

Martin Caon

# Examination Questions and Answers in Basic Anatomy and Physiology

2000 Multiple Choice Questions

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# Preface

Two thousand multiple choice questions that could be asked of a student of introductory human anatomy and physiology are presented in 40 categories. It is assumed that users of these questions are teachers or students who have completed at least part of an anatomy and physiology course that might be offered in the first year of a university degree programme. It is also assumed that they would have access to one of the anatomy and physiology textbooks (or similar) listed in the bibliography below. Each category has an Introduction containing a summary of useful knowledge pertinent to that category of question. However not all possible information is provided within these Introductions, so a textbook is indispensable. The summary Introductions are composed with vocabulary that may be unfamiliar to the beginning student but which should be known in order to understand the questions. You will need to look up the meaning of many unfamiliar words as your studies progress.

All questions have been used at least once, during the author's teaching career, in end of semester examinations of a university first year undergraduate introductory anatomy and physiology course or a physical science course for health science students to support their anatomy and physiology study. Consequently they reflect the author's choice of content. Students enrolled in the courses for which these questions were written include nursing, midwifery, paramedic, physiotherapy, occupational therapy, nutrition and dietetics, health science students, exercise science students and students taking the course as an elective. Often, the students did not have an extensive background in science from their secondary schooling. Some knowledge of physical science is required to understand physiology; hence, physical science questions are included. Students without some background knowledge in chemistry and physics will find such questions challenging and will need to work a little harder to develop their background knowledge. The boundary between chemistry and biochemistry is not distinct; nevertheless, chemistry is implicit in physiology. Furthermore, the physics of the body becomes physiology so gradually that sometimes the boundary between the two is only noticed after it has been crossed.

Some questions were difficult to categorise and may span two (or more) categories. Furthermore, in order to answer some questions, you may need knowledge drawn from other "sections" of anatomy different from the name of the section in

which the question appears. This is not a bad thing as it emphasises the connected nature of human anatomy and physiology. Each question is unique (there are no duplicates). However, many questions will be examining the same (or similar) material albeit with a differently worded question or different choice of answers. If the questions are to be used to compile an examination, then care should be taken to exclude questions that are too similar to already selected ones. On the other hand, if the questions are to be used for instruction or study purposes, I would suggest including several similar questions in consecutive order to emphasise the point and to give the student practice.

## Advice to the Exam Candidate

The correct choice of answer for each question is provided. Accompanying the correct choice is a justification for the choice or an explanation of the correct answer and sometimes of why the other choices are incorrect. The degree of difficulty varies, but not by intentional design. The perception of difficulty depends on that part of science that the question examines, the level of scientific background brought to the course by the student and their level of studious preparation for the examination.

There is only one best correct answer for each of the multiple choice questions among the four choices presented. However, there may be more than one correct answer. You must choose the **best** one. In an examination, never leave a question unanswered. If you cannot decide on an answer, guess at it (after eliminating any choices that you deem to be incorrect). That is, you will be rewarded for the ability to decrease the number of choices from which you are guessing, from 4 to 3 or 2. In marking multiple choice questions, I suggest that that one mark be allocated for a correct answer and that a quarter of a mark be deducted for a wrong answer or an unanswered question. Deducting a quarter mark will reduce the score that would be gained by selecting an answer from the four choices purely at random (i.e. guessing), from about 25 % to about 6 %. Not to deduct a quarter mark is, in my opinion, unsound.

Be aware of questions that are asked in the negative. That is, those that have NOT true; or FALSE; or INCORRECT; or EXCEPT one, in the stem. In this case you are seeking a statement that is wrong in order to answer the question. Do not be intimidated by arithmetical calculations. The calculation itself will be simple. Deciding what to add, multiply or divide with what, is the tricky part.

Some questions have been paraphrased from those published in the third edition of the book *Human Science: Matter and Energy in the Human Body* (Caon, M., & Hickman, R. (2003), Crawford House Australia Publishing, Belair South Australia), and are used with the authors' permission.

