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Biology 12

AUGUST 2001

Course Code = BI

Student Instructions

1. Place the stickers with your Personal Education Number (PEN) in the allotted spaces above. **Under no circumstance is your name or identification, other than your Personal Education Number, to appear on this booklet.**
2. Ensure that in addition to this examination booklet, you have an **Examination Response Form**. Follow the directions on the front of the Response Form.
3. **Disqualification** from the examination will result if you bring books, paper, notes or unauthorized electronic devices into the examination room.
4. When instructed to open this booklet, **check the numbering of the pages** to ensure that they are numbered in sequence from page one to the last page, which is identified by
END OF EXAMINATION.
5. At the end of the examination, place your Response Form inside the front cover of this booklet and return the booklet and your Response Form to the supervisor.

Question 1:

1. .

(8)

Question 9:

9. .

(5)

Question 2:

2. .

(4)

Question 3:

3. .

(3)

Question 4:

4. .

(4)

Question 5:

5. .

(5)

Question 6:

6. .

(7)

Question 7:

7. .

(7)

Question 8:

8. .

(7)

BIOLOGY 12

AUGUST 2001

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GENERAL INSTRUCTIONS

1. Electronic devices, including dictionaries and pagers, are **not** permitted in the examination room.
2. All multiple-choice answers must be entered on the Response Form using an **HB pencil**. Multiple-choice answers entered in this examination booklet will **not** be marked.
3. For each of the written-response questions, write your answer in **ink** unless otherwise instructed in the space provided in this booklet.
4. Ensure that you use language and content appropriate to the purpose and audience of this examination. Failure to comply may result in your paper being awarded a zero.
5. This examination is designed to be completed in **two hours**. *Students may, however, take up to 30 minutes of additional time to finish.*

BIOLOGY 12 PROVINCIAL EXAMINATION

	Value	Suggested Time
1. This examination consists of two parts:		
PART A: 50 multiple-choice questions	50	45
PART B: 9 written-response questions	50	75
	Total:	
	100 marks	120 minutes

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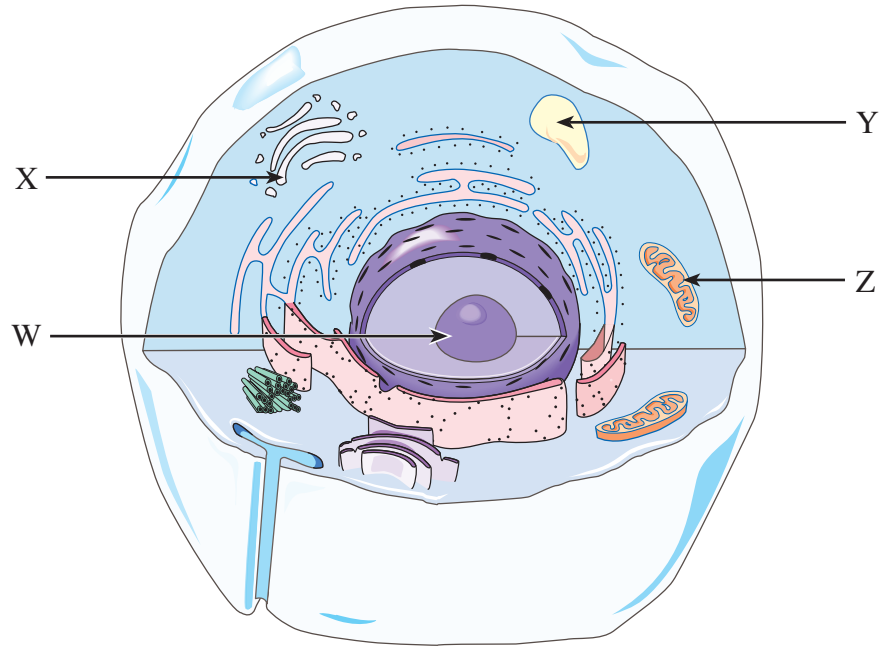
PART A: MULTIPLE CHOICE

Value: 50 marks

Suggested Time: 45 minutes

INSTRUCTIONS: For each question, select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle that has the letter corresponding to your answer.

Use the following diagram to answer question 1.



1. Which of the organelles in the diagram packages proteins for secretion?

- A. W
 - B. X
 - C. Y
 - D. Z
-

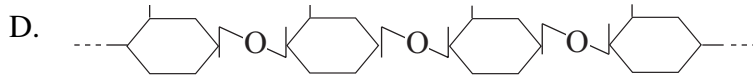
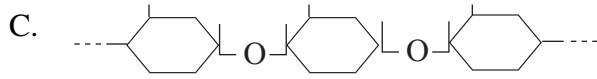
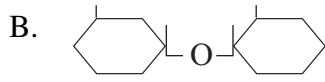
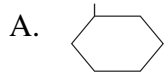
2. Chromosomes are composed of

- A. tRNA and DNA.
- B. tRNA and lipids.
- C. DNA and proteins.
- D. RNA and ribosomes.

