

Embryology #1 – Introduction

- 1) In which period of development are most organ systems highly susceptible to injury?
 - a) Early development
 - b) Embryonic development
 - c) First trimester
 - d) Second trimester
 - e) Third trimester
- 2) Which of the following regarding developmental anomalies is NOT true?
 - a) Malformation results from an intrinsically abnormal development process
 - b) Disruption results from extrinsic breakdown or interference with a normal developmental process
 - c) Deformation is abnormal form that results from mechanical forces
 - d) Dysplasia is abnormal organization of cells into tissue
 - e) Nearly all anomalies are from known etiology
- 3) The male and female processes of meiosis are equal.
 - a) True
 - b) False; for males it results in four spermatids and females result in two ovum with two polar bodies
 - c) False; for males it results in four spermatids and females results in one ovum with three polar bodies
 - d) False, for males and females it results in four (spermatids/ovum) but three of the ovum eventually dissolve as polar bodies
 - e) False, for males it results in one spermatid with three polar bodies and females result in two ovum with two polar bodies

Embryology #2 – Gametogenesis

- 1) The correct order for origin and migration of germ cells is:
 - a) Epiblast to yolk sac to ventral mesentery to genital ridge
 - b) Epiblast to yolk sac to dorsal mesentery to genital ridge
 - c) Epiblast to hypoblast to genital ridge
 - d) Epiblast to mesoderm to genital ridge
 - e) Epiblast to yolk sac to mesoderm to genital ridge
- 2) In male gametogenesis, what is the role of Sertoli cells?
 - a) Form junctional complex
 - b) Attach to basal lamina
 - c) Isolate gamete cells
 - d) Replicate Type A pale spermatogonia
 - e) Give rise to a population of Type B spermatogonia
- 3) Which of the following is NOT a step involved in spermiogenesis prior to losing connection with Sertoli cells?
 - a) Flagella lysis
 - b) Condensation of nucleus
 - c) Formation of neck region and tail
 - d) Loss of cytoplasm
 - e) Acrosome addition
- 4) Where does the process of sperm capacitation take place?

- a) Within the testes
 - b) Within the male urethra
 - c) Within the female genital tract
 - d) Within the ovum
 - e) Within the embryo
- 5) In what phase do the oogonia become arrested until puberty?
- a) Meiosis II metaphase
 - b) Meiosis II prophase
 - c) Meiosis I metaphase
 - d) Meiosis I prophase
 - e) G-phase
- 6) A spike in which hormone restarts meiosis for the oogonia?
- a) hCG
 - b) Estrogen
 - c) Progesterone
 - d) FSH
 - e) LH
- 7) After the primary follicle takes in fluid and forms a large antrum, it is called a:
- a) Stroma
 - b) Primordial follicle
 - c) Thecal follicle
 - d) Graafian follicle
 - e) Antral follicle
- 8) The first meiotic division is completed just prior to ovulation, forming a secondary oocyte. The second division begins immediately but does not finish unless:
- a) hCG levels are high
 - b) Fertilization takes place
 - c) The epiblast is no longer present
 - d) The sperm are uncapacitated
 - e) A developmental anomaly is present
- 9) On the 5th day of the menstrual cycle the hypothalamus secretes _____ which stimulates the pituitary gland to secrete _____ and _____.
- a) GnRH; FSH; LH
 - b) GnRH; hCG; LH
 - c) GnRH; FSH; hCG
 - d) hCG; Progesterone; Estrogen
 - e) hCG; LH; Progesterone
- 10) The syncytiotrophoblast secretes _____ causing the corpus luteum to secrete _____, which maintains pregnancy.
- a) GnRH; LH
 - b) GnRH; FSH
 - c) GnRH; hCG
 - d) hCG; Estrogen
 - e) hCG; Progesterone

Embryology #3 – The First Week

- 1) After the Graafian follicle breaks and before fertilization takes place, the secondary oocyte is surrounded by cells called:
 - a) Fimbriae
 - b) Zona pellucida
 - c) Cumulus oophorus
 - d) Acrosomes
 - e) Oocytes
- 2) What is the result of the cortical reaction?
 - a) The corona radiata forms
 - b) The zona pellucida forms
 - c) Sperm can now enter the egg
 - d) Sperm can no longer enter the egg
 - e) Acrosomes are removed
- 3) Which of the following does NOT take place during fertilization?
 - a) Male pronucleus forms
 - b) Endometrial implantation occurs
 - c) Restoration of a diploid genome
 - d) Determination of genetic sex of the embryo
 - e) Cleavage initiated
- 4) Which structure bounds the cells after fertilization as they compact to form the morula?
 - a) Zona pellucida
 - b) Corona radiata
 - c) Pronucleus
 - d) Inner cell mass
 - e) Outer cell mass
- 5) As the first week begins, the embryoblast forms. It is called an embryoblast because of the cavity between the inner cell (embryoblast) and outer cell mass (trophoblast). This cavity is called the:
 - a) Antrum
 - b) Embryonic gap
 - c) Trophoblastic reticulum
 - d) Epiblast
 - e) Blastocoel
- 6) An ectopic pregnancy would occur if implantation occurred in all of the following places EXCEPT:
 - a) Rectum
 - b) Bladder
 - c) Uterus
 - d) Cervix
 - e) Fallopian tube

Embryology #4 – The Second Week

- 1) The cells of the embryoblast form the hypoblast and epiblast, which begin to form the _____ cavity.
 - a) Chorionic

- b) Antrum
 - c) Blasocele
 - d) Amniotic
 - e) Epiblastic
- 2) The two layers of extraembryonic mesoderm are called:
- a) Endoderm; Mesoderm
 - b) Primary; Secondary
 - c) Somatopleuric; Splanchnopleuric
 - d) Mesenchyme; Parachyme
 - e) Epiblast; Hypoblast
- 3) On day nine, trophoblastic lacunae and maternal sinusoids begin to form around what cells:
- a) Exdoderm
 - b) Extraembryonic coelom
 - c) Extraembryonic splanchnopleuric
 - d) Exocoelomic
 - e) Syncytiotrophoblast
- 4) The cells the continue to divide from the trophoblast are called:
- a) Syncytiotrophoblast
 - b) Cytotrophoblast
 - c) Epiblast
 - d) Hypoblast
 - e) Tertiary stem villi
- 5) A patient is being seen due to hypertension and vaginal bleeding, four months into her pregnancy. High levels of hCG are found but no inner cell mass (embryo) is present. What is likely her diagnosis?
- a) Hydatidiform mole
 - b) Ectopic pregnancy
 - c) Placenta previa
 - d) Placenta abruption
 - e) Placenta accreta

Embryology #5 – The Third Week

- 1) On what day does gastrulation occur?
- a) 14
 - b) 16
 - c) 18
 - d) 20
 - e) 22
- 2) The notocord is composed of ____.
- a) Mesoderm only
 - b) Endoderm only
 - c) Ectoderm only
 - d) Mesoderm and ectoderm
 - e) Mesoderm and endoderm
- 3) The notocord has all of the following functions EXCEPT:

- a) PNS development
 - b) CNS development
 - c) Vertebral column development
 - d) Forms anatomic midline
 - e) Forms nucleus pulposus
- 4) A neurenteric cyst would most likely be located:
- a) Between vertebral spines
 - b) Along the vertebral arch
 - c) Posterior mediastinum
 - d) Anterior mediastinum
 - e) Base of skull
- 5) Lateral folding leads to the formation of an elongated ____.
- a) Heart tube
 - b) Spinal tube
 - c) Allantois
 - d) Gut tube
 - e) Yolk sac
- 6) Which of the following body axis defects (caudal dysgenesis) is associated with limb and urogenital defects?
- a) Sirenomelia
 - b) Holoprosencephaly
 - c) Incomplete situs inversus
 - d) Sacroccocygeal teratoma
 - e) Complete situs inversus

Embryology #6 – Embryonic and Fetal Period

- 1) During the beginning of the embryonic period, the age of the embryo is expressed by ____ and after week four the age is expressed by ____.
- a) CRL; Somites
 - b) Somites; CRL
 - c) Tube diameter; Somites
 - d) Somites; Tube diameter
 - e) CRL; Tube diameter
- 2) On what day does the neural plate begin to fold inward? What day does the cranial neuropore close? What day does the caudal neuropore close?
- a) 18; 22; 24
 - b) 20; 22; 24
 - c) 20; 24; 26
 - d) 22; 24; 26
 - e) 22; 26; 28
- 3) Neural crest cells give rise to all of the following EXCEPT:
- a) Parasympathetic ganglia of CN III, VII, IX, X
 - b) Sympathetic ganglia of V, VII, VIII, IX, X
 - c) Epidermis, hair, nails, cutaneous and mammary glands
 - d) CT around the developing eye and optic nerves
 - e) Pia and arachnoid mater of the occipital region

