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Biology 12

AUGUST 2004

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	0	1	2	3	4		▪	(5)	NR	
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Question 2	0	1	2				▪	(5)	NR	
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Question 3	0	1	2	3	4	5		▪	(5)	NR
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
Question 4	0	1	2	3	4		▪	(5)	NR	
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Question 5	0	1	2				▪	(5)	NR	
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Question 6	0	1	2	3			▪	(5)	NR	
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Question 7	0	1	2	3			▪	(5)	NR	
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BIOLOGY 12

AUGUST 2004

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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: 67 multiple-choice questions	67 marks	80 minutes
PART B: 7 written-response questions	23 marks	40 minutes
Total:	90 marks	120 minutes

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PART A: MULTIPLE CHOICE

Value: 67 marks

Suggested Time: 80 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 on the Response Form that has the letter corresponding to your answer.

1. Which organelles produce molecules for cell recognition?
- A. the ribosomes
 - B. the lysosomes
 - C. the Golgi bodies
 - D. the mitochondria

Use the following diagrams to answer question 2.

Diagram 1

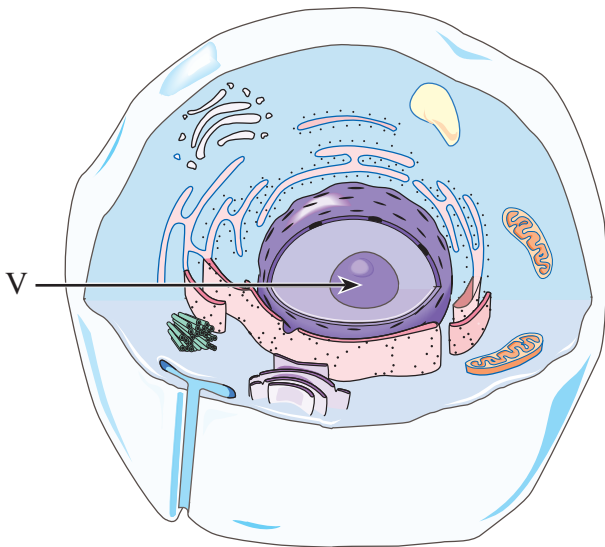
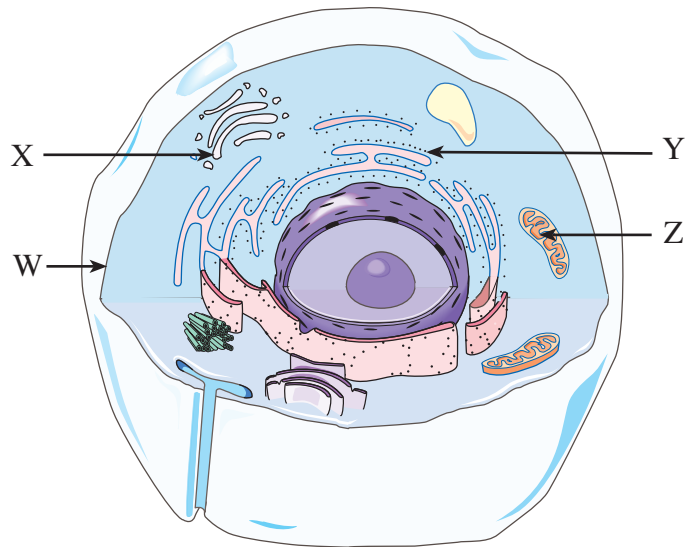


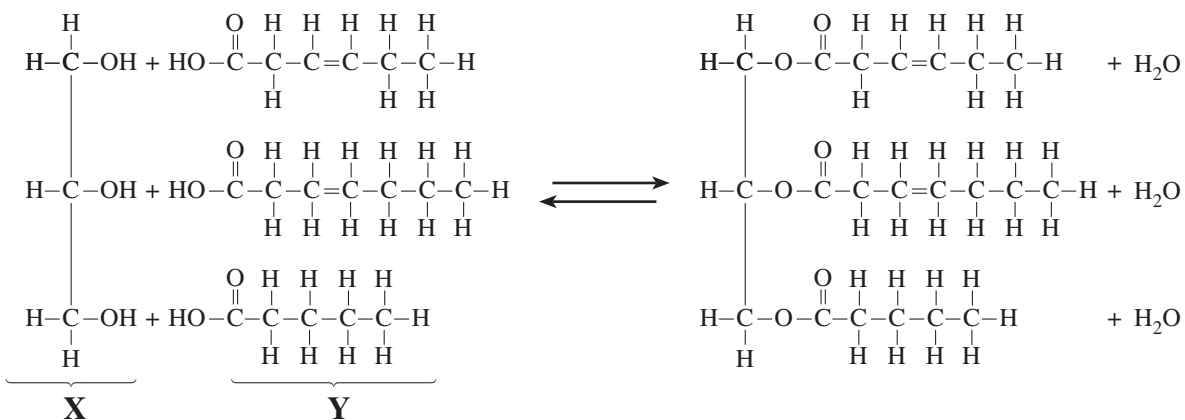
Diagram 2



2. The structure labelled **V** in diagram 1 produces a substance that is a part of which cellular structure in diagram 2?
- A. W
 - B. X
 - C. Y
 - D. Z

3. What molecules are produced during the hydrolysis of dipeptides?
- nucleotides
 - amino acids
 - fatty acids and glycerol
 - glucose molecules and water
4. During what type of reaction do glucose molecules bond together to form starch?
- synthesis
 - hydrolysis
 - translation
 - transcription

Use the following diagram to answer question 5.

