

**SIR ARTHUR LEWIS COMMUNITY COLLEGE
SCIENCE, TECHNOLOGY, INNOVATION AND SUSTAINABILITY**

**2024 – 2025 ACADEMIC YEAR - SEMESTER I
END OF SEMESTER EXAMINATION**

COURSE TITLE : **ANIMAL STRUCTURE AND FUNCTION**
COURST CODE : **BIO 217**
LECTURER : **DONALDENE THOMPSON**
DATE : **Thursday 12th December 2024**
TIME : **9.00 – 11.00 AM**
DURATION : **2 HRS.**
STUDENT ID# :

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Write your student's ID number on all the work you hand in.
2. This paper consists of FOUR (4) Sections A, B C & D.
3. SECTION A consists of 35 multiple-choice questions. Write the correct answer on your answer sheet. ***Each correct will be one (1) mark each.***
4. SECTION B consist of 15 critical thinking multiple choice questions. ***Each correct will be two (2) mark.***
5. SECTION C consist of 18 true or false questions.
6. SECTION D consist of ONE (1) practical question.
7. Graph paper will be provided.
8. A mark will not be deducted for a wrong answer.
9. Do not use correction fluid.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A

For each multiple-choice question there are four possible answers A, B C and D. Choose the one you consider correct and circle your answer on your question paper.

1. Which of the following statements about the parasympathetic nervous system is true?
 - A. controls “fight or flight” response
 - B. can reset organ function to the normal range
 - C. transmits information from the skin to the central nervous system
 - D. stimulates glycogen breakdown
2. Proper nervous system function involves various types of organic molecules. In particular, what is released by motor nerve endings onto muscle cells or tissue?
 - A. acetylcholine
 - B. norepinephrine
 - C. dopamine
 - D. serotonin
3. Medications can be used to treat certain neurodevelopmental disorders. For example, which medications are often used to treat patients with ADHD?
 - A. tranquilizers
 - B. blood pressure medications
 - C. stimulants
 - D. anti-convulsant medication
4. Which type of bone has a central shaft and two rounded ends?
 - A. flat bones
 - B. irregular bones
 - C. sutural bones
 - D. long bones
5. _____ is a characteristic of the synovial fluid.
 - A. stability
 - B. lubrication
 - C. minor movement
 - D. increase of friction
6. Which of the following is an example of a pivot joint?
 - A. neck
 - B. thumb
 - C. hip
 - D. the joint of the wrist
7. Synovial joints allow different types of movement. Turning your head to look over your shoulder is an example of _____.
 - A. abduction
 - B. medial rotation
 - C. lateral rotation
 - D. extension
8. Which of the following best describes a function of smooth muscle tissue?
 - A. It affects the flow of blood and blood pressure
 - B. It stimulates contraction of the heart
 - C. It changes your facial expression.
 - D. It maintains your posture

9. When you eat an apple, it is first physically broken down into smaller fragments. What is the term for this process?
- A. elimination
 - B. absorption
 - C. mastication
 - D. peristalsis
10. Which of the following statements about digestion is true?
- A. Amylase, maltase, and lactase in the mouth digest carbohydrates.
 - B. Trypsin and lipase in the stomach digest protein.
 - C. Bile emulsifies lipids in the small intestine.
 - D. No food is absorbed until it reaches the small intestine.
11. Certain organs control the release of hormones that have vital roles in digestion. Which of the following controls hunger and satiety signals?
- A. thymus
 - B. adrenal cortex
 - C. thyroid
 - D. hypothalamus
12. Certain molecules are required by but not produced by the body. Fat- and water-soluble _____ are organic molecules that cannot be produced by the body but are required for many enzymatic functions.
- A. minerals
 - B. vitamins
 - C. amino acids
 - D. sugars
13. Some unicellular organisms, such as the amoeba, ingest food by endocytosis. The food vesicle fuses with a lysosome, which digests the food. Waste is excreted by which process?
- A. exocytosis
 - B. filtration
 - C. osmoregulation
 - D. dilatation
14. What is the role of gastrin in food digestion and absorption?
- A. Gastrin stimulates release of stomach acid.
 - B. Gastrin stimulates production of bicarbonate.
 - C. Gastrin stimulates pancreatic juice production.
 - D. Gastrin stops the release of stomach acid.
15. What tends to happen to cells in a hypotonic environment?
- A. They remain the same size.
 - B. They shrink due to water loss.
 - C. They allow water to flow in and out at the same rate.
 - D. They swell due to water gain.
16. The kidney is made up of over a million nephrons that give it a granular appearance. What is a nephron?
- A. a network of capillaries
 - B. the cup-shaped chamber surrounding the glomerulus
 - C. the functional unit of the kidney
 - D. the bow-shaped artery at the base of medullary pyramids

