Answers

2.8 Skin

327. a + b + c + d + e +
The skin performs many important functions in physiological homeostasis including osmoregulation, thermoregulation, excretion (in sweat), secretion of protective oils (from sebaceous glands), mechanical protection and sensory reception.

328. a + b – c – d – e +
The mucocutaneous junctions such as are found at the lips are sites of transition between mucous membranes and the skin. They have a thicker epithelium than that of the adjacent skin, but have only a very thin layer of keratin and normally lack sweat glands, sebaceous glands or hairs.

329. a – b – c + d + e –
Thick skin is found only on the soles of the feet and the palms of the hands.

330. a + b + c – d – e –
The epidermis of thick skin has a thick horny layer (stratum corneum) and a clear layer (stratum lucidum). Thick skin lacks melanocytes. Epidermis, which is a stratified epithelium, in common with other epithelia lacks capillaries or fat cells.

331. a + b – c + d + e –
The thick skin of the soles of the feet has ducts of sweat glands, which can be seen passing through the thick horny layer. Keratohyalin granules are prominent in the granular layer (stratum granulosum). There is a continuous desquamation of dead cells from the outer parts of the horny layer. Meissner corpuscles and blood vessels are not present in the epidermis, though they are found in the adjacent underlying dermis.

332. a + b + c – d – e –
Mitotic cells are found in the epidermis of thick skin only in the basal and spiny layers.

333. a + b + c – d + e +

334. a + b + c + d + e +
The horny layer (stratum corneum) of the epidermis helps protect the skin from desiccation, mechanical damage and abrasion, invasion of microorganisms and the penetration of many foreign bodies or dirt. It is relatively impermeable to water. The horny layer is composed of abundant keratin is squamous cells or the remains of cells that have lost their nuclei. These cells have thickened plasma membranes and are continuously being shed or desquamated. When viewed by polarizing microscopy the horny layer is seen to have a birefringent (anisotropic)

component (keratin). The horny layer is not an effective barrier to ultraviolet light.

335. a + b + c + d – e –

336. a – b – c – d + e +
Keratin is a scleroprotein that is birefringent (anisotropic) and which is chemically rich in disulfide bonds. It is the main component of the horny layer of both thick and thin skin. Keratin is also found in hair. Keratin should not be confused with keratin sulfate, the glycosaminoglycan of cartilage or bone matrix

337. a – b + c + d + e –
Eleidin is an amorphous substance found in the clear layer (stratum lucidum) and is stained pink to red with eosin.

338. a + b + c + d + e +

339. a + b + c – d + e +
Skin color depends to a certain degree on its thickness and the underlying vasculature. When the body is subject to cold environmental conditions, the skin is more pallid, whereas in hot conditions the skin in more ruddy. This is part due to the effective functioning of arteriovenous anastomoses and their thermoregulatory role in the skin. When the skin needs more oxygen or the body needs to sweat more profusely, then more blood passes through the capillary beds and vice versa. The main color of the skin is due to the amount of the pigment present in the epidermis, in particular the amount of melanin, though carotene also contributes to skin color. The ruddiness of the skin is in part due to the number of blood vessels supplying the skin and their hemoglobin content.

340. a + b + c + d + e +

341. a + b – c + d – e +
Melanocytes originate in the embryonic neural crest. They are found mainly in the basal layers of the epidermis, though some may also be present in the upper part of the dermis. Melanocytes are the site of synthesis of melanin granules, for which they need the enzyme tyrosinase. The biosynthetic activities of melanocytes are stimulated in response to exposure to ultraviolet light. Melanocytes have long processes that penetrate between the keratinocytes, though no structural junctions (such as desmosomes) are found connecting them to the keratinocytes. The melanin is transferred to the keratinocytes. The melanin is transferred to keratinocytes so that in most cases the epithelial cells have more melanin content than the melanocytes that produced the pigment. In light microscope preparations the melanocytes are usually identifiable by their melanin content.

343. a – b + c + d – e –

Melanosomes are found in both melanocytes and keratinocytes. The melanosomes are usually oval in shape. In people with ginger or blonde hair the melanosomes are more rounded and contain the pigment phaeomelanin. Dark-skinned, elderly people, even if they no longer produce hair pigmentation, still retain their skin pigmentation. In the absence of tyrosinase due to an inborn error of metabolism, melanin cannot be synthesized and the result is then on-pigmented skin or hair of albinos.

344. a + b + c – d + e +

Exposure to ultraviolet light results in an increase in tyrosinae synthesis and increased melanin production in melanocytes. The melanosomes are transferred to and accumulate in the keratinocytes at an increased rate. The skin becomes more cornified and thicker. The number of melanocytes is not increased, though there is an increase in their biosynthetic activities. The number of melanocytes does not differ greatly between people of different skin colors. The 'tanning' process in response to exposure to the sunlight helps prevent undue damage by ultrabviolet light to the genetic complement of cells in the underlying tissues and organs.

345. a – b – c + d + e –

346. a + b + c + d + e +

The dermis originates from the mesenchyme and is composed of two fairly well marked layers: an upper papillary layer adjacent to the basal part of the epidermis and a deeper reticular layer. The epidermis lacks its own blood vessels and relies on the diffusion of nutrients and other metabolites from the blood vessels of the underlying dermis. To a limited degree the dermis also provides some mechanical protection to deeper-lying structures. In the dermis can be found encapsulated receptors, hair follicles, sebaceous glands, sweat glands and also a fairly large number of arteriovenous anastomoses. The hair follicles and glands have an ectodermal origin.

