BMEB216 2022 Spring

Homework 1

1. Multiple Choice

1）The two organ systems that predominantly regulate and maintain homeostasis are the

a) cardiovascular and integumentary systems.
b) nervous and endocrine systems.
c) cardiovascular and respiratory systems.
d) respiratory and muscular systems.
e) urinary and integumentary systems.

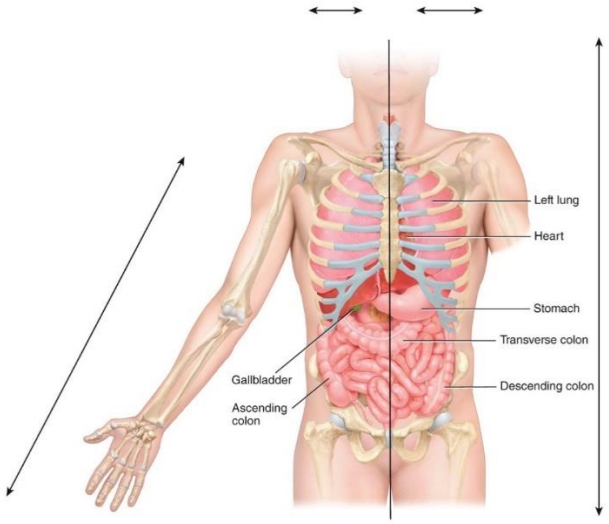
Answer: b

2）When holding your arms out to the side at shoulder level, your fingers are _____from your midline.

a) medial
b) anterior
c) proximal
d) posterior
e) lateral

Answer: e

3）In the figure, the ascending colon and the gallbladder are considered _____to each other



a) ipsilateral
b) contralateral
c) lateral
d)distal
e) posterior

Answer: a

4) Hydrochloric acid and pepsin are enzymes secreted by cells in your stomach to digest proteins. The presence of partially digested protein in the stomach triggers the secretion of more HCl and pepsin. Thus, once digestion begins, it becomes a self-accelerating process. This is an example of
a) positive feedback
b) negative feedback

Answer: a

5) What are the four major elements found in the chemicals that comprise the human body?

a) nitrogen, oxygen, calcium, sodium
b) hydrogen, carbon, phosphorus, calcium
c) carbon, hydrogen, oxygen and nitrogen
d) oxygen, nitrogen, potassium, calcium
e) potassium, phosphorus, sodium, hydrogen
Answer: c

6) Which of the following body process is controlled using a positive feedback loop?

a) decreasing blood calcium in response to elevated blood calcium
b) depolarization causes sodium channels to open and the opening of sodium channels causes

the membrane to depolarize
c)decreasing body temperature in response to elevated body temperature
d) decreasing blood glucose in response to elevated blood glucose
e) decreasing heart rate in response to elevated blood pressure

Answer : b

7) The chemical bonds formed between the oxygen and hydrogen atoms making up a water molecule are called

a) nonpolar covalent bonds.
b) polar covalent bonds.
c) hydrogen bonds.
d) ionic bonds.
e) atomic bonds.

Answer: b

8）An enzyme acts to

a) raise the activation energy needed to start the reaction.
b) lower the activation energy needed to start the reaction.
c) convert the activation energy into potential energy.
d) convert the activation energy into kinetic energy.
e) stop a chemical reaction.

Answer: b

9）This type of lipid is the body’s primary long-term energy storage molecule.

a) steroid
b) phospholipid
c) cholesterol
d) triglyceride
e) lipoprotein

Answer: d

10）This lipid is used by the body as a precursor for the production of steroid hormones.

a) arachidonic acid
b) phospholipid
c) cholesterol

d) triglyceride
e) lipoprotein

Answer: c

11) Which of the following describes the major function of ATP in cells?

a) forms the building blocks for the synthesis of proteins.
b) transfers energy for cell functions
c) carries genetic code needed for protein synthesis
d) carries inherited genetic code that controls protein synthesis
e) transports fluids

Answer: b

12) Which of the following describes the major significance of the element nitrogen in the human body?

a) The ionized form makes body fluids acidic.
b) The ionized form is most plentiful anion in extracellular fluid.
c) The ionized form is needed for action of many enzymes.
d) It is a component of all proteins and nucleic acids.
e) The ionized form is most plentiful cation in extracellular fluid.

