dreams occur.	REM
100. During _____ sleep, the brain wave patterns mimic wakefulness.	REM
101. The type of memory that allows us to complete actions without committing them to permanent memory is called _____ or _____ memory.	short-term; working
102. In order for a memory to become permanent, it must be _____.	associated with pre-existing memories
103. Memories of specific words, associations, or facts are classified as _____ or _____ memories.	factual; declarative (or explicit)
104. Riding a bike or roller skating are examples of _____ or _____ memory.	skill; procedural (or implicit)
105. Damage to the _____ will prevent the acquisition of new declarative memories.	limbic system
106. Procedural memory is mediated by the _____, one of the basal nuclei.	corpus striatum
107. Two changes that occur at the cellular level in the formation of new memories are the formation of new _____, or changes in the strength of the _____.	synapses; response at existing synapses
108. The addition of extra neurotransmitter receptors at an existing synapse during the formation of a memory to make the synapse more responsive to a brief signal is an example of _____.	long-term potentiation

109. The _____ are a set of three connective tissue membranes that surround the CNS.	meninges
110. The tough, fibrous, double-layered, outermost meninx is the _____.	dura mater
111. The separation between the cerebral hemispheres is reinforced by an extension of the dura mater called the _____: anteriorly, it is attached to the crista galli of the skull, and so helps to hold the brain in position.	falx cerebri
112. The _____ are tubes that are formed between the two layers of the dura mater through which venous blood flows.	dural sinuses
113. The _____ is the middle meninx.	arachnoid mater
114. The ____ is the innermost meninx: it clings tightly to the surface of the brain, even in the sulci.	pia mater
115. The wide, cerebrospinal fluid containing space is between the _____ mater and the pia mater and is called the _____ space.	arachnoid; sub-arachnoid
116. The main blood vessels supplying the brain are in the _____ space.	sub-arachnoid
117. _____ fills the ventricles and surrounds the brain and spinal cord, acting as a shock absorber, distributing nutritive materials, removing wastes, and providing a chemically stable environment.	Cerebrospinal fluid
118. The cells of the capillaries in the brain are unusual in that they are _____.	joined by tight junctions
119. Capillaries in the brain are much less _____ than capillaries elsewhere in the body.	permeable
120. Cerebrospinal fluid is formed in regions within the ventricles called _____ by _____ cells.	choroid plexuses; ependymal
121. After the CSF is formed, it circulates from the lateral ventricles to the third and fourth ventricles, and from there to the _____ and central canal of the spinal cord.	sub-arachnoid space
122. After circulation the CSF returns to the blood by passing through the _____, which are clusters of the arachnoid mater which project into the dural sinuses and act as one-way valves.	arachnoid granulations
123. Impaired blood circulation to the brain due to a blocked or broken vessel is known as a(n) _____, _____ or _____.	cerebrovascular accident; stroke; brain attack
124. (True/False) Most of the neuronal death due to a stroke occurs several minutes or even hours after the stroke begins, allowing time for emergency treatment to have a major effect.	TRUE
125. An abnormal build up of beta-amyloid protein fragments in the regions surrounding neurons, and of neurofibrillary tangles in the cytoplasm of pyramidal neurons and in that of neurons whose axons connect with them, are the causes of neuronal death in _____.	Alzheimer's Disease
126. In the elderly, drug reactions, poor circulation, or disease, all of which may be curable, can mimic the dementia caused by _____, which is not.	Alzheimer's Disease

127. In Huntington's Disease, damage to the caudate nucleus, one of the basal nuclei, caused by an abnormal protein leads to _____ and eventually to death.	chorea (or involuntary spastic movements)
128. Loss of dopamine-producing neurons in the substantia nigra leads to tremor, muscular rigidity, slow movement and postural instability in _____.	Parkinson's Disease
129. The _____ is formed of paired strips of cells arising from the ectoderm at the margin of the neural tube.	neural crest
130. The spinal cord itself is formed from the _____, and the dorsal root ganglia are formed from the _____.	neural tube; neural crest
131. The spinal cord extends from the _____ to the _____; below L1 it branches to form the _____.	skull; L1 vertebra; cauda equina
132. In addition to the vertebral column, the spinal cord is protected by the _____ and _____.	meninges; CSF
133. In the inferior regions, there is a gap between the _____ and the _____ into which anesthetics are often introduced ("epidural" – "upon the dura").	dura mater; vertebrae
134. The butterfly-shaped central core of gray matter in the spinal cord can be divided into three regions. The _____ contains the cell bodies of somatic motor neurons.	anterior horn
135. The butterfly-shaped central core of gray matter in the spinal cord can be divided into three regions. The _____ contains the cell bodies of the autonomic motor neurons and is present only in the thoracic and upper lumbar (L1 and L2) regions.	lateral horn
136. The butterfly-shaped central core of gray matter in the spinal cord can be divided into three regions. The _____ contains interneurons.	posterior horn
137. The axons of the neurons from the _____ and _____ horns emerge together as the ventral roots.	lateral; anterior
138. The _____ are formed from the cell bodies of sensory neurons whose axons branch to extend inward to the spinal cord and outward to the body.	dorsal root ganglia
139. _____ are white-matter columns consisting of the myelinated axons of neurons associated with the spinal cord.	Funiculi
140. The neuronal cell bodies for the ascending pathways of the spinal cord itself are found in the _____ or _____.	dorsal horn; dorsal root ganglia
141. Neurons in the _____ have axons which extend from the receptor to the spinal cord, or in some cases all the way to the brain.	dorsal root ganglia
142. Neurons of the dorsal horn receive signals from those in the _____. Their own axons extend to reach neurons in the brain stem, diencephalon, etc.	dorsal root ganglia
143. Detailed information concerning position, vibration, or fine touch are transmitted by the _____ pathway of the somatosensory tracts of the spinal cord. This pathway is located in the _____.	specific ascending (or lemniscal); posterior funiculus
144. Information regarding crude touch, temperature, pressure, and pain is carried through the _____ pathway of the somatosensory tracts of the spinal cord.	non-specific ascending (or anterolateral); anterior and lateral funiculi

145. Messages carried in the specific and non-specific ascending pathways ultimately reach the somatosensory cortex on _____ the sensor.	the side of the body opposite to (contralateral to)
146. Impulses from the trunk and lower limb regarding position and movement are carried through the _____ pathway of the somatosensory tracts of the spinal cord. This pathway is located in the _____.	spinocerebellar; lateral funiculi
147. Messages carried in the specific and non-specific ascending pathways ultimately reach the somatosensory cortex on _____ the sensor.	the same side of the body as (ipsilateral to)
148. Signals from the pyramidal cells in the motor cortex to the spinal cord are carried by the _____, one of the two motor tracts of the spinal cord.	direct system (or pyramidal system)
149. Signals controlling automatic movements such as those needed to maintain balance are carried by the _____ system, one of the two motor tracts of the spinal cord.	indirect (or extra-pyramidal system)
150. The motor tracts of the spinal cord are located in the _____.	lateral and anterior funiculi
151. Damage to the _____ of the spinal cord prevents nerve impulses from reaching the muscle and causes the muscles to remain limp, a condition called _____ paralysis.	anterior horn neurons; flaccid
152. Damage to the _____ in the brain causes the muscles to contract involuntarily and somewhat at random, a condition called _____ paralysis.	primary motor cortex; spastic
153. Because injuries to the anterior spinal cord are nearly always accompanied by injuries to the _____, flaccid paralysis is often accompanied by _____.	posterior spinal cord; numbness (or anesthesia)
154. Long term paralysis results in irreversible deterioration of the _____.	muscle
155. In _____, a contrast dye is injected into one or more arteries to make them visible in X-rays.	angiography
156. _____ tests are used to verify that the spinal cord and brain are functioning properly.	Reflex
157. In _____, multiple X-rays, taken from many angles, are combined by computer into a 3D image.	CAT scans (or CT scans)
158. In _____, radio waves are used to produce detailed images which include soft tissues.	MRI
159. In _____, metabolism by each tissue is measured by passing the patient through a circular scanner after he or she has been given a small amount of a radioactive chemical.	PET scans
160. Conventional diagnosis of Alzheimer's Disease requires two or three years, while newer techniques such as _____ may provide a rapid and unambiguous diagnosis.	PET scans
161. Drugs, radiation, infections, and malnutrition are particularly dangerous while a woman is pregnant because they can alter _____.	CNS development

162. In the elderly, blood pressure abnormalities, poor circulation, poor nutrition, prolonged inactivity and drug interactions can all induce _____. "Recoverable Cognitive Dysfunction"- common in hospitalized elders; complicates care! (Inouye SK, Zhang Y, Han L, Leo-Summers L, Jones R, Marcantonio E., "Recoverable Cognitive Dysfunction at Hospital Admission in Older Persons During Acute Illness." J Gen Intern Med. 2006 Sep 11; PMID: 16965558)	reversible (curable) senility

1. Neural structures other than the brain and spinal cord are all part of the _____.	peripheral nervous system (PNS)
2. Most receptors in the PNS are _____ receptors: that is, they are not a part of a specific body structure dedicated to receiving information from the environment.	simple
3. Receptors in body structures dedicated to receiving information from the environment, such as the eyes and ears, are _____ receptors and the structures themselves are called the _____ organs.	complex; special sense
4. _____ respond to pressure, itch, touch, vibration, and stretch.	Mechanoreceptors
5. _____ are sensitive to changes in temperature.	Thermoreceptors
6. _____ respond to light energy; in humans, these are found in the retina.	Photoreceptors
7. _____ respond to chemicals, and are used in our senses of smell and taste and to detect changes in blood chemistry.	Chemoreceptors
8. _____ are receptors that are dedicated to sensing pain.	Nociceptors
9. Receptors near the body's surface which respond to changes in the external environment are called _____.	exteroceptors
10. _____ are receptors in internal viscera and blood vessels which sense chemical changes, temperature, and other factors necessary to maintain homeostasis.	Interoceptors (or visceroceptors)
11. _____ are receptors which are found in skeletal muscles, tendons, joints, ligaments, etc., which allow us to sense the position of the body.	Proprioceptors
12. Free nerve endings are responsible for detecting _____, _____, _____, _____ and _____.	pain, temperature, itch, joint movement, proprioception
13. Merkel disks respond to _____.	light pressure
14. Hair follicle receptors are responsible for detecting _____.	light touch (hair deflection)
15. Meissner's corpuscles are responsible for detecting _____.	light pressure, texture
16. Pacinian corpuscles are responsible for detecting _____.	deep pressure
17. Ruffini's corpuscles are responsible for detecting _____.	deep pressure or stretch
18. Muscle spindles are responsible for detecting _____.	muscle stretch

19. Golgi tendon organs are responsible for detecting _____.	tendon stretch
20. _____ is the awareness of changes in the internal or external environment while _____ is their interpretation. Both of these occur only in the _____.	Sensation; perception; CNS
21. In order for an event to be sensed, an appropriate receptor must convert the stimulus to a(n) _____.	electric signal (or action potential)
22. _____ are the neurons that are the first to generate an action potential in response to an event.	First order neurons
23. The soma (cell bodies) of the first order neurons reside in the _____ or _____ ganglia.	dorsal root; cranial
24. The _____ are the interneurons in the CNS which receive the signal from the first order neurons. Their cell bodies are found in the _____ of the spinal cord or in the _____, and convey their signals within the spinal cord, or to the thalamus or cerebellum.	second order neurons; dorsal horn; medullary nuclei
25. Some sensory signals are received by third order neurons in the _____ and are passed on to the cerebrum for perception. Others are never perceived, but are instead only sensed and acted on at the subconscious level.	thalamus
26. Perception occurs in the _____.	cerebral cortex
27. A(n) _____ potential is a membrane potential that is caused by an event in the environment and which reaches the threshold level needed to generate an action potential.	generator
28. A generator potential is a(n) _____ potential and so depends on the strength of the stimulus.	graded
29. In receptors that are capable of adaptation, an unchanging stimulus leads to a(n) _____ response.	decreasing and eventually absent
30. Afferent ganglia are found in the _____, adjacent to the _____.	dorsal root ganglia; spinal cord
31. Efferent ganglia are primarily _____ motor neurons whose distribution is _____.	autonomic; complex
32. _____ are cordlike organs in the PNS consisting of peripheral axons, blood vessels, and connective tissue.	Nerves
33. The _____ is the connective tissue surrounding individual axons within a nerve.	endoneurium
34. The _____ is the connective tissue surrounding a fascicle of axons in a nerve.	perineurium
35. The _____ is the connective tissue surrounding the entire nerve (including the blood vessels).	epineurium
36. After the axon of a peripheral neuron is damaged, the _____ end deteriorates.	distal