- 4) The axial skeleton forms from the:
 - a) Paraxial mesoderm
 - b) Intermediate mesoderm
 - c) Lateral plate mesoderm
 - d) Surface ectoderm
 - e) Neural crest cells
- 5) On what day is the first somite formed?
 - a) 18
 - b) 20
 - c) 22
 - d) 24
 - e) 26
- 6) Which structure helps form the GI tract and allantois?
 - a) Endoderm
 - b) Ectoderm
 - c) Paraxial mesoderm
 - d) Intermediate mesoderm
 - e) Lateral plate mesoderm
- 7) Which structures remain most vulnerable to teratogens during the fetal period?
 - a) Vertebral column and back muscles
 - b) Esophagus and anus
 - c) Hands and feet
 - d) Liver and spleen
 - e) Eyes and brain
- 8) The liver becomes the major site of erythropoiesis at week:
 - a) 7
 - b) 8
 - c) 9
 - d) 10
 - e) 11
- 9) Sites of ossification are evident, eye movements begin, and eyes are facing forward during weeks:
 - a) 10-12
 - b) 13-16
 - c) 17-20
 - d) 21-25
 - e) 26-29
- 10) The external genitals can be distinguished as male or female after week:
 - a) 7
 - b) 8
 - c) 9
 - d) 10
 - e) 11
- 11) Primary ovarian follicles are formed and the testes are descending during weeks:
 - a) 10-12

- b) 13-16
 - c) 17-20
 - d) 21-25
 - e) 26-29
- 12) Which of the following occurs during weeks 21-25?
- a) Surfactant is beginning to be secreted in the lungs
 - b) Brown fat is formed
 - c) Limb movement
 - d) Hair present on scalp
 - e) Blood formation has shifted to the spleen
- 13) Which of the following does NOT occur during weeks 26-29?
- a) Lungs are not capable of breathing
 - b) The CNS is capable of controlling breathing and body temperature
 - c) Fat is beginning to accumulate
 - d) The spleen is still making blood cells
 - e) Pupillary light reflex is present
- 14) During the “finishing period” of weeks 35-38, what two systems are preparing for transition to the outside world?
- a) Nervous; Integumentary
 - b) Nervous; Endocrine
 - c) Endocrine; Integumentary
 - d) Cardiovascular; Respiratory
 - e) Nervous; Respiratory
- 15) Which of the following does NOT function in hemopoiesis?
- a) Yolk sac
 - b) Liver
 - c) Heart
 - d) Bone Marrow
 - e) Spleen
- 16) Amniocentesis will show high levels of ____ with neural tube or ventral wall defects.
- a) Alpha-FP
 - b) hCG
 - c) LH
 - d) FSH
 - e) Chromatin

Embryology #7 – Axial Skeleton

- 1) The somites differentiate into a ____ and a ____.
- a) Dermatome; Myotome
 - b) Sclerotome; Myotome
 - c) Dermatome; Sclerotome
 - d) Sclerotome; Dermomyotome
 - e) Myotome; Dermosclerotome
- 2) Which of the following is NOT matched correctly for somites by region?
- a) 4 occipital
 - b) 7 cervical

- c) 8-10 coccygeal
 - d) 12 thoracic
 - e) 5 lumbar and 5 sacral
- 3) Which of the following statements is correct?
- a) C1 and C2 nerve form atlas
 - b) C1 and C2 sclerotome form atlas
 - c) C2 and C3 nerve form C3
 - d) C2 and C3 sclerotome form C3
 - e) C7 and T1 sclerotome form C8
- 4) The annulus fibrosus is formed from the:
- a) Notocord
 - b) Dermomyotome
 - c) Sclerotome
 - d) Mesoderm
 - e) Endoderm
- 5) A tuft of hair on the back of a newborn is likely associated with:
- a) Spina bifida occulta
 - b) Klippel-Feil syndrome
 - c) Spina bifida cystica (myelomeningocele)
 - d) Hypertrichosis lanuginosa
 - e) Hemivertebra scoliosis
- 6) The vast majority of muscle arises from somatic mesoderm. The dorsal part of the myotome becomes the ____ (intrinsic back muscles) and the ventral part becomes the ____.
- a) Endomere; Hypomere
 - b) Dorsal ramus; ventral ramus
 - c) Epimere; Endomere
 - d) Posterior ramus; Anterior ramus
 - e) Epimere; Hypomere

Embryology #8 – PNS

- 1) Which of the following statements is NOT true?
- a) Endoderm gives rise to neural crest cells
 - b) The notocord induces overlying ectoderm to form the neural plate
 - c) The neural plate folds and fuses to form the neural tube
 - d) Neural crest cells arise from the lateral lips of the neural plate
 - e) The neural tube gives rise to the spinal cord and brain
- 2) Which of the following does NOT describe the newly closed neural tube or the layers of differentiation from those cells?
- a) Pseudostratified
 - b) Apical
 - c) Ventricular
 - d) Mantle
 - e) Marginal
- 3) Which spinal cord layer contains cell bodies and astrocytes?
- a) Ventricular
 - b) Ependymal

- c) Mantle
 - d) Marginal
 - e) Pseudostratified
- 4) The sulcus limitans splits the ____ layer into a dorsal (alar plates) and ventral part (basal plates).
- a) Ventricular
 - b) Ependymal
 - c) Mantle
 - d) Marginal
 - e) Pseudostratified
- 5) Cells that remain close to the neural tube (no migration) form:
- a) Branchial arches
 - b) Autonomic ganglia in torso
 - c) Heart
 - d) Melanocytes
 - e) Dorsal root ganglia
- 6) Neural crest cells in the torso give rise to all of the following EXCEPT:
- a) Endocardial cushions
 - b) Bulbus cordis and truncus arteriosus
 - c) Sympathetic chain
 - d) Ectodermal placodes
 - e) Prevertebral and parasympathetic ganglia
- 7) Functional components of the spinal nerve develop in the following sequence:
- a) GVE; GSE; Sensory
 - b) GSE; GVE; Sensory
 - c) Sensory; GVE; GSE
 - d) Sensory; GSE; GVE
 - e) GVE; Sensory; GSE
- 8) GVE fibers are found in all of the following locations EXCEPT:
- a) C1-C7
 - b) T1-L2
 - c) S2-S4
 - d) Brainstem
 - e) IML
- 9) A single dermatomal nerve is lost during a surgical procedure. What best describes the result based on general PNS development?
- a) Loss of sensation of that dermatome due to complete segmental innervation
 - b) No loss of sensation of that dermatome due to complete segmental innervation
 - c) Loss of sensation of that and adjacent dermatomes due to overlapping
 - d) No loss of sensation of that dermatome due to overlapping
 - e) Loss of sensation due to sensory axons following motor pathways
- 10) Pia and arachnoid arise from neural crest cells, but dura mater arises from:
- a) Ectoderm
 - b) Endoderm
 - c) Mesoderm
 - d) Cardiac cushions

- e) Mantle layer
- 11) A baby is born with an apparently serious defect. The spinal cord can be readily seen open on the back, with no skin, vertebra, or erector spinae present in the area. The baby likely has:
- a) Spina bifida occulta
 - b) Spina bifida cystica
 - c) Meningocele
 - d) Meningomyelocele
 - e) Spina bifida with myeloschisis
- 12) A 4-day-old baby boy has not defecated since coming home from the hospital, even though feeding has been normal without any excessive vomiting. Rectal examination reveals a normal anus, anal cavity, and rectum. However, a large fecal mass is found in the colon, and a large release of flatus and feces follows the rectal examination. Which of the following would be suspected:
- a) Rectal atresia
 - b) Hirschsprung disease
 - c) Imperforated anus
 - d) Anal agenesis
 - e) Anorectal agenesis
- 13) An infant is brought to the primary care clinic with incontinence and what the mother describes as “odd-feeling spots on the back.” These appear to be fatty tumors. The child has an abnormal Achilles reflex. Which one of the following would most likely account for these findings?
- a) Tethered cord syndrome
 - b) Thoracic scoliosis
 - c) Spina bifida occulta
 - d) Congenital megacolon
 - e) Turner’s syndrome

Embryology #9 – Development of the Heart

- 1) Cardiac precursor cells form from which layer?
- a) Hypoblast
 - b) Ectoderm
 - c) Epiblast
 - d) Notocord
 - e) Endoderm
- 2) The transverse pericardial sinus forms from the breaking away of?
- a) Somites
 - b) Notocord
 - c) Axial Mesentary
 - d) Dorsal Mesentary
 - e) Ectoderm
- 3) On what day does the heart start to beat?
- a) 22
 - b) 24
 - c) 26