Answer: d

13) The initial energy “investment” needed to start a chemical reaction in a cell is called the

a) energy of products.
b) energy of reactants.
c) potential energy.
d) Gibb’s free energy.
e) activation energy.

Answer: e

14) If there is 24% Adenine present in a DNA helix, how much thymine would be present?

a) 12% thymine
b) 24% thymine
c) 26% thymine
d) 52% thymine

e) 75% thymine

Answer: b

15) Vitamin D is synthesized from cholesterol. What is true about Vitamin D?

a) Vitamin D is water soluble
b) Vitamin D is fat soluble
c) Vitamin D is not soluble in fat or water
d) Vitamin D is soluble in both fat and water

Answer: b

16) In laboratory, Sudan IV is used to test for the presence of hydrophobic substances in food. Which organic molecule would exhibit a positive reaction with Sudan IV?

a) Lipids
b) Nucleic Acids
c) Carbohydrates
d) Globular proteins

Answer: a

17) What are the nonpolar parts of phospholipids?

a) phosphate-containing head groups
b) fatty acid tail groups
c) Both the head and tail groups are nonpolar.
d) Neither the head nor tail groups are nonpolar.

Answer: b

18）Plasma membranes are _____, which means that some chemicals move easily through plasma membrane while other chemicals do not.

a) selectively permeable
b) concentration graded
c) electrically graded
d) selectively soluble
e) electrical insulators

Answer: a

19）Which of the following is the transport process by which gases, like O_2 and CO_2, move through a membrane?

a) osmosis
b) active transport
c) secondary active transport
d) simple diffusion
e) endocytosis

Answer: d

20）Which of the following transport processes uses vesicles that fuse with the plasma membrane to secrete materials into the extracellular fluid?

a) endocytosis
b) exocytosis
c) facilitated diffusion
d) osmosis
e) Both endocytosis and exocytosis.

Answer: b

21）Microfilaments, intermediate filaments and microtubules are all components of a cell’s

a) cytoskeleton.
b) nucleus.
c) plasma membrane.
d) flagella.
e) ribosome.

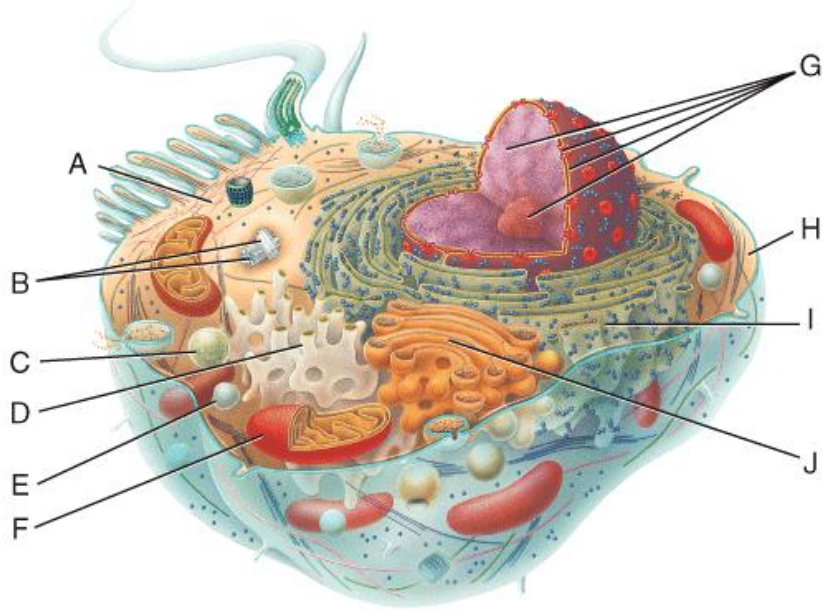
Answer: a

22）Which of the following membrane-enclosed organelles is the site of synthesis of membrane proteins and secretory proteins?