17. An example of a properly functioning homeostatic control system is seen when
- A. the kidneys excrete salt into the urine when dietary salt levels rise.
 - B. the level of glucose in the blood is abnormally high whether or not a meal has been eaten.
 - C. the blood pressure increases in response to an increase in blood volume.
 - D. the core body temperature of a runner rises gradually from 37°C to 45°C.
18. Positive feedback has occurred when
- A. a decrease in blood calcium increases the amount of the hormone that releases calcium from bone.
 - B. a nursing infant's sucking increases the secretion of a milk releasing hormone in the mother.
 - C. an increase in calcium concentration increases the secretion of a hormone that stores calcium in bone.
 - D. a decrease in blood sugar increases the secretion of a hormone that converts glycogen to glucose.
19. Which of the following statements about hormones is **incorrect**?
- A. They are used to communicate between different organisms.
 - B. They are carried by the circulatory system.
 - C. They are modified amino acids, peptides, or steroid molecules.
 - D. They elicit specific biological responses from target cells.
20. Which combination of hormones helps a mother to produce milk and nurse her baby?
- A. luteinizing hormone and oxytocin
 - B. oxytocin, prolactin, and luteinizing hormone
 - C. follicle stimulating hormone and luteinizing hormone
 - D. oxytocin and prolactin
21. The general functions of the nervous system include which of the following?
- I. integration
 - II. motor output
 - III. sensory input
- A. II only
 - B. III only
 - C. I and II only
 - D. I, II, and III
22. Sexual reproduction
- A. can produce diverse phenotypes that may enhance survival of a population in a changing environment.
 - B. guarantees that both parents will provide care for each offspring.
 - C. yields more numerous offspring more rapidly than is possible with asexual reproduction.
 - D. allows animals to conserve resources and reproduce only during optimal conditions.
23. Hibernation and estivation are both examples of
- A. acclimatization.
 - B. non shivering thermogenesis.
 - C. torpor.
 - D. evaporative cooling.
24. Which of the following statements about circulatory systems is false?
- A. In closed circulatory systems, blood flows through vessels that are separate from the interstitial fluid of the body.
 - B. The earthworm has a closed circulatory system.
 - C. In an open circulatory system, hemolymph empties into the body cavity.
 - D. Lobsters are organisms that have closed circulatory systems