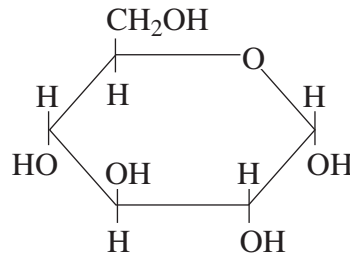


5. What are the structures labelled X and Y?

	X	Y
A.	starch	glycogen
B.	amino acid	tripeptide
C.	glycerol	fatty acid
D.	glycogen	ATP

6. How are carbohydrates, lipids, proteins and nucleic acids similar?
- A. They act as catalysts.
 - B. They are made up of carbon atoms.
 - C. They have a tertiary shape held together by hydrogen bonds.
 - D. They form part of the phospholipid bilayer in the cell membrane.

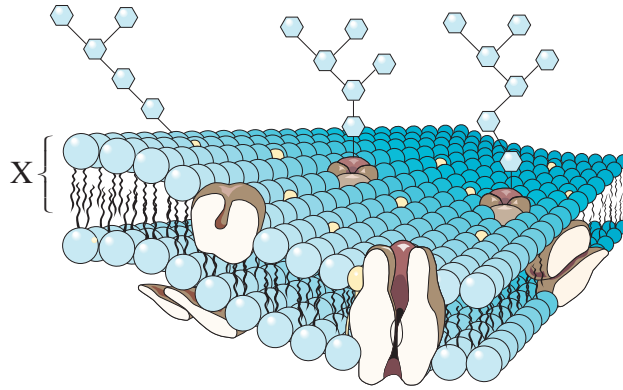
Use the following diagram to answer question 7.



7. Which polymer is formed by the monomer shown in the diagram?
- A. lipid
 - B. protein
 - C. sucrose
 - D. glycogen
-

8. Which element is present in proteins but **not** in most carbohydrates?
- A. carbon
 - B. oxygen
 - C. nitrogen
 - D. hydrogen

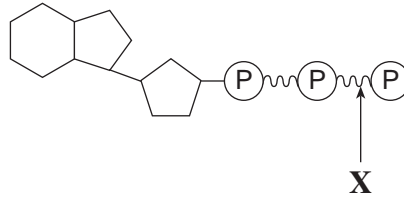
Use the following diagram to answer question 9.



9. Which of the following molecules is a component of X?

- A. glucose
- B. fatty acids
- C. nucleotides
- D. amino acids

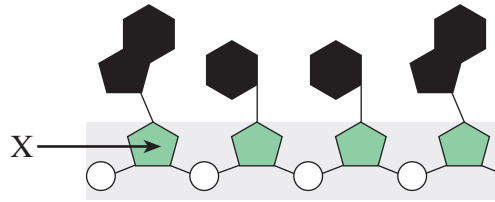
Use the following diagram to answer question 10.



10. What occurs when the bond labelled X is broken?

- A. Energy is released.
- B. Water is produced.
- C. The molecule is denatured.
- D. Carbon dioxide is produced.

Use the following diagram to answer question 11.



11. What is the structure labelled X?
- A. uracil
 - B. ribose
 - C. protein
 - D. phosphate
-
12. Which of the following is a product of the hydrolysis of DNA?
- A. water
 - B. ribose
 - C. nucleotides
 - D. an amine group
13. What type of chemical bond is broken during the first step of replication?
- A. ionic
 - B. peptide
 - C. covalent
 - D. hydrogen
14. What is the production of mRNA called?
- A. mutation
 - B. translation
 - C. replication
 - D. transcription

Use the following chart to answer question 15.

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

15. What is a base sequence for a section of DNA which codes for the amino acids serine and arginine?

- A. A G C A G A
- B. A G T G C T
- C. A G U A G A
- D. U C A U C U

16. What molecule does the word “mosaic” refer to in the fluid-mosaic model of cell-membrane structure?

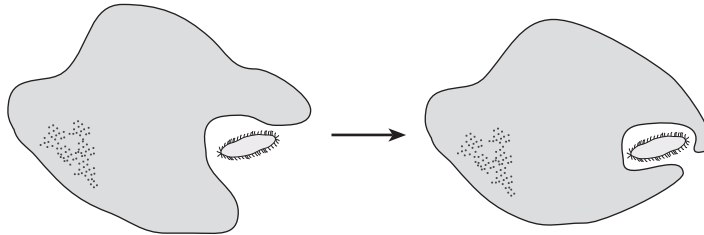
- A. protein
- B. glycogen
- C. cholesterol
- D. phospholipid

17. What is the diffusion of water across a selectively-permeable membrane called?

- A. osmosis
- B. pinocytosis
- C. endocytosis
- D. active transport

18. Which of the following would result in the greatest rate of diffusion of particles across a membrane?
- A. small particles at 10°C
 - B. large particles at 20°C
 - C. large particles at 30°C
 - D. small particles at 40°C

Use the following diagram to answer question 19.