37. After the axon of a peripheral neuron is damaged, _____ cells detach from the myelin sheath and divide to guide new axonal growth.	Schwann
38. Signals carrying information regarding odors are carried to the brain via cranial nerve # _____, the _____ nerve.	1; olfactory
39. Visual signals are carried to the brain via cranial nerve # _____, the _____ nerve.	2; optic
40. Cranial nerve # _____, the _____ nerve, is primarily a motor nerve: it controls the eyelid, four of the six extrinsic muscles which move the eye, and also resizes the iris and focuses the lens.	3; oculomotor
41. Cranial nerve # _____, the _____ nerve, innervates only one of the six muscles which move the eye, the superior oblique muscle.	4; trochlear
42. Cranial nerve # _____, the _____ nerve, controls several of the muscles needed for speech, chewing, and swallowing, as well as carrying sensory information from the face, scalp, and mandibles. (Two of its three branches innervate the teeth.)	5; trigeminal
43. Cranial nerve # _____, the _____ nerve, innervates the muscles of the eye which abduct the eyeballs.	6; abducens
44. Sensations of taste and the ability to control facial expression are provided by cranial nerve # _____, the _____ nerve. It also helps with swallowing and controls the tear glands and two sets of salivary glands.	7; facial
45. Cranial nerve # _____, the _____ nerve, carries sensations needed for hearing and maintaining balance.	8; vestibulocochlear
46. Cranial nerve # _____, the _____ nerve, is involved in taste and carries sensory signals from the tongue, middle ear, and pharynx. It also assists in monitoring blood pressure and blood gas concentrations by carrying information received from receptors in the carotid arteries.	9; glossopharyngeal
47. Cranial nerve # _____, the _____ nerve, is the only cranial nerve to extend below the neck. It innervates the throat and mouth as well as thoracic and abdominal organs.	10; vagus
48. Cranial nerve # _____, the _____ nerve, is the only 'cranial' nerve to include a spinal root. It innervates the larynx, pharynx, and several muscles of the neck.	11; accessory
49. Cranial nerve # _____, the _____ nerve, allows tongue movement during eating and speaking.	12; hypoglossal
50. _____ are small bundles of axons emerging from or entering the spinal cord.	Rootlets
51. As the distance from the spinal cord increases, rootlets merge to form _____.	roots
52. _____ are roots that are formed from the axons of neurons whose cell bodies are in the anterior horn of the spinal cord.	Ventral roots
53. The dorsal roots are formed from the axons of neurons whose cell bodies are in the _____.	dorsal root ganglia
54. Dorsal roots contain _____ fibers.	sensory (or afferent)

55. Spinal nerves leave the spinal column through _____.	intervertebral foramen
56. The ventral and dorsal roots merge to form the _____ as they exit the vertebral column.	spinal nerves
57. Soon after exiting the vertebral column, each spinal nerve divides into four branches, the _____, _____, _____ and _____.	dorsal ramus; ventral ramus; meningeal branch; rami communicantes
58. The rami communicantes are found only in the _____, because they are a part of the _____.	thoracic region; ANS
59. A(n) _____ is a complex network of interacting and cross connected nerves.	plexus
60. Each nerve leaving a plexus is a combination of axons from several _____.	spinal nerves
61. Plexuses consist of axons from the _____ rami of spinal nerves.	ventral
62. All ventral rami except those from _____ intertwine in plexus.	T2 - T 12
63. _____ innervate the thorax, controlling muscles to the ribs, anterolateral thorax, and abdominal wall.	Ventral rami from T1 to T12
64. Because of the complex intertwining of the motor nerves in plexuses, damage to the spinal nerves can be difficult to diagnose based on motor deficits, and must instead be diagnosed based on _____.	sensory deficits
65. A dermatome is a(n) _____.	area of skin innervated by a single spinal nerve
66. The _____ innervates the skin of the neck, ear, back of the head, shoulders, and diaphragm, and is formed from the ventral rami of _____.	cervical plexus; C1 to C4
67. The most important nerve of the cervical plexus is the _____, which innervates the diaphragm and controls _____.	phrenic; breathing
68. The _____ plexus innervates the upper limb, and is formed from the ventral rami of _____.	brachial; C5 to T1
69. The five ventral rami that form the _____ of the brachial plexus merge to form three _____, which then quickly branch into six _____. These then recombine to form three _____. Finally, these branch again to form the five nerves of the upper limb.	roots; trunks; divisions; cords
70. The _____ nerve of the brachial plexus innervates the deltoid and teres minor.	axillary
71. The _____ nerve of the brachial plexus innervates the biceps brachii, brachialis and coracobrachialis.	musculotaneous
72. The _____ nerve of the brachial plexus innervates most of the flexor muscles of the forearm and the lateral portions of the hand.	median

73. The _____ nerve of the brachial plexus innervates the flexor carpi ulnaris, flexor digitorum profundus and the medial portions of the hand.	ulnar
74. The _____ nerve of the brachial plexus innervates parts of the biceps brachii and triceps brachii as well as nearly all of the extensor muscles of the forearm.	radial
75. The _____ plexus innervates the thigh, abdominal wall, and psoas muscles, which is formed from the ventral rami of _____.	lumbar; L1 to L4
76. Thigh flexion, thigh abduction and knee extension are mediated by the _____ and _____, two major nerves of the lumbar plexus.	femoral nerve; obturator nerve
77. The _____ plexus innervates the foot and leg, and is formed from the ventral rami of _____.	sacral; L4 to S4
78. The _____ is the major nerve of the sacral plexus and is the longest and thickest nerve of the body. It is actually a single name for two separate nerves, the tibial nerve and the fibular or peroneal nerve.	sciatic nerve
79. The _____ nerve innervates the foot and leg.	sciatic
80. A(n) _____ is a rapid, involuntary response to a stimulus.	reflex
81. If its effector is a skeletal muscle, a reflex is a(n) _____ reflex.	somatic
82. If its effector is a smooth muscle, cardiac muscle, or gland, a reflex is a(n) _____ reflex.	autonomic
83. _____ reflexes cause contraction of a stretched muscle and relaxation of the antagonist muscle. The most famous example is the patellar reflex, in which the muscles of the quadriceps are stretched by tapping the patellar tendon.	Stretch
84. Pulling a bodypart away from a painful stimulus is a(n) _____ reflex.	flexor OR withdrawal
85. The _____ reflex leads to activation of flexors on one side of the body and extensors on the opposite side.	cross-extensor
86. With age, the number of general sensory receptors such as Meissner's corpuscles and Pacinian corpuscles _____	decreases
87. The _____ reflex prevents an overly-powerful muscle contraction from tearing a tendon by inhibiting the contraction of the muscle.	Golgi tendon

1. The autonomic nervous system is a subdivision of the _____.	motor division of the PNS
2. Visceral activities such as blood pressure, heart rate, pupil size, etc., are controlled by the _____.	autonomic nervous system (ANS)
3. In the somatic nervous system, the effectors are _____.	voluntary
4. In the autonomic nervous system, the effectors are _____.	involuntary muscles and glands
5. In the _____ nervous system, efferent neurons extend their axons directly from the CNS to the effector.	somatic
6. In the _____ nervous system, efferent neurons in the _____ (pre-ganglionic neurons) extend axons to ganglia located throughout the body, where they _____. _____ carry the message to the effector.	autonomic; CNS; synapse with ganglionic neurons; Ganglionic neurons
7. In the _____ nervous system, acetylcholine is the neurotransmitter and it is always a(n) _____.	somatic; activator
8. In the autonomic nervous system, the neurotransmitters are _____ and _____, which can be _____ or _____ depending on the effector involved.	acetylcholine; norepinephrine; excitatory; inhibitory
9. The _____ division of the autonomic nervous system controls processes that are active when all is peaceful and going well.	parasympathetic
10. The _____ division of the autonomic nervous system controls processes that are active when events are stressful.	sympathetic
11. In general, most body functions required for maintenance of homeostasis have components that are controlled by _____ of the ANS.	competition between the parasympathetic and sympathetic divisions
12. Thermoregulation is controlled by the _____ of the ANS.	sympathetic division
13. Metabolic rate is controlled by the _____ of the ANS.	sympathetic division
14. Blood pressure is controlled by the _____ of the ANS.	sympathetic division
15. Some activities are complex and require control by _____ of the ANS.	both the parasympathetic and sympathetic divisions
16. Activation by the _____ division of the ANS is longer lasting than by the _____ division.	sympathetic; parasympathetic
17. _____ is the neurotransmitter used to activate almost all effectors in the sympathetic division of the ANS while _____ is used by the parasympathetic division.	Norepinephrine; acetylcholine
18. Two reasons that activation by the sympathetic division of the ANS has a long duration are that the neurotransmitter _____ is inactivated more slowly than _____, and also acts through _____ systems in the cell rather than directly operating ion channels.	norepinephrine; acetylcholine; second messenger

19. Sympathetic activation releases the neurotransmitters norepinephrine and epinephrine directly into the blood via the action of the _____.	adrenal glands
20. The blood-borne neurotransmitters of the sympathetic division remain active until _____.	they are destroyed by the liver
21. The cell bodies of parasympathetic neurons within the CNS reside _____.	in the brain stem or sacral region of the spinal cord (the cauda equina)
22. Parasympathetic nerve fibers leave the CNS only in the _____ region(s).	cervical and sacral
23. Ganglia for the parasympathetic division of the ANS are located _____.	near, or in, the organs they innervate
24. Sympathetic nerve fibers leave the CNS in the _____ region(s) of the vertebral column.	thoracic and superior lumbar
25. The cell bodies of the pre-ganglionic sympathetic neurons of the ANS form the _____ of the spinal cord.	lateral horn
26. The axons of many of the pre-ganglionic sympathetic neurons synapse adjacent to the spinal cord in the _____.	chain ganglia OR paravertebral ganglia OR central ganglia
27. The cell bodies of many of the post-ganglionic neurons whose axons innervate sympathetic effectors are located adjacent to the vertebrae and are called _____.	chain ganglia OR paravertebral ganglia OR central ganglia
28. The axons of many of the pre-ganglionic sympathetic neurons pass through the chain ganglia and synapse in the _____.	collateral ganglia
29. The cell bodies of many of the post-ganglionic neurons whose axons innervate sympathetic effectors are located in the ventral cavity and are called _____.	collateral ganglia
30. The _____, which refers to the collateral ganglia as a group, clings to the walls of the abdominal aorta.	abdominal aortic plexus
31. _____, which means 'in the trunk of the body', are nerves of the sympathetic ANS which pass through the chain ganglia to synapse in the collateral ganglia.	Splanchnic
32. Sympathetic axons which leave_____ are myelinated and are called the white rami.	the CNS to reach the chain ganglia
33. The axons which leave _____ are not myelinated and are called the gray rami.	neurons in the chain ganglia and extend to the effector
34. Afferent components of the ANS can be found in two locations: in nerves which include _____ and in nerves which include _____.	afferent somatic fibers; efferent ANS fibers
35. _____ is pain arising from the viscera which is perceived to be in a different location. This is thought to be because visceral afferents travel the same pathways as somatic afferents.	Referred pain
36. Unexplained pain in areas of the body not normally considered to be likely to give rise to life threatening problems (for example, the left arm) should be treated seriously because it may be _____.	referred pain from a vital organ such as the heart

37. _____ is an adjective that refers to acetylcholine and is used to describe receptors and nerve fibers that bind or release acetylcholine.	Cholinergic
38. There are two types of cholinergic receptors, _____ and _____, which are sufficiently different that drugs can be found which affect one but not the other.	muscarinic; nicotinic
39. _____ is an adjective that refers to norepinephrine and is used to describe receptors and nerve fibers that bind or release norepinephrine.	Adrenergic
40. There are two major classes of adrenergic receptors, _____ and _____, each of which has several sub-classes and each of which may be targeted by specific drugs.	alpha-adrenergic; beta-adrenergic
41. The effect of a neurotransmitter depends on two factors: the _____ to which they bind and the _____.	receptors; cell type
42. The effect of neurotransmitters on a target organ can sometimes be predicted simply by knowing the _____. For example, fright releases norepinephrine into the blood and is _____ to the heart.	physiological need; excitatory
43. The fact that receptor subtypes exist is very important to the medical field because _____.	it allows drugs to be targeted to specific receptors, cells, tissues, etc.
44. The adrenal medulla is stimulated to secrete epinephrine and norepinephrine directly into the blood by the _____ division of the ANS, and is not affected by the _____ division.	sympathetic; parasympathetic
45. Heart rate is increased by the _____ division of the ANS.	sympathetic
46. Heart rate is decreased by the _____ division of the ANS.	parasympathetic
47. The bronchioles in the lungs are constricted by the _____ division of the ANS.	parasympathetic
48. The bronchioles in the lungs are dilated by the _____ division of the ANS.	sympathetic
49. Digestive tract activity, including motility, secretion of digestive juices, and sphincter relaxation are promoted by the _____ division of the ANS.	parasympathetic
50. Digestive tract activity, including motility, secretion of digestive juices, and sphincter relaxation are inhibited by the _____ division of the ANS.	sympathetic
51. The role of the parasympathetic division of the ANS in the male sexual response is to cause _____, and that of the sympathetic division to cause _____.	penile erection; ejaculation
52. The role of the parasympathetic division of the ANS in the female sexual response is to cause _____, and that of the sympathetic division to cause _____.	clitoral erection; vaginal lubrication and contraction
53. Blood vessels are constricted due to _____.	stimulation by the sympathetic division of the ANS
54. Blood vessels are dilated due to _____.	lack of stimulation by the sympathetic division of the ANS