OVER

3. In contrast to the nuclear envelope, the inner membrane of the mitochondrion
- A. contains pores.
 - B. has many folds.
 - C. is not permeable.
 - D. has two phospholipid layers.
4. Which organelle provides the energy for protein synthesis?
- A. nucleus
 - B. nucleolus
 - C. mitochondrion
 - D. rough endoplasmic reticulum
5. Neutral fats do **not** dissolve in water because
- A. water is non-polar.
 - B. water is polar and neutral fats are non-polar.
 - C. neutral fats are polar and form hydrogen bonds with water.
 - D. neutral fats break down into ions when combined with water.
6. Which of the following describes the action of a buffer?
- A. Lysosomes hydrolyze proteins in the cell.
 - B. During exercise, hemoglobin accepts hydrogen ions (H^+).
 - C. Gastric secretions denature salivary amylase in the stomach.
 - D. Reduced hemoglobin reacts with oxygen to form oxyhemoglobin in the lungs.

7. Which of the following diagrams represents glucose?



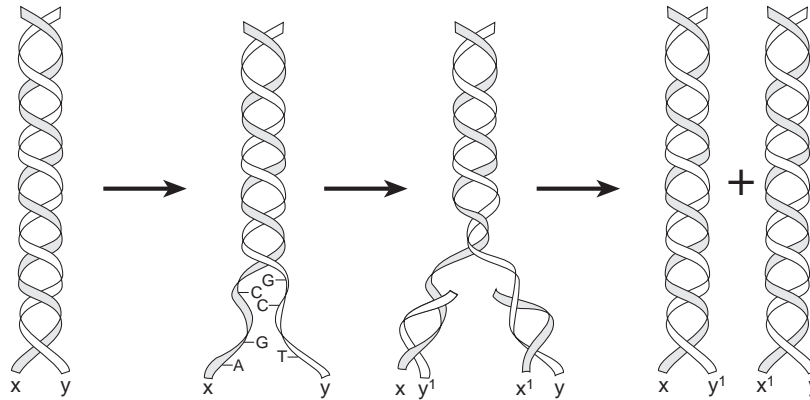
8. Unsaturated fatty acids, like those found in fish oils, are characterized by

- A. the ability to bond with glycerol to make lipids.
- B. bonds between an amine and a carboxyl (acid) group.
- C. having only single bonds between the carbon atoms in the chain.
- D. some carbon atoms in the chain that bond to only one hydrogen atom.

9. If 20% of the base molecules are guanine, how many thymine molecules are present in a DNA molecule with 1 000 bases?

- A. 200
- B. 300
- C. 400
- D. 600

Use the following diagram to answer questions 10 and 11.



10. The diagram above represents

- A. DNA replication.
- B. mRNA translation.
- C. mRNA elongation.
- D. DNA transcription.

11. The process shown in the diagram occurs in the

- A. nucleus.
- B. nucleolus.
- C. ribosomes.
- D. rough endoplasmic reticulum.

Use the following information to answer question 12.

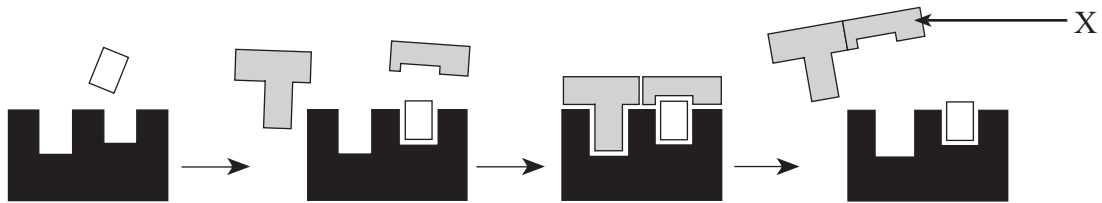
- uracil
- adenine
- thymine
- phosphate
- deoxyribose

12. RNA contains how many of the molecules above?

- A. one
- B. two
- C. three
- D. four

13. Worn-out red blood cells are removed from the blood by the process of
- osmosis.
 - exocytosis.
 - endocytosis.
 - simple diffusion.
14. The hormone responsible for increasing the rate at which cells release energy from carbohydrates is
- ATP.
 - ADH.
 - thyroxin.
 - aldosterone.

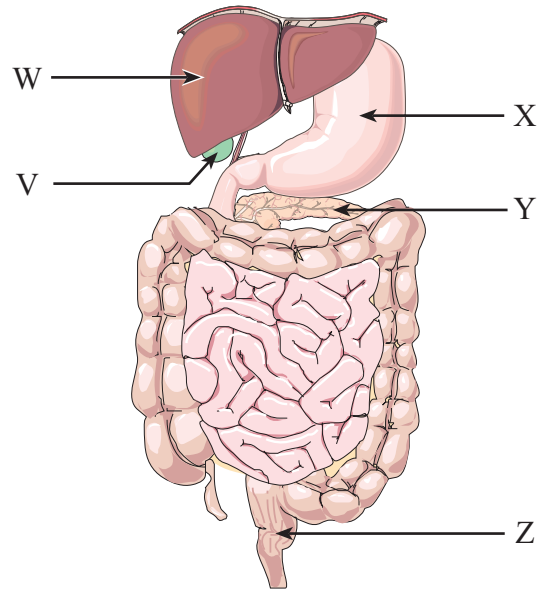
Use the following diagram to answer question 15.



15. The structure labelled **X** is the
- product.
 - enzyme.
 - substrate.
 - enzyme-substrate complex.
-

16. Bicarbonate ions and digestive enzymes are present in secretions from the
- liver.
 - stomach.
 - pancreas.
 - small intestine.

Use the following diagram to answer questions 17 and 18.