19. What is the process illustrated in the diagram above?
- A. hydrolysis
 - B. exocytosis
 - C. pinocytosis
 - D. phagocytosis
-
20. What happens to an animal cell when it is placed in a hypertonic solution?
- A. lysis
 - B. crenation
 - C. plasmolysis
 - D. increased turgor
21. The secretion of thyroxin would trigger which of the following effects?
- A. an increase in ATP production
 - B. a decrease in the speed of nerve impulse transmission
 - C. an increase in the amount of glycogen present in the liver
 - D. a decrease in the amount of sodium re-absorbed into the blood

Use the following chart to answer question 22.

	Temperature (°C)	pH	Substrate
W	37	2.0	protein
X	37	8.0	starch
Y	70	7.4	dipeptides
Z	15	2.0	protein

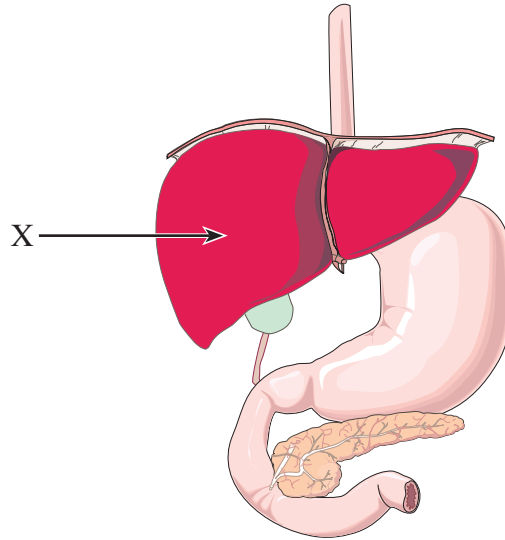
22. During which of the conditions above would pepsin function optimally?

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

23. Which structure is **not** part of the pathway that food follows on its way through the digestive tract?

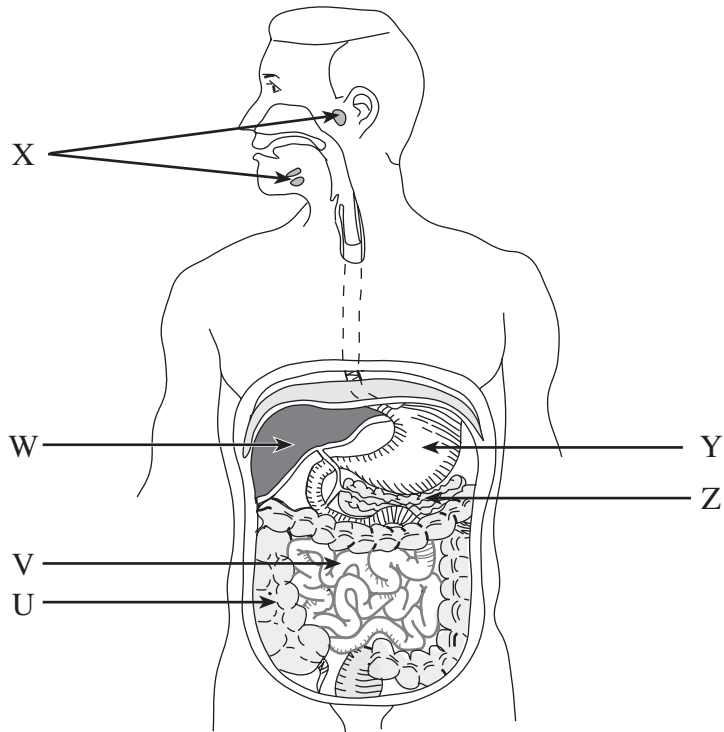
- A. pharynx
- B. duodenum
- C. gall bladder
- D. cardiac sphincter

Use the following diagram to answer question 24.



24. What is a function of the secretions produced by structure **X**?
- A. to increase the surface area of fats
 - B. to decrease the pH of the stomach
 - C. to break down proteins to peptides
 - D. to break down glycogen to maltose

Use the following diagram to answer questions 25 and 26.