25. Melatonin is a hormone produced in the pineal gland. It can be used to treat symptoms of sleep disorders and seasonal affective disorder because
- A. it is normally produced only in the light.
 - B. it activates the brainstem.
 - C. its peak production is normally at night.
 - D. it increases production of serotonin.
26. What are antigens?
- A. proteins that consist of two light and two heavy polypeptide chains
 - B. foreign molecules that trigger the generation of antibodies
 - C. proteins found in the blood that cause foreign blood cells to clump
 - D. proteins released during an inflammatory response
27. Which of the following cell types are responsible for initiating a secondary immune response?
- A. macrophages
 - B. B cells
 - C. memory cells
 - D. T cells
28. Inflammatory responses may include which of the following?
- A. clotting proteins migrating away from the site of infection
 - B. reduced permeability of blood vessels to conserve plasma
 - C. increased activity of phagocytes in an inflamed area
 - D. release of substances to decrease the blood supply to an inflamed area
29. Which of the following differentiates T cells and B cells?
- A. T cells but not B cells can directly attack and destroy invading pathogens
 - B. Only B cells are produced from stem cells of the bone marrow.
 - C. Only B cells take part in cell mediated immunity.
 - D. T cells but not B cells are stimulated to increase the rate of their cell cycles.
30. What happens when beta cells of the pancreas release insulin into the blood?
- A. Alpha cells are stimulated to release glucose into the blood.
 - B. The liver breaks down glycogen to glucose.
 - C. Blood glucose levels rise to a set point and stimulate glucagon release.
 - D. Body cells take up more glucose.
31. "Winter acclimatization" in mammals can include
- A. hibernation through the season of extreme cold.
 - B. changing the proportion of saturated and unsaturated fats in cell membranes.
 - C. the production of antifreeze compounds within cells.
 - D. the denaturation of proteins that cannot withstand extreme temperature.
32. Which statement about the complement system is true?
- A. These proteins act individually to attack and lyse microbes.
 - B. These proteins are involved in innate immunity and not acquired immunity.
 - C. These proteins are one group of antimicrobial proteins acting together in cascade fashion.
 - D. These proteins are secreted by cytotoxic T cells and other CD8 cells.
33. An ectotherm is more likely to survive an extended period of food deprivation than would an equally sized endotherm because
- A. the ectotherm metabolizes its stored energy more readily than can the endotherm.
 - B. the ectotherm maintains a higher basal metabolic rate.
 - C. the ectotherm expends more energy/kg body weight than the endotherm.
 - D. the ectotherm invests little energy in temperature regulation.

34. What is the difference between an osmoregulator and an osmoconformer?
- A. Osmoregulators can change the osmotic pressure of their body fluids, while osmoconformers cannot.
 - B. Osmoconformers can change the osmotic pressure of their body fluids, while osmoregulators cannot.
 - C. Osmoregulators match the osmotic pressure of their cells with that of the environment, while osmoconformers do not.
 - D. Osmoconformers match the osmotic pressure of their cells with that of the environment, while osmoregulators do not.
35. What is the primary function of humoral immunity?
- A. It produces antibodies that circulate in body fluids.
 - B. It is responsible for transplant tissue rejection.
 - C. D. It protects the body against cells that become cancerous.
 - D. It primarily defends against bacteria and viruses that have already infected cells.

SECTION B: Critical Thinking Questions

36. What are the roles of vasodilation and vasoconstriction in maintaining body temperature?
- A. Vasodilation allows for radiation and evaporative heat loss, and vasoconstriction brings blood to the core to conserve heat by vital organs.
 - B. Vasodilation brings blood to the core to conserve heat by vital organs, and vasoconstriction results in radiation and evaporative heat loss.
 - C. Vasodilation results in the formation of an insulating layer between skin and internal organs causing heat conservation and brings blood to the core to conserve heat.
 - D. Vasodilation results in radiation and evaporative heat loss, and vasoconstriction transfers heat from arteries to veins to warm blood returning to the heart.
37. Neurons have several specialized structures, including dendrites. What might happen if an individual has malformed dendrites?
- A. The individual's neurons would not be able to receive input properly.
 - B. The individual's neurons would not be able to synthesize proteins.
 - C. The individual's neurons would not be able to communicate with target neurons.
 - D. The individual's neurons would not be able to carry nerve signals.
38. How can squamous epithelia, which have a high surface area-to-volume ratio, both facilitate diffusion and prevent damage from abrasion?
- A. Single layers of squamous epithelia facilitate gas, nutrient or waste exchange, whereas stratified layers provide protection but are not replaceable following damage.
 - B. Stratified layers of squamous epithelia facilitate gas, nutrient or waste exchange, whereas single layers provide protection and are replaceable following damage.
 - C. Single layers of squamous epithelia facilitate gas, nutrient or waste exchange whereas stratified layers provide protection and are replaceable following damage.
 - D. Single layers of squamous epithelia facilitate only exchange of gases by diffusion, whereas stratified layers provide protection and are replaceable following damage.
39. What is the relationship between basal metabolic rate (BMR) and body size? Why?
- A. BMR decreases with body size, because larger animals require more energy to maintain their size. However, smaller animals have relatively higher BMRs per body weight because they have greater surface area.
 - B. BMR increases with body size, because smaller animals require more energy to maintain their size. However, larger animals have relatively higher BMRs per body weight because they have greater surface area.

