

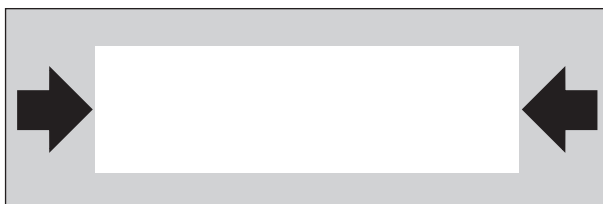
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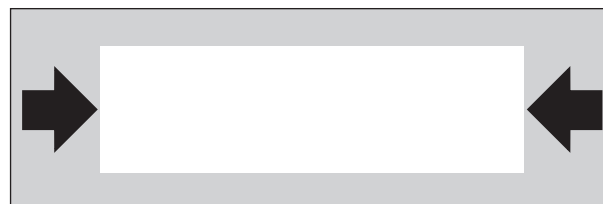
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Biology 12

AUGUST 2003

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. .

(4)

Question 9:

9. .

(5)

Question 2:

2. .

(3)

Question 10:

10. .

(6)

Question 3:

3. .

(4)

Question 11:

11. .

(4)

Question 4:

4. .

(7)

Question 12:

12. .

(2)

Question 5:

5. .

(4)

Question 6:

6. .

(4)

Question 7:

7. .

(3)

Question 8:

8. .

(4)

BIOLOGY 12

AUGUST 2003

COURSE CODE = BI

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 marks	45 minutes
PART B: 12 written-response questions	50 marks	75 minutes
Total:	100 marks	120 minutes

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PART A: MULTIPLE CHOICE

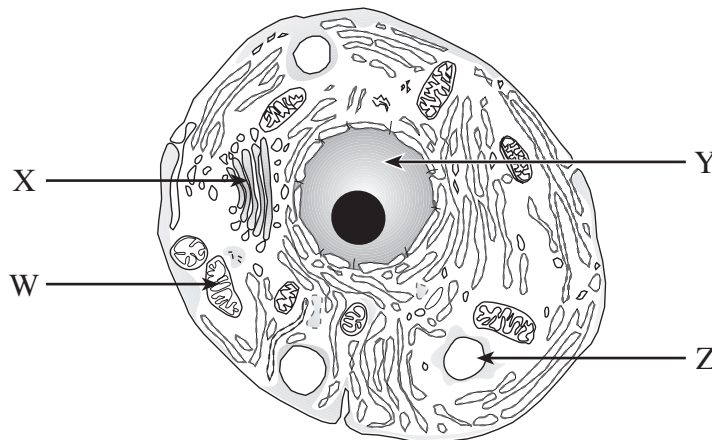
Value: 50 marks

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 on the Response Form that has the letter corresponding to your answer.

1. What organelle contains enzymes that hydrolyze proteins?
 - A. ribosomes
 - B. lysosomes
 - C. rough endoplasmic reticulum
 - D. smooth endoplasmic reticulum

Use the following diagram to answer question 2.



2. Which labelled structure modifies polypeptides produced at the rough endoplasmic reticulum?
 - A. W
 - B. X
 - C. Y
 - D. Z