25. Which structures produce secretions which aid in the digestion of proteins?

- A. U, Y
- B. V, W
- C. Y, Z
- D. X, V

26. Which structures produce secretions which aid in the digestion of carbohydrates?

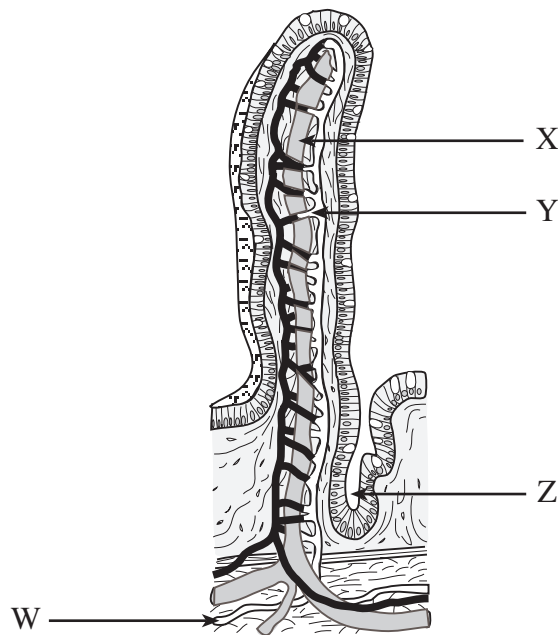
- A. U, V
- B. U, Y
- C. W, V
- D. X, Z

27. How would digestion be affected if liver secretions were unable to enter the duodenum?

- A. The rate of emulsification would increase.
- B. The breakdown of maltose would increase.
- C. There would be less amino acid production.
- D. The rate of fatty acid production would decrease.

28. Which of the following is a result of the low pH of the stomach?
- A. the production of vitamin K
 - B. the activation of trypsinogen
 - C. the break down of starch to maltose
 - D. the conversion of pepsinogen to pepsin

Use the following diagram to answer question 29.



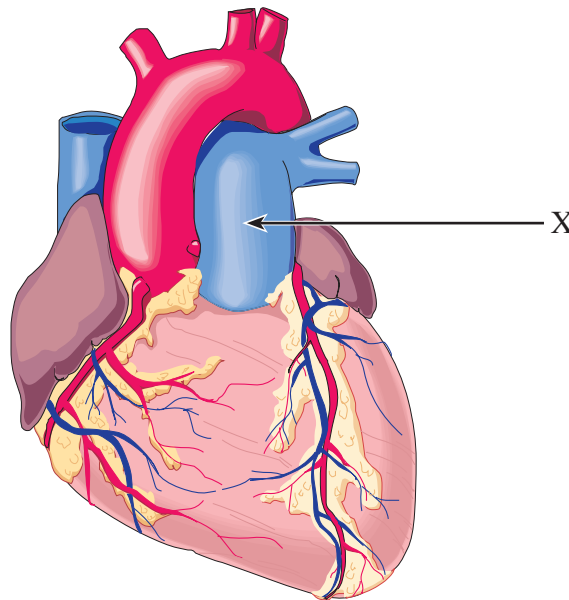
29. Where does the absorption of amino acids take place?
- A. W
 - B. X
 - C. Y
 - D. Z

-
30. Which characteristics of the digestive system increase its surface area?
- A. *E. coli*, bile and villi
 - B. villi, ridges/folds and length
 - C. sphincters, peristalsis and epiglottis
 - D. intestinal glands, gastric glands and ridges/folds

31. Which blood vessels carry blood to and from the legs?

- A. iliac arteries and veins
- B. renal arteries and veins
- C. hepatic vein and posterior vena cava
- D. mesenteric arteries and hepatic portal vein

Use the following diagram to answer questions 32 and 33.



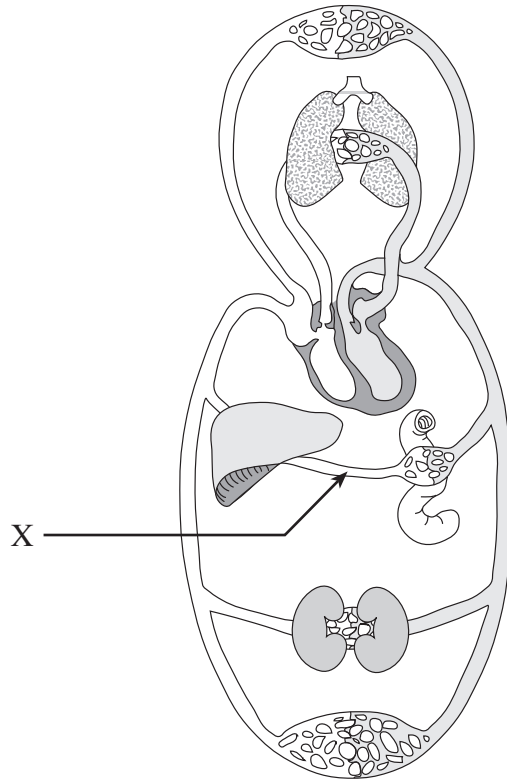
32. What is the function of structure **X**?

- A. to carry oxygenated blood to the body from the heart
- B. to return oxygenated blood to the heart from the lungs
- C. to carry deoxygenated blood to the lungs from the heart
- D. to return deoxygenated blood to the heart from the body

33. Which blood vessel is **not** shown in the diagram?

- A. the aorta
- B. the coronary artery
- C. the anterior vena cava
- D. the posterior vena cava