55. Diverse signals from the limbic system, the reticular formation, the cerebral cortex, and the spinal cord are integrated to influence the activity of the ANS by _____.	the hypothalamus
56. The _____ mediates many reflex actions required for homeostasis, including breathing, heart rate, heart contraction force, and blood pressure.	brain stem
57. The _____ mediates many activities requiring autonomic activity, including defecation, urination, erection (penile or clitoral), and ejaculation.	spinal cord
58. Hypertension (high blood pressure) results if the _____ response is overactive.	sympathetic vasoconstrictor
59. Raynaud's disease is a disease in which _____.	blood vessels constrict in the fingers and toes
60. Re-activation of somatic fibers in the spinal cord following non-permanent injury result in _____ and _____ in the regions inferior to the injury as part of the mass reflex reaction.	pain; convulsions
61. Re-activation of autonomic fibers in the spinal cord following non-permanent injury result in potentially fatal _____ and in _____ as part of the mass reflex reaction.	blood vessel constriction; colon and bladder emptying
62. During development, pre-ganglionic neurons of the ANS are derived from the _____.	embryonic neural tube
63. During development, autonomic nervous system structures in the PNS such as ganglionic neurons and the adrenal medulla are derived from the _____.	neural crest
64. _____ is a form of low blood pressure common in old age, and occurs when sympathetic vasoconstrictive centers are slow to respond to positional changes.	Orthostatic hypotension
65. Orthostatic hypotension, dry eyes, and constipation are all linked to a common cause in old age: _____.	decrease in the efficiency of the ANS

1. _____, or taste, is the sensation and perception of chemicals dissolved in saliva.	Gustation
2. _____, or smell, is the sensation and perception of chemicals dissolved in the fluids of the nasal membranes.	Olfaction
3. The five classes of chemoreceptor for gustation are _____, _____, _____, _____, and _____.	salty; sweet; sour; bitter; umami
4. Chemoreceptors in the mouth are located on _____, a specialized structure found on gustatory cells.	gustatory hairs
5. The small visible bumps on the tongue are _____.	mucosal papillae
6. Taste buds are _____ within some types of mucosal papillae, not the mucosal papillae themselves.	microscopic groups of cells
7. Cells which comprise taste buds die after roughly _____, and are replaced by division of _____.	one week; basal cells
8. The chemoreceptor cells involved in gustation signal by _____, not by themselves generating an electrical signal. (They are not neurons.)	releasing a neurotransmitter
9. Chemoreceptors _____ when they bind to the chemical they are built to recognize.	change shape
10. The nerves which send axons to meet the chemoreceptor cells involved in gustation are cranial nerves #s _____, _____, or _____.	VII; IX; X
11. Once a signal is generated by a taste bud, associated neurons carry the signal to the _____, which relays it to the _____, which in turn sends it to the _____, _____ and _____.	medulla; thalamus; cerebral cortex (OR taste cortex of cerebrum); hypothalamus; limbic system
12. The _____ is a patch of olfactory epithelium slightly larger than the top surface of the tongue.	olfactory organ
13. The olfactory organ is located in the _____.	roof of the nasal cavity
14. As air is inhaled, chemicals carried by it dissolve in the _____ of the olfactory organ, allowing them to bind to the chemoreceptors of the olfactory cells found there.	liquid coating the mucosa (OR mucous)
15. Olfactory cells are _____.	bipolar neurons
16. The axons of olfactory cells form the filaments of _____: they pass through the _____ of the skull to reach the olfactory bulb, where they synapse with neurons of the olfactory tract.	cranial nerve I (the olfactory nerve); cribriform plate
17. Unlike taste, there are _____ <roughly how many?> of odorant receptors (chemoreceptors for chemicals sensed as an odor).	hundreds of different types
18. Each neuron expresses _____ <roughly how many?>, odorant receptors.	one, or at most a few

19. Eyelids are thick, skin covered folds supported internally by the _____, which also anchor the _____ and_____, the muscles which control the motion of the eyelids.	tarsal plates; orbicularis oculi; levator palpebrae superioris
20. Eyelids protect the eye when closed, and also _____ and _____ by blinking.	spread lubricants; remove debris
21. Eyelashes on each lid serve as extremely sensitive _____, triggering reflex eyelid closure when sensation is unexpected.	touch receptors
22. Glands with ducts at the edges of each lid produce _____.	oily secretions that lubricate lids
23. _____ are transparent mucous membranes that line the eyelids and the anterior surface of the eyeball (except for _____). Their major function is to produce a lubricating mucus that prevents the eye from drying.	Conjunctiva; the cornea
24. The lacrimal apparatus includes the _____, which produces tears, and the ducts that drain excess liquid into the _____.	lacrimal gland; nasal passages
25. Tears enter the eye _____ and leave via ducts at the medial corner of the eye (the _____).	superiolaterally; medial canthus
26. Tears contain mucus, _____ and _____, an enzyme, both of which protect the eye from bacteria.	antibodies; lysozyme
27. The extrinsic eye muscles include four _____ which direct the eye's gaze up, down, left, or right. In addition, there are two_____ (superior and inferior) which keep the eye from spinning or twisting.	rectus muscles; oblique muscles
28. The eye itself has an outer wall composed of three layers, or "_____."	tunics
29. The _____ is the outermost layer of the eyeball: in the front it is clear, forming the _____. The surrounding areas are white, and form the _____.	fibrous tunic; cornea; sclera
30. In the back of the eye, the fibrous tunic extends to cover the optic nerve, and is continuous with the _____.	dura mater
31. The _____ (or _____) is the middle layer of the eyeball's wall.	vascular tunic; uvea
32. In the front of the eye, the vascular tunic (or uvea) forms the _____.	iris
33. The iris lies between the _____ and the _____ and is continuous with the next region, the ciliary body, which is _____.	cornea; lens; smooth muscular tissue that controls the shape of the lens
34. Posterior to the ciliary body is the _____ a dark brown membrane that contains _____.	choroid; the blood vessels that supply the eye tunics
35. The uvea is also known as the _____.	vascular tunic
36. The _____ (or _____) is the innermost layer of the eye.	sensory tunic; retina

37. The cells of the outer layer of the retina (in relation to the center of the eye) store _____ and act as _____. Both of these functions support the outer layer.	vitamin A; phagocytes
38. The retina has two sub-layers: the outer layer of the retina (in relation to the center of the eye) is pigmented to _____.	prevent light reflection from the back of the eye
39. The outer layer of the retina (in relation to the center of the eye) is a(n) _____ which contains the _____.	transparent neural layer; photoreceptor cells
40. During youth, the lens is flexible, which allows us to _____. This process is called _____.	alter its shape to focus on nearby or distant objects; accomodation
41. Visual acuity is measured by comparison with the average. If one has "20/20 vision," it means that one sees as clearly at 20 feet as _____.	an average person sees at 20 feet
42. The lens is made of special proteins called _____. These in turn are made by special cells called _____, which contain no nuclei and few organelles.	crystallins; lens fibers
43. Unlike most proteins, crystallins are never _____.	degraded
44. The lens of the eye gets less flexible as we age in part because crystallins are _____ by cells throughout life, and because these proteins are apt to become _____ due to poor repair and lack of replacement.	produced; crosslinked
45. The anterior cavity of the eye is filled with _____, a clear fluid similar to blood plasma.	aqueous humor
46. The anterior and posterior cavities of the eye are separated by the _____.	lens
47. The anterior and posterior chambers of the anterior cavity of the eye are separated by the _____.	iris
48. The aqueous humor is formed in the _____ of the eye, and is reabsorbed in the _____.	posterior chamber of the anterior cavity; anterior chamber of the anterior cavity
49. The posterior cavity of the eye is filled with _____, a jelly-like substance which is produced _____ and is not _____.	vitreous humor; before birth; replaced
50. Vitreous humor functions to _____ the retina and helps to maintain _____ against the pressure of the extrinsic muscles.	support; the shape of the eye
51. The axons of the retinal ganglion cells run along the surface of the retina before leaving the eye as the _____.	optic nerve
52. The region of the retina where the axons of the retinal ganglion cells leave the eye is called the _____ or _____, and lacks _____.	optic disk; blind spot; photoreceptor cells
53. In order to interact with photoreceptors, light must actually pass *through* the _____; the light-sensitive portion of the photoreceptor cells form the posterior aspect of this layer.	retina
54. Most of the light-bending which results in an image forming on the retina is due to the _____. Many patients benefit from having it re-shaped surgically to correct myopia, hyperopia, or astigmatism.	cornea

55. In a relaxed eye, the lens is _____ by ligaments of the eye.	stretched
56. Contracting the ciliary body of an eye results in _____ tension on the lens, so that (if the lens belongs to a young person) it becomes _____.	less; rounder
57. The light sensitive portion of the photreceptor cells is _____ to maximize surface area, and contains many _____ which absorb light.	wrinkled; photopigment molecules
58. When a photopigment is hit by an appropriate light, it breaks apart into two parts: a vitamin A derivative, _____, and a glycoprotein, _____.	retinal; opsin
59. The membrane potential in photoreceptor cells is unusual: _____ is allowed to leak across the membrane. This flow of ions is called the _____.	sodium; dark current
60. Opsin activates a second messenger system which _____ sodium channels in the photoreceptor cells.	closes
61. When a photoreceptor cell membrane hyperpolarizes, the cell _____. This lets nearby bipolar neurons know that the photoreceptor has been exposed to light.	stops releasing neurotransmitters
62. There are two types of photoreceptor cell: _____, which respond to as little as a single photon of light, regardless of color, and _____, which are less sensitive but respond color.	rods; cones
63. How many type(s) or retinal exist? How many type(s) of opsin?	one; four
64. There are three sub-types of "cones," each of which has its own type of _____ and responds to a different _____.	opsin; color
65. We integrate signals from the three types of cone in order to recognize _____.	many different colors
66. The photopigment in rods is called _____; in bright light, it is present only as _____ and _____.	rhodopsin; retinal; opsin
67. (A) Photoreceptor cell releases neurotransmitter. (B) Photoreceptor cell opens sodium channels. (C) Opsin closes sodium channels. (D) Neurotransmitter molecules from bipolar cells binds to ganglion cells. (E) Photoreceptor cell stops releasing neurotransmitter. (F) Light hits a photoreceptor cell and causes retinal and opsin to separate. (G) Bipolar cells start to release neurotransmitter molecules. What is the correct order for the above events?	B-A-F-C-E-G-D Note: do not memorize the letters, on a test the question would have the items shuffled.
68. Cones are about _____ sensitive than rods.	100-fold less
69. The acuity of vision with rods is lower than of vision with cones because _____.	several rods signal each ganglion cell
70. High acuity vision is provided by _____.	cones
71. The region of the eye which has the most cones (and thus has the highest acuity) and has no rods at all consists of the _____ and _____.	macula lutea; fovea centralis

72. The only region of the eye capable of high-acuity vision (such as that used to read fine print) consists of the _____ and _____.	macula lutea; fovea centralis
73. _____ is a problem in which the cornea is unevenly shaped, so that objects appear wavy.	Astigmatism
74. _____ is nearsightedness: the eye is _____, resulting in a very close field of vision.	Myopia; elongated
75. _____ is farsightedness: the eye is _____, and the lens cannot be _____ enough to focus on near objects.	Hyperopia; shortened; round
76. A cataract refers to _____.	clouding of the lens
77. Two common agents that increase the risk of cataract are _____ and _____.	smoking; ultraviolet light
78. If the flow of the aqueous humor out of the eye is partially blocked, the result is _____ called glaucoma, which will eventually damage the retina and cause _____.	an increase in the internal pressure of the eye; blindness
79. Color blindness is due to the genetic absence of one type of _____.	cone
80. Color blindness is due to a defect on the _____ chromosome.	X
81. When we first enter a dim area, we are unable to see because _____ and _____.	all rhodopsin in rods is photobleached; the cones are not sensitive enough to detect dim light
82. An immediate adaptation that helps us to see in a dim area is that the _____.	pupil dilates
83. A slow but complete adaptation to a lack of light is made possible by synthesis of _____ in rods.	rhodopsin
84. Since retinal is made from _____, dark adaptation due to rhodopsin synthesis from retinal and opsin is sensitive to a dietary deficiency in this substance.	vitamin A
85. When exposed to light suddenly after the eyes have adjusted to dim light, the light seems bright because all _____ in the rods photobleaches, as does much of the photopigment in cones, resulting in complete closure of the _____ of the rods and a dramatic increase in their closure in cones. This effect is decreased by adaptation.	rhodopsin; sodium channels
86. At the optic chiasma, fibers from the _____ of each retinal field cross over to the opposite side.	medial half
87. The left hemisphere of the brain receives information from the _____..	right half of the visual field
88. Axons from retinal neurons meet to form the _____, and then travel to three areas, the _____, _____ and _____.	optic nerve; thalamus; midbrain; hypothalamus
89. Signals from fibers of the optic nerve which travel to the thalamus ultimately are conveyed to the _____.	optic cerebral cortex