- C. BMR increases with body size, because larger animals require more energy to maintain their size. However, smaller animals have relatively higher BMRs per body weight because they have greater surface area for their mass
- D. BMR decreases with body size, because smaller animals require more energy to maintain their size. However, larger animals have relatively higher BMRs per body weight because they have greater surface area for their mass.

40. What might make you suspect that an individual has Alzheimer’s disease?
- A. disruptive memory loss, confusion about time or place, difficulty with planning and executing tasks, poor judgment, and/or personality changes
 - B. slowed movements, balance and posture problems, rigid muscles, speech changes, and/or psychological symptoms such as dementia
 - C. impaired social skills, repetitive motor behaviors, strict adherence to certain rituals, and preoccupation with specific subjects
 - D. balance and posture problems, repetitive motor behaviors, difficulty with planning and executing tasks, poor judgment, and/or personality changes

Organism	Method of circulation
A	Closed 2-chambered heart
B	Closed within 4-chambered heart
C	Open with some closed arterial vessels
D	Closed within 3-chambered heart
E	Open within hemocoel
F	Diffusion

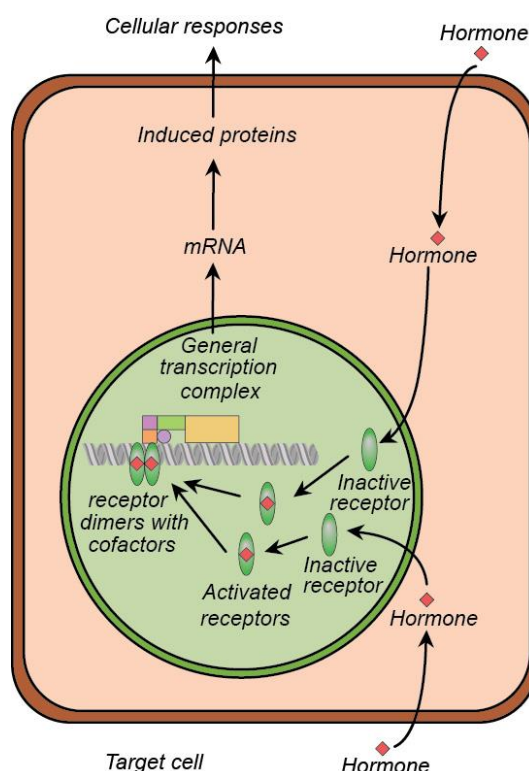
41. The student notices there are some notes on each jar, providing information on each animal’s classification. The student labels the unknown animals A-F and enters each animal’s circulatory system characteristics in a table. If the student wished to create a phylogeny of organisms A through F, in what order would the organisms most likely appear on the tree, from left to right, and why?
- A. The order would be F, E, C, A, B, D as the general trend in circulatory system evolution is toward increasingly closed systems.
 - B. The order would be B, D, A, C, E, F as the general trend in circulatory system evolution is toward increasingly open systems.
 - C. The order would be F, E, C, A, D, B as the general trend in circulatory system evolution is toward increasingly closed systems.
 - D. The order would be F, E, C, D, B, A as the general trend in circulatory system evolution is toward increasingly open systems.
42. The endocrine system incorporates feedback mechanisms that maintain homeostasis. Which of the following demonstrates negative feedback by the endocrine system?
- A. During labor, the fetus exerts pressure on the uterine wall, inducing the production of oxytocin, which stimulates uterine wall contraction. The contractions cause the fetus to further push on the wall, increasing the production of oxytocin.
 - B. After a meal, blood glucose levels become elevated, stimulating beta cells of the pancreas to release insulin into the blood. Excess glucose is then converted to glycogen in the liver, reducing blood glucose levels.
 - C. At high elevation, atmospheric oxygen is more scarce. In response to signals that oxygen is low, the brain decreases an individual’s rate of respiration to compensate for the difference.
 - D. A transcription factor binds to the regulatory region of a gene, blocking the binding of another transcription factor required for expression.