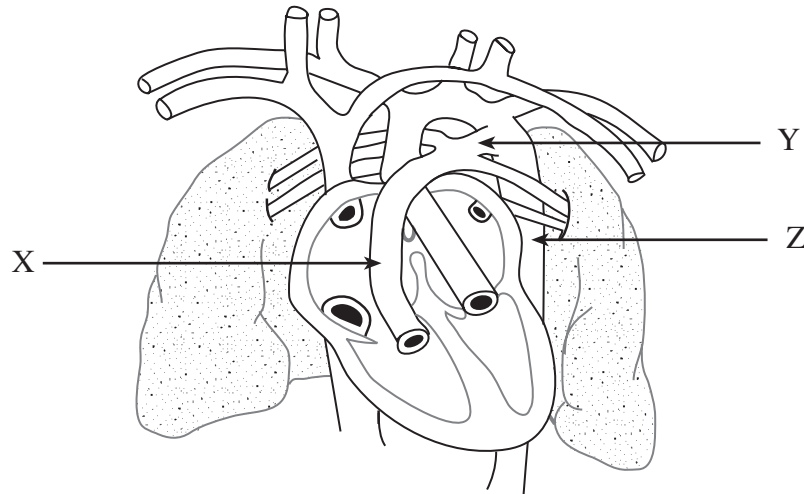
Use the following diagram to answer question 34.



34. What is the blood vessel labelled **X**?

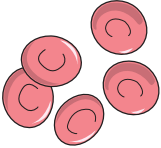
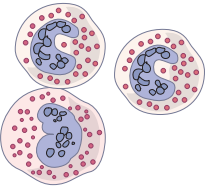
- A. the renal vein
- B. the hepatic vein
- C. the mesenteric artery
- D. the hepatic portal vein

Use the following diagram to answer question 35.



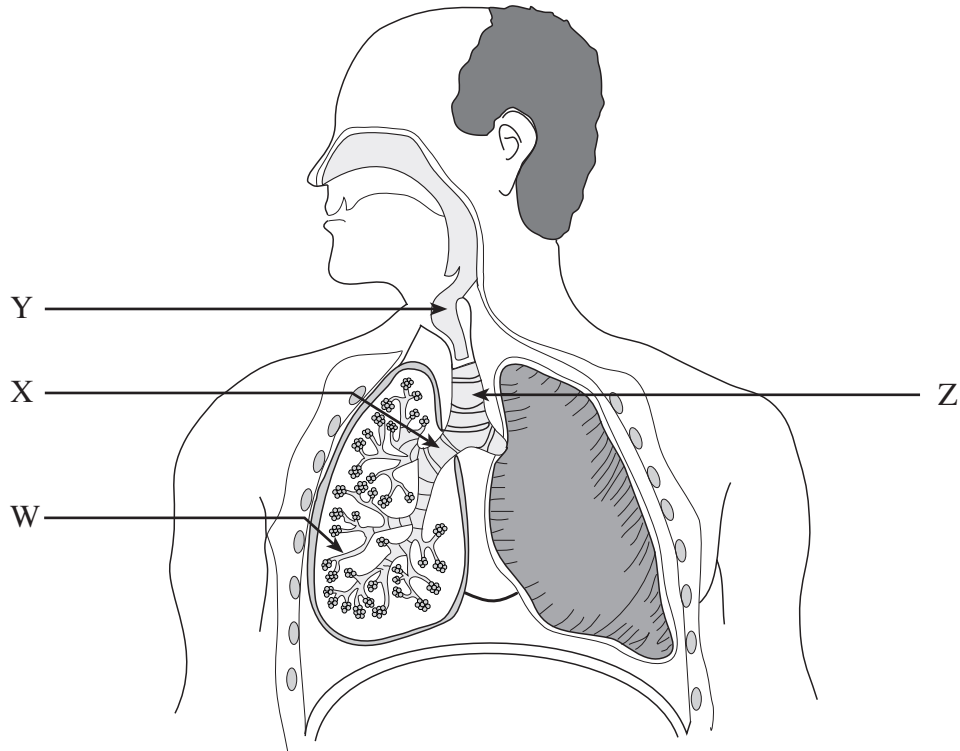
35. What would be a result of structure **Y** remaining functional after birth?
- A. Blood would flow from the left ventricle to the right ventricle.
 - B. The levels of oxygen in structure **Z** would be lower than normal.
 - C. The levels of carbon dioxide in structure **X** would be lower than normal.
 - D. Blood in the left atrium would have higher concentrations of oxygen than blood in the right atrium.

36. What are the functions of each type of cell shown?

	
A. to carry oxygen	to carry carbon dioxide
B. to fight infection	to engulf bacteria
C. to make antibodies	to fight infection
D. to transport hydrogen ions	to engulf bacteria