17. Which letter identifies the gall bladder?

- A. V
- B. X
- C. Y
- D. Z

18. Which organ is involved in maintaining a constant level of glucose in the blood?

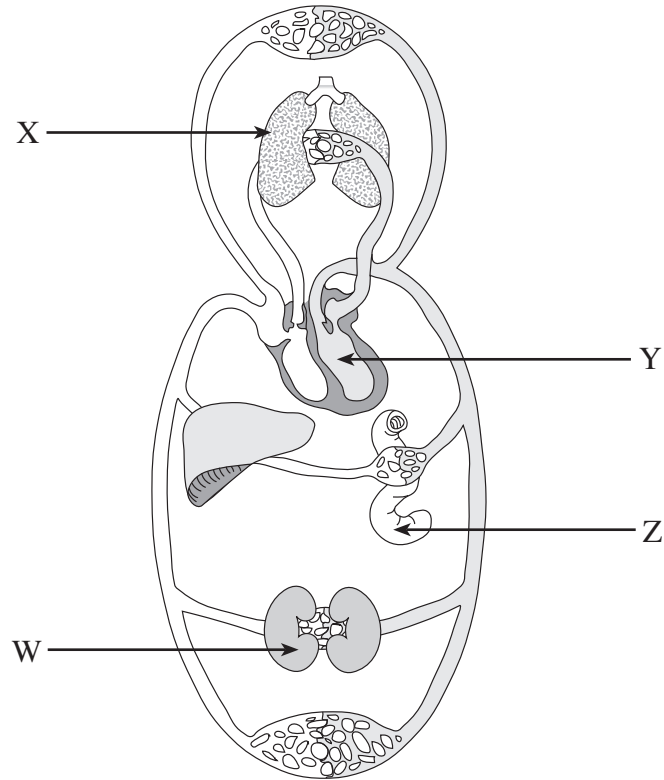
- A. V
 - B. W
 - C. X
 - D. Z
-

19. Which of the following substances is chemically digested by a component of saliva?

- A. lipid
- B. starch
- C. protein
- D. nucleic acid

20. Lipase, when added to gastric juice, is ineffective due to the presence of
- A. mucus.
 - B. trypsin.
 - C. bicarbonate ions.
 - D. hydrochloric acid.
21. Villi are found in the
- A. esophagus.
 - B. liver.
 - C. small intestine.
 - D. stomach.
22. Which of the following blood vessels have thin, permeable walls?
- A. veins
 - B. venules
 - C. arterioles
 - D. capillaries
23. The vessel that returns blood that is low in oxygen to the heart is the
- A. coronary artery.
 - B. pulmonary vein.
 - C. pulmonary artery.
 - D. anterior (superior) vena cava.

Use the following diagram to answer questions 24 and 25.



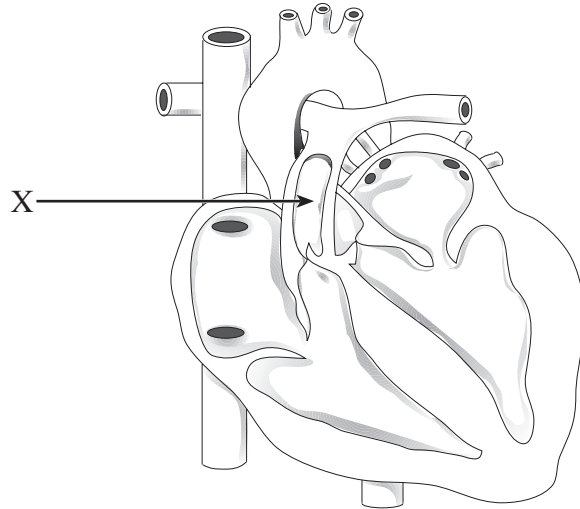
24. Which arteries bring blood to structure **Z**?

- A. hepatic
- B. iliac
- C. mesenteric
- D. renal

25. Blood flowing through the hepatic vein is obstructed. As a result, the blood pressure increases in the organs drained by the hepatic portal vein. Which of the following organs would be affected?

- A. W
- B. X
- C. Y
- D. Z

Use the following diagram to answer question 26.



26. The blood vessel labelled **X** carries high levels of
- A. oxyhemoglobin toward the heart.
 - B. oxyhemoglobin away from the heart.
 - C. reduced hemoglobin toward the heart.
 - D. reduced hemoglobin away from the heart.

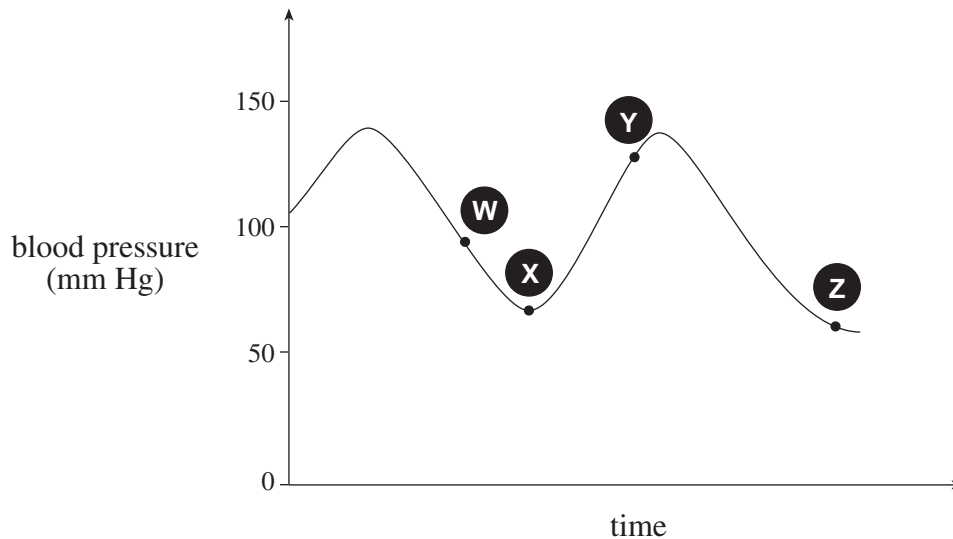
Use the following information to answer question 27.