## Bibliography

Textbooks suitable for use in an introductory anatomy and physiology course. Later editions may exist, and earlier editions will suffice:

Caon, M. & Hickman, R. (2003) *Human Science: Matter and Energy in the Human Body* 3rd ed, Crawford House Australia Publishing, Belair South Australia. ISBN 0863332552

Marieb, E.N & Hoehn K.N. (2015) *Human Anatomy & Physiology* 10th ed, Pearson

Martini, F.H., Nath, J.L. & Bartholomew, E. F. (2015) *Fundamentals of Anatomy & Physiology* 10th ed, Pearson

McKinley, M.P. Oloughlin, V.D. & Bidle T.S. (2013) *Anatomy & Physiology An Integrative Approach*, McGraw Hill

Patton, K.T. & Thibodeau, G.A. (2016) *Anatomy & Physiology* 9th ed, Elsevier

Saladin, K.S. (2012) *Anatomy & Physiology: The unity of form and function* 6th ed, McGraw Hill

Tortora, G.J. & Derrickson, B. (2012) *Principles of Anatomy & Physiology* 13th ed, Wiley

Van De Graff, K.M. & Fox, S.I. (1999) *Concepts of human Anatomy & Physiology* 5th ed, WCB

VanPutte, C. Regan, A. Russo, A. & Seeley, R. (2016?) *Seeley's Anatomy & Physiology* 11th ed, McGraw Hill

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# Chapter 1

## Organisation of the Body

A large part of beginning the study of anatomy and physiology is learning the specialised words that are used. This new terminology may seem daunting but the challenge lies in its unfamiliarity rather than its difficulty of comprehension. You must expect to encounter a lot of new words and be prepared to learn them over the course of your study. Many of the words contain information as the words are constructed with a prefix and a suffix or a stem that identifies the word as referring to a specific part of anatomy or physiology. This sometimes makes the words rather long or unusual.

You should know what the anatomical position of the body is and in what direction the transverse, sagittal & coronal planes of the body lie. Directional terms such as: proximal/distal; deep/superficial; superior/inferior; lateral/medial; anterior/posterior; caudal/cephalic allow the location of one anatomical feature to be placed relative to another. The dorsal and ventral body cavities are located on different sides of the body and contain different organs. For ease of communication, the abdomen is divided into nine regions: right hypochondriac, epigastric, left hypochondriac, right lumbar, umbilical, left lumbar, right inguinal, hypogastric (or pubic), left inguinal regions. You should know the difference between physiology and anatomy and the definitions of metabolism, anabolism and catabolism.

1. Which of the listed terms is described by: “All the chemical processes that take place in the organelles and cytoplasm the cells of the body”?
  - A. Metabolism
  - B. Cellular respiration
  - C. Homeostasis
  - D. Physiology

Answer is A: The quoted statement is a definition of metabolism

2. Which major organ lies deep to the right hypochondriac region?

- A. The stomach
- B. The spleen
- C. The liver
- D. The duodenum

Answer is C: hypochondriac = below the rib cartilage; liver is located mostly on the right side.

3. Which plane of the body divides it into dorsal and ventral regions?

- A. Transverse
- B. Axial
- C. Coronal
- D. Sagittal

Answer is C: dorsal and ventral = front and back – a coronal section so divides the body into these sections.

4. To which of the following does the “tissue level” of structural organisation refer?

- A. atoms, ions, molecules and electrolytes
- B. mitochondria, ribosomes, nucleus, endoplasmic reticulum
- C. nephron, alveolus, villus, lobule
- D. muscle, nervous, connective, epithelial

Answer is D: the listed structures are the four major tissue types.

5. The directional term “superior” in anatomy means which of the following?

- A. cephalic
- B. ventral
- C. caudal
- D. dorsal

Answer is A: cephalic refers to the head region. While superior refers to being closer to the head than is the other anatomical structure in question.

6. Which of the following is the best definition of physiology?

- A. The microscopic study of tissues and cells
- B. The study of how the body works.
- C. All the chemical processes that take place in the organelles of the body’s cells.
- D. The body’s automatic tendency to maintain a relatively constant internal environment.

Answer is B: physiology is indeed the study of how the (healthy) body functions.

7. The “anatomical position” could be described as which of the following?

- A. Lying down prone
- B. Lying down supine
- C. Standing displaying the ventral surface of the body
- D. Standing with arms and legs abducted

Answer is C: this is the best answer. Standing is required, as is having the arms hanging parallel to the sides, with palms facing forward.

8. Which choice best describes the location of the majority of the musculo-skeletal system?

- A. It is in the dorsal cavity
- B. It is in the ventral cavity
- C. It is in the abdomino-pelvic cavity
- D. It is not located in a body cavity

Answer is D: the musculo-skeletal system is located in the arms and legs, and surrounding, but outside of the abdomino-pelvic, thoracic and the dorsal cavities.

9. Which of the following is/are the contents of the ventral cavity?

- A. heart and lungs
- B. brain and spinal cord
- C. viscera
- D. gut, kidneys, liver, pancreas, spleen, bladder, internal reproductive organs.

Answer is C: this is the best answer. It is a collective term for all organs in the thoracic and abdomino-pelvic cavities.