a) rough endoplasmic reticulum
b) smooth endoplasmic reticulum
c) nucleus
d) lysosome
e) Golgi complex

Answer: a

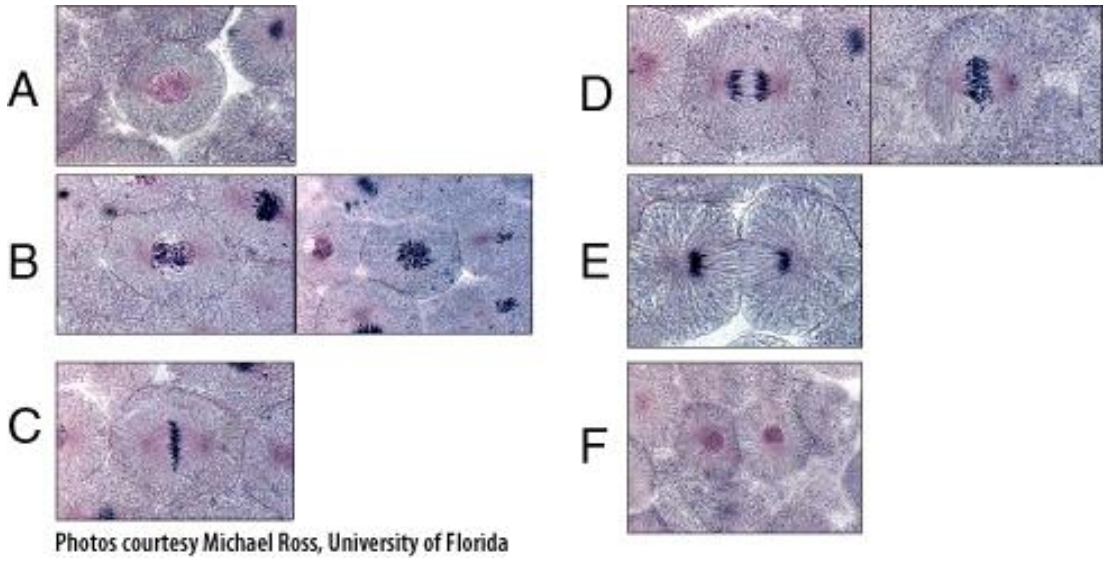
23）In the diagram, which organelle is used to modify, sort and transport proteins?



a) D
b) I
c) A
d) J
e) G

Answer: d

24）In the diagram, which panel shows events occurring during anaphase?