- d) 28
 - e) 30
- 4) What structure does the proximal third of the bulbus cordis become?
- a) Right Ventricle
 - b) Left Ventricle
 - c) Ventricular Outflow Tracts
 - d) Aorta & Pulmonary Artery
 - e) Left & Right Atria
- 5) What structure does the middle third (conus cordis) of the bulbus cordis become?
- a) Right Ventricle
 - b) Left Ventricle
 - c) Ventricular Outflow Tracts
 - d) Aorta & Pulmonary Artery
 - e) Left & Right Atria
- 6) What structure does the distal third (truncus arteriosus) of the bulbus cordis become?
- a) Right Ventricle
 - b) Left Ventricle
 - c) Ventricular Outflow Tracts
 - d) Aorta & Pulmonary Artery
 - e) Left & Right Atria
- 7) What major structure is formed by the sinus venosus?
- a) Aorta
 - b) Left Ventricle
 - c) Right Ventricle
 - d) Left Atrium
 - e) Right Atrium
- 8) Where is the ostium primum formed?
- a) Between Right and Left Ventricles
 - b) Between Right and Left Atria
 - c) Between Right Atrium and Ventricle
 - d) Between Left Atrium and Ventricle
 - e) Within the Coronary Sinus
- 9) What is the correct order of cardiac conduction?
- a) AV node to SA node to His bundle to Purkinje fibers
 - b) Purkinje fibers to His bundle to SA node to AV node
 - c) SA node to AV node to His bundle to Purkinje fibers
 - d) Purkinje fibers to His bundle to AV node to SA node
 - e) Bachman's bundle to SA node to AV node to ventricles
- 10) Which of the following is NOT associated with an Atrial Septal Defect?
- a) Persistent ostium secundum
 - b) Endocardial cushion defect
 - c) Sinus venosum defect
 - d) Probe patency
 - e) Transposition of the Great Vessels
- 11) What defect is necessary to survive with pulmonary atresia?
- a) Atrial septal defect

- b) Aortic valve stenosis
 - c) Undeveloped coronary sinus
 - d) Left bundle branch block
 - e) Right bundle branch block
- 12) Which of the following is NOT associated with Tetralogy of Fallot?
- a) Pulmonary stenosis
 - b) Pulmonary atresia
 - c) Ventricular septal defect
 - d) Right ventricular hypertrophy
 - e) Dextroposition of the Aorta (over riding aorta)

Embryology #10 – Vasculature

- 1) All arteries, veins, and lymphatic channels form from ____.
- a) Ectoderm
 - b) Mesoderm
 - c) Endoderm
 - d) Chorion
 - e) Villi
- 2) During what weeks of development do the pharyngeal/branchial arches form?
- a) 2nd to 3rd
 - b) 3rd to 4th
 - c) 4th to 5th
 - d) 5th to 6th
 - e) 6th to 7th
- 3) Which aortic arches are important for the abdomen and thorax?
- a) I, II, III
 - b) I, II, III, IV, V
 - c) V only
 - d) IV, VI
 - e) I, II, IV
- 4) Which nerve is associated with the aortic arches IV and VI?
- a) V – Trigeminal Nerve
 - b) VI – Abducent Nerve
 - c) IX – Glossopharyngeal Nerve
 - d) X – Vagus Nerve
 - e) XI – Accessory Nerve
- 5) Aortic arch IV forms the ____ on the right side of the embryo and the ____ on the left.
- a) Right subclavian artery; Arch of aorta
 - b) Ductus arteriosus; Pulmonary Artery
 - c) Arch of aorta; Pulmonary Artery
 - d) Ductus arteriosus; Right subclavian artery
 - e) Arch of aorta; Ductus arteriosus
- 6) What tissue do the vitelline arteries supply?
- a) Ectoderm
 - b) Mesoderm
 - c) Endoderm

- d) Aortic
 - e) Pulmonic
- 7) At birth, a child's skin appears much less pink than would be expected. The physician determines that the child's ductus arteriosus did not close. The child has a blue tint because the ductus arteriosus is shunting blood from the ____ to the ____.
- a) Right Atrium; Left Atrium
 - b) Pulmonary Artery; Aorta
 - c) Right Ventricle; Left Ventricle
 - d) Inferior Vena Cava; Right Atrium
 - e) Descending Aorta; Umbilical Arteries
- 8) In utero, the ductus venosus helps shunt blood away from the very first organ it reaches to more important organs like the brain. This shunt bypasses the ____.
- a) Lungs
 - b) Aorta
 - c) Spleen
 - d) Pancreas
 - e) Liver
- 9) During fetal life, in which of the following structures is the percent hemoglobin/oxygen saturation level of fetal blood the lowest?
- a) Right Atrium
 - b) Inferior Vena Cava
 - c) Umbilical Vein
 - d) Ductus Arteriosus
 - e) Descending Aorta
- 10) During week six (lymphatic vessel development), the dilated lymph sac that forms at the lower end of the thoracic duct is called the ____.
- a) Lymphocitic Sac
 - b) Iliac Lymph Sac
 - c) Retroperitoneal Lymph Sac
 - d) Jugular Lymph Sac
 - e) Cisterna Chyli
- 11) What cardinal vein is responsible for draining the body wall
- a) Subcardinal
 - b) Cacrocardinal
 - c) Supracardinal
 - d) Dorsal cardinal
 - e) Ventral cardinal

Embryology #11 – Body Cavities

- 1) During the formation and partitioning of the intraembryonic coeloem, the lateral plate mesoderm forms. What are the two parts of this mesoderm?
- a) Somatic; Splanchnic
 - b) Intraembryonic; Somatic
 - c) Intraembryonic; Splanchnic
 - d) Longitudinal; Transverse
 - e) Yolk sac; Gut tube

- 2) The coelomic epithelium gives rise to all of the following EXCEPT:
- Smooth muscle
 - Connective tissue of tubes
 - Cardiac muscle
 - Sternal notch
 - Reproductive tract
- 3) What differentiates an omphalocele from a congenital umbilical hernia (gastroschisis)?
- Location of heart
 - Fusion of sternum
 - Amniotic membrane
 - Location of umbilical cord
 - Closure of fossa ovalis
- 4) The septum transversum separates the thoracic and abdominal cavities and is initially _____.
- For communication
 - Incomplete
 - Complete
 - On the same side as cervical somites
 - Not innervated by C3, 4, 5
- 5) The rapid growth of lung buds results in the body wall mesoderm splitting into the definitive body wall and pleuropericardial membranes, which contain the phrenic nerves and _____ veins.
- Cardiac
 - Cardinal
 - Brachiocephalic
 - Subclavian
 - Anastomosing
- 6) All of the following structures contribute to the thoracoabdominal diaphragm EXCEPT:
- Septum transversum
 - Pleuroperitoneal fold
 - Dorsal mesentery
 - Paraxial mesoderm
 - Fibrous pericardium
- 7) A newborn baby has difficulty breathing, fast respirations, and a fast heart rate. The baby appears bluish and the left chest appears larger than the right. After a chest x-ray, it is found that the newborn does not have a defect in the right crus nor a deficit between the sternal and costal heads of the diaphragm. Which of the following is most likely?
- Esophageal hernia
 - Parasternal hernia
 - Hernia of Bochdalek
 - Morgagni's hernia
 - Inguinal hernia
- 8) The mesentery is a _____ layer of peritoneum. The artery associated with the midgut region is called the _____.
- Single; Superior mesenteric

- b) Single; Inferior mesenteric
 - c) Single; Celiac trunk
 - d) Double; Superior mesenteric
 - e) Double; Inferior mesenteric
- 9) The dorsal mesentery runs the entire length of the gut tube. Which of the following structures is a derivative of this mesentery and NOT attached to the liver?
- a) Greater omentum
 - b) Falciform ligament
 - c) Cloaca
 - d) Lesser omentum
 - e) Spleen
- 10) The spleen is the hematopoietic organ between weeks _____ and later serves as a _____ organ.
- a) 12-24; digestive
 - b) 12-24; lymph
 - c) 25-30; digestive
 - d) 25-30; lymph
 - e) 9-11; digestive
- 11) The ventral mesentery is associated with the foregut. Which of the following structures is NOT a derivative of this mesentery and is attached to the liver?
- a) Lesser omentum
 - b) Falciform ligament
 - c) Coronary ligaments
 - d) Right and left triangular ligaments
 - e) Transverse mesocolon
- 12) As the stomach rotates to the left, the _____ is formed within the greater omentum. The epiploic foramen of Winslow is the communication from this space to the greater sac (peritoneal cavity).
- a) Greater omentum
 - b) Lesser omentum
 - c) Omental bursa
 - d) Cardiac foramen
 - e) Falciform
- 13) An organ is covered only on one surface with peritoneum and is immobile. How would you classify this organ?
- a) Peritoneal
 - b) Intraperitoneal
 - c) Subperitoneal
 - d) Retroperitoneal
 - e) Supraperitoneal
- 14) The ascending and descending colon had a mesentery in the embryo, but became an organ not covered on all sides by peritoneum. How would you classify this organ?
- a) Peritoneal
 - b) Subperitoneal
 - c) Primary Retroperitoneal
 - d) Secondary Retroperitoneal