10. Which of the stated relationships is correct?

- A. the heart is inferior to the clavicle
- B. the shoulder is distal to the carpals
- C. the phalanges are proximal to the metacarpals
- D. the eye is medial to the eyebrows

Answer is A: The heart is indeed below (inferior) to the clavicle. All other choices are wrong.

11. Which of the following is/are the contents of the dorsal body cavity?

- A. heart and lungs
- B. brain and spinal cord
- C. viscera
- D. gut, kidneys, liver, pancreas, spleen, bladder, internal reproductive organs.

Answer is B: dorsal refers to the back, the cavity enclosed by the skull and vertebrae.

12. Which of the stated relationships is correct?

- A. the heart is superior to the large intestine
- B. the shoulder is distal to the metacarpals
- C. the phalanges are proximal to the carpals
- D. the eye is medial to the nose

Answer is A: the heart is indeed above (superior) to the intestine. All other answers are wrong.

13. What is the study of how body parts function called?

- A. histology
- B. physiology
- C. homeostasis
- D. metabolism

Answer is B: physiology refers to function

14. Which of the following correctly describes the two named body parts?

- A. the elbow is proximal to the shoulder
- B. the phalanges are distal to the carpals
- C. the ribs are proximal to the sternum
- D. the elbow is distal to the knee

Answer is B: phalanges (finger bones) are indeed further from the trunk along the arm, than are the carpals (wrist bones)

15. Which one of the following statements is correct?

- A. the diaphragm separates the brain and spinal cord
- B. the ventral cavity contains the male and female reproductive system
- C. the abdomino-pelvic cavity contains the spinal cord.
- D. the dorsal cavity contains the brain and spinal cord

Answer is D: dorsal means back and that is the cavity with spinal cord and brain. B is incorrect as the genitalia are outside the ventral cavity.

16. Complete the sentence correctly: "Cervical vertebrae are....."

- A. superior to the rib cage.
- B. inferior to the thoracic vertebrae.
- C. located between the thoracic and sacral vertebrae.
- D. fused into a single bone called the sacrum.

Answer is A: cervix refers to "neck". The cervical vertebrae are in the neck hence are above (superior) to the rib cage.

17. The dorsal body cavity contains which of the following organs?

- A. The brain.
- B. The brain and spinal cord.

- C. The brain, spinal cord and heart.
- D. The brain, spinal cord, heart and kidneys.

Answer is B: Dorsal refers to the back and is opposite to ventral. Only the brain and spinal cord occupy the dorsal cavity. All other answers are incorrect.

18. What does the process known as anabolism refer to?

- A. the use of energy for producing chemical substances.
- B. the breaking down phase of metabolism.
- C. all the chemical process that take place in the organelles of the cells.
- D. the supply of nutrients to the body's cells.

Answer is A: anabolism refers to the process of constructing/building molecules (think anabolic steroids). B refers to catabolism. C refers to metabolism.

19. To what does the term “hypochondriac” refer?

- A. A condition of having too few chondria.
- B. The region of abdomen inferior to the ribs.
- C. A person who often complains of an ailment.
- D. Having insufficient cartilage in the knees.

Answer is B: In this case “hypo-” means below, while “-chondr” refers to the cartilage joining the ribs to the sternum (the costal cartilages). The regions of the abdomen immediately inferior to these rib cartilages (on the left and right sides of the body) is what is being referred to

20. If a medical image displays internal anatomy in mid-sagittal section, which of the following describes the section?

- A. A vertical section through the nose and umbilicus that divides the body into right and left halves.
- B. A cross-section through the midriff at about the level of the liver.
- C. A cross-section through the upper chest at about the level of the shoulders.
- D. A vertical section through the midpoint of the clavicle and through either the right or left thigh.

Answer is A: A Sagittal section divides the body into left and right portions. A mid sagittal section means that the dividing line is in the vertical mid line of the body so that the halves are equal.

21. Which of the following best describes the “anatomical position”?

- A. Standing vertically, arms held horizontally, legs apart so that the tips of the head, hands and feet lie on an imaginary circle, drawn around the body.
- B. Standing “to attention”, with hands held so that thumbs are ventral while the fifth digit is dorsal.

- C. Standing “at ease” with hands clasped behind your back while adjacent and dorsal to the sacrum.
- D. Standing vertically, arms parallel and lateral to the ribs with hands inferior to the elbows and supinated.

Answer is D: The anatomical position is achieved when standing with feet comfortably apart while displaying the ventral surface of the head, body and forearms to the same direction (forwards).

22. Which term describes the location of the adrenal glands with reference to the kidneys?
- A. proximal
  - B. distal
  - C. superior
  - D. inferior

Answer is C: The adrenal glands are on the cephalic side of the kidneys. Being closer to the head, they are termed “superior to the kidneys”.