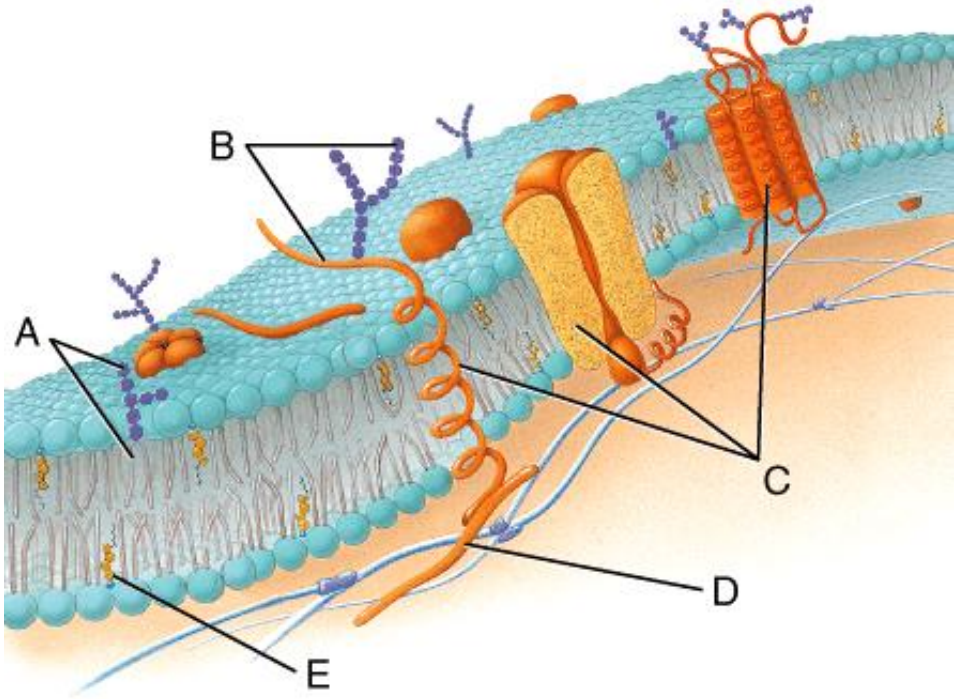


a) A
b) B
c) C

d) D
e) E

Answer: d

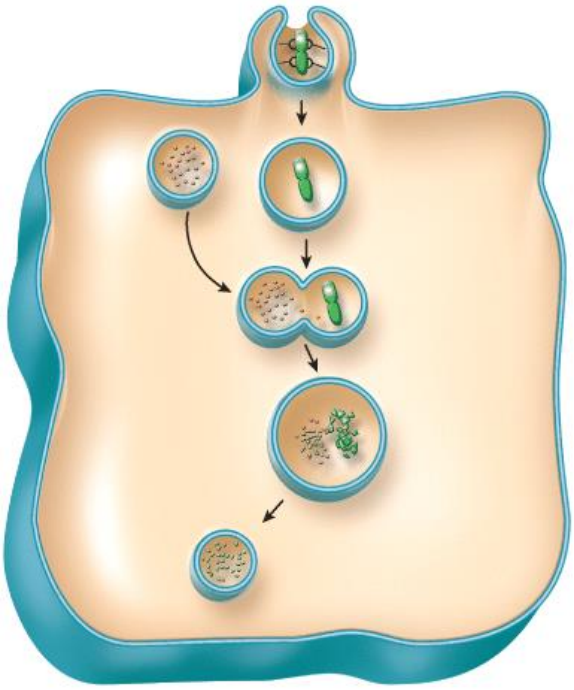
25）What structural component of the membrane is labeled (E) in the diagram?



a) glycoprotein
b) cholesterol
c) channel protein
d) glycolipid
e) phospholipid

Answer: b

26）Which of the following is the correct sequence of events in phagocytosis shown in the figure?



a) pseudopods surround particle > phagosome formed > fusion of lysosome and phagosome > digestion by lysosomal enzymes > residual body formed
b) phagosome formed > pseudopods surround particle > fusion of lysosome and phagosome > digestion by lysosomal enzymes > residual body formed
c) phagosome formed > pseudopods surround particle > fusion of lysosome and phagosome > residual body formed > digestion by lysosomal enzymes
d) residual body formed > phagosome formed > pseudopods surround particle > fusion of lysosome and phagosome > digestion by lysosomal enzymes
e) fusion of lysosome and phagosome > residual body formed > phagosome formed > pseudopods surround particle > digestion by lysosomal enzymes

Answer: a

27）The difference in concentration of a specific chemical, like Na+, on the inside and outside of a plasma membrane is referred as a(n)

a) electrochemical potential.
b) membrane potential.
c) electrical gradient.
d) concentration gradient.
e) biological capacitance.