43. Why does the human body need more than its skin to function as a barrier to infecting pathogens?
- A. Skin works only against some types of bacteria. To prevent the entry of other pathogens, other physical or chemical barriers are needed.
 - B. Skin does not provide a broad coverage against invasion of the body by any foreign particle, so it is not a very effective barrier.
 - C. Pathogens could enter the body through several places that are not covered by skin that need to have a barrier to prevent infection.
 - D. Skin acts only as a chemical barrier against pathogens. The body also needs physical barriers to prevent various types of infection
44. Cell surface recognition occurs during many types of immune responses, including immediate and induced immune responses. How do natural killer cells and interferons represent one of each type of immune response (immediate and induced), and how does cell surface recognition play a role?
- A. Natural killer cells are an example of induced immune response as they attack host cells that have lost normal cell surface markers. Interferons are an example of immediate immune response as they are induced after cell surface markers on invading pathogens are recognized by host cells.
 - B. Natural killer cells are an example of immediate immune response as they attack host cells that have lost normal cell surface markers. Interferons are an example of induced immune response as they are induced after cell surface markers on invading pathogens are recognized by host cells.
 - C. Natural killer cells are an example of immediate immune response as they are induced after cell surface markers on invading pathogens are recognized by host cells. Interferons are an example of induced immune response as they attack host cells that have lost normal cell surface markers.
 - D. Natural killer cells are an example of induced immune response as they are induced after cell surface markers on invading pathogens are recognized by host cells. Interferons are an example of immediate immune response as they attack host cells that have lost normal cell surface markers.
45. What are naïve B or T cells and how do they function in cell-mediated and humoral immune responses?
- A. Naïve B and T cells are lymphocytes of the B and T types that have come into contact with pathogenic antigens. Naïve T cells produce antibodies in the humoral immune response, while naïve B cells stimulate the cell-mediated immune response.
 - B. Naïve B and T cells are lymphocytes of the B and T types that normally circulate in the body at all times and have not come into contact with any pathogenic antigens. Activated T cells produce antibodies in the humoral immune response, while activated B cells stimulate the cell-mediated immune response.
 - C. Naïve B and T cells are lymphocytes of the B and T types that normally circulate in the body at all times and have not come into contact with any pathogenic antigens. Activated B cells produce antibodies in the humoral immune response, while activated T cells stimulate the cell-mediated immune response.
 - D. Naïve B and T cells are lymphocytes of the B and T types that have come into contact with pathogenic antigens. Naïve B cells produce antibodies in the humoral immune response, while naïve T cells stimulate the cell-mediated immune response.
46. Invertebrate animals have innate immune systems but lack adaptive immune systems. Vertebrates, including fish, amphibians, reptiles, birds, and mammals have both systems. What does this suggest about the evolution of these two immune systems?
- A. This suggests that the innate immune system evolved first. Invertebrates and vertebrates had a common ancestor, which had an innate immune system. After the two lineages diverged, the vertebrate line developed adaptive immunity, which continued to evolve in all vertebrates.