23. Which of the following terms is NOT used to identify a region of the abdomen?
- A. left hypochondriac
  - B. hypogastric
  - C. epigastric
  - D. right sacral

Answer is D: Right sacral is not a region on the anterior surface of the abdomen.

24. What structure separates the thoracic cavity from the abdominal cavity?
- A. The mediastinum
  - B. The diaphragm
  - C. The peritoneum
  - D. The pylorus

Answer is B: The muscular diaphragm physically separates these two ventral cavities.

# Chapter 2

## Cells and Tissues

### 2.1 Cells and Tissues

Cells are composed of their cytoplasm, which includes the cytosol and organelles; the nucleus and the surrounding plasma membrane. You should know that the plasma membrane is a double layer of phospholipid molecules and that these molecules have a hydrophilic end and a hydrophobic end. The plasma membrane contains proteins including the ATPase (the sodium-potassium pump) which moves sodium ions out of the cell while moving potassium ions into the cell. You should know the names and function of some of the organelles. For example you should know that mitochondria produce ATP and that ribosomes synthesise proteins from amino acids.

You will become familiar with the names of many cells. Often a word can be recognised as the name of a cell because it ends in “-cyte” or, if it is an immature cell, by ending in “-blast”. Four major types of tissue are identified in the body: epithelial, connective, muscle and neural tissues. Of course there are many subtypes within these categories. For example epithelial tissue may be squamous, cuboidal, columnar or glandular. Muscle may be skeletal, smooth or cardiac. Connective tissue is quite varied and you should be aware of the many different examples of tissue that are categorised as “connective”. For example, blood, bone, dermis, cartilage and tendon are all connective tissue.

1. Which structure within the cell produces ATP (adenosine triphosphate)?
  - A. the mitochondria
  - B. the nucleus
  - C. peripheral proteins
  - D. the endoplasmic reticulum

Answer is A: This is a basic function of mitochondria. All other answers are wrong.



2. Which of the following is **NOT** a component of the cell plasma membrane?
- A. cholesterol
  - B. proteins
  - C. microfilaments
  - D. phospholipids

Answer is C: microfilaments occur inside the cell.

3. Which list below contains the four types of tissue?
- A. extracellular fluid, skeletal tissue, glandular tissue, connective tissue.
  - B. extracellular fluid, muscle tissue, glandular tissue, cartilaginous tissue.
  - C. neural tissue, skeletal tissue, epithelial tissue, cartilaginous tissue.
  - D. Neural tissue, muscle tissue, epithelial tissue, connective tissue.

Answer is D: These are the four types. Extracellular fluid is not a tissue. Cartilage is a type of connective tissue.

4. Except for one, the following are types of cells. Which one is **NOT** a type of cell?
- A. platelets
  - B. leucocytes
  - C. macrophages
  - D. osteoblasts

Answer is A: Platelets are fragments of a cell (a megakaryocyte) bound by a membrane.

5. In which part of a cell does the process of making ATP from oxygen and glucose take place?
- A. lysosomes
  - B. ribosomes
  - C. mitochondria
  - D. golgi apparatus

Answer is C: ATP production is the function of mitochondria.

6. Which of the following is a function of membrane proteins?
- A. to process lipids and proteins for secretion through the plasma membrane
  - B. to act as receptors for hormones
  - C. to synthesise proteins from amino acids
  - D. to act as a cytoskeleton to support and shape the cell

Answer is B: One function of membrane proteins is to receive (amino acid based) hormones that cannot pass through the plasma membrane.

7. What is the difference between simple squamous cells and simple columnar cells?
- A. squamous cells are flattened while columnar cells are taller than they are wide.
  - B. simple squamous cells are one layer thick while simple columnar cells are several layers thick.
  - C. simple squamous cells are epithelial tissue while simple columnar cells are connective tissue.
  - D. squamous cells are flattened while columnar cells are cuboidal.

Answer is A: The names of the cells contains a description of their shape: either flat, or like columns. Simple refers to a single layer of cells

8. Which of the following is **NOT** an example of a cell?
- A. macrophages
  - B. lysosomes
  - C. plasmocytes
  - D. chondroblasts

Answer is B: the suffix “-some” refers to an organelle within a cell. The other suffixes all indicate a type of cell.

9. Which cell organelles contain an acidic environment capable of digesting a wide variety of molecules?
- A. Lysosomes
  - B. Ribosomes
  - C. Centrosomes
  - D. Golgi complex

Answer is A: the prefix “lyso-” refers to the ability to dissolve or destroy molecules or cells.