e) Supraperitoneal

Embryology #12 – Digestive System

- 1) The midgut begins with ____ and ends with ____.
 - a) 1/2 jejunum; 2/3 transverse colon
 - b) 1/2 ileum; 2/3 sigmoid colon
 - c) 1/2 jejunum; 2/3 rectum
 - d) 1/2 duodenum; 2/3 transverse colon
 - e) 1/2 duodenum; 1/3 sigmoid colon
- 2) The middle of the duodenum would receive blood from:
 - a) Superior mesenteric artery only
 - b) Inferior mesenteric artery only
 - c) Celiac artery only
 - d) Celiac and inferior mesenteric artery
 - e) Celiac and superior mesenteric artery
- 3) The first stomach rotation causes the ____ and ____ vagus nerves to become the ____ and ____ vagal trunks, respectively.
 - a) Left; Right; Superior; Inferior
 - b) Right; Left; Lateral; Medial
 - c) Left; Right; Lateral; Medial
 - d) Right; Left; Anterior; Posterior
 - e) Left; Right; Anterior; Posterior
- 4) Stomach rotation causes the duodenum to take on a ____ shape. During the second month, the duodenal lumen closes but is recanalized by ____.
 - a) C; Apoptosis
 - b) S; Apoptosis
 - c) C; Cell corrosion
 - d) S; Cell corrosion
 - e) C; Duodenal growth
- 5) What two structures only form on the ventral side of the bile duct?
 - a) Liver; Pancreas
 - b) Liver; Gallbladder
 - c) Pancreas; Gallbladder
 - d) Heart; Liver
 - e) Heart; Pancreas
- 6) Which of the following is NOT a part of the developing pancreas?
 - a) Dorsal bud
 - b) Ventral bud
 - c) Ventral bile duct
 - d) Main pancreatic duct
 - e) Accessory duct
- 7) Meckel's diverticulum is a congenital connection from the umbilicus via a vitelline ligament to the _____. It affects 2% of the population, is typically 2 inches long, is 2 times more likely in males, and typically presents at 2 years of age.
 - a) Duodenum
 - b) Jejunum

- c) Ileum
 - d) Transverse colon
 - e) Sigmoid colon
- 8) During week six, the midgut herniates through the umbilical ring, rotating ____ degrees counterclockwise. Near week ten, the midgut returns, rotating ____ degrees for an overall rotation of ____ degrees.
- a) 180; 180; 0
 - b) 180; 180; 360
 - c) 90; 180; 90
 - d) 90; 180; 270
 - e) 270; 90; 180
- 9) A three-week old male infant comes into the Emergency Room for weight loss and acute dehydration. The infant has been projectile vomiting and the condition is worsening. Which of the following is most likely?
- a) Gastric atresia
 - b) Pyloric stenosis
 - c) Annular pancreas
 - d) Malrotation of the gut
 - e) Intestinal duplication

Embryology #13 – Urinary System

- 1) The urinary system develops mainly from:
- a) Ectoderm
 - b) Paraxial mesoderm
 - c) Intermediate mesoderm
 - d) Lateral plate mesoderm
 - e) Endoderm
- 2) During the pronephros period (week 3), the first kidney develops in the ____ region. By week 4 this kidney degenerates.
- a) Cervical
 - b) Thoracic
 - c) Lumbar
 - d) Sacral
 - e) Cloaca
- 3) The mesonephros (embryologic kidney) forms from weeks 4-8 in the ____ region.
- a) Cervical
 - b) Thoracic
 - c) Lumbar
 - d) Sacral
 - e) Cloaca
- 4) The metanephros (weeks 5 and on) give rise to the ureteric bud and form in the ____ region.
- a) Cervical
 - b) Thoracic
 - c) Lumbar
 - d) Sacral

- e) Cloaca
- 5) The ureteric bud gives rise to the _____ and the metanephric mesoderm (blastema) gives rise to the _____.
- a) Nephrons; Collecting system
 - b) Collecting system; Nephrons
 - c) Bowman's capsule; Ureter
 - d) Loop of Henle; Renal pelvis
 - e) Distal/proximal convoluted tubules; Major/minor calyces
- 6) As the kidney ascends, it rotates from _____-facing to _____-facing (relating to the hilum facing direction).
- a) Anterior; Inferior
 - b) Posterior; Lateral
 - c) Anterior; Lateral
 - d) Posterior; Medial
 - e) Anterior; Medial
- 7) The urorectal septum divides the _____ from the _____.
- a) Anorectal canal; Urogenital sinus
 - b) Urogenital sinus; Mesonephric duct
 - c) Urinary bladder; Allantois
 - d) Urachus; Allantois
 - e) Mesonephric duct; Ureteric bud
- 8) The urachus forms the:
- a) Allantois
 - b) Median umbilical ligament
 - c) Medial umbilical ligament
 - d) Lateral umbilical ligament
 - e) Round (umbilical) ligament
- 9) The urogenital sinus is made from what type of tissue?
- a) Muscle
 - b) Nerve
 - c) Connective
 - d) Epithelial
- 10) The bladder becomes continuous with the lower end of the mesonephric (Wolffian) duct, which will form the _____ of the bladder.
- a) Urethra
 - b) Prostate
 - c) Trigone
 - d) Posterior wall
 - e) Anterior wall
- 11) At birth, a child has large palpable flank masses and abnormal extremities. The delivery physician is very concerned as she knows this autosomally-dominant disorder can lead to renal failure and the child will likely need a kidney transplant to survive. Which of the following disorders does the child likely have?
- a) Polycystic kidney
 - b) Renal agenesis
 - c) Pelvic kidney

- d) Bifid ureter
 - e) Bifid kidney
- 12) This disorder, associated with oligohydramnios, occurs when the ureteric bud fails to reach the metanephric mesoderm.
- a) Polycystic kidney
 - b) Renal agenesis
 - c) Pelvic kidney
 - d) Horseshoe kidney
 - e) Bifid ureter
- 13) What artery prevents the horseshoe kidney (metanephric mesodermal fusion) from ascending high into the abdomen?
- a) Celiac trunk
 - b) Superior mesenteric artery
 - c) Inferior mesenteric artery
 - d) Left renal artery
 - e) Right renal artery
- 14) Which of the following disorders would show an increased level of alpha fetoprotein (AFP) during maternal Quad testing/screening?
- a) Renal agenesis
 - b) Horseshoe kidney
 - c) Bifid ureter
 - d) Ectopic ureter
 - e) Exstrophy of the bladder
- 15) A newborn baby presents with fluid draining from the umbilicus onto the skin. Testing of the fluid identifies it as urine. What is the most likely diagnosis?
- a) Urachal cyst
 - b) Urachal fistula
 - c) Exstrophy of the bladder
 - d) Bifid ureter
 - e) Horseshoe kidney

Embryology #14 – Reproductive System

- 1) Testis determining factor (TDF), a transcription factor, is turned on by a(n) _____ chromosome from the _____.
- a) X; egg
 - b) Y; egg
 - c) X; sperm
 - d) Y; sperm
- 2) The indifferent gonad forms as a pair of longitudinal ridges _____ to the mesonephric ridges.
- a) Medial
 - b) Lateral
 - c) Superior
 - d) Inferior

- 3) The germ cells arise from the epiblast (week 2) and are in the yolk sac during week 3. At week 5, they migrate through the dorsal mesentery of the _____ and arrive at the genital ridge in week 6.
- Foregut
 - Midgut
 - Hindgut
 - Cloaca
 - Cervical region
- 4) All of the following contribute to the indifferent gonad EXCEPT:
- Ectodermic placodes
 - Endodermic germ cells
 - Coelomic epithelium
 - Mesenchymal cells
- 5) During development of the ovaries, the primitive sex (medullary) cords _____.
- Proliferate
 - Move laterally
 - Move medially
 - Differentiate
 - Degenerate
- 6) The gubernaculum is attached to the uterus and as the ovaries descend it becomes the _____ of the uterus.
- Canal of Nuck
 - Ovarian ligament
 - Round ligament
 - Ovarian and round ligaments
 - Gubernacular ligament
- 7) Development of the testis is induced by the sry-gene, which encodes testis-determining factor (TDF). TDF causes all of the following EXCEPT:
- The sex cords continue to proliferate to form the testis
 - Leydig cells are secreting testosterone thus have very little SER
 - Towards the hilum, the cords grow into a network that will give rise to the rete testes
 - During further development, a thick layer (tunica albuginea) separates the cords from the surface epithelium
 - Sex cords become seminiferous cords that form seminiferous tubules (Sertoli cells), straight tubules, and rete testes
- 8) Which of the following inhibits the growth of the paramesonephric duct (males)?
- Testosterone
 - Leydig Cells
 - Dihydrotestosterone
 - Estrogens
 - Mullerian substances (MIFs)
- 9) As the testes descend, they follow the:
- Processus vaginalis
 - Parietal layer of tunica vaginalis
 - Visceral layer of tunica vaginalis