Answer: d

28）These types of cell junctions anchor adjacent cells together and resist their separation during contractile activities.

a) tight junctions and hemidesmosomes
b) gap junctions and tight junctions
c) adherens junctions and desmosomes
d) desmosomes and gap junctions
e) hemidesmosome and tight junctions

Answer: c

29）The extracellular matrix of connective tissue consists of

a) enzymes and membranous organelles.
b) plasma membranes and ground substance.
c) keratinized cells and protein fibers.
d) calcified crystals of minerals and enzymes.
e) protein fibers and ground substance.

Answer: e

30）Which polysaccharide is commonly found in the ground substance of connective tissues?

a) Hyaluronic acid
b) Melanin
c) Cholesterol
d) Glycogen
e) Starch

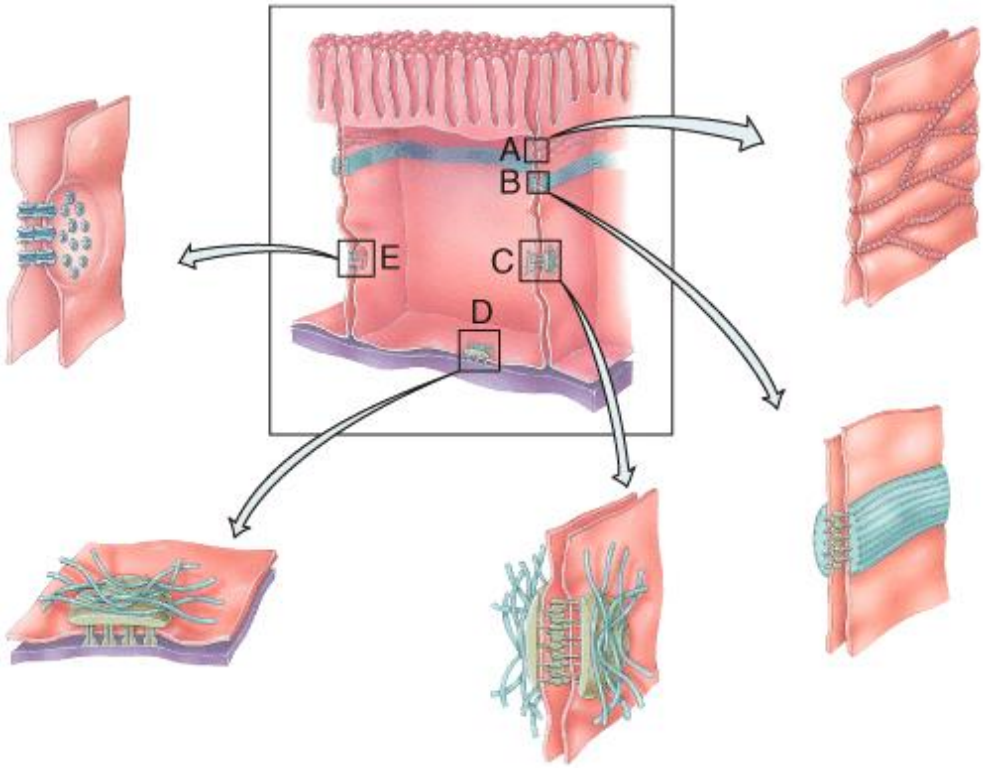
Answer: a

31）Immature, undifferentiated cells that can divide to replace lost or damaged cells are called

a) stem cells.
b) parenchymal cells.
c) fibroblast cells
d) granulocytes.
e) agranulocytes.