- | |
|---|
| <ul style="list-style-type: none">1. umbilical artery2. umbilical vein3. anterior vena cava4. right atrium |
|---|

27. Which of the following would represent the correct order of structures in the circulatory system of the fetus if the structures are placed in order from highest oxygen concentration to lowest oxygen concentration? **DELETED**
- A. 2 → 3 → 4 → 1
 - B. 2 → 4 → 1 → 3
 - C. 1 → 2 → 4 → 3
 - D. 1 → 4 → 3 → 2

28. The structure that prevents blood from moving back into the left ventricle is the
- A. cardiac sphincter.
 - B. chordae tendineae.
 - C. atrioventricular valve.
 - D. aortic semilunar valve.

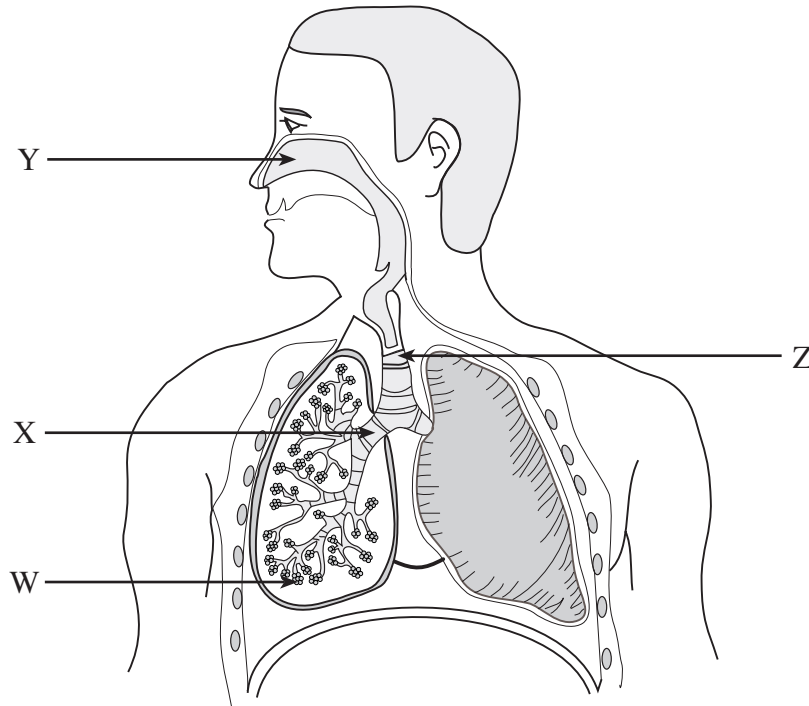
Use the following graph to answer question 29.



29. The graph shows changes in blood pressure in the aorta over time. Which letter would indicate when ventricular systole is occurring?
- A. W
 - B. X
 - C. Y
 - D. Z

30. A person's blood pressure rose from 120/80 to 160/100 during a stressful situation. This change in blood pressure was caused by a hormone released from the
- A. thalamus.
 - B. thyroid gland.
 - C. adrenal gland.
 - D. corpus callosum.

Use the following diagram to answer question 31.

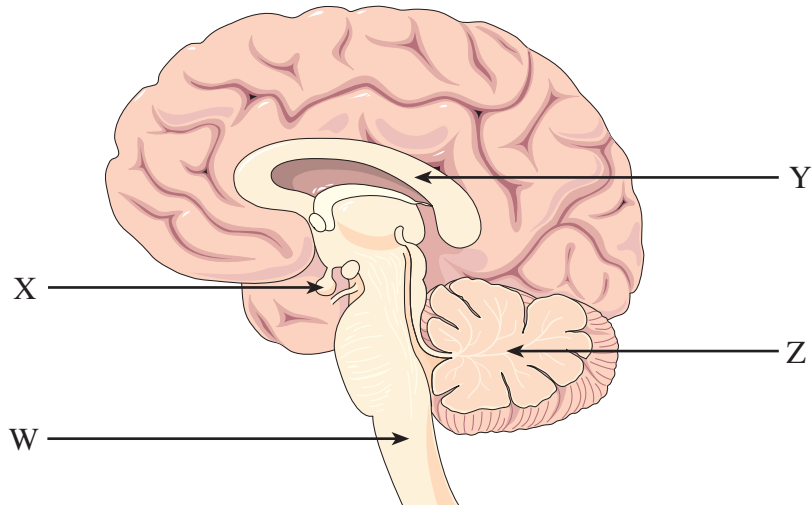


31. Which letter indicates the alveoli?
- A. W
 - B. X
 - C. Y
 - D. Z
-
32. Which of the following is responsible for keeping the respiratory tract clear of mucus and debris?
- A. cilia
 - B. alveoli
 - C. pharynx
 - D. diaphragm
33. The contraction of the diaphragm is accompanied by the
- A. relaxation of rib muscles, increased thoracic cavity volume and exhalation.
 - B. relaxation of rib muscles, decreased thoracic cavity volume and exhalation.
 - C. contraction of rib muscles, increased thoracic cavity volume and inhalation.
 - D. contraction of rib muscles, decreased thoracic cavity volume and inhalation.