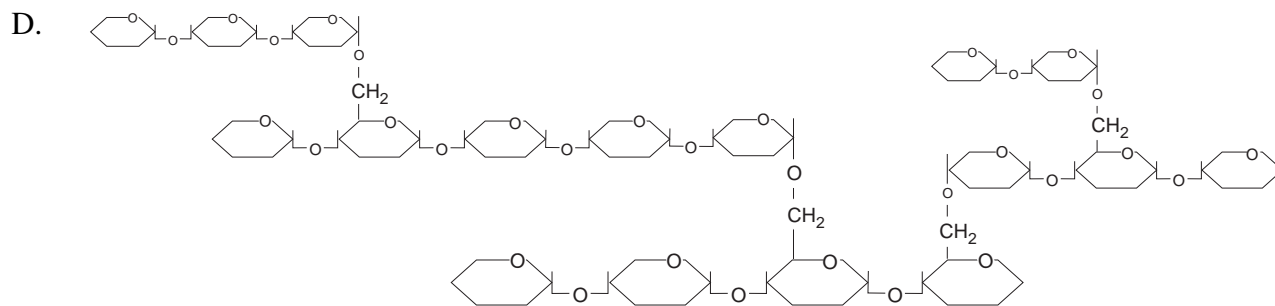
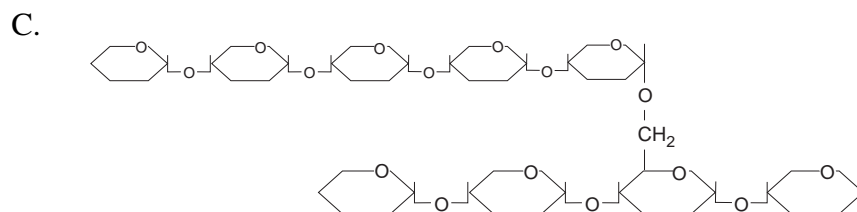
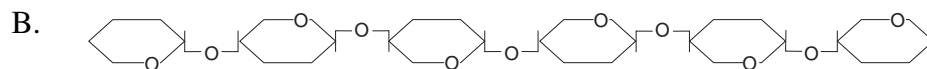
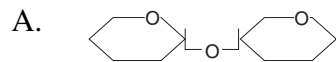
3. Which of the following increases in concentration when amino acids are dissolved in water?

- A. H^+
- B. OH^-
- C. HCO_3^-
- D. $COOH$

4. What is the empirical formula of a carbohydrate?

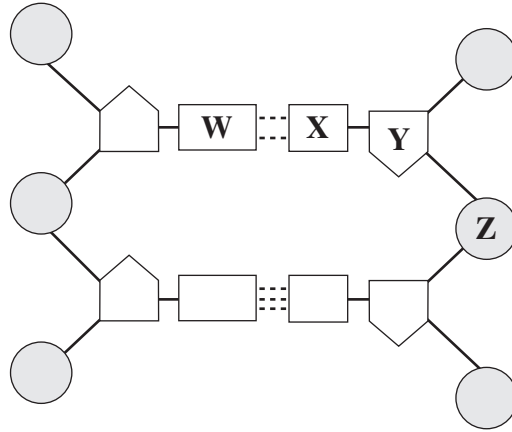
- A. CH_4
- B. CHO
- C. CH_2O
- D. $C_6H_{12}O_6$

5. Which of the following would function as a structural component of plant cell walls?



6. What accounts for the secondary structure of a protein molecule?
- A. hydrolysis
 - B. denaturation
 - C. ionic bonding
 - D. hydrogen bonding
7. Which of the following is an example of complementary base pairing?
- A. guanine—uracil
 - B. adenine—cytosine
 - C. cytosine—thymine
 - D. cytosine—guanine
8. Which of the following is a characteristic of replication?
- A. Sugar joins to phosphate groups, producing new DNA.
 - B. Anticodons bond to codons by complementary base pairing, producing proteins.
 - C. Adenine bonds with thymine and cytosine bonds with guanine, producing mRNA.
 - D. Adenine bonds with uracil and cytosine bonds with guanine, producing new DNA.
9. What is meant by the term “unzipping” as it occurs during replication?
- A. denaturing of the DNA molecule
 - B. formation of temporary bonds between mRNA and tRNA
 - C. breaking the bonds between the bases of DNA nucleotides
 - D. breaking the bonds between the sugar and phosphate molecules

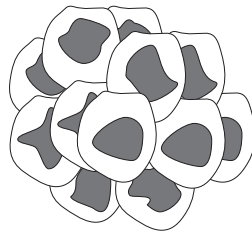
Use the following diagram to answer question 10.