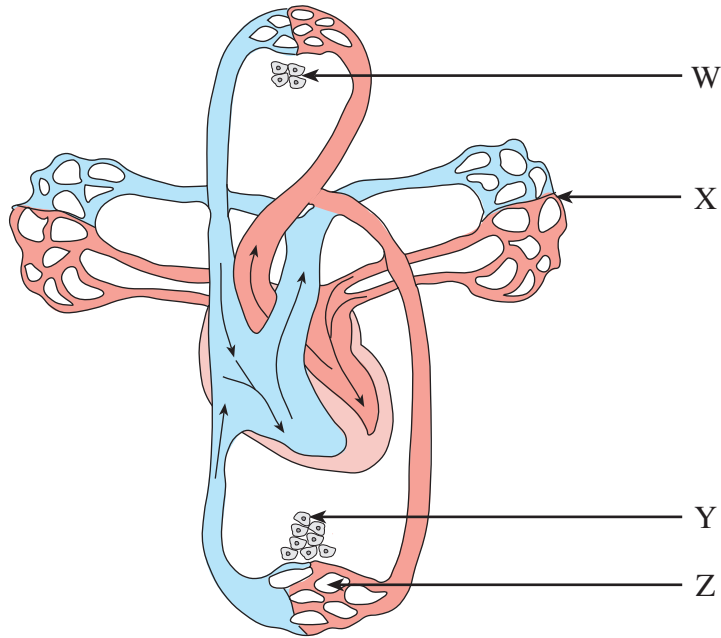
37. What causes materials to move from the blood to the tissues at the arterial end of the capillary bed?
- A. osmosis
 - B. blood pressure
 - C. active transport
 - D. facilitated transport
38. What is the last heart chamber that blood passes through on its way to the systemic system?
- A. left atrium
 - B. right atrium
 - C. left ventricle
 - D. right ventricle
39. Which heart structure is not functioning properly if an electrical device is needed to stimulate the atria to contract?
- A. septum
 - B. SA node
 - C. AV node
 - D. chordae tendineae
40. What is the function of the Purkinje fibres?
- A. to cause atrial contraction
 - B. to act as a pacemaker and initiate the heartbeat
 - C. to prevent the valves from inverting during heartbeat
 - D. to conduct impulses from the AV node to the ventricles
41. Where are the pleural membranes found?
- A. in both bronchi
 - B. inside the alveoli
 - C. surrounding all cells
 - D. lining the thoracic cavity

Use the following diagram to answer question 42.



42. Which structure is capable of constricting and dilating as a result of the contraction of the surrounding smooth muscle?
- A. W
 - B. X
 - C. Y
 - D. Z

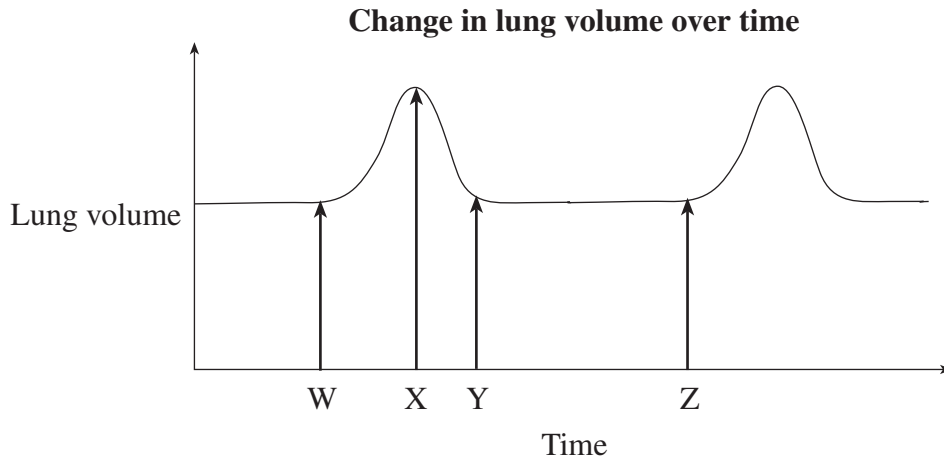
Use the following diagram to answer question 43.



43. Which of the following indicates the site of external respiration?

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

Use the following graph to answer question 44.



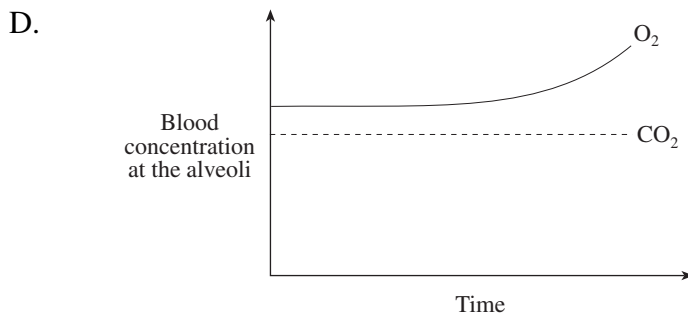
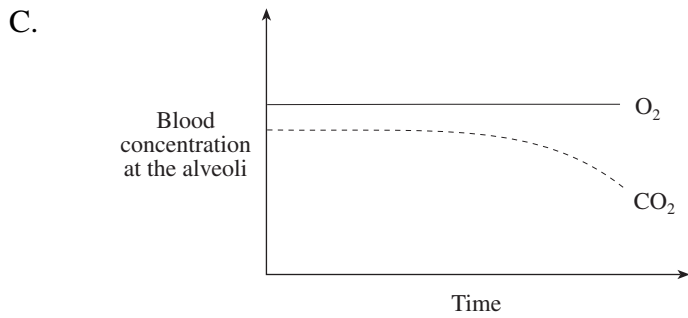
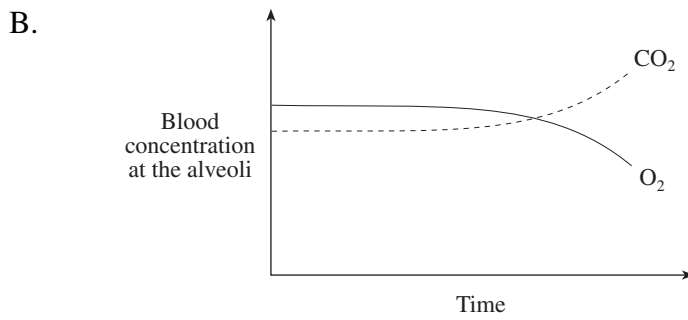
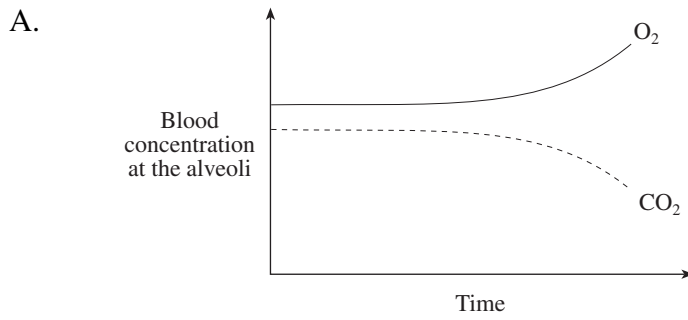
44. When does the diaphragm contract during breathing?