90. Some fibers from the optic nerve travel to the midbrain, which controls _____ and _____.	eye movement; pupil dilation
91. Some fibers from the optic nerve travel to the hypothalamus, which interprets _____ and sets _____.	time of day; circadian rhythm
92. The combination of inhibitory and excitatory processing in the retina results in signal processing which emphasizes _____.	edges
93. Depth perception is made possible by processing in the _____, which separates signals from the two eyes before forwarding the signals to the visual cortex.	thalamus
94. The _____ contains an exact map of the retina, so that a ganglion cell's action potential in the retina is matched by the excitation of a single neuron in this region.	visual cortex
95. The outer ear is composed of the visible portion of the ear, as well as the _____ and _____.	external auditory canal; eardrum (OR tympanic membrane)
96. The _____ is the boundary between the outer and the middle ear.	tympanic membrane (OR eardrum)
97. The small, air-filled, mucosa-lined cavity medial to the eardrum is the _____.	middle ear (OR tympanic cavity)
98. The pharyngotympanic tube (aka Eustachian tube) connects the _____ to the _____.	middle ear; nasal pharynx
99. The _____ allows air pressure in the middle ear to equalize with the external environment.	pharyngotympanic tube OR Eustachian tube
100. Sound is vibration of gas or liquid. Our ability detect it begins as vibrating air molecules push and pull on the _____.	eardrum (OR tympanic membrane)
101. The three small bones of the middle ear transmit vibratory motion from the eardrum to the _____.	oval window (OR perilymph, via the oval window)
102. Excessive motion of the three bones of the middle ear is prevented by the _____ muscle and _____ muscle.	tensor tympani; stapidius
103. The small bones of the middle ear are the _____, _____ and _____.	malleus; incus; stapes
104. The inner ear is also called the _____.	labyrinth
105. The part of the inner ear that is formed from the _____ bone is called the _____ labyrinth.	temporal; bony
106. The soft tissue portion of the inner ear (which is filled with fluid) is called the _____ labyrinth.	membranous
107. The membranous labyrinth is surrounded by fluid called _____ and filled with _____.	perilymph; endolymph

108. The vestibule is a compartment of the inner ear which is the major system involved in _____.	equilibrium (OR balance)
109. The semicircular canals are compartments of the inner ear which sense _____.	rotation of the head
110. The cochlea is a snail shaped organ in the inner ear which is responsible for _____.	hearing
111. The actual organ within the cochlea which is responsible for hearing is the _____.	Organ of Corti
112. As vibrations in the ear cause the eardrum to vibrate, the eardrum pushes against the _____.	ossicles (OR malleus, incus, and stapes)
113. The three bones of the middle ear are collectively called the _____.	ossicles
114. As the eardrum vibrates, the ossicles move, and their movement is converted to motion of the _____.	perilymph
115. The oval window is blocked by the _____, while the round window is closed by a flexible membrane.	stapes
116. Movement of fluid in the inner ear causes movement of the fibers of the _____, which are much like the strings of an instrument.	basilar membrane
117. Movement of the fibers of the basilar membrane causes movement of the _____ of hair cells, which in turn stimulate the cochlear (vestibulocochlear) nerve.	stereocilia
118. Electrically encoded impulses representing sound are conducted from the ear to the brain by the _____ nerve.	vestibulocochlear
119. Motion of the fluid in the inner ear causes the motion of _____ and the opening of _____ in the hair cells of the Organ of Corti.	cilia; mechanically gated ion channels
120. Ultimately, signals from the auditory pathway find their way to the _____.	auditory cortex
121. Auditory pathways decussate so that both cortices _____.	receive input from both ears
122. Action potential frequency of cochlear cells gives information as to the _____ of a sound, while the responses of particular fibers in various regions of the basilar membrane gives information regarding _____.	loudness; pitch
123. We are able to localize sound by comparing the _____ each ear and the _____ each ear.	time at which the sound was received by; loudness of the sound in
124. The _____ are receptors in the vestibule which respond to vertical and horizontal acceleration and gravity.	maculae
125. The vestibule contains two chambers: the _____, and slightly inferomedial to that, the _____.	utricle; saccule

126. The maculae contain hair cells whose processes are imbedded in _____ called otoliths, which are bound together by a jellylike mass.	calcium carbonate stones
127. The macula in the utricle is on the _____ surface: its hair cells are sensitive to _____.	inferior; horizontal motion
128. The macula in the saccule is on the _____ surface: its hair cells are sensitive to _____.	medial; vertical motion
129. The hair cells of the maculae respond to bending of their processes (which are called stereocilia and kinetocilia) by either opening or closing channel proteins, depending on _____.	the direction in which they are bent
130. The swollen regions at the entrance to each semicircular canal are the _____, each of which houses an equilibrium receptor called a(n) _____.	ampullae; crista ampullaris
131. Each crista ampullaris has hair cells which extend into a soft ridge called the _____.	cupula
132. As fluid flows through the semicircular canals in response to rotation of the head, the _____ bends. This bends the hair cells, which then _____, depending on the direction in which they are bent.	cupula; opene or close channel proteins
133. In response to changes in their membrane potential caused by the opening or closing of channel proteins in their processes, hair cells in the inner ear _____, which activate associated nerve fibers.	release varying amounts of neurotransmitter
134. Signaling from hair cells in the inner ear is moderate when the kinocilia are in the neutral position: signaling increases or decreases as stereocilia or kinetocilia bend, depending on _____.	the direction in which they are bent
135. _____ is caused by impaired sound conduction to fluids of the inner ear.	Conduction deafness
136. _____ is caused by damage to the neural structures of the ear at any point from the cochlear hair cells to the auditory cortical cells.	Sensorineural deafness
137. _____ is a ringing or clicking sound in the ears in the absence of auditory stimuli. It can have many causes.	Tinnitus
138. Equilibrium depends on integration of signals from the eyes, ears, and body. _____ results if these signals do not agree with one another.	Motion sickness
139. Ear development begins in the three week embryo, and diseases such as german measles, if contracted by the mother during _____, can cause deafness in the child.	the first trimester.
140. Vision does not reach maturity until the age of, approximately, _____ years.	six
141. Age related damage to the _____ is called macular degeneration, and is a common cause of late-life blindness. (Only _____ vision remains.)	macula lutea; peripheral
142. The joints of the inner ear, like those throughout the body, are prone to inflammation and faulty remodeling with age, a process called _____: the result is conduction deafness.	osteosclerosis
143. Death of the hair cells in the Organ of Corti is common in old age, leading to _____.	sensorineural deafness

1. _____ tend to be localized and immediate (microseconds to seconds): _____ tend to be widespread, slow (minutes to hours) to be implemented, and slow (minutes to hours) to deactivate.	Neural controls; hormonal controls
2. Circulating hormones are released into _____ by an endocrine gland, and must travel to reach their (often distant) target.	the blood
3. _____ signals are similar to hormones in many ways, but act only on the very cells that release them!	Autocrine
4. _____ signals are similar to hormones in many ways, but act only on neighboring cells, not on distant targets.	Paracrine
5. _____ are biologically active lipids which act in an autocrine or paracrine manner. They are made from essential fatty acids and influence inflammation, ion transport, sleep, and other activities.	Eicosanoids
6. _____ hormones are made from an amino acid by chemical modification, or made by joining amino acids to form a peptide (very small protein).	Amino acid based
7. Steroids, one of the two major hormone classes, are made from _____.	cholesterol
8. Amino acid based hormones generally bind _____, but _____ is an important exception.	at the cell's surface; thyroid hormone
9. _____ enter the cell and interact directly with DNA and nuclear factors to bring about changes in gene expression.	Steroid hormones (OR steroids)
10. In order for a cell to respond to a hormone, the cell must _____.	have an appropriate receptor
11. The receptors for steroids and thyroid hormone are _____.	intracellular
12. If the signal for an organ to release a hormone is _____, the signal is humoral.	the level of a chemical in the blood
13. If the signal for an organ to release a hormone is _____, the signal is neural.	transmitted by the nervous system
14. If the signal for an organ to release a hormone is _____, the signal is hormonal.	a releasing hormone
15. Hormone production is usually limited by _____ feedback in which the target organ alters the blood levels of a(n) _____, the _____, or a(n) _____.	negative; chemical; hormone itself; secondary hormone
16. The pituitary gland is suspended from (and connected to) the _____ by the _____.	hypothalamus; infundibulum
17. Hormones are transported from the hypothalamus to the pituitary via the _____.	infundibulum
18. The pituitary is also called the _____: the anterior portion is the _____, and the posterior portion is the _____.	hypophysis; adenohypophysis; neurohypophysis

19. Together, the _____ and _____ regulate the secretion of virtually every hormone in the body.	hypothalamus; pituitary
20. Growth hormone is secreted by the _____.	adenohypophysis
21. Because growth hormone is the master growth regulator, too little results in dwarfism and too much results in giantism, but in both cases growth remains _____.	proportional
22. In adults, growth hormone serves to maintain _____.	lean mass
23. Secretion of growth hormone is primarily regulated by _____ and _____, both of which are released by the _____.	growth hormone releasing hormone; growth hormone inhibiting hormone; hypothalamus
24. Normal development and activity of the thyroid gland is controlled by _____, a hormone released by the _____.	thyrotropin (OR TSH OR thyroid stimulating hormone); adenohypophysis
25. Release of thyrotropin is caused by _____, a hormone whose own production is limited by _____ feedback and which is produced by the _____.	thyrotropin releasing hormone; negative; hypothalamus
26. Release of corticosteroids is regulated by the hormone _____, which is produced by the _____.	ACTH (OR adrenocorticotropic hormone, OR corticotropin); adenohypophysis
27. The release of ACTH is controlled by the hormone _____, which is produced by the _____.	CRH (OR corticotropin releasing hormone); hypothalamus
28. The gonadotropins _____ and _____ are produced during and after puberty: they regulate the function of the ovaries and testes, and control egg and sperm production. They are made by the _____.	LH (or luteinizing hormone); FSH (follicle stimulating hormone); adenohypophysis
29. The release of LH and FSH is controlled by _____, which is produced by the _____.	gonadotropin-releasing hormone (GnRH); hypothalamus
30. _____ stimulates milk production by the breasts, and is produced by the _____.	PRL (or prolactin); adenohypophysis
31. PRL release is stimulated by _____, which is produced by the _____ at the end of pregnancy and in response to a baby's suckling.	PRH (OR prolactin releasing hormone); hypothalamus
32. The two hormones released by the neurohypophysis are _____ and _____. Both, however, are produced in the _____.	oxytocin; ADH (OR antidiuretic hormone); hypothalamus
33. _____ is a strong stimulant of uterine contractions and controls the secretion (not the production) of milk in response to a baby's suckling. It is released from the _____ but produced by the _____.	Oxytocin; neurohypophysis; hypothalamus
34. Antidiuretic hormone (ADH) promotes _____ by the _____.	water retention; kidneys
35. The release of ADH is controlled by _____ in the _____.	osmoreceptors; hypothalamus
36. The phrase 'thyroid hormone' refers actually to two hormones, _____ and _____.	T3 (OR triiodothyronine); T4 (OR tetraiodothyronine)

37. T4 is also known as _____.	thyroxine
38. The numbers in 'T3' and 'T4' refer to the number of _____ atoms bound to each molecule.	iodine
39. _____ is produced in the hypothalamus: it stimulates the release of _____ from the adenohypophysis, which in turn stimulates the release of thyroid hormone from the thyroid gland.	TRH (thyrotropin releasing hormone); thyrotropin (OR TSH OR thyroid stimulating hormone)
40. _____ are target cells for thyroid hormone.	Most cells in the body
41. Although they are not steroids, T3 and T4 bind to _____ and control _____.	intracellular (OR nuclear) receptors; gene activation
42. In response to T3 and T4, cells increase their _____, building more mitochondria and increasing ion flux across their membranes. As a result, energy is used to produce _____.	metabolic rate; heat
43. The third hormone produced by the thyroid is unlike the other two: it helps to regulate _____ metabolism, and is called _____.	calcium; calcitonin
44. Calcitonin stimulates _____ and inhibits _____, and as a result bone density is _____.	osteoblasts; osteoclasts; promoted (OR increased)
45. _____ cells in the thyroid gland produce _____, which is a large glycoprotein from which T3 and T4 are made.	Follicle; thyroglobulin
46. Follicle cells surround compartments (follicles) in which iodinated thyroglobulin is _____.	stored
47. When T3 and T4 are needed, iodinated thyroglobulin _____. The vesicle combines with a lysosome, and iodinated thyroglobin is cut enzymatically to produce the mature hormone.	re-enters the follicle cells via pinocytosis
48. T3 and T4 are present in the blood _____.	bound to carrier proteins
49. T3 and T4 levels are controlled by _____ feedback: they _____ production of TSH and sensitivity to TRH.	negative; inhibit
50. _____ cells in the _____ glands release _____, which is the hormone that is the primary control of calcium metabolism in the body.	Chief; parathyroid; PTH (OR parathyroid hormone)
51. PTH _____ calcium in the blood.	increases
52. PTH _____ osteoclasts and enhances _____ by the kidneys.	stimulates; reabsorption of calcium phosphate
53. PTH release is inhibited by _____, an example of _____ regulation.	calcium; humoral
54. Intestinal absorption of calcium is promoted by the hormone _____.	PTH (or parathyroid hormone)