10. Which of the following correctly identifies the parts labelled **W**, **X**, **Y** and **Z**?

	W	X	Y	Z
A.	phosphate	ribose	cytosine	guanine
B.	thymine	uracil	ribose	phosphate
C.	adenine	thymine	phosphate	ribose
D.	adenine	thymine	deoxyribose	phosphate

Use the following diagram to answer question 11.

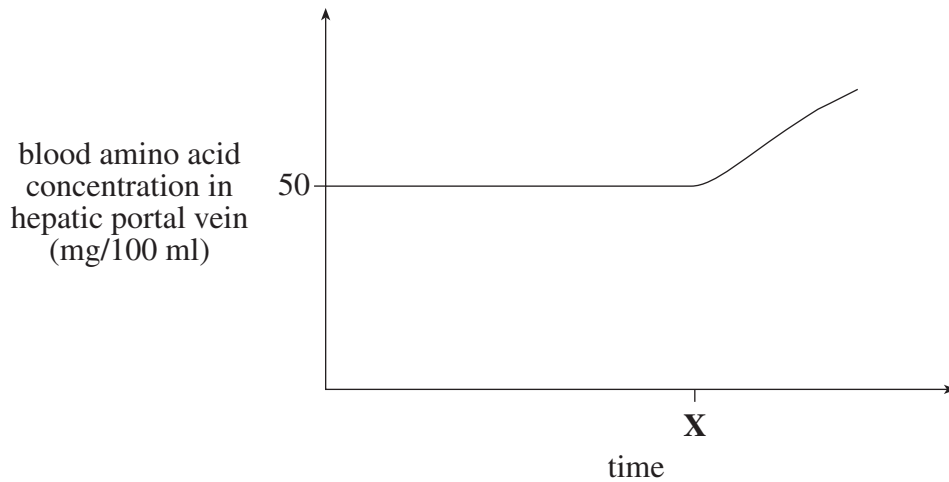


11. What are two characteristics of the cells shown in the diagram?

- A. rapid growth and low metabolic rate
- B. contact inhibition and abnormal nuclei
- C. lack of contact inhibition and disorganized growth
- D. contact inhibition and the inability to cause vascularization

12. When asbestos dust causes normal genes to become cancer-causing genes it is acting as
- A. a promoter.
 - B. an initiator.
 - C. an inhibitor.
 - D. an oncogene.
13. Which of the following does **not** affect the rate of an enzyme-catalyzed reaction?
- A. pH
 - B. temperature
 - C. osmotic pressure
 - D. substrate concentration
14. Vitamins act as which of the following in biochemical reactions?
- A. buffers
 - B. enzymes
 - C. substrates
 - D. coenzymes
15. What structure prevents food from entering the trachea?
- A. the tongue
 - B. the pharynx
 - C. the epiglottis
 - D. the cardiac sphincter
16. Which is a function of the large intestine?
- A. the secretion of bile
 - B. the absorption of vitamins
 - C. the production of glycogen
 - D. the release of sodium bicarbonate

Use the following graph to answer question 17.



17. What enzyme is responsible for the change at time X?
- A. lipase
 - B. amylase
 - C. nuclease
 - D. peptidase
-
18. Which of the following is a reactant in the chemical digestion of food?
- A. water
 - B. enzymes
 - C. hormones
 - D. heavy metals
19. Which enzyme functions optimally in a low pH?
- A. lipase
 - B. pepsin
 - C. trypsin
 - D. amylase
20. What would result if insulin was injected into a healthy person?
- A. Blood glucose levels would increase.
 - B. The liver would convert glycogen into glucose.
 - C. Glucose concentration in body cells would increase.
 - D. The cell membrane would become less permeable to glucose.

21. The removal of the gall bladder would affect the rate of digestion of which of the following?
- A. lipids
 - B. proteins
 - C. nucleotides
 - D. carbohydrates
22. Which of the following results in an increase in the surface area of food?
- A. lipase digesting starch
 - B. peristalsis in the stomach
 - C. synthesis of glycogen in the liver
 - D. absorption of water in the large intestine

Use the following table to answer question 23.