OVER

34. Which enzyme speeds up the reaction between CO_2 and H_2O ?
- A. amylase
 - B. dehydrogenase
 - C. carbonic anhydrase
 - D. acetylcholinesterase
35. During internal respiration, excess hydrogen ions react with
- A. oxygen to form oxyhemoglobin.
 - B. hemoglobin to form reduced hemoglobin.
 - C. carbon dioxide to form bicarbonate ions.
 - D. bicarbonate ions to form water and carbon dioxide.
36. Some neurotransmitters in the peripheral nervous system stop or reduce muscle-cell contractions. These neurotransmitters must work by
- A. destroying cholinesterase in the synaptic cleft.
 - B. decreasing the amount of stimulus required for depolarization.
 - C. preventing the sodium gates from opening in the postsynaptic membranes.
 - D. preventing the reabsorption of acetylcholine in the presynaptic membranes.

Use the following diagram to answer questions 37 and 38.



37. Which of the following indicates the medulla oblongata?

- A. W
- B. X
- C. Y
- D. Z

38. Which of the following activities accompanies high activity in structure **Z**?

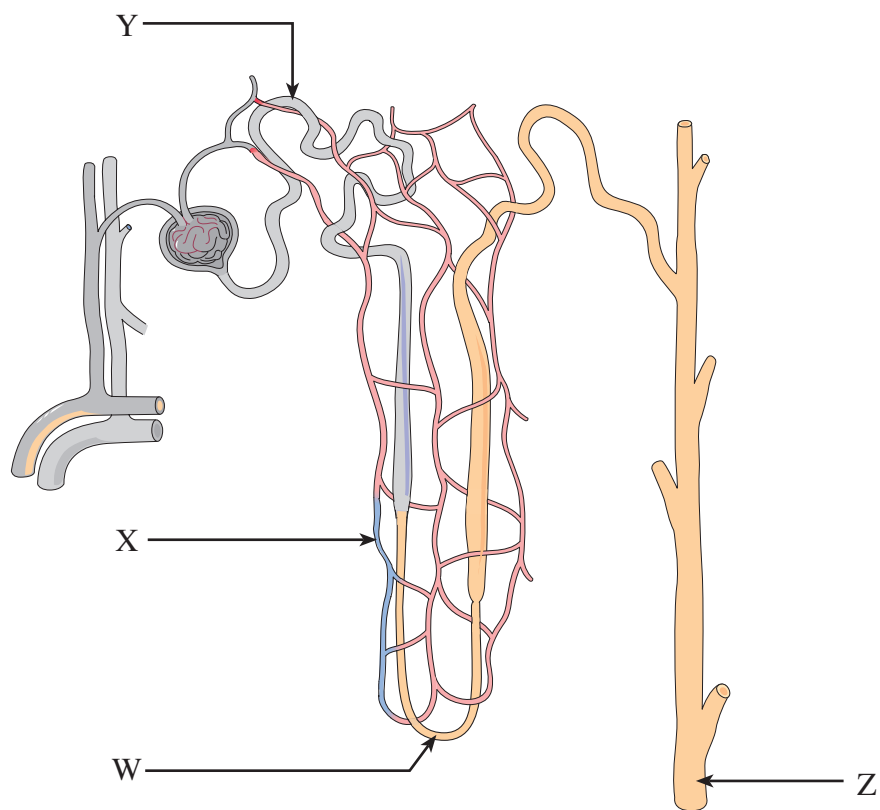
- A. sleeping
 - B. swallowing food
 - C. studying for an exam
 - D. performing a gymnastics routine
-

39. Which of the following inhibits the digestive actions of the stomach and the small intestine?

- A. cerebellum
- B. anterior pituitary gland
- C. sympathetic nervous system
- D. parasympathetic nervous system

40. Voluntary movement of the limbs is initiated by the
- A. cerebrum.
 - B. cerebellum.
 - C. hypothalamus.
 - D. medulla oblongata.
41. When proteins are broken down, urea is produced and enters the blood plasma. Which of the following processes would account for the presence of urea in the nephron?
- A. pressure filtration at the glomerulus
 - B. tubular excretion in the distal tubule
 - C. active transport in the collecting duct
 - D. facilitated transport in the proximal tubule
42. Which of the following structures would have cells with the greatest concentration of mitochondria in their cytoplasm?
- A. glomerulus
 - B. collecting duct
 - C. Bowman's capsule
 - D. proximal convoluted tubule
43. Low levels of sodium ions (Na^+) in the body result in the secretion of
- A. adrenalin.
 - B. aldosterone.
 - C. insulin.
 - D. thyroxin.

Use the following diagram to answer question 44.