Answer: a

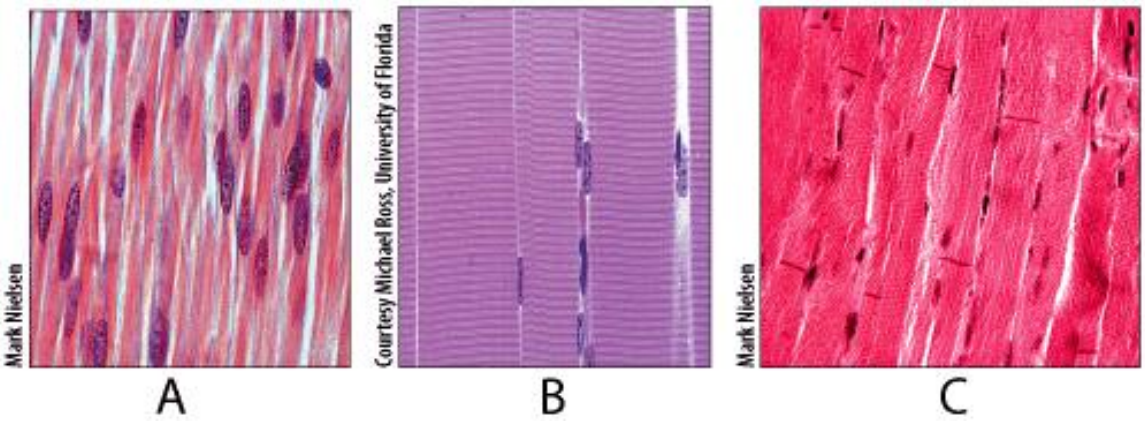
32）In the diagram shown below, which cellular junction will prevent acidic stomach fluid from seeping into the connective tissue?



a) A
b) B
c) C
d) D
e) E

Answer: a

33）In the figure shown, which light micrograph shows a muscle tissue that is under involuntary control?



a) A only
b) B only
c) C only
d) A and B
e) A and C

Answer: e

34) _____muscle pumps blood through the body and _____is located in the wall of blood vessels ?

a) Skeletal muscle; smooth muscle
b) Smooth muscle; cardiac muscle
c) Cardiac muscle; smooth muscle
d) Cardiac muscle; skeletal muscle
e) Smooth muscle; smooth muscle

Answer: c

35) Keratinized stratified squamous epithelium composes the

a) epidermis.
b) dermis.
c) hypodermis.
d) subcutaneous layer.
e) superficial fascia.

Answer: a

36）Choose the following statements that describe keratin.

1. Keratin is a tough, fibrous protein.
2. Keratin is used for pigmenting skin.
3. Keratin helps protect the skin.
4. Keratin participates in immune responses.
5. Keratin protects the skin from UV light.

a) 1 and 3
b) 1, 3, 4, 5
c) 2, 4, 5
d) 1, 2, 3, 4, 5
e) 3 and 5
Answer: a

37）This layer is attached to the basement membrane by hemidesmosomes and to other cells by desmosomes.

a) Stratum basale
b) Stratum spinosum
c) Stratum granulosum
d) Stratum lucidum
e) Stratum corneum