- B. This suggests that the adaptive immune system evolved first. Invertebrates and vertebrates had a common ancestor, which had an innate immune system. After the two lineages diverged, the vertebrate line developed adaptive immunity, which continued to evolve in all vertebrates.
- C. This suggests that the innate immune system evolved first. Invertebrates and vertebrates had a common ancestor, which had an adaptive immune system. After the two lineages diverged, the vertebrate line developed innate immunity, which continued to evolve in all vertebrates.
- D. This suggests that the adaptive immune system evolved first. Invertebrates and vertebrates had a common ancestor, which had an adaptive immune system. After the two lineages diverged, the vertebrate line developed innate immunity, which continued to evolve in all vertebrates

47. Analyze the descriptions below to identify the one that correctly differentiates between the types of muscle tissue.
- A. Voluntary muscles cannot be consciously controlled, as is the case with cardiac muscles. Involuntary muscles can be controlled by an individual's will, as is the case with skeletal muscles.
 - B. Voluntary muscles can be controlled by an individual's will, as is the case with skeletal muscles. Involuntary muscles cannot be consciously controlled, as is the case with cardiac muscles.
 - C. Voluntary muscles cannot be consciously controlled, as is the case with the movement of legs while walking. Involuntary muscles can be controlled by an individual's will, as is the case with muscles in the digestive system.
 - D. Voluntary muscles can be controlled by an individual's will, as is the case with cardiac muscles. Involuntary muscles cannot be consciously controlled, as is the case with skeletal muscles.

48.



(credit: modification of work by H. Maurice Goodman/ScienceDirect)

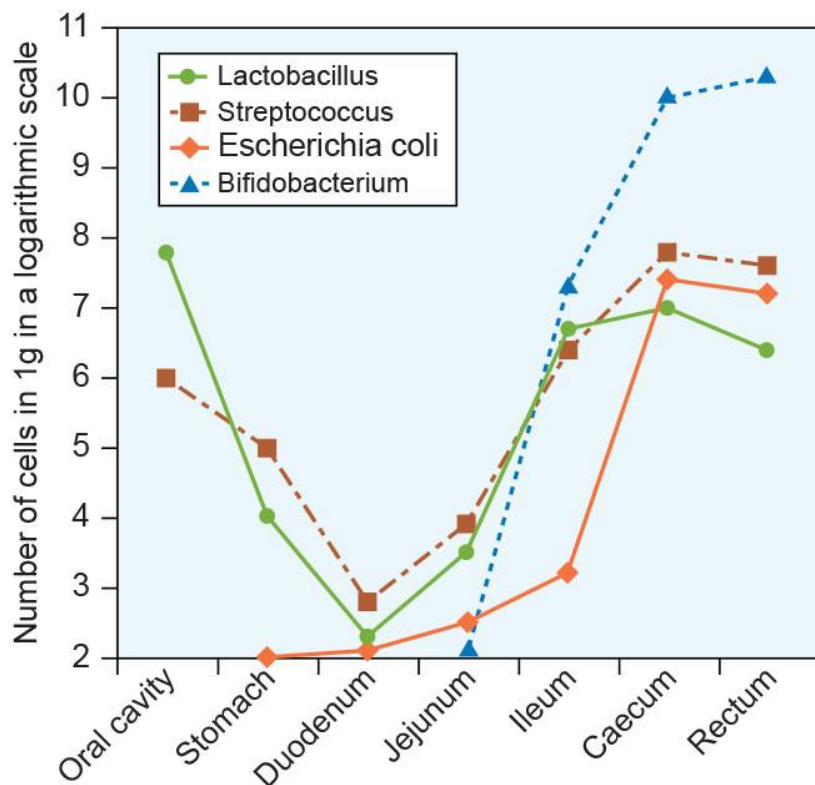
The image shows the action of a hormone on a cell.

What type of hormone is shown here?

- A. Lipid-soluble hormone.
- B. RNA-derived hormone.
- C. Amino acid-derived hormone.
- D. Peptide hormone.

49. Why is it useful for blood to travel slowly through capillary beds?
- To allow antibodies to enter infected cells and to promote the diffusion of fluid into the interstitial space.
 - To assist with gas and nutrient exchange and to prevent the diffusion of fluid into the interstitial space.
 - To assist with gas and nutrient exchange and to promote the diffusion of fluid into the interstitial space.
 - To allow antibodies to enter infected cells and to prevent the diffusion of fluid into the interstitial space.