10. Which form of transport through the plasma membrane requires the expenditure of energy by the cell?
- A. Facilitated diffusion
  - B. Osmosis
  - C. Active transport
  - D. Diffusion

Answer is C: The term “active” implies using energy (in the form of ATP) to move a molecule against its concentration gradient, while the other processes are all passive.

11. Which of the tissue types below consists of a single layer of cells?
- A. stratified squamous epithelial tissue
  - B. glandular epithelium

- C. areolar connective tissue
- D. simple columnar epithelial tissue

Answer is D: the word “simple” indicates a single layer of cells. Stratified means several layers (or strata) of cells.

12. One of the following is **NOT** a serous membrane. Which one?
- A. pleura
  - B. peritoneum
  - C. mucosa
  - D. pericardium

Answer is C: mucosa is a mucus membrane (& secretes mucus)

13. Which of the following is **NOT** made predominantly from epithelial tissue?
- A. In the dermis
  - B. In exocrine glands
  - C. In endocrine glands
  - D. In the endothelium of blood vessels

Answer is A: The dermis contains connective tissue, nervous tissue & muscle as well as epithelial tissue.

14. What are tendons and ligaments composed of?
- A. Dense connective tissue
  - B. Liquid connective tissue
  - C. Muscular tissue
  - D. Epithelial tissue

Answer is A: tendons & ligaments are dense CT. This is strong as there is a high proportion of fibres.

15. What is the composition of the intercellular matrix in connective tissue?
- A. Cells and fibres
  - B. Serous and mucus membranes and lamina propria
  - C. Protein fibres and ground substance
  - D. Interstitial fluid

Answer is C: “intercellular” means between cells. So matrix is fibres & ground substance (but no cells).

16. Which statement about the plasma membrane is **INCORRECT**?
- A. It is selectively permeable.
  - B. It is composed of two layers of glycoprotein molecules.
  - C. It contains receptors for specific signalling molecules.

- D. The plasma membranes of adjacent cells are held together by desmosomes.

Answer is B: The PM is indeed made of two layers, but they are phospholipid (not glycoprotein) molecules.

17. Which of the following is **NOT** epithelial tissue?

- A. the epidermis
- B. glandular tissue
- C. the internal lining of blood vessels
- D. the dermis

Answer is D: The dermis contains some of all four types of tissue.

18. Which of the following is **NOT** a cell found in connective tissue?

- A. adipocytes
- B. chondroblasts
- C. keratinocytes
- D. osteoblasts

Answer is C: Keratinocytes are in the epidermis which is epithelial tissue. The other cell types occur in fat, cartilage and bone.

19. What tissue has cells that are closely packed and that have one surface attached to a basement membrane and the other free to a space?

- A. epithelial tissue
- B. muscle tissue
- C. connective tissue
- D. nervous tissue

Answer is A: This is a definition of epithelial tissue.

20. What is the name of the mechanism that ensures that there is a higher concentration of sodium ions in the extracellular fluid than in the intracellular fluid?

- A. Facilitated diffusion
- B. The sodium-potassium pump
- C. Secondary active transport
- D. Osmosis

Answer is B: The “pump” (or ATPase) transports  $\text{Na}^+$  out and  $\text{K}^+$  into the cell.

21. What are lysosomes, centrosomes and ribosomes example of?

- A. stem cells
- B. organelles within a cell
- C. sensory receptors in the dermis
- D. exocrine glands

Answer is B: the suffix “-some” refers to small body or organelle within a cell.

22. What does simple columnar epithelial tissue refer to? Tissue with
- A. a single layer of cells longer than they are wide.
  - B. a single layer of cells whose length, breadth and depth are about the same size.
  - C. several layers of cells, all of the same type.
  - D. several layers of cells but without a basement membrane.

Answer is A: simple = one layer. Columnar means oblong or shaped like a column.

23. Which of the following is **NOT** an example of connective tissue?
- A. blood
  - B. bone
  - C. tendon
  - D. epidermis

Answer is D: the epidermis (on top of the dermis) is epithelial tissue.

24. What is the function of phospholipids in the plasma membrane?
- A. to maintain the intracellular fluid at a similar composition to that of the interstitial fluid.
  - B. to form channels to selectively allow passage of small molecules.
  - C. to act as receptors for signalling chemicals.
  - D. to present a barrier to the passage of water-soluble molecules.

Answer is D: molecules that are soluble in water cannot pass through lipid (fat). So the phospholipids are a barrier. The functions described by B. & C. are performed by other molecules in the plasma membrane.