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

45. Which structure has rings of cartilage?

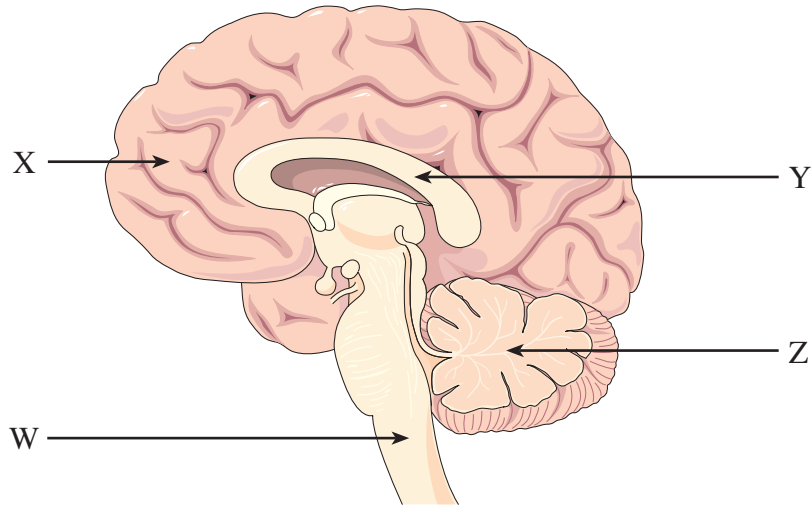
- A. the trachea
- B. the epiglottis
- C. the diaphragm
- D. the bronchioles

46. Which graph shows the changes that occur in oxygen and carbon dioxide concentrations in the blood during external respiration?



47. How does a neuron respond to a strong stimulus?
- A. It produces a larger action potential.
 - B. It causes more action potentials in a given period of time.
 - C. It causes action potentials to be conducted down the neuron at a faster rate.
 - D. It causes more ions to cross the neuron membrane during the action potential.
48. What is the pathway of an impulse in a reflex arc?
- A. from the brain to the interneuron, then to the sensory neuron
 - B. from the motor neuron to the brain, then to the sensory neuron
 - C. from the motor neuron to the interneuron, then to the sensory neuron
 - D. from the sensory neuron to the interneuron, then to the motor neuron
49. What type of cell is found only in the central nervous system?
- A. receptor
 - B. interneuron
 - C. motor neuron
 - D. sensory neuron
50. Which part of the nervous system functions to lower blood pressure and heart rate after a frightening experience?
- A. a reflex arc
 - B. the somatic system
 - C. the sympathetic system
 - D. the parasympathetic system
51. Which of the following occurs during increased acetylcholine secretion?
- A. bronchioles dilate
 - B. increase in blood pressure
 - C. decrease in intestinal activity
 - D. conversion of glucose to glycogen

Use the following diagram to answer questions 52 and 53.



52. Which labelled structure is responsible for smooth and coordinated movement in the body?

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

53. Which of the following is a function of structure **W**?

- A. solving a mathematical problem
- B. sweating to cool the body on a hot day
- C. waking up to music from an alarm clock
- D. sneezing when an irritant enters the nose

54. How does the hypothalamus control the secretion of hormones from the anterior pituitary?

- A. It sends impulses to the anterior pituitary by way of nerve cells.
- B. It sends neurotransmitter chemicals along axons to the anterior pituitary.
- C. It produces releasing hormones which are delivered to the anterior pituitary along axons.
- D. It produces releasing hormones that are transported to the anterior pituitary through the blood.