55. The outer portion of the adrenal glands, the _____, is _____ tissue derived from embryonic mesoderm.	adrenal cortex; glandular
56. The inner part of the adrenal glands, the _____, is _____ tissue.	adrenal medulla; nervous
57. The adrenal cortex synthesizes _____, which take their name from the location of their synthesis.	corticosteroids
58. There are two major classes of corticosteroid, the _____ and _____.	mineralocorticoids; glucocorticoids
59. _____ regulate the concentrations of ions in the blood, particularly sodium. In humans, _____ is the major example.	Mineralocorticoids; aldosterone
60. One class of corticosteroids, the _____, increases blood volume and pressure in readiness for exertion.	mineralocorticoids
61. Aldosterone is secreted in response to low blood levels of _____ or high blood levels of _____.	sodium; potassium
62. If sodium is being excreted by the body, _____ must be lost as well.	water
63. Aldosterone is secreted in response to _____ blood volume caused by _____.	low; water loss
64. _____ are released by the adrenal cortex in response to stress: they provide energy for 'fight or flight' functions by diverting energy away from immunity and anabolism, and increase blood volume and pressure in readiness for exertion.	Corticosteroids
65. One class of corticosteroids, the _____, provides energy for 'fight or flight' functions by diverting energy away from immunity and anabolism.	glucocorticoids
66. In humans, the principle glucocorticoid is _____.	cortisol
67. _____, although defined as 'male' sex hormones, are present in both genders. In addition to the gonads, the _____ also produces them in low amounts.	Androgens; adrenal cortex
68. Androgens are necessary in _____ for the onset of puberty, the appearance of secondary sex characteristics, and sex drive.	both genders
69. Epinephrine and norepinephrine are also known as _____.	catecholamines (OR adrenaline and noradrenaline)
70. Epinephrine and norepinephrine are released into the blood by the _____.	adrenal medulla
71. The pancreas produces both exocrine and endocrine secretions. Acinar cells produce an enzyme-rich juice used for _____.	digestion
72. Clusters of cells in the pancreas called _____ produce two hormones, _____ and _____, which regulate blood sugar levels.	pancreatic islets (OR Islets of Langerhans); glucagon; insulin

73. In the pancreas, _____ cells produce insulin; _____ cells produce glucagon.	beta; alpha
74. Glucagon is released in response to _____ or _____ in the blood, and its major target is the _____.	low sugar levels; high amino acid levels; liver
75. In response to glucagon, the liver increases _____ and _____, releasing sugar into the blood.	gluconeogenesis; glycogenolysis
76. Glycogenolysis is _____.	the breakdown of glycogen to glucose
77. Gluconeogenesis is_____.	synthesis of glucose from amino acids or from lactic acid or lipids
78. Because of its role in increasing blood sugar levels, glucagon is also released in response to signals from the _____.	sympathetic nervous system
79. Insulin is made as a prohormone: a small piece of the prohormone called the _____ is excised and floats free in the blood. Knowing its level allows estimation of _____ even in diabetics whose insulin is high due to injection.	C-peptide; the amount of insulin produced by the body
80. The major targets of insulin are _____, _____ and _____.	muscle; fat; liver
81. Cells in _____ and _____ cannot remove sugar from the blood unless insulin is present.	muscle; fat
82. Cells in the _____ produce sugar and 'ketone bodies' for the rest of the body to use as fuel unless insulin is present.	liver
83. Pancreatic cells produce insulin in response to _____ signals.	humoral
84. The major symptom of diabetes is _____, which means, '_____.'	hyperglycemia; high blood sugar
85. Chronic _____ damages many organs and systems and can result in blindness, the need for amputation due to poor circulation, and other maladies.	hyperglycemia
86. There are two types of diabetes: in type I, the pancreas _____; in type II, the body's cells are _____.	does not produce insulin; unable to respond to insulin
87. In type I diabetes in particular, a dangerous complication is _____ due to the uncontrolled over-production of 'ketone bodies' by the liver. It can result in coma or death.	ketoacidosis
88. Ketoacidosis is _____ due to high 'ketone body' levels.	acidification of the blood
89. The two major products of the ovaries are _____ and _____: however, they also produce small amounts of testosterone and other androgens.	estrogens; progesterone
90. In addition to their role in pregnancy, hormones produced by the _____ are responsible for maturation of the reproductive organs, breast development, and the menstrual cycle. (This question, of course, refers to females.)	ovaries

91. The major hormone produced by the testes is _____, although other androgens and even estrogen are produced in small amounts.	testosterone
92. In the male, _____ initiates maturation of male reproductive organs, causes appearance of secondary sexual characteristics and sex drive, is necessary for sperm production, and maintains sex organs in their functional state.	testosterone
93. The heart produces _____, which reduces blood pressure, blood volume, and blood sodium concentration.	ANP (OR atrial natriuretic peptide)
94. Erythropoietin is produced by the _____, and acts to increase the body's production of red blood cells.	kidney
95. _____ releases several hormones involved in energy intake, macronutrient metabolism, insulin sensitivity.	Adipose tissue (OR Fat)
96. Cells within the digestive system release hormones which control _____.	ingestion, digestion, and excretion

Appendix 1

Language of Anatomy		Chemistry Overview		Cell Overview		Tissues		The Integumentary System		Bones and Skeletal Tissue		The Axial Skeleton		The Appendicular Skeleton		Joints	
1.	LA1	1.	ChO1	1.	CeO1	1.	T1	1.	InS1	1.	BST1	1.	AxS1	1.	ApS1	1.	J1
2.	LA2	2.	ChO2	2.	CeO2	2.	T2	2.	InS2	2.	BST2	2.	AxS2	2.	ApS2	2.	J2
3.	LA3	3.	ChO3	3.	CeO3	3.	T3	3.	InS3a	3.	BST3	3.	AxS3	3.	ApS3	3.	J3
4.	LA4	4.	ChO4	4.	CeO4	4.	T4	4.	InS4	4.	BST4	4.	AxS4	4.	ApS4	4.	J4
5.	LA5	5.	ChO5	5.	CeO5	5.	T5	5.	InS5	5.	BST5	5.	AxS5	5.	ApS5	5.	J5
6.	LA6	6.	ChO6	6.	CeO6	6.	T6	6.	InS6	6.	BST6	6.	AxS6	6.	ApS6	6.	J6
7.	LA7	7.	ChO7	7.	CeO7	7.	T7	7.	InS7	7.	BST7	7.	AxS7	7.	ApS7	7.	J7
8.	LA8	8.	ChO8	8.	CeO8	8.	T8	8.	InS8	8.	BST8	8.	AxS8	8.	ApS8	8.	J8
9.	LA9	9.	ChO9	9.	CeO9	9.	T9	9.	InS9	9.	BST9	9.	AxS9	9.	ApS9	9.	J9
10.	LA10	10.	ChO10	10.	CeO10	10.	T10	10.	InS10	10.	BST10	10.	AxS10	10.	ApS10	10.	J10
11.	LA11	11.	ChO11	11.	CeO11	11.	T11	11.	InS11	11.	BST11	11.	AxS11	11.	ApS11	11.	J11
12.	LA12	12.	ChO12	12.	CeO12	12.	T12	12.	InS12	12.	BST12	12.	AxS12	12.	ApS12	12.	J12
13.	LA13	13.	ChO13	13.	CeO13	13.	T13	13.	InS13	13.	BST13	13.	AxS13	13.	ApS13	13.	J13
14.	LA14	14.	ChO14	14.	CeO14	14.	T14	14.	InS14	14.	BST14	14.	AxS14	14.	ApS14	14.	J14
15.	LA15	15.	ChO15	15.	CeO15	15.	T15	15.	InS15	15.	BST15	15.	AxS15	15.	ApS15	15.	J15
16.	LA16	16.	ChO16	16.	CeO16	16.	T16	16.	InS16	16.	BST16	16.	AxS16	16.	ApS16	16.	J16
17.	LA17	17.	ChO17	17.	CeO17	17.	T17	17.	InS17	17.	BST17	17.	AxS17	17.	ApS17	17.	J17
18.	LA18	18.	ChO18	18.	CeO18	18.	T18	18.	InS18	18.	BST18	18.	AxS18	18.	ApS18	18.	J18
19.	LA19	19.	ChO19	19.	CeO19	19.	T19	19.	InS19	19.	BST19	19.	AxS19	19.	ApS19	19.	J19
20.	LA20	20.	ChO20	20.	CeO20	20.	T20a	20.	InS20	20.	BST20	20.	AxS20	20.	ApS20	20.	J20
21.	LA21	21.	ChO21	21.	CeO21	21.	T21	21.	InS21	21.	BST21	21.	AxS21	21.	ApS21	21.	J21a
22.	LA22	22.	ChO22	22.	CeO22	22.	T22	22.	InS22	22.	BST22	22.	AxS22	22.	ApS22	22.	J22
23.	LA23	23.	ChO23	23.	CeO23	23.	T23	23.	InS23	23.	BST23	23.	AxS23	23.	ApS23	23.	J23
24.	LA24	24.	ChO24	24.	CeO24	24.	T24	24.	InS24	24.	BST24	24.	AxS24	24.	ApS24	24.	J24
25.	LA25	25.	ChO25	25.	CeO25	25.	T25	25.	InS25	25.	BST25	25.	AxS25	25.	ApS25	25.	J25
26.	LA26	26.	ChO26	26.	CeO26	26.	T26	26.	InS26	26.	BST26	26.	AxS26	26.	ApS26	26.	J26
27.	LA27	27.	ChO27	27.	CeO27	27.	T27	27.	InS27	27.	BST27	27.	AxS27	27.	ApS27	27.	J27
28.	LA28	28.	ChO28	28.	CeO28	28.	T28	28.	InS28	28.	BST28	28.	AxS28	28.	ApS28	28.	J28
29.	LA29	29.	ChO29	29.	CeO29	29.	T29	29.	InS29	29.	BST29	29.	AxS29	29.	ApS29	29.	J29
30.	LA30	30.	ChO30	30.	CeO30	30.	T30	30.	InS30	30.	BST30	30.	AxS30	30.	ApS30	30.	J30
31.	LA31	31.	ChO31	31.	CeO31	31.	T31	31.	InS31	31.	BST31	31.	AxS31	31.	ApS31	31.	J31
32.	LA32	32.	ChO32	32.	CeO32	32.	T32	32.	InS32	32.	BST32	32.	AxS32	32.	ApS32	32.	J32
33.	LA33	33.	ChO33	33.	CeO33	33.	T33	33.	InS33	33.	BST33	33.	AxS33	33.	ApS33	33.	J33
34.	LA34	34.	ChO34	34.	CeO34	34.	T34	34.	InS34	34.	BST34	34.	AxS34	34.	ApS34	34.	J34
35.	LA35	35.	ChO35	35.	CeO35	35.	T35	35.	InS35	35.	BST35	35.	AxS35	35.	ApS35	35.	J35
36.	LA36	36.	ChO36	36.	CeO36	36.	T36	36.	InS36	36.	BST36	36.	AxS36	36.	ApS36	36.	J36
37.	LA37	37.	ChO37	37.	CeO37	37.	T37	37.	InS37	37.	BST37	37.	AxS37	37.	ApS37	37.	J37
38.	LA38	38.	ChO38	38.	CeO38	38.	T38	38.	InS38	38.	BST38	38.	AxS38	38.	ApS38	38.	J38
39.	LA39	39.	ChO39	39.	CeO39	39.	T39	39.	InS39	39.	BST39	39.	AxS39	39.	ApS39	39.	J39
40.	LA40	40.	ChO40	40.	CeO40	40.	T40	40.	InS40	40.	BST40	40.	AxS40	40.	ApS40	40.	J40
41.	LA41	41.	ChO41	41.	CeO41	41.	T41	41.	InS41	41.	BST41	41.	AxS41	41.	ApS41	41.	J41
42.	LA42	42.	ChO42	42.	CeO42	42.	T42	42.	InS42	42.	BST42	42.	AxS42	42.	ApS42	42.	J42
43.	LA43	43.	ChO43	43.	CeO43	43.	T43	43.	InS43	43.	BST43	43.	AxS43	43.	ApS43	43.	J43a
44.	LA44	44.	ChO44	44.	CeO44	44.	T44	44.	InS44	44.	BST44	44.	AxS44	44.	ApS44	44.	J44
45.	LA45	45.	ChO45	45.	CeO45	45.	T45	45.	InS45	45.	BST45	45.	AxS45	45.	ApS45	45.	J45
46.	LA46	46.	ChO46	46.	CeO46	46.	T46	46.	InS46	46.	BST46	46.	AxS46	46.	ApS46	46.	J46