25. Which one of the following cell types is found in epithelial tissue?
- A. plasma cells
  - B. leucocytes
  - C. keratinocytes
  - D. chondroblasts

Answer is C: keratinocytes produce keratin, the protein of the epidermis, which is epithelial tissue.

26. Which of the following is **NOT** part of the plasma membrane of a cell?
- A. integral proteins
  - B. glycoproteins
  - C. plasma proteins
  - D. peripheral proteins

Answer is C: as the name implies, plasma proteins are found in the blood plasma. Not to be confused with the plasma membrane.

27. A major role for mitochondria is to

- A. transcribe the information in DNA (deoxyribonucleic acid)
- B. produce ATP (adenosine triphosphate)
- C. synthesise proteins from amino acids
- D. use enzymes to lyse molecules

Answer is B: ATP is only produced within the mitochondria.

28. Choose the tissue below that is one of the four primary types of body tissue.

- A. epidermal tissue
- B. epithelial tissue
- C. interstitial tissue
- D. osseous tissue

Answer is B: epithelial is a major tissue type (as is muscle, nervous & connective)

29. What are the primary types of tissue in the body?

- A. Muscle, nervous, connective and epithelial
- B. Muscle, nervous, connective, osseous and epithelial
- C. Muscle, nervous, connective, osseous, blood and epithelial
- D. Muscle, nervous, connective, glandular and epithelial

Answer is A: There are 4 major types (not 5 or 6). Osseous & blood are also connective, while glandular tissue is also epithelial.

30. What is the name of the membrane that surrounds the lungs?

- A. visceral peritoneum
- B. parietal peritoneum
- C. visceral pleura
- D. dura mater

Answer is C: Pleura is around the lung, while visceral refers to the layer of the pleura that is attached to the lung surface.

31. What is a role performed by mitochondria?

- A. contain enzymes capable of digesting molecules
- B. produce ATP
- C. synthesise proteins
- D. synthesise fatty acids, phospholipids & cholesterol

Answer is B: mitochondria produce ATP. The other tasks are performed by lysosomes, ribosomes and endoplasmic reticulum respectively.

32. Which of the following is **NOT** found in the plasma membrane?

- A. proteins
- B. cholesterol
- C. endoplasmic reticulum
- D. phospholipids

Answer is C: endoplasmic reticulum is an organelle and found within the cell.

33. Which one of the following cell types is found in epithelial tissue?

- A. mast cells
- B. adipocytes
- C. chondroblasts
- D. keratinocytes

Answer is D: These cells produce keratin, the protein of the stratum corneum

34. Which of the following is **NOT** part of the plasma membrane of a cell?

- A. phospholipid
- B. glycoprotein
- C. chromatin
- D. cholesterol

Answer is C: chromatin makes up chromosomes.

35. A major role for mitochondria is to

- A. synthesise fatty acids, phospholipids & steroids
- B. deliver lipids and proteins to plasma membrane for secretion
- C. synthesise proteins from amino acids
- D. produce ATP (adenosine triphosphate)

Answer is D: mitochondria produce ATP from glucose

36. Choose the tissue below that is **NOT** one of the four primary types of body tissue.

- A. connective tissue
- B. muscular tissue
- C. nervous tissue
- D. osseous tissue

Answer is D: osseous tissue (or bone) is a connective tissue

37. What is the purpose of mitochondria?

- A. to store the nucleolus and chromatin
- B. to produce adenosine triphosphate

- C. to support and shape the cell.
- D. they produce enzymes to break down molecules

Answer is B: Mitochondria are the site of ATP production

38. The plasma membrane of a cell contains molecules that have a hydrophobic end and a hydrophilic end What are they called?
- A. phospholipids
  - B. cholesterol
  - C. integral proteins
  - D. glycoproteins

Answer is A: the phosphate end is hydrophilic (water soluble) while the lipid end is hydrophobic (insoluble in water).

39. Adipocytes are found in which type of tissue?
- A. muscle tissue
  - B. epithelial tissue
  - C. nervous tissue
  - D. connective tissue

Answer is D: adipocytes are found in fat (adipose tissue) which is a type of connective tissue.

40. What is the role of mitochondria? To:
- A. function in cell division
  - B. synthesise proteins
  - C. form part of the plasma membrane
  - D. synthesise fatty acids, phospholipids and steroids.

Answer is C: mitochondria produce ATP

41. Which one of the following cell types is found in epithelial tissue?
- A. mast cells
  - B. adipocytes
  - C. chondroblasts
  - D. melanocytes

Answer is D: melanocytes produce melanin to protect the skin from ultraviolet radiation and it results in tanning of the skin.