Blood vessel	Average blood pressure (mm Hg)	Total cross-sectional area (cm²)
W	100	2.5
X	1	8
Y	20	2500
Z	60	40

23. Through which vessel would blood move most slowly?
- A. W
 - B. X
 - C. Y
 - D. Z
-

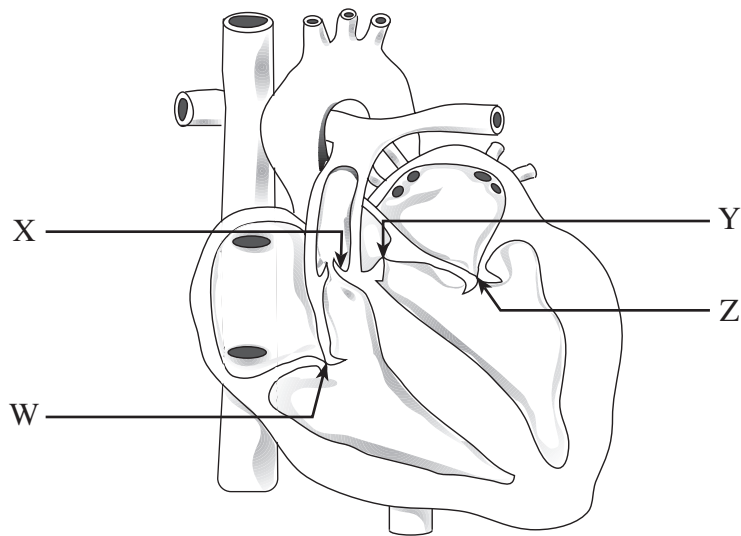
24. What two vessels carry blood to the anterior vena cava?
- A. the jugular vein and the iliac vein
 - B. the jugular vein and the subclavian vein
 - C. the hepatic portal vein and the renal vein
 - D. the coronary vein and the pulmonary vein

OVER

25. Which of the following maintains the osmotic pressure of the blood?

- A. urea
- B. protein
- C. glycogen
- D. phospholipids

Use the following diagram to answer question 26.