44. Which of the following structures has receptor sites for ADH and aids in the reabsorption of water?

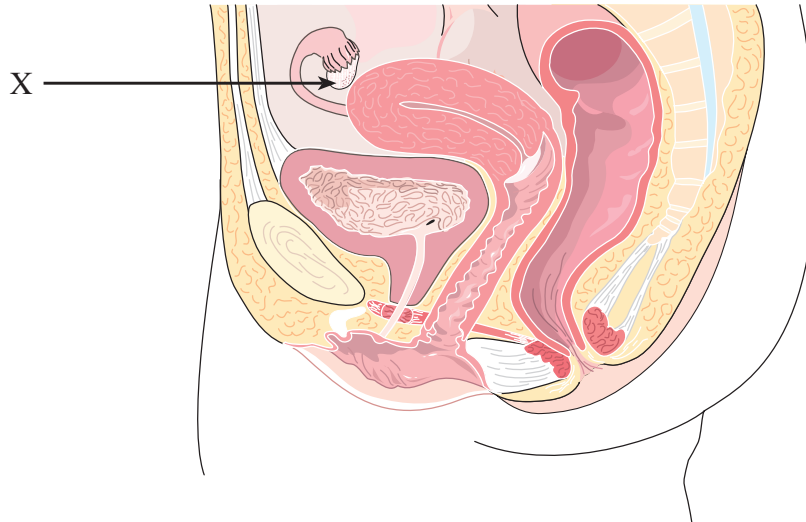
- A. W
- B. X
- C. Y
- D. Z

45. Which structure is sometimes surgically tied shut to prevent sperm from leaving the body?

- A. ureter
- B. seminal vesicle
- C. seminiferous tubules
- D. ductus (vas) deferens

46. Testosterone production in the male occurs in the
- A. prostate gland.
 - B. interstitial cells.
 - C. Cowper's gland.
 - D. seminiferous tubules.
47. The structure in the sperm that contains 23 chromosomes is the
- A. tail.
 - B. head.
 - C. acrosome.
 - D. mid-piece.
48. A steroid hormone produced in the ovary that causes breast development is
- A. estrogen.
 - B. aldosterone.
 - C. luteinizing hormone (LH).
 - D. follicle-stimulating hormone (FSH).

Use the following diagram to answer question 49.



49. Which of the following structures is labelled X?

- A. ovary
- B. uterus
- C. cervix
- D. oviduct

50. Which of the following is true of human chorionic gonadotropin (HCG)?

- A. It stimulates the corpus luteum.
- B. It causes progesterone levels to decrease.
- C. It causes degeneration of the endometrium.
- D. It stimulates the secretion of follicle-stimulating hormone (FSH).

**This is the end of the multiple-choice section.
Answer the remaining questions directly in this examination booklet.**

OVER

PART B: WRITTEN RESPONSE

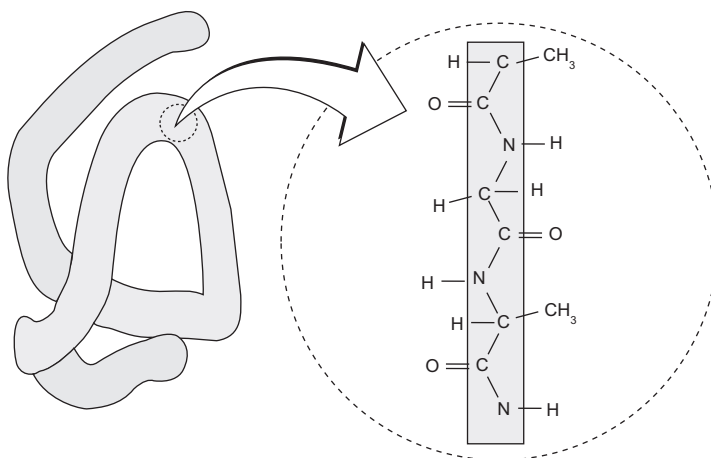
Value: 50 marks

Suggested Time: 75 minutes

- INSTRUCTIONS:**
1. Use a **pen** for this part of the examination unless otherwise instructed.
 2. Write your answers in the space below the questions.
 3. Organization and planning space has been incorporated into the space allowed for answering each question.
 4. You may not need all of the space provided to answer each question.

Use the following diagram to answer question 1 a).

Molecule X



1. a) i) Identify molecule **X** and name the organelle where the molecule is made.

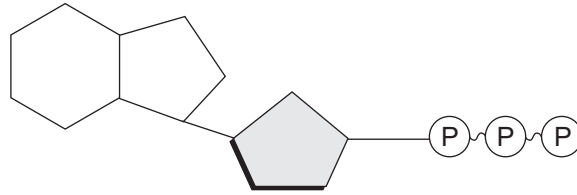
Name of molecule: **(1 mark)**

Name of organelle where made: **(1 mark)**

- ii) Describe **two** ways in which molecule **X** is used by the cell membrane. **(2 marks)**

Use the following diagram to answer question 1 b).

Molecule Y



b) i) Identify molecule **Y** and name the organelle where the molecule is made.

Name of molecule:

(1 mark)

Name of organelle where made:

(1 mark)

ii) Describe **two** ways in which molecule **Y** is used by the cell membrane. (2 marks)

Use the following chart of mRNA codons to answer question 2 a).

Three-letter codons of messenger RNA and the amino acids specified by the codons			
AAU } AAC } Asparagine	CAU } CAC } Histidine	GAU } GAC } Asparatic acid	UAU } UAC } Tyrosine
AAA } AAG } Lysine	CAA } CAG } Glutamine	GAA } GAG } Glutamate	UAA } UAG } Stop
ACU } ACC } ACA } ACG } Threonine	CCU } CCC } CCA } CCG } Proline	GCU } GCC } GCA } GCG } Alanine	UCU } UCC } UCA } UCG } Serine
AGU } AGC } Serine	CGU } CGC } CGA } CGG } Arginine	GGU } GGC } GGA } GGG } Glycine	UGU } UGC } Cysteine
AGA } AGG } Arginine			UGA – Stop UGG – Tryptophan
AUU } AUC } AUA } Isoleucine	CUU } CUC } CUA } CUG } Leucine	GUU } GUC } GUA } GUG } Valine	UUU } UUC } Phenylalanine
AUG – Methionine			UUA } UUG } Leucine

2. A segment of hemoglobin has the following sequence of amino acids:

leucine–threonine–proline–glutamate–glutamate

The same segment of hemoglobin found in people who have sickle-cell anemia has the following sequence:

leucine–threonine–proline–valine–glutamate

a) Using the chart above, explain how DNA is different in people with sickle-cell anemia.