Appendix 1

Language of Anatomy		Chemistry Overview		Cell Overview		Tissues		The Integumentary System		Bones and Skeletal Tissue		The Axial Skeleton		The Appendicular Skeleton		Joints	
48.	LA48	48.	ChO48	48.	CeO48	48.	T48	48.	InS48	48.	BST48	48.	AxS48	48.	ApS48	48.	J48
49.	LA49	49.	ChO49	49.	CeO49	49.	T49	49.	InS49	49.	BST49	49.	AxS49	49.	ApS49	49.	J49
50.	LA50	50.	ChO50	50.	CeO50	50.	T50	50.	InS50	50.	BST50	50.	AxS50	50.	ApS50	50.	J50
51.	LA51	51.	ChO51	51.	CeO51	51.	T51	51.	InS51	51.	BST51	51.	AxS51	51.	ApS51	51.	J51
52.	LA52	52.	ChO52	52.	CeO52	52.	T52	52.	InS52	52.	BST52	52.	AxS52	52.	ApS52	52.	J52
53.	LA53	53.	ChO53	53.	CeO53	53.	T53	53.	InS53	53.	BST53	53.	AxS53	53.	ApS53	53.	J53
54.	LA54	54.	ChO54	54.	CeO54	54.	T54	54.	InS54	54.	BST54	54.	AxS54	54.	ApS54	54.	J54
55.	LA55	55.	ChO55	55.	CeO55	55.	T55a	55.	InS55	55.	BST55	55.	AxS55	55.	ApS55	55.	J55
56.	LA56	56.	ChO56	56.	CeO56	56.	T56	56.	InS56	56.	BST56	56.	AxS56	56.	ApS56	56.	J56
57.	LA57	57.	ChO57	57.	CeO57	57.	T57	57.	InS57	57.	BST57	57.	AxS57	57.	ApS57	57.	J57
58.	LA58	58.	ChO58	58.	CeO58	58.	T58	58.	InS58	58.	BST58	58.	AxS58	58.	ApS58	58.	J58
59.	LA59	59.	ChO59	59.	CeO59	59.	T59	59.	InS59	59.	BST59	59.	AxS59	59.	ApS59	59.	J59
60.	LA60	60.	ChO60	60.	CeO60	60.	T60	60.	InS60	60.	BST60	60.	AxS60	60.	ApS60	60.	J60
61.	LA61	61.	ChO61	61.	CeO61	61.	T61	61.	InS61	61.	BST61	61.	AxS61	61.	ApS61	61.	J61
62.	LA62	62.	ChO62	62.	CeO62	62.	T62	62.	InS62a	62.	BST62	62.	AxS62a	62.	ApS62	62.	J62
63.	LA63	63.	ChO63	63.	CeO63	63.	T63	63.	InS63	63.	BST63	63.	AxS63	63.	ApS63	63.	J63
64.	LA64	64.	ChO64	64.	CeO64	64.	T64	64.	InS64	64.	BST64	64.	AxS64a	64.	ApS64a	64.	J64
65.	LA65	65.	ChO65	65.	CeO65	65.	T65	65.	InS65	65.	BST65	65.	AxS65	65.	ApS65	65.	J65
66.	LA66	66.	ChO66	66.	CeO66	66.	T66	66.	InS66	66.	BST66	66.	AxS66	66.	ApS66	66.	J66
67.	LA67	67.	ChO67	67.	CeO67	67.	T67	67.	InS67	67.	BST67	67.	AxS67	67.	ApS67	67.	J67
68.	LA68	68.	ChO68	68.	CeO68	68.	T68	68.	InS68	68.	BST68	68.	AxS68	68.	ApS68	68.	J69
69.	LA69	69.	ChO69	69.	CeO69	69.	T69	69.	InS69	69.	BST69	69.	AxS69	69.	ApS69	69.	J70
70.	LA70	70.	ChO70	70.	CeO70	70.	T70	70.	InS70	70.	BST70	70.	AxS70	70.	ApS70	70.	J71
71.	LA71	71.	ChO71	71.	CeO71	71.	T71	71.	InS71	71.	BST71	71.	AxS71	71.	ApS71	71.	J72
72.	LA72	72.	ChO72	72.	CeO72	72.	T72	72.	InS72	72.	BST72a	72.	AxS72	72.	ApS72	72.	J73
73.	LA73	73.	ChO73	73.	CeO73	73.	T73	73.	InS73	73.	BST73	73.	AxS73	73.	ApS73	73.	J74
74.	LA74	74.	ChO74	74.	CeO74	74.	T74	74.	InS74	74.	BST74	74.	AxS74	74.	ApS74	74.	J75
75.	LA75	75.	ChO75	75.	CeO75	75.	T75	75.	InS75	75.	BST75	75.	AxS75	75.	ApS75	75.	J76
76.	LA76	76.	ChO76	76.	CeO76	76.	T80	76.	InS76	76.	BST76	76.	AxS76	76.	ApS76	76.	J77
77.	LA77	77.	ChO77	77.	CeO77	77.	T81	77.	InS77	77.	BST77	77.	AxS77	77.	ApS77	77.	J78
78.	LA78	78.	ChO78	78.	CeO78	78.	T82	78.	InS78	78.	BST78	78.	AxS78	78.	ApS78	78.	J79
79.	LA79	79.	ChO79	79.	CeO79	79.	T83	79.	InS79	79.	BST79	79.	AxS79	79.	ApS79	79.	J80
80.	LA80	80.	ChO80	80.	CeO80	80.	T84			80.	BST80	80.	AxS80	80.	ApS80	80.	J81
81.	LA81	81.	ChO81	81.	CeO81					81.	BST81	81.	AxS81	81.	ApS81	81.	J82
82.	LA82	82.	ChO82	82.	CeO82					82.	BST82	82.	AxS82	82.	ApS82	82.	J83
83.	LA83	83.	ChO83	83.	CeO83					83.	BST83	83.	AxS83	83.	ApS83a	83.	J84
84.	LA84	84.	ChO84	84.	CeO84					84.	BST84	84.	AxS84	84.	ApS84	84.	J85
85.	LA85	85.	ChO85	85.	CeO85					85.	BST85	85.	AxS85	85.	ApS85	85.	J86
86.	LA86	86.	ChO86	86.	CeO86					86.	BST86	86.	AxS86	86.	ApS86	86.	J86
87.	LA87	87.	ChO87	87.	CeO87					87.	BST87	87.	AxS87	87.	ApS87	87.	J87
88.	LA88	88.	ChO88	88.	CeO88					88.	BST88	88.	AxS88	88.	ApS88	88.	J88
89.	LA89	89.	ChO89	89.	CeO89					89.	BST89	89.	AxS89	89.	ApS89	89.	J89
90.	LA90	90.	ChO90	90.	CeO90					90.	BST90	90.	AxS90	90.	ApS90	90.	J90
91.	LA91	91.	ChO91	91.	CeO91					91.	BST91	91.	AxS91			91.	J91
92.	LA92			92.	CeO92					92.	BST92	92.	AxS92			92.	J92
93.	LA93			93.	CeO93					93.	BST93	93.	AxS93			93.	J93

Language of Anatomy	Chemistry Overview	Cell Overview	Tissues	The Integumentary System	Bones and Skeletal Tissue	The Axial Skeleton	The Appendicular Skeleton	Joints
95. LA95		95. CeO95			95. BST95	95. AxS95		95. J95
96. LA96		96. CeO96				96. AxS96		
97. LA97		97. CeO97				97. AxS97		
98. LA98		98. CeO98				98. AxS98		
99. LA99		99. CeO99				99. AxS99		
100. LA100		100. CeO100				100. AxS100		
101. LA101						101. AxS101		
102. LA102						102. AxS102		
103. LA103						103. AxS103		
104. LA104						104. AxS104		
105. LA105						105. AxS105		
106. LA106						106. AxS106		
107. LA107						107. AxS107		
108. LA108						108. AxS108		
109. LA109						109. AxS109		
110. LA110						110. AxS110		
111. LA111						111. AxS111		
112. LA112						112. AxS112		
113. LA113						113. AxS113		
114. LA114						114. AxS114		
115. LA115						115. AxS115		
116. LA116						116. AxS116		
117. LA117						117. AxS117		
118. LA118						118. AxS118		
119. LA119						119. AxS119a		
120. LA120						120. AxS120		
121. LA121						121. AxS121		
122. LA122						122. AxS122		
123. LA124								
124. LA125								
125. LA127								
126. LA128								
127. LA129								
128. LA130								
129. LA131								
130. LA132								
131. LA133								
132. LA135								
133. LA136								
134. LA137								
135. LA138								
136. LA139								
137. LA140								
138. LA141								
139. LA142								
140. LA143								

Language of Anatomy		Chemistry Overview	Cell Overview	Tissues	The Integumentary System	Bones and Skeletal Tissue	The Axial Skeleton	The Appendicular Skeleton	Joints
142.	LA145								
143.	LA146								
144.	LA147								
145.	LA148								
146.	LA149								
147.	LA150								
148.	LA151								
149.	LA152								
150.	LA153								
151.	LA154								
152.	LA155								
153.	LA156								
154.	LA157								
155.	LA158								
156.	LA159								
157.	LA160								
158.	LA161								
159.	LA162								
160.	LA163								
161.	LA164								
162.	LA165								
163.	LA166								

Appendix 1

Muscle Tissue		Muscles - Prime Movers		Nervous Tissue		The CNS		The PNS		The ANS		Special Senses		Special Senses	
1.	MT1	1.	MPM1	1.	NT1	1.	CNS1	1.	PNS1	1.	ANS1	1.	SS1	1.	SS1
2.	MT2	2.	MPM2	2.	NT2	2.	CNS2	2.	PNS2	2.	ANS2	2.	SS2	2.	SS2
3.	MT3	3.	MPM3	3.	NT3	3.	CNS3a	3.	PNS3	3.	ANS3	3.	SS3	3.	SS3
4.	MT4	4.	MPM4	4.	NT4	4.	CNS4	4.	PNS4	4.	ANS4	4.	SS4	4.	SS4
5.	MT5	5.	MPM5	5.	NT5	5.	CNS5a	5.	PNS5	5.	ANS5	5.	SS5	5.	SS5
6.	MT6	6.	MPM6	6.	NT6	6.	CNS5b	6.	PNS6	6.	ANS6	6.	SS6	6.	SS6
7.	MT7	7.	MPM7	7.	NT7	7.	CNS6	7.	PNS7	7.	ANS7	7.	SS7	7.	SS7
8.	MT8	8.	MPM8	8.	NT8	8.	CNS7	8.	PNS8	8.	ANS8	8.	SS8	8.	SS8
9.	MT9a	9.	MPM9	9.	NT9	9.	CNS8	9.	PNS9	9.	ANS9	9.	SS9	9.	SS9
10.	MT10	10.	MPM10	10.	NT10	10.	CNS9	10.	PNS10	10.	ANS10	10.	SS10	10.	SS10
11.	MT11	11.	MPM11	11.	NT11	11.	CNS10	11.	PNS11	11.	ANS11a	11.	SS11	11.	SS11
12.	MT12	12.	MPM12	12.	NT12	12.	CNS11	12.	PNS12	12.	ANS12	12.	SS12	12.	SS12
13.	MT13	13.	MPM13	13.	NT13	13.	CNS12	13.	PNS13	13.	ANS13	13.	SS13	13.	SS13
14.	MT14	14.	MPM14	14.	NT14	14.	CNS13	14.	PNS14	14.	ANS14	14.	SS14	14.	SS14
15.	MT15	15.	MPM15	15.	NT15	15.	CNS14	15.	PNS15	15.	ANS15	15.	SS15	15.	SS15
16.	MT16	16.	MPM16	16.	NT16	16.	CNS15	16.	PNS16	16.	ANS16	16.	SS16	16.	SS16
17.	MT17	17.	MPM17	17.	NT17	17.	CNS16	17.	PNS17	17.	ANS17a	17.	SS17	17.	SS17
18.	MT18	18.	MPM18	18.	NT18	18.	CNS17	18.	PNS18	18.	ANS18	18.	SS18	18.	SS18
19.	MT19	19.	MPM19	19.	NT19	19.	CNS18a	19.	PNS19	19.	ANS19	19.	SS19	19.	SS19
20.	MT20	20.	MPM20	20.	NT20	20.	CNS18b	20.	PNS20	20.	ANS20	20.	SS19b	20.	SS19b
21.	MT21	21.	MPM21	21.	NT21	21.	CNS18c	21.	PNS21	21.	ANS20a	21.	SS20	21.	SS20
22.	MT22	22.	MPM22	22.	NT22	22.	CNS18d	22.	PNS22	22.	ANS21	22.	SS21	22.	SS21
23.	MT23	23.	MPM23	23.	NT23	23.	CNS19	23.	PNS23	23.	ANS22	23.	SS22	23.	SS22
24.	MT24	24.	MPM24	24.	NT24	24.	CNS20	24.	PNS24	24.	ANS23	24.	SS23	24.	SS23
25.	MT25	25.	MPM25	25.	NT25	25.	CNS20a	25.	PNS25	25.	ANS24a	25.	SS24	25.	SS24
26.	MT26	26.	MPM26	26.	NT26	26.	CNS21a	26.	PNS26	26.	ANS25a	26.	SS25	26.	SS25
27.	MT27	27.	MPM27	27.	NT27	27.	CNS22	27.	PNS27	27.	ANS25b	27.	SS26	27.	SS26
28.	MT28	28.	MPM28	28.	NT28	28.	CNS23a	28.	PNS28	28.	ANS26a	28.	SS27	28.	SS27
29.	MT29	29.	MPM29	29.	NT29	29.	CNS24	29.	PNS29	29.	ANS27a	29.	SS28	29.	SS28
30.	MT30	30.	MPM30	30.	NT30	30.	CNS25	30.	PNS30	30.	ANS28	30.	SS29	30.	SS29
31.	MT31	31.	MPM31	31.	NT31	31.	CNS26	31.	PNS31	31.	ANS29	31.	SS30	31.	SS30
32.	MT32	32.	MPM32	32.	NT32	32.	CNS27	32.	PNS32	32.	ANS30	32.	SS31	32.	SS31
33.	MT33	33.	MPM33	33.	NT33	33.	CNS28a	33.	PNS33	33.	ANS31	33.	SS32	33.	SS32
34.	MT34	34.	MPM34	34.	NT34	34.	CNS29	34.	PNS34	34.	ANS32	34.	SS33	34.	SS33
35.	MT35	35.	MPM35	35.	NT35	35.	CNS30	35.	PNS35	35.	ANS33	35.	SS34	35.	SS34
36.	MT36	36.	MPM36	36.	NT36	36.	CNS31	36.	PNS36	36.	ANS34	36.	SS35a	36.	SS35a
37.	MT37	37.	MPM37	37.	NT37	37.	CNS32	37.	PNS37	37.	ANS35	37.	SS36a	37.	SS36a
38.	MT38a*	38.	MPM38	38.	NT38	38.	CNS33	38.	PNS38	38.	ANS36	38.	SS37a	38.	SS37a
39.	MT39	39.	MPM39	39.	NT39	39.	CNS33a	39.	PNS39	39.	ANS37	39.	SS38a	39.	SS38a
40.	MT40	40.	MPM40	40.	NT40	40.	CNS34	40.	PNS40	40.	ANS38	40.	SS39a	40.	SS39a
41.	MT41	41.	MPM41	41.	NT41	41.	CNS35	41.	PNS41a	41.	ANS39	41.	SS39b	41.	SS39b
42.	MT42	42.	MPM42	42.	NT42	42.	CNS36	42.	PNS42	42.	ANS40	42.	SS40	42.	SS40
43.	MT43	43.	MPM43	43.	NT43	43.	CNS37	43.	PNS43	43.	ANS41	43.	SS41	43.	SS41
44.	MT44	44.	MPM44	44.	NT44	44.	CNS38	44.	PNS44	44.	ANS42	44.	SS42	44.	SS42
45.	MT45	45.	MPM45	45.	NT45	45.	CNS39	45.	PNS45	45.	ANS43	45.	SS43	45.	SS43
46.	MT46	46.	MPM46	46.	NT46	46.	CNS40	46.	PNS46	46.	ANS44	46.	SS44	46.	SS44