- d) Caudal genical ligament
 - e) Cryptorchidism
- 10) The epididymis, ductus deferens, ejaculatory duct, and seminal vesicle all arise from:
- a) The Mullarian ducts
 - b) The paramesonephric ducts
 - c) The mesonephric ducts
 - d) Leydig hormones
 - e) Wolffian hormones
- 11) The uterine tubes, uterus, cervix, and superior part (1/3) of the vagina all arise from:
- a) The Wolffian ducts
 - b) The paramesonephric ducts
 - c) The mesonephric ducts
 - d) Leydig hormones
 - e) Mullarian hormones
- 12) The epoophoron and paroophoron, which are important as cysts may form from these remnants, arise from:
- a) The Mullarian ducts
 - b) The paramesonephric ducts
 - c) The mesonephric ducts
 - d) Leydig hormones
 - e) Wolffian hormones
- 13) The lower portion of the vagina is derived from:
- a) Sinovaginal bulb
 - b) Uteral lumen
 - c) Hymn
 - d) Urogenital sinus
 - e) Vaginal plate
- 14) What structure in the indifferent stage (weeks 3-6) becomes the clitoris?
- a) Urogenital groove
 - b) Genital swelling
 - c) Urethral fold
 - d) Perineum
 - e) Genital tubercle
- 15) What structure in the indifferent stage (weeks 3-6) becomes the phallus?
- a) Urogenital groove
 - b) Genital swelling
 - c) Urethral fold
 - d) Perineum
 - e) Genital tubercle
- 16) Genetic 46XY would be:
- a) Turner's syndrome
 - b) Klinefelter syndrome
 - c) True hermaphrodite
 - d) Male pseudo-hermaphrodite
 - e) Female pseudo-hermaphrodite

17) A child is born with a tumor on their adrenal glands. This leads to adrenal hyperplasia. They display 46XX phenotypical characteristics. Which of the following is the best description of this patient:

- a) Turner's syndrome
- b) Klinefelter syndrome
- c) True hermaphrodite
- d) Male pseudo-hermaphrodite
- e) Female pseudo-hermaphrodite

18) A patient is born with karotype 46XY but has no problem with production of testosterone or mullarian inhibiting hormone. Their vagina ends in a blind pouch and testes are lodged in the inguinal canal. Which of the following is the best description of this patient:

- a) Male pseudo-hermaphrodite
- b) Female pseudo-hermaphrodite
- c) Androgen insensitivity syndrome
- d) Turner's syndrome
- e) Klinefelter syndrome

19) A young boy is learning how to use a standup urinal and must hold his penis pointing superiorly due to a birth defect. Which of the following describes his defect?

- a) Bifid penis
- b) Hypospadias
- c) Hydrocele
- d) Cryptochridism
- e) Bicornis

Embryology #15 – Placenta

1) The placenta has all of the following functions EXCEPT:

- a) Deoxygenation of blood
- b) Hormone production
- c) Protection
- d) Nutrition
- e) Excretion

2) The decidua, or maternal part of the placenta (endometrium), has three parts. Which part is deep to the fetus and forms at the implantation site?

- a) Decidua parietalis
- b) Decidua capsularis
- c) Decidua basalis

3) The decidua reaction protects the uterus (endometrium) from the:

- a) Chorion
- b) Amnion
- c) Uterine cavity
- d) Syncytiotrophoblast
- e) Cytotrophoblast

4) The finger-like projections of cytotrophoblast into syncytiotrophoblast are called:

- a) Somatic villi
- b) Splanchnic villi

- c) Connection stalks
 - d) Secondary chorionic villi
 - e) Primary chorionic villi
- 5) When the mesenchyme of the villi gives rise to blood vessels and blood cells, the villi is known as:
- a) Primary
 - b) Secondary
 - c) Tertiary
- 6) At the fetomaternal junction, projections of decidua basalis towards the chorionic plate serve to divide the fetal placenta into irregular areas called:
- a) Endometriums
 - b) Cotyledons
 - c) Anchoring villi
 - d) Smooth chorion
 - e) Villus chorion
- 7) During labor, what membrane ruptures (“water breaks”)?
- a) Amniochorionic
 - b) Amniotic
 - c) Chorionic
 - d) Decidua capsularis
 - e) Decidua parietalis
- 8) In placental circulation, what is the next path of blood after passing through the umbilical arteries?
- a) Fetus
 - b) Chorionic arteries
 - c) Capillary bed
 - d) Umbilical veins
 - e) Internal iliac arteries (maternal)
- 9) Blood in the intervillous space is considered ____ the mother’s circulatory system and adequate irrigation of chorionic villi ____ an important factor in the development of the fetus.
- a) Inside; Is not
 - b) Inside; Is
 - c) Outside; Is not
 - d) Outside; Is
- 10) Development of the placental membrane consists of all of the following EXCEPT:
- a) Syncytiotrophoblast
 - b) Cytotrophoblast
 - c) Embryonic connective tissue
 - d) Endothelium of the fetal vessels
 - e) Cotyledons
- 11) A patient presents in labor and is found to have a severe obstetric complication. The physician is very concerned about hemorrhage and talks to the patient about surgery and the possibility of hysterectomy due to full-thickness penetration. What condition does this patient have?
- a) Placenta previa

- b) Placenta accreta
 - c) Placenta percreta
 - d) Placental abruption
 - e) Ectopic pregnancy
- 12) The vessels of the umbilical cord are:
- a) 1 artery, 1 vein
 - b) 2 arteries, 2 veins
 - c) 1 artery, 2 veins
 - d) 2 arteries, 1 vein
- 13) Which of the following is responsible for bladder development?
- a) Allantois
 - b) Yolk sac
 - c) Amniotic fluid
 - d) Primordial gut
 - e) Kidneys

Embryology #16 – Pharyngeal Arches

- 1) During the 4th week of development, in what region does the pharyngeal apparatus develop?
- a) Cephalic
 - b) Foregut
 - c) Midgut
 - d) Hindgut
 - e) Caudal
- 2) What type of cells makes up the pharyngeal apparatus pouches?
- a) Endoderm
 - b) Ectoderm
 - c) Mesenchyme
 - d) Intermediate mesoderm
 - e) Lateral plate mesoderm
- 3) What type of cells makes up the pharyngeal apparatus clefts?
- a) Endoderm
 - b) Ectoderm
 - c) Mesenchyme
 - d) Intermediate mesoderm
 - e) Lateral plate mesoderm
- 4) What pharyngeal/branchial arch does the oropharyngeal membrane develop from?
- a) Sixth
 - b) Fourth
 - c) Third
 - d) Second
 - e) First
- 5) A typical pharyngeal/branchial arch contains all of the following EXCEPT:
- a) Nerve
 - b) Artery

- c) Vein
 - d) Somitomeres
 - e) Cartilage
- 6) What aortic arch forms the carotid arteries?
- a) Sixth
 - b) Fourth
 - c) Third
 - d) Second
 - e) First
- 7) What aortic arch forms the maxillary artery?
- a) Sixth
 - b) Fourth
 - c) Third
 - d) Second
 - e) First
- 8) What aortic arch forms the hyoid and stapedial artery?
- a) Sixth
 - b) Fourth
 - c) Third
 - d) Second
 - e) First
- 9) What two ear bones are formed together (first arch)?
- a) Malleus & Incus
 - b) Malleus & Stapes
 - c) Incus & Stapes
 - d) Incus & Styloid process
 - e) Styloid process & Malleus
- 10) From what pharyngeal/branchial arch(es) does the epiglottic cartilage form?
- a) Second
 - b) Third
 - c) Second & Third
 - d) Fourth
 - e) Third & Fourth
- 11) What pharyngeal/branchial arch is associated with muscles of facial expression?
- a) First
 - b) Fourth
 - c) Third
 - d) Second
 - e) Sixth
- 12) What pharyngeal/branchial arch is associated with the stylopharyngeus muscle?
- a) First
 - b) Third
 - c) Fourth
 - d) Sixth
 - e) Second
- 13) What pharyngeal/branchial arch is associated with muscles of mastication?

- a) First
 - b) Third
 - c) Fourth
 - d) Sixth
 - e) Second
- 14) All of the following are associated with the vagus nerve EXCEPT:
- a) Cricothyroid from 4th arch (superior laryngeal nerve)
 - b) Pharyngeal constrictor muscles
 - c) Glossopharyngeal muscle
 - d) Levator veli palatini
 - e) Remaining laryngeal muscles from 6th arch (recurrent laryngeal nerve)
- 15) What pouch forms the inferior parathyroid?
- a) Second
 - b) Third, Superior
 - c) Third, Inferior
 - d) Fourth, Superior
 - e) Fourth, Inferior
- 16) What pouch forms the ultimopharyngeal body?
- a) Second
 - b) Third, Superior
 - c) Third, Inferior
 - d) Fourth, Superior
 - e) Fourth, Inferior
- 17) What pouch allows you to equalize pressure in your ears by blowing into a pinched nose?
- a) First
 - b) Second
 - c) Third
 - d) Fourth
 - e) Sixth
- 18) As the thyroid gland develops, what divides the taste buds of the tongue, splits between the anterior 2/3 and posterior 1/3, and forms the foramen cecum?
- a) Palatine tonsil
 - b) Root of tongue
 - c) Terminal sulcus
 - d) Laryngeal orifice
 - e) Epiglottis
- 19) The pyramidal lobe, seen in some individuals, is remnant from what structure?
- a) Tongue
 - b) Hyoid bone
 - c) Pharyngeal gut
 - d) Thyroglossal duct
 - e) Foramen cecum
- 20) Branchial fistulas result from persistence of the pharyngeal grooves, when the second arch fails to grow over the third and fourth arches. What aspect of the neck do these open onto?