26. Which of the labelled structures prevents blood from re-entering the right atrium from the right ventricle?

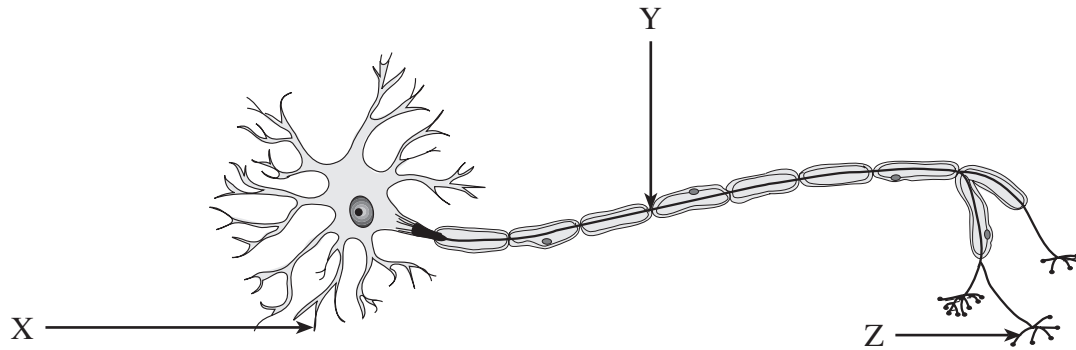
- A. W
- B. X
- C. Y
- D. Z

27. Through how many heart valves must a blood cell pass as it moves from the brain to the lungs?

- A. 2
- B. 4
- C. 6
- D. 8

28. What is the effect of acetylcholine on the body?
- A. It decreases the heart rate.
 - B. It increases the blood pressure.
 - C. It decreases the blood flow to the skin.
 - D. It decreases the blood flow to the digestive system.
29. Cilia in the trachea sweep debris toward which of the following structures?
- A. the alveoli
 - B. the bronchi
 - C. the pharynx
 - D. the bronchioles
30. What structure, composed of thin-walled epithelial cells that secrete lipoproteins, allows the diffusion of gases?
- A. the alveolus
 - B. the bronchiole
 - C. the diaphragm
 - D. the pleural membrane
31. Which of the following occurs during exhalation?
- A. The diaphragm flattens.
 - B. The rib muscles contract.
 - C. Air pressure increases in the lungs.
 - D. The thoracic cavity increases in volume.

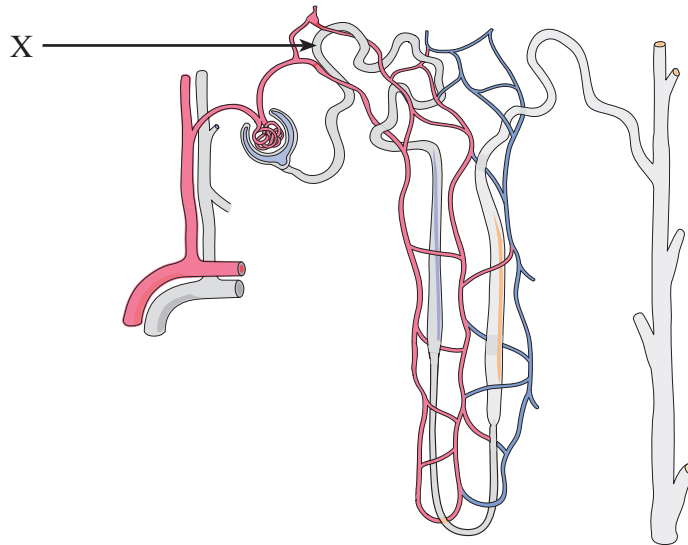
Use the following diagram to answer question 32.



32. Which of the following occurs if the neuron is stimulated at **Y**?
- A. The nerve impulse will travel to **X** and then to the brain.
 - B. The nerve impulse will travel to a sensory receptor located at **Z**.
 - C. The nerve impulse will travel to **Z** and then stimulate an effector.
 - D. The nerve impulse will travel to **X** and stimulate the release of neurotransmitters.
-
33. Which of the following events causes the polarity to change from -65mV to $+40\text{mV}$ across the membrane of the axon?
- A. the diffusion of sodium ions into the axon
 - B. the diffusion of potassium ions into the axon
 - C. the active transport of sodium ions out of the axon
 - D. the active transport of potassium ions out of the axon
34. Which of the following would initiate an action potential?
- A. the release of neurotransmitters from the postsynaptic membrane
 - B. the exit of potassium ions from the axon during the refractory period
 - C. the depolarization of the dendrite when the threshold level is reached
 - D. the decreased permeability of the presynaptic membrane to calcium ions
35. What is the function of hydrolytic enzymes in the synaptic cleft?
- A. to increase the threshold level
 - B. to break down neurotransmitters
 - C. to stimulate contractile proteins in the synaptic ending
 - D. to increase the permeability of the presynaptic membrane to calcium ions

36. Which of the following causes nerve impulses to move more quickly along the neuron?
- A. the presence of the myelin sheath
 - B. an increased intensity of the action potential
 - C. the stimulation of the parasympathetic nervous system
 - D. the action of hydrolytic enzymes present in the synaptic gap

Use the following diagram to answer question 37.