Muscle Tissue		Muscles - Prime Movers		Nervous Tissue		The CNS		The PNS		The ANS		Special Senses		Special Senses	
48.	MT48a	48.	MPM48	48.	NT48	48.	CNS42	48.	PNS48	48.	ANS46	48.	SS46	48.	SS46
49.	MT48b	49.	MPM49	49.	NT49	49.	CNS43	49.	PNS49	49.	ANS47	49.	SS47	49.	SS47
50.	MT49	50.	MPM50	50.	NT50	50.	CNS44	50.	PNS50	50.	ANS48	50.	SS48	50.	SS48
51.	MT50	51.	MPM51	51.	NT51	51.	CNS45	51.	PNS51	51.	ANS49	51.	SS49	51.	SS49
52.	MT51	52.	MPM52	52.	NT52	52.	CNS46	52.	PNS52	52.	ANS50	52.	SS50	52.	SS50
53.	MT52	53.	MPM53	53.	NT53	53.	CNS47	53.	PNS53	53.	ANS51	53.	SS51	53.	SS51
54.	MT53	54.	MPM54	54.	NT54	54.	CNS48	54.	PNS54	54.	ANS52	54.	SS52	54.	SS52
55.	MT54	55.	MPM55	55.	NT55	55.	CNS49	55.	PNS55	55.	ANS53	55.	SS53	55.	SS53
56.	MT55	56.	MPM56	56.	NT56	56.	CNS50	56.	PNS56	56.	ANS53a	56.	SS54	56.	SS54
57.	MT56	57.	MPM57	57.	NT57	57.	CNS51	57.	PNS57	57.	ANS53b	57.	SS55a	57.	SS55a
58.	MT57	58.	MPM58	58.	NT58	58.	CNS52	58.	PNS58	58.	ANS54	58.	SS55b	58.	SS55b
59.	MT58	59.	MPM59a	59.	NT59	59.	CNS53	59.	PNS59	59.	ANS55	59.	SS56	59.	SS56
60.	MT59	60.	MPM60	60.	NT60	60.	CNS54	60.	PNS60	60.	ANS56	60.	SS57	60.	SS57
61.	MT60	61.	MPM61	61.	NT61	61.	CNS55	61.	PNS61	61.	ANS57	61.	SS58	61.	SS58
62.	MT61	62.	MPM62	62.	NT62	62.	CNS56	62.	PNS62	62.	ANS58	62.	SS59a	62.	SS59a
63.	MT62a	63.	MPM63	63.	NT63	63.	CNS57	63.	PNS63	63.	ANS59a	63.	SS59b	63.	SS59b
64.	MT63	64.	MPM64	64.	NT64	64.	CNS58	64.	PNS64	64.	ANS61	64.	SS59c	64.	SS59c
65.	MT64	65.	MPM65	65.	NT65	65.	CNS59	65.	PNS65	65.	ANS62	65.	SS59d	65.	SS59d
66.	MT65	66.	MPM66	66.	NT66	66.	CNS59a	66.	PNS66			66.	SS60	66.	SS60
67.	MT66	67.	MPM67	67.	NT67	67.	CNS60a	67.	PNS67			67.	SS61a	67.	SS61a
68.	MT67	68.	MPM68	68.	NT68	68.	CNS60b	68.	PNS68			68.	SS62	68.	SS62
69.	MT68	69.	MPM69	69.	NT69	69.	CNS61	69.	PNS69			69.	SS63a	69.	SS63a
70.	MT69	70.	MPM70	70.	NT70	70.	CNS62	70.	PNS70			70.	SS64	70.	SS64
71.	MT70a	71.	MPM71	71.	NT71	71.	CNS63	71.	PNS71			71.	SS65	71.	SS65
72.	MT71	72.	MPM72	72.	NT72a	72.	CNS64	72.	PNS72			72.	SS66	72.	SS66
73.	MT72	73.	MPM73	73.	NT73	73.	CNS65	73.	PNS73			73.	SS67	73.	SS67
74.	MT73	74.	MPM74	74.	NT74	74.	CNS66	74.	PNS74			74.	SS68	74.	SS68
75.	MT74	75.	MPM75a	75.	NT75	75.	CNS67	75.	PNS75			75.	SS69	75.	SS69
76.	MT75	76.	MPM76	76.	NT76	76.	CNS68	76.	PNS76			76.	SS70	76.	SS70
77.	MT76	77.	MPM77	77.	NT77	77.	CNS69	77.	PNS77			77.	SS71	77.	SS71
78.	MT77	78.	MPM78	78.	NT78	78.	CNS70	78.	PNS78			78.	SS72	78.	SS72
79.	MT78	79.	MPM79	79.	NT79	79.	CNS71	79.	PNS79			79.	SS73	79.	SS73
80.	MT79	80.	MPM80	80.	NT80	80.	CNS72	80.	PNS86			80.	SS74	80.	SS74
81.	MT80	81.	MPM81	81.	NT81	81.	CNS73	81.	PNS87			81.	SS75	81.	SS75
82.	MT81	82.	MPM82	82.	NT82	82.	CNS74	82.	PNS88			82.	SS76	82.	SS76
83.	MT82	83.	MPM83	83.	NT83	83.	CNS75	83.	PNS89			83.	SS77	83.	SS77
84.	MT83	84.	MPM84	84.	NT84	84.	CNS76a	84.	PNS90a			84.	SS78	84.	SS78
85.	MT84	85.	MPM85	85.	NT85a	85.	CNS77	85.	PNS91			85.	SS79	85.	SS79
86.	MT85	86.	MPM86	86.	NT86	86.	CNS78	86.	PNS92			86.	SS80	86.	SS80
87.	MT86	87.	MPM87	87.	NT87	87.	CNS79	87.	PNS93			87.	SS81	87.	SS81
88.	MT87	88.	MPM88	88.	NT88	88.	CNS80					88.	SS82a	88.	SS82a
89.	MT88	89.	MPM89	89.	NT89	89.	CNS81					89.	SS83	89.	SS83
90.	MT89	90.	MPM90	90.	NT90	90.	CNS82					90.	SS84	90.	SS84
91.	MT90	91.	MPM91	91.	NT91	91.	CNS83a					91.	SS85	91.	SS85
92.	MT91	92.	MPM92	92.	NT92	92.	CNS84a					92.	SS86	92.	SS86
93.	MT92	93.	MPM93	93.	NT93	93.	CNS85					93.	SS87	93.	SS87

Muscle Tissue		Muscles - Prime Movers		Nervous Tissue		The CNS		The PNS	The ANS	Special Senses		Special Senses	
95.	MT94	95.	MPM95	95.	NT95	95.	CNS87			95.	SS89	95.	SS89
96.	MT95	96.	MPM96	96.	NT96	96.	CNS88			96.	SS90	96.	SS90
97.	MT96	97.	MPM97	97.	NT97	97.	CNS89a			97.	SS91	97.	SS91
98.	MT97	98.	MPM98	98.	NT98	98.	CNS90			98.	SS92a	98.	SS92a
99.	MT98	99.	MPM99	99.	NT99	99.	CNS91			99.	SS93a	99.	SS93a
100.	MT99	100.	MPM100	100.	NT100	100.	CNS92			100.	SS93b	100.	SS93b
101.	MT100	101.	MPM101	101.	NT101	101.	CNS93			101.	SS94a	101.	SS94a
102.	MT101	102.	MPM102	102.	NT102	102.	CNS94			102.	SS95a	102.	SS95a
103.	MT102	103.	MPM103	103.	NT103	103.	CNS95			103.	SS96a	103.	SS96a
104.	MT103	104.	MPM104	104.	NT104	104.	CNS96			104.	SS97	104.	SS97
105.	MT104	105.	MPM105	105.	NT105	105.	CNS97			105.	SS98	105.	SS98
106.	MT105	106.	MPM106	106.	NT106	106.	CNS98			106.	SS99	106.	SS99
107.	MT106	107.	MPM107	107.	NT107	107.	CNS99			107.	SS100	107.	SS100
108.	MT107	108.	MPM108	108.	NT108	108.	CNS100			108.	SS101	108.	SS101
109.	MT108	109.	MPM109	109.	NT109	109.	CNS101			109.	SS102	109.	SS102
110.	MT109	110.	MPM110	110.	NT110	110.	CNS102			110.	SS103	110.	SS103
111.	MT110	111.	MPM111	111.	NT111	111.	CNS103			111.	SS104	111.	SS104
112.	MT111	112.	MPM112	112.	NT112	112.	CNS104			112.	SS105	112.	SS105
113.	MT112	113.	MPM113	113.	NT113	113.	CNS105			113.	SS106	113.	SS106
114.	MT113	114.	MPM114	114.	NT114	114.	CNS106			114.	SS107	114.	SS107
115.	MT114	115.	MPM115	115.	NT115	115.	CNS107			115.	SS108	115.	SS108
116.	MT115	116.	MPM116	116.	NT116	116.	CNS108			116.	SS109	116.	SS109
117.	MT116			117.	NT117	117.	CNS109			117.	SS110	117.	SS110
118.	MT117			118.	NT118	118.	CNS110			118.	SS111	118.	SS111
119.	MT118			119.	NT119	119.	CNS111			119.	SS112	119.	SS112
120.	MT119			120.	NT120	120.	CNS112			120.	SS114	120.	SS114
121.	MT120			121.	NT125	121.	CNS113			121.	SS115	121.	SS115
122.	MT121			122.	NT126	122.	CNS114a			122.	SS116	122.	SS116
123.	MT122			123.	NT127	123.	CNS115			123.	SS117	123.	SS117
124.	MT123					124.	CNS116			124.	SS118	124.	SS118
125.	MT124					125.	CNS117			125.	SS119	125.	SS119
126.	MT125					126.	CNS118			126.	SS120	126.	SS120
127.	MT126					127.	CNS119			127.	SS122	127.	SS122
128.	MT127					128.	CNS120			128.	SS123a	128.	SS123a
129.	MT128					129.	CNS121			129.	SS124	129.	SS124
130.	MT129					130.	CNS122			130.	SS125	130.	SS125
131.	MT130					131.	CNS123a			131.	SS126	131.	SS126
132.	MT131					132.	CNS124			132.	SS127	132.	SS127
133.	MT132					133.	CNS124a			133.	SS128a	133.	SS128a
134.	MT133					134.	CNS125			134.	SS128b	134.	SS128b
135.	MT134					135.	CNS126a			135.	SS129	135.	SS129
136.	MT135					136.	CNS127			136.	SS130	136.	SS130
137.	MT136					137.	CNS128			137.	SS131	137.	SS131
						138.	CNS129			138.	SS133a	138.	SS133a
						139.	CNS130			139.	SS133b	139.	SS133b
						140.	CNS130a			140.	SS134	140.	SS134

Muscle Tissue	Muscles - Prime Movers	Nervous Tissue	The CNS	The PNS	The ANS	Special Senses	Special Senses
			142. CNS130c			142. SS136	142. SS136
			143. CNS131			143. SS137	143. SS137
			144. CNS132a				
			145. CNS132b				
			146. CNS133				
			147. CNS133a				
			148. CNS134				
			149. CNS135				
			150. CNS136				
			151. CNS137				
			152. CNS138				
			153. CNS139a				
			154. CNS140				
			155. CNS141				
			156. CNS142				
			157. CNS143				
			158. CNS144				
			159. CNS145				
			160. CNS146				
			161. CNS147				
			162. CNS148				

Creative Commons Legal Code

Attribution-ShareAlike 3.0 United States

CREATIVE COMMONS CORPORATION IS NOT A LAW FIRM AND DOES NOT PROVIDE LEGAL SERVICES. DISTRIBUTION OF THIS LICENSE DOES NOT CREATE AN ATTORNEY-CLIENT RELATIONSHIP. CREATIVE COMMONS PROVIDES THIS INFORMATION ON AN "AS-IS" BASIS. CREATIVE COMMONS MAKES NO WARRANTIES REGARDING THE INFORMATION PROVIDED, AND DISCLAIMS LIABILITY FOR DAMAGES RESULTING FROM ITS USE.