- a) Lateral
 - b) Medial
 - c) Anterior
 - d) Posterior
 - e) Inferior
- 21) Facial defects can result from deficient _____ cells, which are important for the development of the pharyngeal/branchial arches.
- a) Endoderm
 - b) Ectoderm
 - c) Mesenchyme
 - d) Intermediate mesoderm
 - e) Neural crest
- 22) Treacher Collins Syndrome and Pierre Robin Sequence involve genetic defects in what pharyngeal/branchial arch?
- a) First
 - b) Second
 - c) Third
 - d) Fourth
 - e) Sixth
- 23) What structure is missing in children born with DiGeorge Anomaly?
- a) Thyroid
 - b) Parathyroid
 - c) Thymus
 - d) Heart
 - e) Jawbone
- 24) A midline neck mass is the distinguishing characteristic of which of the following?
- a) Ectopic thyroid tissue
 - b) Branchial vestiges
 - c) Thyroglossal cysts
 - d) Branchial fistula
 - e) Pierre Robin Sequence
- 25) What part of the tongue do the fused distal tongue buds form?
- a) Anterior 1/3
 - b) Posterior 1/3
 - c) Anterior 2/3s
 - d) Posterior 2/3s
 - e) No notable contribution to the tongue
- 26) Somatic sensation for the anterior 2/3s of the tongue comes from _____ and visceral sensation for the anterior 2/3s of the tongue comes from _____.
- a) CN IX; CN XII
 - b) CN XII; CN IX
 - c) CN VII; CN V
 - d) CN V; CN VII
 - e) CN XII; CN XII
- 27) Taste from the root of the tongue is associated with what cranial nerve?
- a) CN V

- b) CN VII
- c) CN IX
- d) CN X
- e) CN XII

Embryology #17 – Skull, Face, and Palate

- 1) The skull develops from ____ around the developing brain and consists of the neurocranium and viscerocranium.
 - a) Endoderm
 - b) Ectoderm
 - c) Mesenchyme
 - d) Intermediate mesoderm
 - e) Lateral plate mesoderm
- 2) Which of the following is NOT part of the chondrocranium?
 - a) Postchordal cartilage
 - b) Prechordal cartilage
 - c) Parachordal cartilage
 - d) Hypophysial cartilage
 - e) Olfactory, otic, and optic capsules
- 3) All of the flat bones on top of the skull (the “dome”) are formed from the:
 - a) Membranous viscerocranium
 - b) Membranous neurocranium
 - c) Cartilaginous viscerocranium
 - d) Cartilaginous neurocranium
- 4) Which of the following is a single (not paired) bone derived from the viscerocranium?
 - a) Temporal
 - b) Occipital
 - c) Mandibular
 - d) Maxillary
 - e) Frontonasal
- 5) The membranous neurocranium has six of these structures which help during birth.
 - a) Frontal grooves
 - b) Parietal plates
 - c) Squamous parts of the temporal bone
 - d) Fontanelles
 - e) Portions of the occipital angle
- 6) Which of the following forms most of the bones at the base of the skull?
 - a) Membranous viscerocranium
 - b) Membranous neurocranium
 - c) Cartilaginous viscerocranium
 - d) Cartilaginous neurocranium
- 7) How many facial primordia are involved in initial facial development?
 - a) 5
 - b) 4
 - c) 3
 - d) 2

- e) 1
- 8) At a college party, a student tries to impress his friends with a trick he discovered. He is able to sniff liquid into his nose and squirt it from the corner of his eye. What embryological structure makes this possible?
- a) Stomodum
 - b) Mandibular prominence
 - c) Nasolacrimal duct
 - d) Nasal pit
 - e) Frontonasal prominence
- 9) A child is born with fetal alcohol syndrome and is lacking developed midline structures. From what segment is the child's smoothed philtrum derived, as well as the rest of the primary palate?
- a) Nasolacrimal
 - b) Nasomaxillary
 - c) Philomaxillary
 - d) Intermaxillary
 - e) Philolacrimal
- 10) The primary palate forms the premaxillary part of the maxilla and holds the ____.
- a) Molars
 - b) Premolars
 - c) Incisors
 - d) Canines
 - e) Wisdom teeth
- 11) The palatine shelf (secondary plate) grows from which original location?
- a) Midline
 - b) Lateral
 - c) Anterior (incisors)
 - d) Posterior (molars)
 - e) Superior (soft palate)
- 12) What cranial anomaly would result in a skull that becomes much taller than normal?
- a) Acrania
 - b) Scaphocephaly
 - c) Oxycephaly
 - d) Plagiocephaly
 - e) Microcephaly
- 13) Which rare cleft disorder involves failure of the mandibular prominence to fuse?
- a) Cleft lip
 - b) Anterior cleft
 - c) Posterior cleft
 - d) Median cleft
 - e) Median cleft of the lower lip
- 14) Excessive merging of the maxillary and mandibular prominences would cause:
- a) Cleft lip
 - b) Facial cleft
 - c) Microstomia
 - d) Microcephaly

- e) Median cleft
- 15) What type of facial anomaly would start at the lip and extend to the orbit?
 - a) Facial cleft
 - b) Median cleft
 - c) Cleft lip
 - d) Anterior cleft
 - e) Posterior cleft
- 16) What type of facial anomaly extends through the soft and hard palate?
 - a) Facial cleft
 - b) Median cleft
 - c) Cleft lip
 - d) Anterior cleft
 - e) Posterior cleft
- 17) What type of facial anomaly involves the alveolar part of the maxilla?
 - a) Facial cleft
 - b) Median cleft
 - c) Cleft lip
 - d) Anterior cleft
 - e) Posterior cleft

Embryology #18 – Eye

Match the following structures with their developmental origin:

- 1) Choroid and sclera
- 2) Lens
- 3) Retina and optic nerve
- 4) Fibrous and vascular coats
- 5) Which of the following is continuous with the dura of the central nervous system?
 - a) Retina
 - b) Optic nerve
 - c) Lens
 - d) Fibrous coat
 - e) Sclera
- 6) Where does the hyaloid artery develop in relation to the optic stalk?
 - a) Along the outer layer
 - b) Between the outer and inner layer
 - c) Inside of the stalk
 - d) On the lateral surface of the choroid fissure
 - e) On the medial surface of the choroid fissure
- 7) Which of the following forms the pigmented layer of the eye?
 - a) Intraretinal space
 - b) Optic fissure
 - c) Hyaloid artery
 - d) Optic stalk outer layer
 - e) Optic stalk inner layer
- 8) Which of the following forms the neural retina?
 - a) Intraretinal space

- b) Optic fissure
 - c) Hyaloid artery
 - d) Optic stalk outer layer
 - e) Optic stalk inner layer
- 9) The ciliary body, pupil muscles, and iris are formed from the optic cup. Where the iris is formed there is a gap that remains. What is this gap?
- a) Pupil
 - b) Ciliary body
 - c) Connective tissue
 - d) Sphincter pupillae
 - e) Sinus venosus sclerae
- 10) Floaters (the appearance of muscae volitantes – “flying flies”) are shadow-like shapes that can sometimes be seen in one’s field of vision. They may appear as spots, threads, or fragments which float slowly before one’s eyes. Floaters are deposits within the vitreous humor. What embryological structure within the vitreous humor could lead to floaters?
- a) Lens
 - b) Hyaloid artery
 - c) Central artery of the retina
 - d) Iris
 - e) Pupil
- 11) The cornea is derived from all of the following EXCEPT:
- a) Neuroectoderm
 - b) Surface ectoderm
 - c) Mesoderm
 - d) Neural crest
- 12) The conjunctival sac lies between the cornea and eyelids. What develops as pouches form the conjunctival sac?
- a) Eyelid
 - b) Suspensory ligament
 - c) Lacrimal glands
 - d) Iridopupillary membrane
 - e) Vitreous humor
- 13) The scleral venous sinus is the outflow of fluid from the _____ to the _____.
- a) Anterior chamber; Posterior chamber
 - b) Posterior chamber; Anterior chamber
 - c) Anterior chamber; Venous system
 - d) Posterior chamber; Venous system
 - e) Optic cup; Venous system
- 14) The levator palpebrae muscle arises from a splitting of what extrinsic eye muscle(s)?
- a) Lateral rectus
 - b) Medial rectus
 - c) Inferior rectus
 - d) Superior rectus
 - e) Superior/Inferior obliques
- 15) What congenital defect is a result of the intraretinal space remaining (not being obliterated) and is associated with blindness in the non-fused area of the eye?