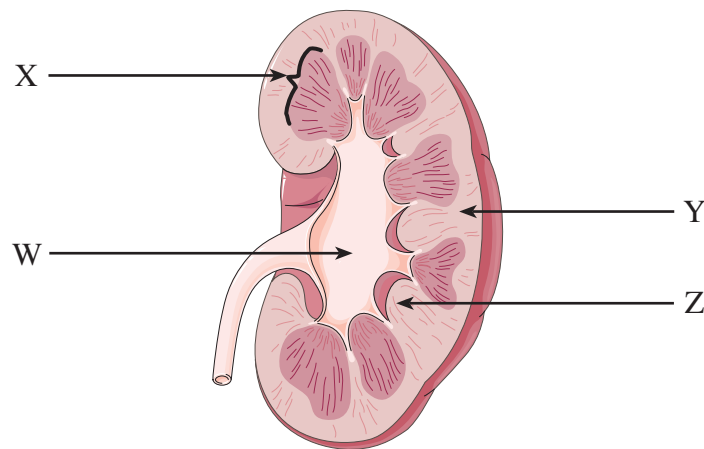
37. The structure labelled **X** is located in what part of the kidney?
- A. the renal artery
 - B. the renal pelvis
 - C. the renal cortex
 - D. the renal medulla
-

38. Where does active transport play an important role in urine formation?
- A. in the glomerulus
 - B. in the renal artery
 - C. in the Bowman's capsule
 - D. in the distal convoluted tubule

39. Urine enters the bladder through which structure?

- A. the ureter
- B. the kidney
- C. the urethra
- D. the collecting duct

Use the following diagram to answer question 40.



40. Which labelled structure receives the contents of the collecting ducts?

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

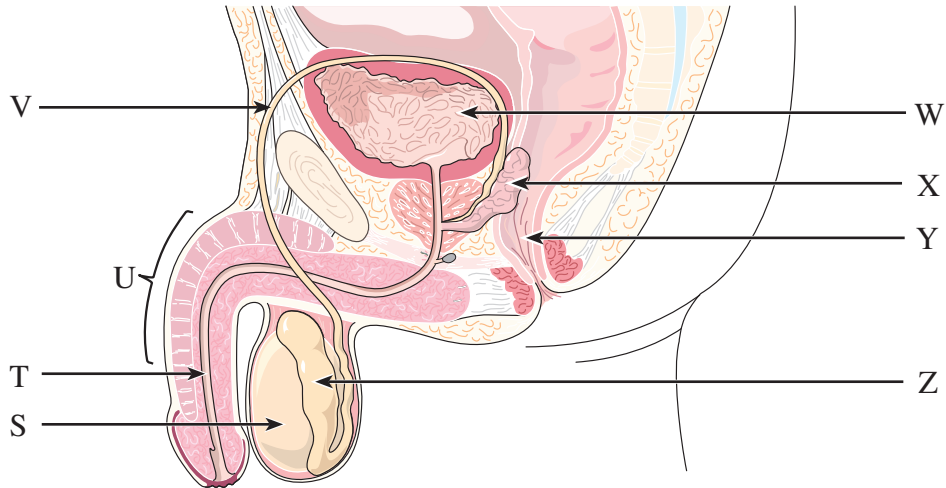
41. Upon what is filtration of blood in the glomerulus dependent?

- A. blood pressure
- B. decreased blood volume
- C. parasympathetic stimulation
- D. increased waste concentration in the blood

42. What structure secretes aldosterone?

- A. the adrenal gland
- B. the hypothalamus
- C. the pituitary gland
- D. the medulla oblongata

Use the following diagram to answer questions 43, 44, 45 and 46.



43. Which of the following correctly describes the pathway sperm follow from their formation to their exit from the body?