55. What structure stores urine?

- A. the ureter
- B. the urethra
- C. the renal medulla
- D. the urinary bladder

56. What organ removes urea from the blood and reabsorbs glucose and amino acids?

- A. the liver
- B. the kidney
- C. the pancreas
- D. the adrenal gland

Use the following list of substances to answer question 57.

water
urea
glucose
uric acid
large proteins
hydrogen ions
red blood cells

57. How many of these substances are normally found in urine?

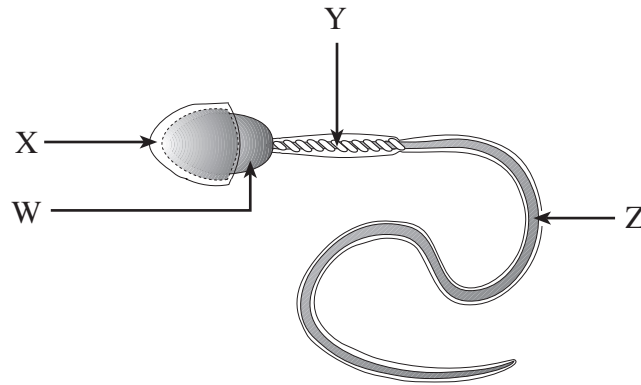
- A. 3
 - B. 4
 - C. 5
 - D. 6
-

58. What part of the kidney filters blood plasma, selectively re-absorbs salt and excretes potassium ions?

- A. the nephron
- B. the glomerulus
- C. the renal pelvis
- D. the renal medulla

59. Which of the following surrounds the glomerulus?
- A. the afferent arteriole
 - B. the Bowman's capsule
 - C. the peritubular capillaries
 - D. the proximal convoluted tubule
60. Inhibition of sodium reabsorption could lead to an increase in the excretion of which of the following?
- A. water
 - B. glucose
 - C. proteins
 - D. red blood cells
61. Through which structure do sperm travel after leaving the vas deferens?
- A. the urethra
 - B. the epididymis
 - C. the prostate gland
 - D. the seminiferous tubules
62. Which of the following is a function of the seminal vesicles?
- A. to carry semen to the urethra
 - B. to produce releasing hormones
 - C. to add secretions to the seminal fluid
 - D. to provide a place for sperm to mature

Use the following diagram to answer question 63.



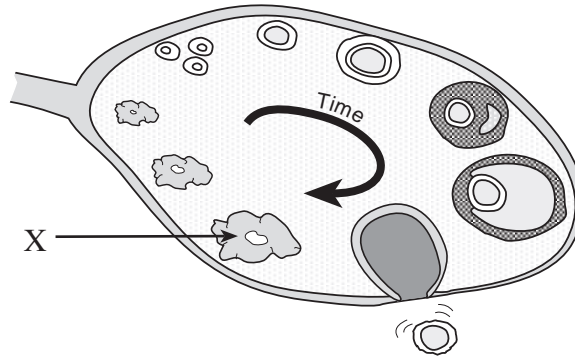
63. Which structure contains many mitochondria which provide energy for the cell to move?

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

64. Secretions from which of the following controls the production of testosterone?

- A. the prostate gland
- B. the seminiferous tubules
- C. the anterior pituitary gland
- D. the posterior pituitary gland

Use the following diagram to answer question 65.



65. Which substance causes the development of structure X?
- A. estrogen
 - B. luteinizing hormone
 - C. follicle-stimulating hormone
 - D. human chorionic gonadotropin
-
66. The secretory phase of the uterine cycle is primarily the result of increased secretions by the
- A. follicle.
 - B. endometrium.
 - C. corpus luteum.
 - D. posterior pituitary.
67. Which of the following would be a result of increased levels of HCG in the blood?
- A. Menstruation would occur.
 - B. Ovulation would not occur.
 - C. There would be a decrease in the amount of progesterone secreted.
 - D. There would be an increase in the concentration of follicle-stimulating hormone in the blood.

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

PART B: WRITTEN RESPONSE

Value: 23 marks

Suggested Time: 40 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. You may not need all of the space provided to answer each question.

1. Describe **four** different functions of proteins found in the cell membrane. **(4 marks)**

2. Explain how the following are involved in protein synthesis. **(2 marks: 1 mark each)**

nucleolus:

enzymes:

Use the following data to answer question 3.

Amount of substrate (g)	Rate of product production (g/min)
0.3	0.3
0.9	0.9
1.3	1.3
2.4	1.3
3.5	1.3

3. In an enzyme-catalyzed reaction, the amount of substrate was measured and compared to the rate of product production. The data is shown above.

a) Graph the data. (Plot the amount of substrate [independent variable] on the x -axis.)

(2 marks)

Rate of product production vs. Amount of substrate



b) Explain the observed results.

(2 marks)

c) Suggest a way to increase the rate of product production for substrate amounts greater than 3.5 grams.

(1 mark)

5. a) Explain why the knee-jerk reflex still functions in a person with a severed spinal cord. **(1 mark)**

b) Why is there is no sensation of the stimulus? **(1 mark)**

6. Explain how ADH secretion affects the composition of the blood.

(3 marks)

7. Describe how the secretion of testosterone is regulated in males.

(3 marks)

END OF EXAMINATION