- a) Coloboma
 - b) Congenital retinal detachment
 - c) Microphthalmia
 - d) Congenital glaucoma
 - e) Persistent papillary membrane
- 16) A child presents with moderate vision loss. Upon examination, the eye has a key-hole appearance due to improper closure of the choroid fissure. What defect does this child have?
- a) Coloboma
 - b) Congenital retinal detachment
 - c) Microphthalmia
 - d) Congenital glaucoma
 - e) Anophthalmia
- 17) What congenital defect is often associated with a midline proboscis (appendage)?
- a) Coloboma
 - b) Anophthalmia
 - c) Microphthalmia
 - d) Congenital glaucoma
 - e) Cyclopia
- 18) What congenital defect looks similar to cyclopia but involves two eyes?
- a) Cyclopia
 - b) Synophthalmia
 - c) Microphthalmia
 - d) Anophthalmia
 - e) Coloboma
- 19) A child is brought to their pediatrician a month after birth. The mother describes the eyes as having spider webs in them. What congenital defect is she likely referring to?
- a) Coloboma
 - b) Microphthalmia
 - c) Congenital retinal detachment
 - d) Congenital glaucoma
 - e) Anophthalmia
- 20) Congenital glaucoma is associated with what teratogen?
- a) Thalidomide
 - b) Rubella
 - c) Syphilis
 - d) Lithium
 - e) Lead

Embryology #19 – Ear

- 1) The otic placode develops as a thickening of which of the following?
- a) Ectoderm
 - b) Endoderm
 - c) Paraxial mesoderm
 - d) Intermediate mesoderm
 - e) Lateral plate mesoderm

- 2) Congenital deafness occurs due to abnormal development of what part of the ear?
 - a) External
 - b) Middle
 - c) Internal
- 3) Which of the following form the vestibulocochlear ganglion?
 - a) Endoderm and ectoderm
 - b) Ectoderm and otic placode
 - c) Otic placode and intermediate mesoderm
 - d) Lateral plate mesoderm and otic placode
 - e) Otic placode and neural crest
- 4) A child is brought to the primary care clinic by a concerned mother. The mother thought her child was just clumsy originally, but is now worried because at age three the child still cannot walk without falling over. A malformation of which of the following could lead to this problem?
 - a) Ductus reuniens
 - b) Perilymphatic duct
 - c) Utricle
 - d) Saccule
 - e) Cochlear duct
- 5) The spiral ganglion is related to what structure?
 - a) Malleus
 - b) Incus
 - c) Stapes
 - d) Cochlea
 - e) Otic hair cells
- 6) If the cochlear duct is unwound it would be sandwiched between two layers of vacuolized cartilage (from mesenchyme). What is the name of the area of continuity of these two cartilages with the cochlea, which forms the central bony support?
 - a) Scala vestibuli
 - b) Scala tympani
 - c) Modiolis
 - d) Cochlear duct epithelium
 - e) Tectorial membrane
- 7) The ear forms between which pharyngeal/branchial arches?
 - a) One and two
 - b) Two and three
 - c) Three and four
 - d) Four and five
- 8) Which germ layer forms the inner ear?
 - a) Endoderm
 - b) Mesoderm
 - c) Ectoderm
- 9) What pharyngeal/branchial arch does the tensor tympani muscle derive from?
 - a) First
 - b) Second
 - c) Third

- d) Fourth
 - e) Sixth
- 10) Which of the following is NOT derived from the second pharyngeal/branchial arch?
- a) Stapes
 - b) Incus
 - c) Styloid process
 - d) Stylohyoid ligament
 - e) Lesser horn of hyoid bone
- 11) A child is brought to the clinic with deformities of the external ear. The clinician believes there was malformation of a structure that forms between the first and second pharyngeal/branchial arch. What structure is this?
- a) External auditory meatus
 - b) Incus
 - c) Stapes
 - d) Tympanic membrane
 - e) Auricular hillocks
- 12) Which of the following does NOT contribute to the cutaneous innervation of the ear?
- a) CN V
 - b) CN VII
 - c) CN VIII
 - d) CN IX
 - e) CN X
- 13) Minor deformities of the external ear are clinically significant as they suggest other congenital anomalies.
- a) True
 - b) False
- 14) Preauricular sinuses have only cosmetic significance but can become infected. They result from abnormal closure of which pharyngeal groove?
- a) First
 - b) Second
 - c) Third
 - d) Fourth
 - e) Fifth
- 15) During normal development, there is a plug of cells situated in front of the tympanic membrane. These cells normally regress. If these cells fail to die, what occurs?
- a) Atresia of the internal auditory meatus
 - b) Atresia of the cochlea
 - c) Atresia of the tympanic membrane
 - d) Atresia of the middle ear
 - e) Atresia of the external auditory meatus

Embryology #20 – Birth Defects and Fetal Diagnosis

- 1) Birth defects, the leading cause of infant mortality, accounts for what approximate percentage of infant deaths?
- a) 2%
 - b) 3%

- c) 6%
 - d) 16%
 - e) 21%
- 2) Most congenital malformations occur during which weeks of gestation?
- a) 0 to 3
 - b) 3 to 8
 - c) 8 to 10
 - d) 10 to 16
 - e) 16 to birth
- 3) Clubfeet, which is due to mechanical forces in the womb, is an example of:
- a) Disruption
 - b) Deformation
 - c) Syndrome
 - d) Minor anomaly
 - e) Association
- 4) VACTERL (vertebral, anal, cardiac, tracheoesophageal, renal, limb) are non-random anomalies that occur together more frequently than chance alone. Which of the following is this an example of?
- a) Disruption
 - b) Deformation
 - c) Syndrome
 - d) Minor anomaly
 - e) Association
- 5) A vascular accident leading to bowel atresia, which is a result of morphological alteration to an already formed structure, is called:
- a) Disruption
 - b) Deformation
 - c) Syndrome
 - d) Minor anomaly
 - e) Association
- 6) What is a group of anomalies occurring together that has a specific common cause?
- a) Disruption
 - b) Deformation
 - c) Syndrome
 - d) Minor anomaly
 - e) Association
- 7) Which of the following statement about the principles of teratology is NOT true?
- a) Susceptibility to teratogenesis depends on the genotype of the conceptus
 - b) The maternal genome plays an important role with respect to drug metabolism, resistance to infection, and other processes that affect the conceptus
 - c) Susceptibility to teratogenesis depends on the development stage at the time of exposure
 - d) Manifestation of abnormal development depends on duration of exposure and not dose of exposure to a teratogen
 - e) Manifestations of abnormal development include death, malformation, growth retardation, and function disorders

- 8) Maternal hyperthermia, from febrile illness and even hot-tubs/saunas, is associated with all of the following birth defects EXCEPT:
- a) Anencephaly
 - b) Spina bifida
 - c) Mental retardation
 - d) Cardiac abnormalities
 - e) Deafness
- 9) Toxoplasmosis (*Toxoplasmosis gondii* protozoan parasite) has what characteristic feature of fetal infection?
- a) Hydrocephalus
 - b) Cerebral calcifications
 - c) Microphthalmia
 - d) Limb hypoplasia
 - e) Cataracts
- 10) What types of birth defects can ionizing radiation cause?
- a) Central nervous system
 - b) Limb defects
 - c) Gastrointestinal defects
 - d) Vascular defects
 - e) Virtually any type of defect
- 11) Which of the following teratogens is associated with absence of extremities?
- a) Thalidomide
 - b) Rubella
 - c) Syphilis
 - d) Lithium
 - e) Lead
- 12) During the 6th through the 11th week of development a woman uses methamphetamine. Along with cardiovascular defects, which of the following is the most likely defect her child could be born with?
- a) Limb defects
 - b) Anencephaly
 - c) Cleft lip/palate
 - d) Masculinization of the female genitalia
 - e) Malformation of the uterine tubes
- 13) Which of the following teratogens is the leading cause of mental retardation?
- a) Thalidomide
 - b) Lithium
 - c) Syphilis
 - d) Alcohol
 - e) Lead
- 14) A woman is prescribed Isotretinoin (analog of vitamin A) for her cystic acne. Although she is pregnant, the clinician does not question her about being pregnant or taking a pregnancy test. Which of the following types of birth defects can this patient's child be born with?
- a) Central nervous system
 - b) Limb defects