- A. U → Y → W → T
- B. S → Z → W → X
- C. S → Z → X → Y
- D. S → Z → V → T

44. Which of the following is a function of the secretions from the structure labelled S?

- A. to buffer the pH of the semen
- B. to cause beard growth at puberty
- C. to cause rhythmic contractions of the uterus
- D. to cause increased secretion of releasing hormones

45. Structure X refers to which of the following?

- A. the testes
- B. the epididymis
- C. the vas deferens
- D. the seminal vesicles

46. Which labelled structure transfers semen to the female?

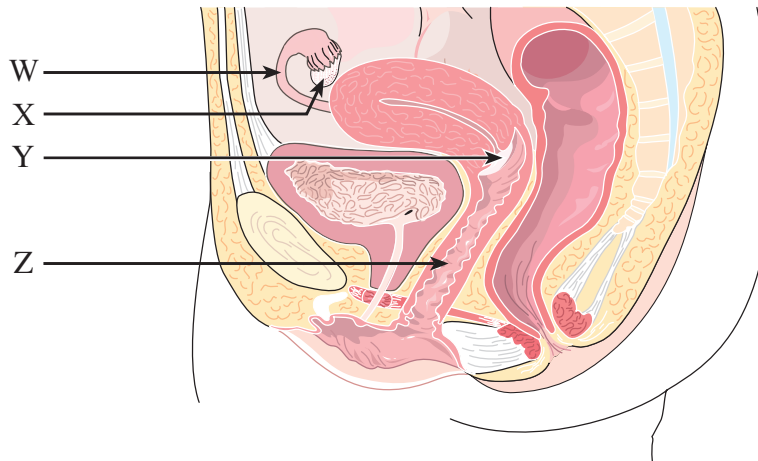
- A. X
- B. Y
- C. Z
- D. U

OVER

47. Which of the following structures secretes testosterone?

- A. the prostate
- B. the epididymis
- C. the vas deferens
- D. the interstitial cells

Use the following diagram to answer question 48.



48. Where does fertilization of an egg usually occur?

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

49. What occurs when hormones are released by the corpus luteum?

- A. Menstruation begins.
- B. The uterine lining thickens.
- C. The secretion of releasing hormones increases.
- D. The production of human chorionic gonadotropin (HCG) decreases.

50. What effect would decreasing levels of estrogen and progesterone have on the female reproductive system?
- A. Ovulation would occur.
 - B. The corpus luteum would degenerate.
 - C. The endometrium would break down.
 - D. The uterine lining would become secretory.

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

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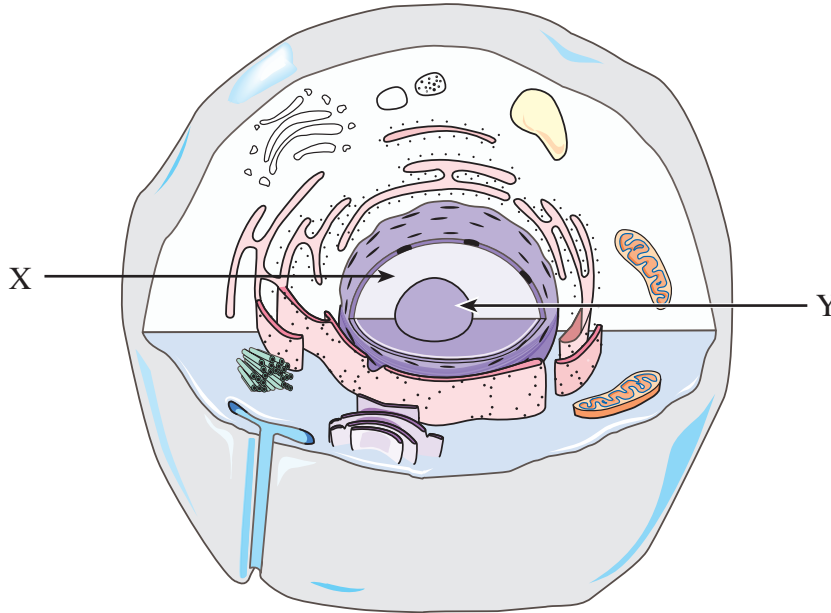
PART B: WRITTEN RESPONSE

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. You may not need all of the space provided to answer each question.

Use the following diagram to answer question 1.