42. What is the difference between “loose” connective tissue (CT) and “dense” connective tissue?
- A. Fibres occupy most of the volume in dense CT
  - B. Dense CT includes cartilage, loose CT does not.



- C. Loose CT has a good blood supply while dense CT does not.
- D. Loose CT has no fibres (and dense CT does).

Answer is A: the preponderance of fibres is what makes the CT “dense”. Cartilage is classified as supportive CT.

43. Facilitated diffusion refers to the process of
- A. movement along a concentration gradient assisted by protein carrier molecules.
  - B. movement of ions and molecules along a concentration gradient.
  - C. transport of molecules and ions against their concentration gradient.
  - D. water movement through a semi-permeable membrane

Answer is A: facilitated refers to the role of the protein carriers. The other choices refer to diffusion, active transport and osmosis respectively

44. What do fibroblasts, chondroblasts, osteoblasts and haemocytoblasts have in common?
- A. they are all types of white blood cell.
  - B. they are all macrophages.
  - C. they are all immature cells.
  - D. they are all types of epithelial cell.

Answer is C: the suffix “-blast” implies that these cells have not yet finished their differentiation. That is are immature.

45. Which is **NOT** true of connective tissue (CT)?
- A. the cells are closely packed
  - B. the tissue contains protein fibres and ground substance.
  - C. types include loose CT, dense CT and liquid CT.
  - D. CT contains white blood cells.

Answer is A: being close packed is a property of epithelial tissue. In CT the cells are widely spaced, being separated by the ground substance.

46. Active transport across the plasma membrane may be described by which statement?
- A. active transport requires energy from ATP.
  - B. active transport is also known as endocytosis.
  - C. active transport moves molecules along their concentration gradient.
  - D. active transport is the movement of lipid-soluble molecules through the plasma membrane.

Answer is A: this is the only correct answer. The others are not true.

47. Which of the following cell types denotes an immature cell?

- A. macrophages
- B. monocytes
- C. osteoblasts
- D. ribosomes

Answer is C: The suffix “-blast” indicates that the cell is immature.

48. Choose the membrane that is **NOT** a serous membrane.

- A. pleura
- B. peritoneum
- C. pericardium
- D. lamina propria

Answer is D: the lamina propria is a “basement membrane” attached to epithelial tissue. The others are serous membranes.

49. Which organelle is the site of ATP production?

- A. the nucleus
- B. endoplasmic reticulum
- C. mitochondria
- D. golgi apparatus

Answer is C: the mitochondria is where ATP is produced.

50. Which of the following is **ONE** major function of epithelial cells?

- A. movement
- B. secretion
- C. support of other cell types
- D. transmit electrical signals

Answer is B: glandular tissue are one type of epithelial tissue and their function is to produce material to secrete.

51. What are the major types of tissue in the body?

- A. nervous, muscle, epithelial, connective.
- B. squamous, cuboidal, columnar, transitional.
- C. osteocytes, chondrocytes, leucocytes, adipocytes.
- D. protein, adipose, cartilage, osseous.

Answer is A: choice C refers to cell types; B is a list of epithelial tissue. Protein is applied to molecules.

52. Which of the following is **NOT** one of the organelles within a cell?

- A. desmosome
- B. endoplasmic reticulum
- C. mitochondrion
- D. golgi apparatus

Answer is A: desmosome (despite having the suffix “-some”) are not within the cell. They are structures that join adjacent plasma membranes to each other.

53. Which list contains the main body tissue types?

- A. glandular, connective, osseous, nervous
- B. epithelial, nervous, connective, muscle.
- C. endothelial, connective, muscle, cartilaginous
- D. epithelial, cartilaginous, muscle, glandular

Answer is B: the terms osseous, glandular and cartilaginous disqualify the other choices.

54. The process of “diffusion” through a membrane may be described by which of the following?

- A. the movement of ions and molecules away from regions where they are in high concentration towards regions where they are in lower concentration.
- B. the use of energy from ATP to move ions and small molecules into regions where they are in lower concentration.
- C. the plasma membrane engulfs the substance and moves it through the membrane.
- D. the use of energy from ATP to move water molecules against their concentration gradient.

Answer is A: the choices with ATP are nonsense. While choice C refers to endocytosis.

55. The process of “active transport” through a membrane may be described by which of the following?

- A. the movement of ions and small molecules away from regions where they are in high concentration.
- B. the use of energy from ATP to move ions and small molecules into regions where they are in lower concentration.
- C. the plasma membrane engulfs the substance and moves it through the membrane.
- D. the use of energy from ATP to move ions and small molecules against their concentration gradient.

Answer is D: energy (ATP) is required to force molecules against their concentration gradient.