License

THE WORK (AS DEFINED BELOW) IS PROVIDED UNDER THE TERMS OF THIS CREATIVE COMMONS PUBLIC LICENSE ("CCPL" OR "LICENSE"). THE WORK IS PROTECTED BY COPYRIGHT AND/OR OTHER APPLICABLE LAW. ANY USE OF THE WORK OTHER THAN AS AUTHORIZED UNDER THIS LICENSE OR COPYRIGHT LAW IS PROHIBITED.

BY EXERCISING ANY RIGHTS TO THE WORK PROVIDED HERE, YOU ACCEPT AND AGREE TO BE BOUND BY THE TERMS OF THIS LICENSE. TO THE EXTENT THIS LICENSE MAY BE CONSIDERED TO BE A CONTRACT, THE LICENSOR GRANTS YOU THE RIGHTS CONTAINED HERE IN CONSIDERATION OF YOUR ACCEPTANCE OF SUCH TERMS AND CONDITIONS.

1. Definitions

a. **"Collective Work"** means a work, such as a periodical issue, anthology or encyclopedia, in which the Work in its entirety in unmodified form, along with one or more other contributions, constituting separate and independent works in themselves, are assembled into a collective whole. A work that constitutes a Collective Work will not be considered a Derivative Work (as defined below) for the purposes of this License.
b. **"Creative Commons Compatible License"** means a license that is listed at http://creativecommons.org/compatiblelicenses that has been approved by Creative Commons as being essentially equivalent to this License, including, at a minimum, because that license: (i) contains terms that have the same purpose, meaning and effect as the License Elements of this License; and, (ii) explicitly permits the relicensing of derivatives of works made available under that license under this License or either a Creative Commons unported license or a Creative Commons jurisdiction license with the same License Elements as this License.
c. **"Derivative Work"** means a work based upon the Work or upon the Work and other pre-existing works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which the Work may be recast, transformed, or adapted, except that a work that constitutes a Collective Work will not be considered a Derivative Work for the purpose of this License. For the avoidance of doubt, where the Work is a musical composition or sound recording, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered a Derivative Work for the purpose of this License.
d. **"License Elements"** means the following high-level license attributes as selected by Licensor and indicated in the title of this License: Attribution, ShareAlike.
e. **"Licensor"** means the individual, individuals, entity or entities that offers the Work under the terms of this License.
f. **"Original Author"** means the individual, individuals, entity or entities who created the Work.
g. **"Work"** means the copyrightable work of authorship offered under the terms of this License.
h. **"You"** means an individual or entity exercising rights under this License who has not previously violated the terms of this License with respect to the Work, or who has received express permission from the Licensor to exercise rights under this License despite a previous violation.

2. Fair Use Rights. Nothing in this license is intended to reduce, limit, or restrict any rights arising from fair use, first sale or other limitations on the exclusive rights of the copyright owner under copyright law or other applicable laws.

3. License Grant. Subject to the terms and conditions of this License, Licensor hereby grants You a worldwide, royalty-free, non-exclusive, perpetual (for the duration of the applicable copyright) license to exercise the rights in the Work as stated below:

a. to reproduce the Work, to incorporate the Work into one or more Collective Works, and to reproduce the Work as incorporated in the Collective Works;
b. to create and reproduce Derivative Works provided that any such Derivative Work, including any translation in any medium, takes reasonable steps to clearly label, demarcate or otherwise identify that changes were made to the original Work. For example, a translation could be marked "The original work was translated from English to Spanish," or a modification could indicate "The original work has been modified.";
c. to distribute copies or phonorecords of, display publicly, perform publicly, and perform publicly by means of a digital audio transmission the Work including as incorporated in Collective Works;
d. to distribute copies or phonorecords of, display publicly, perform publicly, and perform publicly by means of a digital audio transmission Derivative Works.

e. For the avoidance of doubt, where the Work is a musical composition:

    i. **Performance Royalties Under Blanket Licenses**. Licensor waives the exclusive right to collect, whether individually or, in the event that Licensor is a member of a performance rights society (e.g. ASCAP, BMI, SESAC), via that society, royalties for the public performance or public digital performance (e.g. webcast) of the Work.
    ii. **Mechanical Rights and Statutory Royalties**. Licensor waives the exclusive right to collect, whether individually or via a music rights agency or designated agent (e.g. Harry Fox Agency), royalties for any phonorecord You create from the Work ("cover version") and distribute, subject to the compulsory license created by 17 USC Section 115 of the US Copyright Act (or the equivalent in other jurisdictions).

f. **Webcasting Rights and Statutory Royalties**. For the avoidance of doubt, where the Work is a sound recording, Licensor waives the exclusive right to collect, whether individually or via a performance-rights society (e.g. SoundExchange), royalties for the public digital performance (e.g. webcast) of the Work, subject to the compulsory license created by 17 USC Section 114 of the US Copyright Act (or the equivalent in other jurisdictions).

The above rights may be exercised in all media and formats whether now known or hereafter devised. The above rights include the right to make such modifications as are technically necessary to exercise the rights in other media and formats. All rights not expressly granted by Licensor are hereby reserved.

4. Restrictions. The license granted in Section 3 above is expressly made subject to and limited by the following restrictions:

a. You may distribute, publicly display, publicly perform, or publicly digitally perform the Work only under the terms of this License, and You must include a copy of, or the Uniform Resource Identifier for, this License with every copy or phonorecord of the Work You distribute, publicly display, publicly perform, or publicly digitally perform. You may not offer or impose any terms on the Work that restrict the terms of this License or the ability of a recipient of the Work to exercise of the rights granted to that recipient under the terms of the License. You may not sublicense the Work. You must keep intact all notices that refer to this License and to the disclaimer of warranties. When You distribute, publicly display, publicly perform, or publicly digitally perform the Work, You may not impose any technological measures on the Work that restrict the ability of a recipient of the Work from You to exercise of the rights granted to that recipient under the terms of the License. This Section 4(a) applies to the Work as incorporated in a Collective Work, but this does not require the Collective Work apart from the Work itself to be made subject to the terms of this License. If You create a Collective Work, upon notice from any Licensor You must, to the extent practicable, remove from the Collective Work any credit as required by Section 4(c), as requested. If You create a Derivative Work, upon notice from any Licensor You must, to the extent practicable, remove from the Derivative Work any credit as required by Section 4(c), as requested.
b. You may distribute, publicly display, publicly perform, or publicly digitally perform a Derivative Work only under: (i) the terms of this License; (ii) a later version of this License with the same License Elements as this License; (iii) either the Creative Commons (Unported) license or a Creative Commons jurisdiction license (either this or a later license version) that contains the same License Elements as this License (e.g. Attribution-ShareAlike 3.0 (Unported)); (iv) a Creative Commons Compatible License. If you license the Derivative Work under one of the licenses mentioned in (iv), you must comply with the terms of that license. If you license the Derivative Work under the terms of any of the licenses mentioned in (i), (ii) or (iii) (the "Applicable License"), you must comply with the terms of the Applicable License generally and with the following provisions: (I) You must include a copy of, or the Uniform Resource Identifier for, the Applicable License with every copy or phonorecord of each Derivative Work You distribute, publicly display, publicly perform, or publicly

digitally perform; (II) You may not offer or impose any terms on the Derivative Works that restrict the terms of the Applicable License or the ability of a recipient of the Work to exercise the rights granted to that recipient under the terms of the Applicable License; (III) You must keep intact all notices that refer to the Applicable License and to the disclaimer of warranties; and, (IV) when You distribute, publicly display, publicly perform, or publicly digitally perform the Work, You may not impose any technological measures on the Derivative Work that restrict the ability of a recipient of the Derivative Work from You to exercise the rights granted to that recipient under the terms of the Applicable License. This Section 4(b) applies to the Derivative Work as incorporated in a Collective Work, but this does not require the Collective Work apart from the Derivative Work itself to be made subject to the terms of the Applicable License.

c. If You distribute, publicly display, publicly perform, or publicly digitally perform the Work (as defined in Section 1 above) or any Derivative Works (as defined in Section 1 above) or Collective Works (as defined in Section 1 above), You must, unless a request has been made pursuant to Section 4(a), keep intact all copyright notices for the Work and provide, reasonable to the medium or means You are utilizing: (i) the name of the Original Author (or pseudonym, if applicable) if supplied, and/or (ii) if the Original Author and/or Licensor designate another party or parties (e.g. a sponsor institute, publishing entity, journal) for attribution ("Attribution Parties") in Licensor's copyright notice, terms of service or by other reasonable means, the name of such party or parties; the title of the Work if supplied; to the extent reasonably practicable, the Uniform Resource Identifier, if any, that Licensor specifies to be associated with the Work, unless such URI does not refer to the copyright notice or licensing information for the Work; and, consistent with Section 3(b) in the case of a Derivative Work, a credit identifying the use of the Work in the Derivative Work (e.g., "French translation of the Work by Original Author," or "Screenplay based on original Work by Original Author"). The credit required by this Section 4(c) may be implemented in any reasonable manner; provided, however, that in the case of a Derivative Work or Collective Work, at a minimum such credit will appear, if a credit for all contributing authors of the Derivative Work or Collective Work appears, then as part of these credits and in a manner at least as prominent as the credits for the other contributing authors. For the avoidance of doubt, You may only use the credit required by this Section for the purpose of attribution in the manner set out above and, by exercising Your rights under this License, You may not implicitly or explicitly assert or imply any connection with, sponsorship or endorsement by the Original Author, Licensor and/or Attribution Parties, as appropriate, of You or Your use of the Work, without the separate, express prior written permission of the Original Author, Licensor and/or Attribution Parties.

5. Representations, Warranties and Disclaimer

UNLESS OTHERWISE MUTUALLY AGREED TO BY THE PARTIES IN WRITING, LICENSOR OFFERS THE WORK AS-IS AND ONLY TO THE EXTENT OF ANY RIGHTS HELD IN THE LICENSED WORK BY THE LICENSOR. THE LICENSOR MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE WORK, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, MARKETABILITY, MERCHANTIBILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, OR THE ABSENCE OF LATENT OR OTHER DEFECTS, ACCURACY, OR THE PRESENCE OF ABSENCE OF ERRORS, WHETHER OR NOT DISCOVERABLE. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO SUCH EXCLUSION MAY NOT APPLY TO YOU.

6. Limitation on Liability. EXCEPT TO THE EXTENT REQUIRED BY APPLICABLE LAW, IN NO EVENT WILL LICENSOR BE LIABLE TO YOU ON ANY LEGAL THEORY FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES ARISING OUT OF THIS LICENSE OR THE USE OF THE WORK, EVEN IF LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

7. Termination

a. This License and the rights granted hereunder will terminate automatically upon any breach by You of the terms of this License. Individuals or entities who have received Derivative Works or Collective Works from You under this License, however, will not have their licenses terminated provided such individuals or entities remain in full compliance with those licenses. Sections 1, 2, 5, 6, 7, and 8 will survive any termination of this License.
b. Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work). Notwithstanding the above, Licensor reserves the right to release the Work under different license terms or to stop distributing the Work at any time; provided, however that any such election will not serve to withdraw this License (or any other license that has been, or is required to be, granted under the terms of this License), and this License will continue in full force and effect unless terminated as stated above.

8. Miscellaneous

a. Each time You distribute or publicly digitally perform the Work (as defined in Section 1 above) or a Collective Work (as defined in Section 1 above), the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.
b. Each time You distribute or publicly digitally perform a Derivative Work, Licensor offers to the recipient a license to the original Work on the same terms and conditions as the license granted to You under this License.
c. If any provision of this License is invalid or unenforceable under applicable law, it shall not affect the validity or enforceability of the remainder of the terms of this License, and without further action by the parties to this agreement, such provision shall be reformed to the minimum extent necessary to make such provision valid and enforceable.
d. No term or provision of this License shall be deemed waived and no breach consented to unless such waiver or consent shall be in writing and signed by the party to be charged with such waiver or consent.
e. This License constitutes the entire agreement between the parties with respect to the Work licensed here. There are no understandings, agreements or representations with respect to the Work not specified here. Licensor shall not be bound by any additional provisions that may appear in any communication from You. This License may not be modified without the mutual written agreement of the Licensor and You.

Creative Commons Notice

Creative Commons is not a party to this License, and makes no warranty whatsoever in connection with the Work. Creative Commons will not be liable to You or any party on any legal theory for any damages whatsoever, including without limitation any general, special, incidental or consequential damages arising in connection to this license. Notwithstanding the foregoing two (2) sentences, if Creative Commons has expressly identified itself as the Licensor hereunder, it shall have all rights and obligations of Licensor.

Except for the limited purpose of indicating to the public that the Work is licensed under the CCPL, Creative Commons does not authorize the use by either party of the trademark "Creative Commons" or any related trademark or logo of Creative Commons without the prior written consent of Creative Commons. Any permitted use will be in compliance with Creative Commons' then-current trademark usage guidelines, as may be published on its website or otherwise made available upon request from time to time. For the avoidance of doubt, this trademark restriction does not form part of this License.

Creative Commons may be contacted at http://creativecommons.org/.