(2 marks)

b) State **two** environmental agents that can change the DNA.

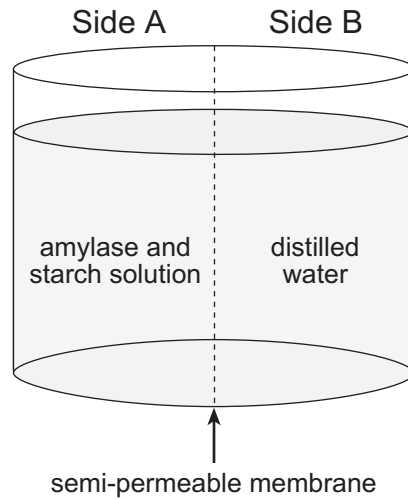
(2 marks)

i) _____

ii) _____

3. Tissue sample **A** is taken from a mole on the skin that shows abnormal growth while tissue sample **B** is composed of normal skin cells. Describe how the cells in tissue sample **A** are different from those in tissue sample **B**. **(3 marks)**

Use the following diagram to answer question 4.



4. Side **A** contains a solution of amylase and starch. Side **B**, which only contains distilled water, is separated from side **A** by a semi-permeable membrane. The contents of the beaker are kept at 37°C.

a) What characteristic does the semi-permeable membrane share with a living membrane? **(1 mark)**

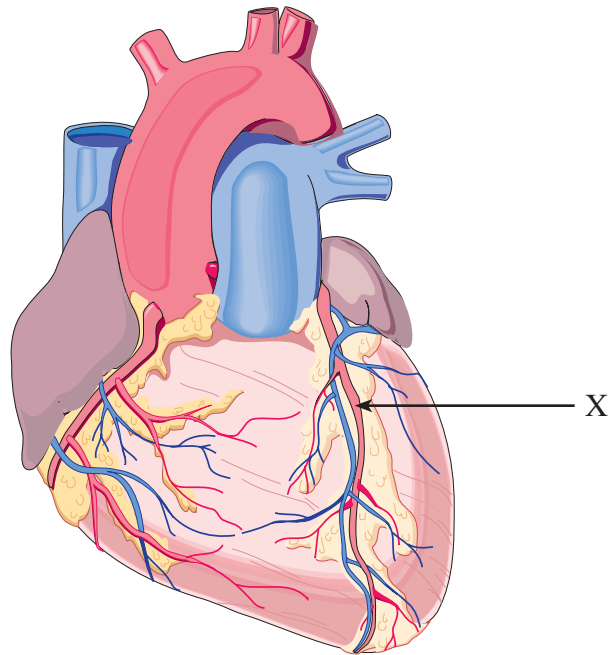
b) After 20 minutes, the liquid on side **B** was tested and a disaccharide was found. Identify this disaccharide and account for its presence on side **B**.

(3 marks: 1 mark for name; 2 marks for explanation)

Name: _____

Explanation: _____

Use the following diagram to answer question 5 a).



5. a) Describe **three** things that would occur if the artery labelled **X** became blocked? (3 marks)

i) _____

ii) _____

iii) _____

b) What would happen if the atrioventricular (AV) valve in the left side of the heart did **not** close properly? (2 marks)

Use the following information to answer questions 6 a) and b).

ACTIVITY	RATE OF AIR INTAKE
exercise	7–8 L/min.
sitting (at rest)	4–5 L/min.
sleeping	2 L/min.

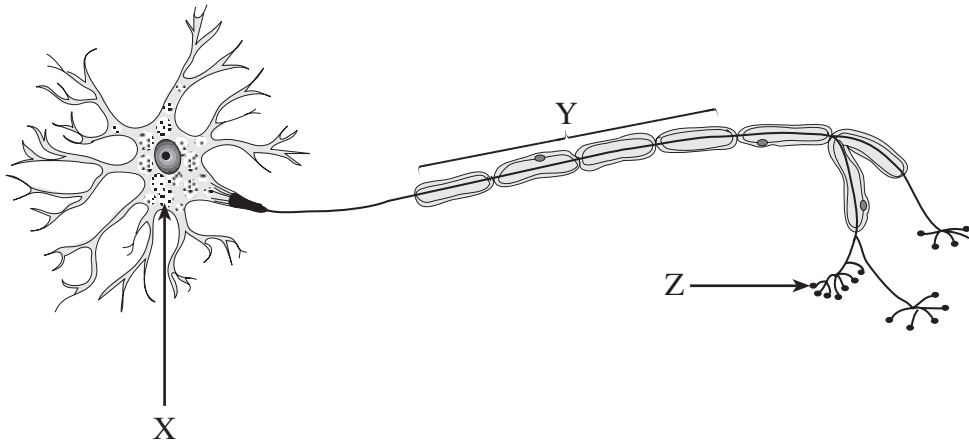
6. a) What substance found in the plasma would cause the change in the rate of air intake during exercise? **(1 mark)**

- b) Write the chemical reactions that occur during internal respiration that return the rate of air intake during exercise to the resting rate. **(2 marks)**

- c) i) Why would a drop in pH cause the enzymes that clot blood to function at a slower rate? **(2 marks)**

- ii) State **two** other conditions that would have the same effect on the enzymes in the blood. **(2 marks)**

Use the following diagram to answer question 7.