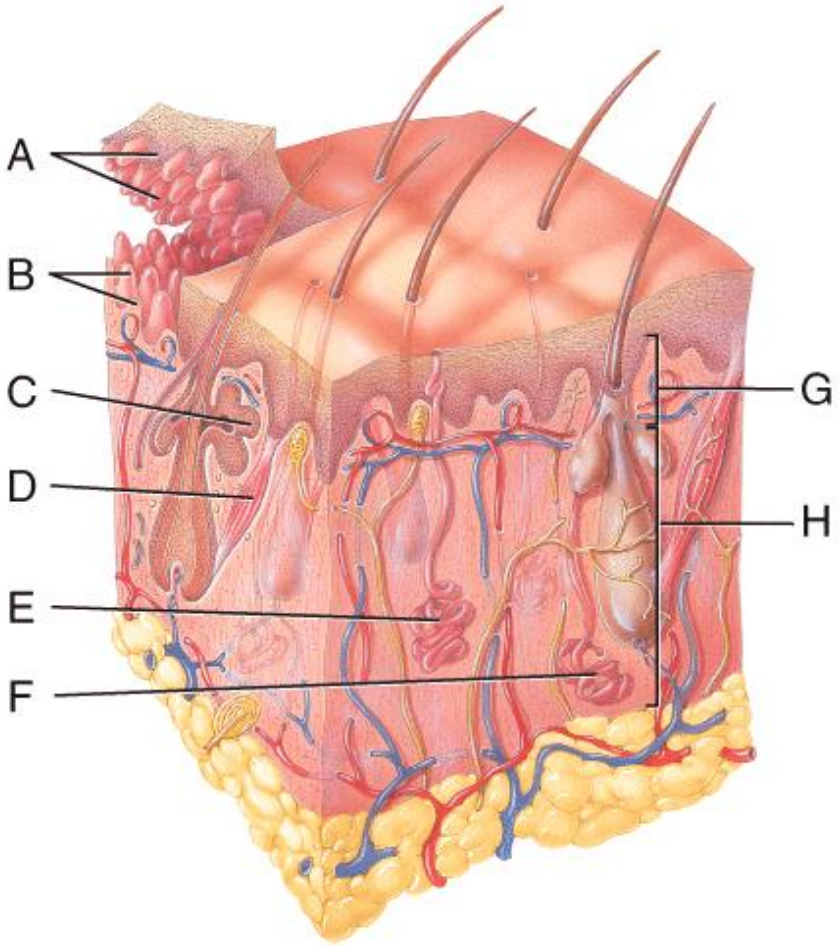
Answer: a

38）Which structure found in the skin plays an important role in thermoregulation?

a) Melanocytes
b) Sebaceous glands
c) Sweat glands
d) Stratum lucidum
e) Epidermal ridges

Answer: c

39）In the diagram of skin shown below, which labeled structure generates fingerprints?



a) A
b) B
c) G
d) D

Answer: a

40) Without enzymatic action of tyrosinase, what pathway is blocked in the body pertaining to skin?

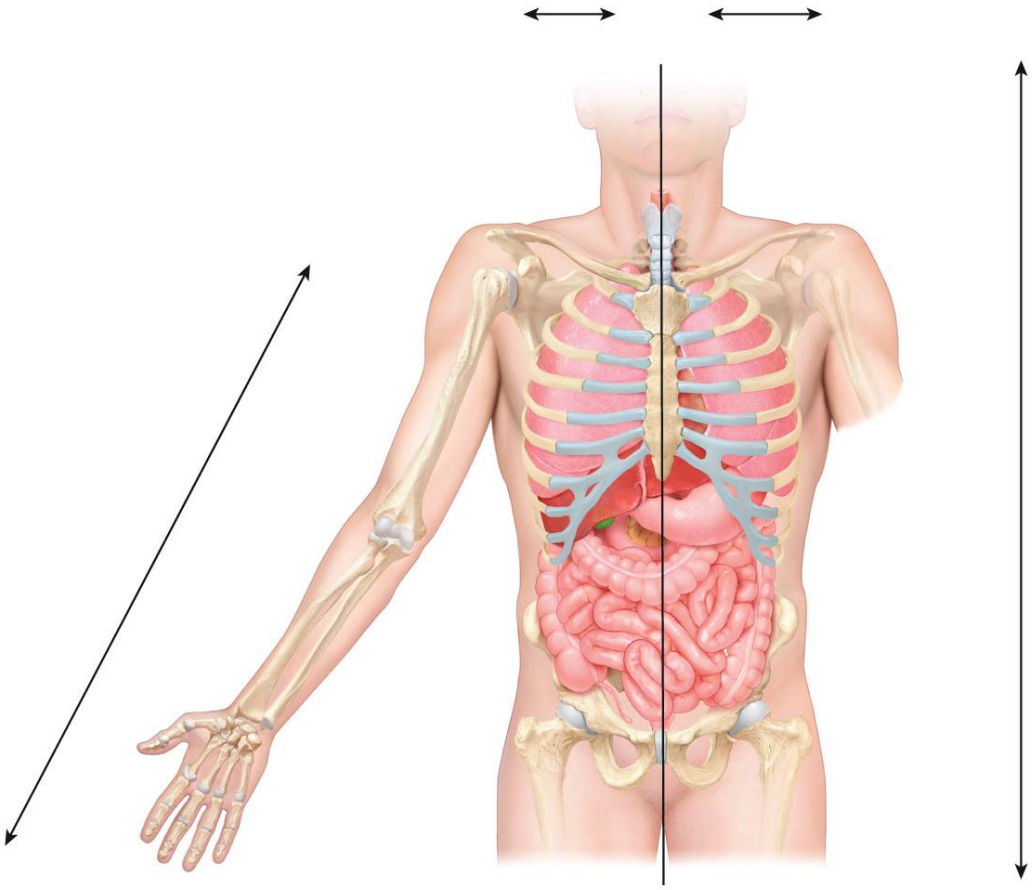
a) carotene production
b) melanin production
c) tyrosine production
d) hemoglobin production
e) keratin production