56. Which of the following is the smallest living structural unit of the body?

- A. atom
- B. molecule
- C. organelle
- D. cell

Answer is D: the cell is smallest structural unit that is deemed to be alive.

57. Which of the following enables ions such as sodium to cross a plasma membrane?

- A. phospholipid bilayer
- B. peripheral proteins
- C. integral proteins
- D. desmosomes

Answer is C: one function of integral protein in the PM is to form channels to allow for the passage of ions.

58. Cell membranes can maintain a difference in electrical charge between the interior of the cell and the extracellular fluid. What is this charge difference called?

- A. excitability
- B. the membrane potential
- C. the action potential
- D. the sodium-potassium pump

Answer is B: the inside of a cell is negative while the exterior side of the membrane is positive. This difference in charge constitutes a difference in electrical potential (or voltage), known as the resting membrane potential. An action potential is generated when the membrane is stimulated and the potential reversed.

59. The resting membrane potential of a cell is the consequence of which of the following concentrations of ions?

- A. High  $K^+$  and  $Cl^-$  outside the cell and high  $Na^+$  and large anions inside the cell.
- B. High  $K^+$  and  $Na^+$  outside the cell and high  $Cl^-$  and large anions inside the cell.
- C. High  $Cl^-$  and  $Na^+$  outside the cell and high  $K^+$  and large cations inside the cell.
- D. High  $Ca^{2+}$  and  $Na^+$  outside the cell and high  $K^+$  and large cations inside the cell.

Answer is C: These ionic species are largely responsible for the membrane potential (cations are negative ions). While there is a higher concentration of Ca outside the cell than inside, there are fewer Ca than Cl ions.

60. What is one function of mitochondria? To

- A. produce enzymes to break down molecules
- B. produce molecules of ATP
- C. hold adjacent cells together
- D. allow passage of molecules through the plasma membrane

Answer is B: Mitochondria are organelles within which ATP is made.

61. Membrane proteins perform the following functions **EXCEPT** one. Which One?

- A. form the glycocalyx
- B. act as receptor proteins
- C. form pores to allow the passage of small solutes
- D. behave as enzymes.

Answer is A: the glycocalyx refers to molecules in the plasma membrane that have a carbohydrate chain attached (prefix “glyco-”).

62. Facilitated diffusion differs from active transport because facilitated diffusion:

- A. requires energy from ATP
- B. moves molecules from where they are in lower concentration to higher concentration
- C. moves molecules from where they are in higher concentration to lower concentration.
- D. involves ions & molecules that pass through membrane channels.

Answer is C: diffusion always refers to movement from high to low concentration (without energy expenditure). Facilitated refers to the assistance provided by a transport molecule that is designed for the purpose.

63. Which of the following is **NOT** a connective tissue?

- A. blood
- B. mesothelium
- C. fat
- D. tendon

Answer is B: mesothelium is simple squamous epithelium that is found in serous membranes.

64. The cells that are found in tendons are called:

- A. osteocytes
- B. adipocytes
- C. haemocytoblasts
- D. fibroblasts

Answer is D: Simple Squamous. A single layer of flat (squashed) cells so diffusion through the layer takes place easily. Lines heart, lymph & blood vessels (known as endothelium). Called mesothelium when in serous membranes.

65. Which one of the following terms best describes the structure of the cell membrane:

- A. fluid mosaic model
- B. static mosaic model
- C. quaternary structure
- D. multilayered structure

Answer is A: “fluid” implies the structure can move and change (not like a brick wall); mosaic refers to the presence of proteins scattered among the glycolipids.

66. Which one of the following terms best describes a phospholipid. It consists of a:

- A. polar head and polar tail
- B. non-polar head and a polar tail
- C. polar head and non-polar tail
- D. non-polar head and a non-polar tail

Answer is C: polar = hydrophilic head of phosphate (which can dissolve in the aqueous extracellular solution because water molecules are polar); non-polar = hydrophobic tails of lipid, which being non-polar, cannot dissolve in aqueous solutions.

67. One of the functions of integral proteins in cell membranes is to:

- A. maintain the rigid structure of the cell
- B. support mechanically the phospholipids
- C. interact with the cytoplasm
- D. form channels for transport functions

Answer is D: some proteins form channels which allow molecules and ions to enter the cell.

68. Which one of the following best describes what a cell membrane consists of?

- A. lipids, proteins, ribosomes
- B. lipids, cholesterol, proteins
- C. cholesterol, proteins, cytoplasm
- D. lipids, proteins, cytoplasm

Answer is B: these are the three major constituents. Ribosomes and cytoplasm are found inside the cell.