50.



(credit: modification of work by Tomotari Mitsuoka/Chounaisaikin_no_hanashi, Iwanami Shoten, Publishers),

This graph shows the number of bacteria in different parts of the human digestive system. Each line shows a separate bacteria species.

Which statement is correct?

- The stomach does not have any bacteria.
- Bifidobacterium is found in the mouth and the stomach.
- Escherichia coli (E. coli) is found mostly in the colon and the rectum.
- Streptococcus is found in highest numbers in the mouth.

SECTION C –

Instructions: Read each statement carefully and write true or false as appropriate

51.

Statement	True or False
a. People conditioned to high altitudes have higher hemoglobin concentrations than people conditioned to low altitudes.	
b. Athletes conditioned for endurance are able to use more of the oxygen available in the blood stream than unconditioned people	
c. Most antigens are polysaccharides because of their large size and their complexity of shape	
d. Peptic ulcers of the duodenum are caused mainly by excessive HCl secretion by the stomach	
e. Alpha, beta, and gamma globulins are all plasma proteins produced by the liver; and they all function as antibodies in immune defense against foreign antigens	
f. Autoimmune diseases result in the production of autoantibodies by T cells to self-antigens, which may result in inflammation and organ damage or even organ death.	
g. Gallstones are small, hard, mineral deposits made mainly from cholesterol molecules.	
h. The process of phagocytosis is an integral part of both specific and nonspecific immune defense activities.	
i. As blood flows through capillaries, the hydrostatic pressure of the blood forces some fluid out of the capillary walls and into the tissue spaces.	
j. All antibodies have a "Y" shape composed of four interconnected protein chains, with the "fork" region serving as the antigen-binding fragment and the "stalk" region serving as the crystallizable fragment.	
k. The lymph nodes within the lymphatic system are considered part of the excretory system.	
l. Strenuous exercise has no significant effect on the PO ₂ of the arterial blood	
m. It is not the presence of two X chromosomes, but the lack of a Y chromosome, that directs all XX embryos to become female	
n. Histamine causes vasodilation and increased capillary permeability, thereby allowing plasma proteins to leak out and into the tissue fluid resulting in localized swelling or edema.	
o. The most common and yet the smallest plasma protein is albumin, whose primary function is to draw water from the surrounding extracellular fluid (ECF) into the capillary plasma.	

p. Tissue fluid is the same as interstitial fluid; and may form lymph fluid that returns to the venous blood through lymphatic vessels.	
q. Even after exhaling as forcefully as possible, one still has air in the lungs	
r. Interferons are polypeptides produced in small amounts by host cells infected with one virus, which can then interfere with the ability of a second, unrelated strain of virus to infect other cells in the same host	

SECTION D: - Practical Question

52.

A student investigated the effect of exercise on breathing rate.

The breathing rates of five people were measured at rest and after running for different periods of time. The people rested between each period of running

The results are shown in Table 1.

Table 1

Running time /minutes	Breathing rate/breaths per minute					
	Persons					Average
	One	Two	Three	Four	Five	
0	20	22	22	26	28	24
2	32	28	28	32	32	31
4	39	38	38	42	40	
6	46	52	52	46	44	48
8	48	50	52	46	44	48
10	49	51	51	46	43	48

(i) Complete Table 1 by calculating the average breathing rate for four minutes of running.

(1)

(ii) The student thought that the result for person two at six minutes was an anomaly. Suggest what the student should do to determine if the result is anomalous. (1)

(iii) Use the graph paper provided and Plot a graph to show the relationship between running time and the average breathing rate. Draw a line of best fit. (4)

- (iv) Use your graph to estimate the average breathing rate for one minute of running. Show on the graph how you obtained your answer. (2)

- (v) Use your graph to describe the relationship between running time and the average breathing rate. (3)

END OF EXAMINATION