Answer: b

2. Label Image

1)Create labels for the following directional terms:

Lateral
Medial
Superior
Inferior
Proximal
Distal



3. Essay questions

1）Describe the differences between positive and negative feedback systems.

Solution: A positive feedback system will strengthen or reinforce a change in one of the body's controlled conditions while a negative feedback system will reverse a change in a controlled condition.

2）Describe the functions of water in the body.

Solution: Water is a Solvent that allows transportation of Solutes. Water acts in hydrolysis

reactions to split reactants. Water can transport heat in the body and can be used to release heat from the body as occurs in sweating. Water is used as a lubricant, particularly in serous fluids like those surrounding the lungs and on mucosal membranes like those lining the gastrointestinal tract.

3) Briefly describe the fluid mosaic model.

Solution: The fluid mosaic model states that the molecular arrangement of the plasma membrane resembles an ever-moving sea of fluid lipids containing a mosaic of many different proteins.

4) Describe five different functions of integral membrane proteins.

Solution: Some membrane proteins act as ion channels or carriers that transport substances across the membrane. Other membrane proteins act as receptors that allow the cell to respond to various types of ligands. Other membrane proteins are enzymes that catalyze specific chemical reactions. Still other membrane proteins act as linker proteins that anchor cells to neighboring structures including other cells. Lastly, some membrane proteins serve as cell identity molecules.

5) Anne suffers from Ehlers-Danlos, a rare inherited disorder of connective tissue, specifically affecting collagen fibers. Because many connective tissues contain collagen throughout the body, she has issues with many tissues, joints, and skin.Name 4 tissues that would be affected and where in the body would the damage be seen.

Solution:
Areolar connective tissue in the papillary region of the dermis and the subcutaneous region of the body. Reticular connective tissue's reticular fibers would be affected due to them being modified collagen. The stromas would not be as supportive. Dense regular in ligaments and tendons. Dermis, sclera and the periosteum and perichondrium's dense irregular would be affected. Elastic connective tissue located in lungs and blood vessels. Fibrocartilage located in the meniscus and intervertebral discs. Bone would lose much of its strength.

6) Describe the structural characteristics of the epidermis that contribute to its ability to protect the surface of an animal.

Solution: Multiple layers of cells in stratified squamous epithelium help resist friction. Keratin of intermediate filaments provides strength to tissue by binding cells tightly together and to underlying tissue, thus creating a barrier to microbes. Lamellar granules of keratinocytes produce a lipid-rich, water-repellent (sealant) to protect from dehydration and entry of foreign materials. Melanin, produced by melanocytes, protects underlying tissue from UV light. Sebum secreted onto the surface helps protect from dehydration and microbial invasion. Intraepidermal macrophages (Langerhans cells) participate in immune response to microbial

invasion.