1. Name structures **X** and **Y** and explain how each functions in protein synthesis.
(4 marks: 1 mark each for structure; 1 mark each for function)

structure **X**:

name: _____

function: _____

structure **Y**:

name: _____

function: _____

2. Draw a diagram showing the bonding between water molecules and explain how the structure of the water molecules allows these bonds to form. (You may use a pencil for your diagram.)
(3 marks: 1 mark for diagram; 2 marks for explanation)

explanation: _____

3. Describe how each of the following contributes to the production of a protein. **(4 marks)**

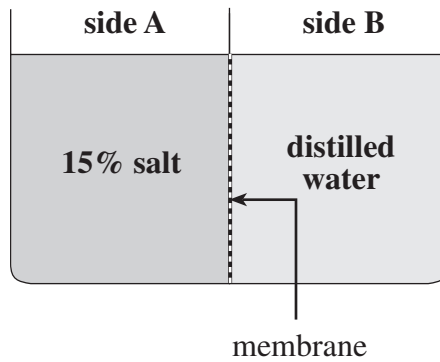
DNA:

codon:

tRNA:

ribosome:

Use the following diagram to answer question 4.



4. An experiment was carried out to study the movement of molecules through a membrane. Two solutions were placed into a container on either side of a membrane which is permeable to salt and water. The temperature was maintained at 40°C.

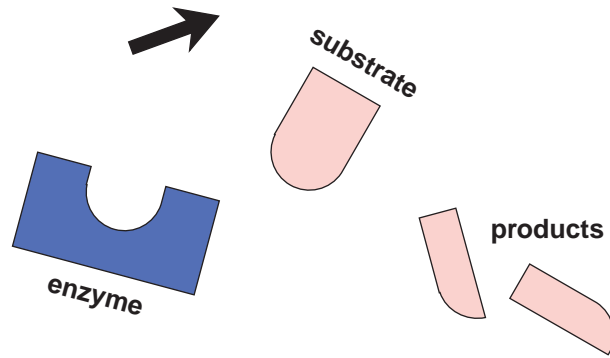
a) Describe what happens to the volume of the solution on both side **A** and side **B** after five hours. Explain your answer. **(2 marks)**

b) Describe what happens to the solute concentration on side **B**. Explain your answer. **(3 marks)**

- c) If the temperature at the beginning of the experiment was at 5°C , describe how the results obtained at 5°C would be different from the results obtained at 40°C . Explain your answer.

(2 marks)

Use the following symbols to answer question 5.



5. Using **all** of the symbols above as often as necessary, produce a diagram to illustrate how enzymes function. Explain your diagram. (You may use a pencil for your diagram.)
(4 marks: 2 marks for diagram; 2 marks for explanation)

explanation: _____

8. Complete the following table.

(4 marks: 1 mark each for location; 1 mark each for function)

Structure	Location in the heart	Function
Sinoatrial (SA) node		
Purkinje fibres		

9. a) Compare the pH and temperature of the blood in the lung capillaries with the blood in the capillaries of other body tissues. **(2 marks)**

- b) How does the pH and temperature of the blood in the body tissues affect the ability of oxygen to bind to hemoglobin? **(1 mark)**

- c) How would the conditions of the blood in the body tissues change during strenuous exercise? **(2 marks)**

10. a) Identify the division of the autonomic nervous system that is involved in the “fight or flight” response. **(1 mark)**

b) Identify the hormone involved in the “fight or flight” response, name its source gland, and give **three** effects that the hormone has on the body.
(5 marks: 1 mark for hormone; 1 mark for source gland; 3 marks for effects)

hormone: _____

source gland: _____

effects:

i) _____

ii) _____

iii) _____

11. Describe how the secretion of each of the following will affect the composition of blood.

(4 marks: 2 marks each)

aldosterone:

antidiuretic hormone:

12. Explain what happens to the uterine lining during the first five days of the uterine cycle and explain why this occurs. **(2 marks)**

END OF EXAMINATION