7. a) Identify the following structures.

(2 marks: 1 mark each)

Structure **X**:

Structure **Z**:

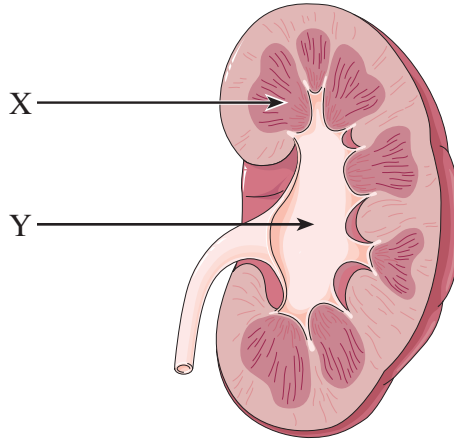
b) Describe the stages in the transmission of a nerve impulse.

(4 marks)

c) How would nerve impulse transmission be affected without the cells that form structure **Y**?

(1 mark)

Use the following diagram to answer questions 8 a) and b).



8. a) Identify structure **X** and describe the environment within the structure.

(2 marks: 1 mark for name; 1 mark for description)

Name: _____

Description: _____

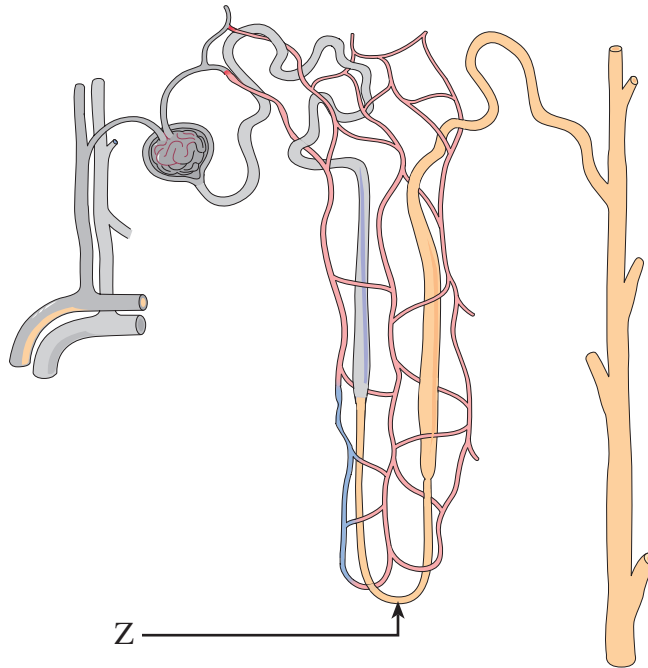
b) Identify structure **Y** and give its function.

(2 marks: 1 mark for name; 1 mark for function)

Name: _____

Function: _____

Use the following diagram to answer question 8 c).



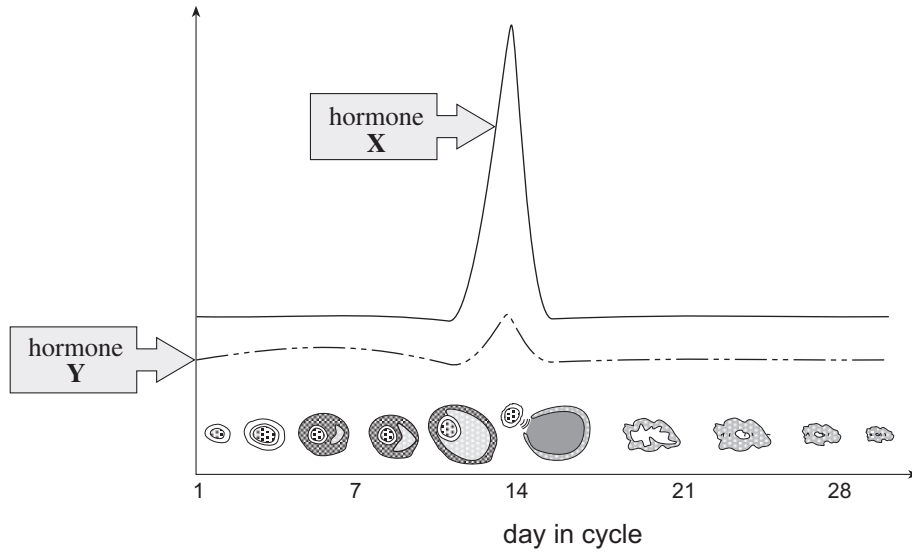
c) Identify structure **Z** and describe **two** characteristics that assist in its function.
(3 marks: 1 mark for name; 2 marks for characteristics)

Name: _____

Characteristic 1: _____

Characteristic 2: _____

Use the following diagram to answer question 9.



9. a) On what day does ovulation take place? (1 mark)

b) i) Identify hormone X. (1 mark)

ii) What structure secretes hormone X? (1 mark)

c) Describe the effects on the body caused by the release of hormone Y between days 1 and 14. (2 marks)

END OF EXAMINATION