347. a – b – c – d + e –

The reticular layer of the dermis is composed in particular of irregular, dense, connective tissue, and has more fibers but fewer cells than the papillary layer.

348. a + b – c + d + e +

The elastic fibers of the skin are found mainly in the dermis. They greatly increase in thickness and quantity in old age, though the aged skin is less elastic. If the skin of an elderly person is nipped between the forefingers it does not return to its normal position with the ease of that of younger skin. This loss of elasticity is believed to be a major cause of skin wrinkling in old age.

349. a – b + c + d + e +
The hypodermis is not an integral part of the skin, but is regarded as a subcutaneous layer. The hypodermis is rich in adipose tissue and helps bind the skin to adjacent structures, whilst allowing a degree of skin mobility.

350. a + b – c – d + e –
The fats left in fingerprints are secreted by the merocrine (eccrine) sweat glands. Fingers, which are covered on the palm side with thick skin, lack hairs and sebaceous glands.

351. a + b + c + d + e +
Hairs, nails, sweat glands and mammary glands are all epithelial derivatives of skin.

352. a – b + c – d + e +

353. a + b + c + d + e –

354. a + b + c – d + e +
Sebaceous glands secrete sebum, which is a waxy secretion that helps lubricate hairs and prevent them from sticking together. Sebum helps provide a waxy waterproofing to the skin and helps maintain epidermal integrity and prevent skin cracking. Sebaceous glands are found associated with hairs but are absent in thick skin (where there are no hairs present). Sebum secretion is influenced by sex hormones; hormonal disturbances during adolescence may result in facial acne. Sebaceous glands are composed of cells that are rich in lipid. The glands show holocrine secretion in which whole cells, together with their contents, are secreted through short secretory ducts that open on hair follicles. The contraction of arrector pili muscles causes the secretionof the subem from the glands.

355. a + b – c – d + e +
Arrector pili muscles are smooth muscles found in the dermis and associated with hair follicles. Their contraction causes the hairs to become more erect and this may be in response to fear or cold. The latter results in ‘goose pimples’. Their contraction also cause the release of secretion from sebaceous glands.

356. a – b + c + d + e +
The muscles of facial expression are striated muscles that terminate in the dermis and are responsible for many of the voluntary movements of the facial skin, ears and scalp. They are believed to be vestiges of the well-developed ‘panniculus carnosus’ found in many mammals, such as dogs, which are able to shake their fur dry after swimmintg or dislodge insects by muscle contraction.

357. a – b – c + d – e +

358. a + b – c + d – e –
Merocrine (eccrine) sweat glands are present from birth. They are found all over the body including thick skin. Merocrine sweat glands are not associated with hairs. Their secretory units arefound in the dermis and are composed of simple tubular glands, which are often coiled. Release of secretion into the lumina of secretory units results from the contraction of the surrounding myoepipthelial cells.

359. a – b + c + d + e +

360. a – b + c + d + e –
Apocrine sweat glands appear only at puberty. They are sometimes called odoriferous glands as their secretion has a distinct smell. These apocrine sweat glands are connected to hairs and are found in the armpit, groin area and to a certain degree around the nipples. The secretory units of apocrine sweat glands are much larger than those of the merocrine (eccrine) sweat glands.

361. a – b – c + d + e +

362. a – b + c – d + e +

363 a + b + c + d + e +
Hairs are not found in thick skin. Hairs are not uniform in structure; there are thick, stronger hairs, which have a central medulla in the shaft and thinner hairs that lack this medulla. Hairs serve several functions including tactile reception aiding heat retention of the body, an d also serve as secondary sexual characters (breast, public hair, axillary hair). Body hair growth is not continuous or synchronous, but hairs grow in a mosaic pattern. The colour and growth of hair depends on age, sex, genotype, body site, hormonal factors and general physical well-being.

364. a + b – c – d – e -
Lanugo hairs are fine, soft, silky hair found on fetuses and the new born. These lanugo hairs are soon shed. They lack a central medulla in the hair shaft.

365. a – b – c + d + e +
The cuticle, cortex and medulla of hairs are keratinized. Whereas the medulla is only moderately keratinized (and found only in thick hairs), the cortex is heavily keratinized and the cuticle is the most heavily keratinized layer.

366. a – b – c + d + e +
The so-called ‘glassy membrane’ is found between the outer epithelial sheath and the surrounding dermal sheath. It is really visible in light microscope preparations. In electron micrographs the ‘glassy membrane’ is seen to have a similar appearance to a thickened basal lamina of epithelial cells.

367. a – b – c + d + e +
The medulla is only found in thick hairs and is absent from lanugo hairs, It is composed of large vacuolated cells that are moderately keratinized.

368. a + b – c – d – e +
'Club' hairs are inactive and have hair bulbs that do not surround the dermal papillae.

369. a – b + c + d – e +
The cuticle of hairs is composed of non-pigmented, strongly-keratinized cells in the form of thin, flattened, overlapping scales.

370. a – b + c – d – e -
The melanocytes of hairs are found mainly in the hair bulbs. The melanocytes are easily identified in most histological preparations because of the dark pigment they contain.

371. a + b + c + d - e -

372. a – b + c + d – e -
Fingernails develop from epithelial cells of the dorsal and ventral nail matrix. These cells become keratinized and form the nail plate. The nail plate is composed of translucent cells containing a hard keratin.

373. a + b – c – d + e +
The eponychium of nails is a thickened layer of keratin, often referred to in daily speech as the 'cuticle' of the nail. The role of the eponychium is to prevent foreign bodies or dirt penetrating the base of the nail.