- c) Gastrointestinal defects
 - d) Vascular defects
 - e) Virtually any type of defect
- 15) Which of the following teratogens is associated with indistinct philtrum, thin upper lip, depressed nasal bridge, short nose, and flat mid-face?
- a) Syphilis
 - b) Alcohol
 - c) Thalidomide
 - d) Lithium
 - e) Hyperthermia
- 16) Diethylstilbestrol (DES) was once prescribed to women to prevent miscarriages. However, it has since been found to be a teratogen that causes what type of defects?
- a) Reproductive system
 - b) Central nervous system
 - c) Gastrointestinal
 - d) Limb (partial or total absence)
 - e) Virtually any type of defect
- 17) Which of the following defects is the most common when the mother has diabetes?
- a) Malformation of the uterus
 - b) Cleft lip/palate
 - c) Heart and neural tube defects
 - d) Microcephaly
 - e) Cataracts
- 18) Mothers with phenylketonuria (PKU) who maintain a low-phenylalanine diet prior to conception reduce their increased risk of birth defects by what percentage?
- a) 100%
 - b) 80%
 - c) 60%
 - d) 40%
 - e) 20%
- 19) Which of the following defects is the most likely when the mother is obese?
- a) Malformation of the uterus
 - b) Cleft lip/palate
 - c) Heart and neural tube defects
 - d) Microcephaly
 - e) Glaucoma
- 20) A pregnant woman is trying to maintain a healthy diet during pregnancy. For variety, she has swordfish, shark, tilefish, and pork. Weeks later the Food and Drug Administration (FDA) releases a statement showing the fish she ate had high levels of organic mercury. A consumer alert is also released for pork as the hogs were fed seed corn, which was sprayed with a mercury-containing fungicide. Which of the following will her child most likely be born with?
- a) Pulmonary edema
 - b) Spina bifida
 - c) Anencephaly
 - d) Mental retardation

- e) Cerebral palsy
- 21) Which of the following fetal therapies is usually done to the fetus directly and not to the mother?
- a) Infection treatment
 - b) Fetal anemia treatment
 - c) Thyroid treatment
 - d) Cardiac arrhythmia treatment
- 22) Which of the following defects treated by fetal surgery is the most controversial because the abnormality is not life threatening?
- a) Neural tube defects
 - b) Cystic (adenomatoid) lesions
 - c) Congenital diaphragmatic hernia
 - d) Obstructive urinary disease of the urethra

Embryology #21 – Integumentary System

- 1) Up to the 5th week of development, the embryonic skin is only a single layer of:
- a) Ectoderm
 - b) Endoderm
 - c) Paraxial mesoderm
 - d) Intermediate mesoderm
 - e) Lateral plate mesoderm
- 2) Which layer of skin is responsible for production of new cells?
- a) Stratum corneum
 - b) Stratum lucidum
 - c) Stratum granulosum
 - d) Stratum spinosum
 - e) Stratum germinativum
- 3) What germ layer forms the melanocytes?
- a) Endoderm
 - b) Neural crest
 - c) Paraxial mesoderm
 - d) Intermediate mesoderm
 - e) Lateral plate mesoderm
- 4) What germ layer is the dermis derived from?
- a) Paraxial mesoderm
 - b) Intermediate mesoderm
 - c) Lateral plate mesoderm
 - d) Neural crest
 - e) Endoderm
- 5) At birth the infant is covered by a whitish paste (vernix caseosa), which protects the skin against the macerating action of amniotic fluid. Which of the following is the vernix caseosa derived from?
- a) Arrector pili muscles
 - b) Dermal root sheaths
 - c) Hair papilla
 - d) Sebaceous glands

- e) Hair blood vessels
- 6) During a routine examination of a female patient, accessory nipples are found in the axilla and on the mid thorax along the embryological mammary ridge. What is the terminal extension of this ridge?
- a) Mid thorax
 - b) Diaphragm
 - c) Umbilicus
 - d) Pubic region
 - e) Lower thigh to knee
- 7) Mammary glands are formed from which of the following?
- a) Neural crest
 - b) Endoderm
 - c) Mesenchyme
 - d) Ectoderm
- 8) From what layer of the epidermis do hair follicles begin to proliferate?
- a) Stratum corneum
 - b) Stratum lucidum
 - c) Stratum granulosum
 - d) Stratum spinosum
 - e) Stratum germinativum
- 9) This disorder results from excessive keratinization of the skin, whereby the skin appears as very dry and scaly. In extreme cases (harlequin fetus), the skin is abnormally thick and cracked.
- a) Albinism
 - b) Amelogenesis imperfecta
 - c) Leprosy
 - d) Psoriasis
 - e) Ichthyosis
- 10) A patient presents with red blotches on their face and neck. They say they've had these birthmarks as long as they can remember and they were told it has something to do with capillaries. Which of the following malformation does this patient likely have?
- a) Albinism
 - b) Angioma
 - c) Ichthyosis
 - d) Collodion
 - e) Thalidomide defect

AnswerKey

Embryo #1

- 1) B
- 2) E
- 3) C

Embryo #2

- 1) B
- 2) C
- 3) A
- 4) C
- 5) D
- 6) E
- 7) D
- 8) B
- 9) A
- 10) E

Embryo #3

- 1) C
- 2) D
- 3) B
- 4) A
- 5) E
- 6) C

Embryo #4

- 1) D
- 2) C
- 3) E
- 4) B
- 5) A

Embryo #5

- 1) B
- 2) E
- 3) A
- 4) C
- 5) D
- 6) A

Embryo #6

- 1) B
- 2) D
- 3) C
- 4) A

5) B

6) A

7) E

8) C

9) B

10) C

11) C

12) A

13) E

14) D

15) C

16) A

Embryo #7

- 1) D
- 2) B
- 3) B
- 4) C
- 5) A
- 6) E

Embryo #8

- 1) A
- 2) B
- 3) C
- 4) C
- 5) E
- 6) D
- 7) B
- 8) A
- 9) D
- 10) C
- 11) E
- 12) B
- 13) A

Embryo #9

- 1) C
- 2) D
- 3) A
- 4) A
- 5) C
- 6) D
- 7) E
- 8) B
- 9) C

10) E

11) A

12) B

Embryo #10

- 1) B
- 2) C
- 3) D
- 4) D
- 5) A
- 6) C
- 7) B
- 8) E
- 9) A
- 10) E
- 11) C

Embryo #11

- 1) A
- 2) D
- 3) C
- 4) B
- 5) B
- 6) E
- 7) C
- 8) D
- 9) A
- 10) B
- 11) E
- 12) C
- 13) D
- 14) D

Embryo #12

- 1) D
- 2) E
- 3) E
- 4) A
- 5) B
- 6) C
- 7) C
- 8) D
- 9) B

Embryo #13

- 1) C

2) A

3) C

4) D

5) B

6) E

7) A

8) B

9) D

10) C

11) A

12) B

13) C

14) E

15) B

Embryo #14

- 1) D
- 2) A
- 3) C
- 4) A
- 5) E
- 6) D
- 7) B
- 8) E
- 9) A
- 10) C
- 11) B
- 12) C
- 13) D
- 14) E
- 15) E
- 16) D
- 17) E
- 18) C
- 19) B

Embryo #15

- 1) A
- 2) C
- 3) D
- 4) E
- 5) C
- 6) B
- 7) A
- 8) B
- 9) D

- 10) E
- 11) C
- 12) D
- 13) A

Embryo #16

- 1) A
- 2) A
- 3) B
- 4) E
- 5) C
- 6) C
- 7) E
- 8) D
- 9) A
- 10) E
- 11) D
- 12) B
- 13) A
- 14) C
- 15) B
- 16) E
- 17) A
- 18) C
- 19) D
- 20) A
- 21) E
- 22) A
- 23) B
- 24) C
- 25) C
- 26) D
- 27) D

Embryo #17

- 1) C
- 2) A
- 3) B
- 4) E
- 5) D
- 6) C
- 7) A
- 8) C
- 9) D
- 10) C
- 11) B

- 12) C
- 13) E
- 14) C
- 15) A
- 16) E
- 17) D

Embryo #18

- 1) D
- 2) B
- 3) A
- 4) C
- 5) E
- 6) C
- 7) D
- 8) E
- 9) A
- 10) B
- 11) A
- 12) C
- 13) C
- 14) D
- 15) B
- 16) A
- 17) E
- 18) B
- 19) C
- 20) B

Embryo #19

- 1) A
- 2) B
- 3) E
- 4) C
- 5) D
- 6) C
- 7) A
- 8) B
- 9) A
- 10) B
- 11) E
- 12) C
- 13) A
- 14) A
- 15) E

Embryo #20

- 1) E
- 2) B
- 3) B
- 4) E
- 5) A
- 6) C
- 7) D
- 8) E
- 9) B
- 10) E
- 11) A
- 12) C
- 13) D
- 14) E
- 15) B
- 16) A
- 17) C
- 18) A
- 19) C
- 20) E
- 21) B
- 22) A

Embryo #21

- 1) A
- 2) E
- 3) B
- 4) C
- 5) D
- 6) D
- 7) C
- 8) A
- 9) E
- 10) B