

MINISTRY USE ONLY

MINISTRY USE ONLY

Place Personal Education Number (PEN) here.

Place Personal Education Number (PEN) here.



BRITISH  
COLUMBIA

© 2001 Ministry of Education

MINISTRY USE ONLY

Biology 12

JANUARY 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.  .   
(2)

Question 9:  
9.  .   
(6)

Question 2:  
2.  .   
(2)

Question 10:  
10.  .   
(2)

Question 3:  
3.  .   
(5)

Question 11:  
11.  .   
(4)

Question 4:  
4.  .   
(6)

Question 12:  
12.  .   
(3)

Question 5:  
5.  .   
(4)

Question 6:  
6.  .   
(7)

Question 7:  
7.  .   
(3)

Question 8:  
8.  .   
(6)

**BIOLOGY 12**

**JANUARY 2001**

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

	<b>Value</b>	<b>Suggested Time</b>
1. This examination consists of <b>two</b> parts:		
PART A: 50 multiple-choice questions	50	45
PART B: 12 written-response questions	50	75
	<b>Total:</b>	
	<b>100 marks</b>	<b>120 minutes</b>

**THIS PAGE INTENTIONALLY BLANK**

## PART A: MULTIPLE CHOICE

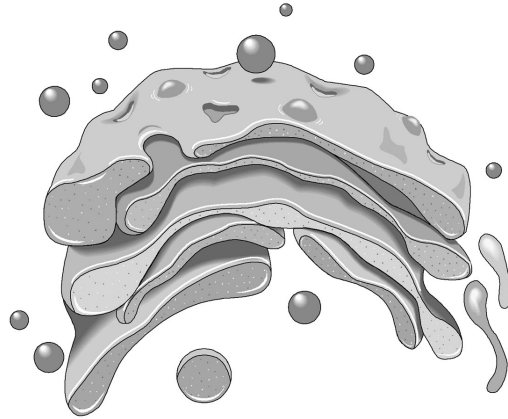
Value: 50 marks

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.

1. The majority of cell processes are controlled by the
  - A. nucleus.
  - B. lysosome.
  - C. mitochondria.
  - D. endoplasmic reticulum.
  
2. The products of mitochondria include ATP and
  - A. water.
  - B. lipids.
  - C. oxygen.
  - D. glucose.
  
3. At which of the following cell structures would adenine bond with thymine but **not** uracil?
  - A. nucleus
  - B. ribosomes
  - C. Golgi bodies
  - D. endoplasmic reticulum

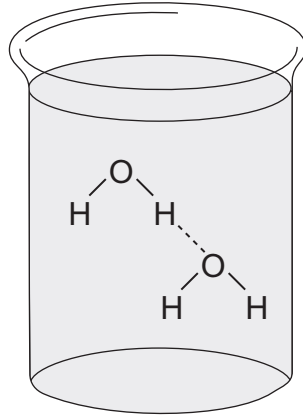
Use the following diagram to answer question 4.



4. The function of the organelle shown in the diagram is to
- A. produce ATP.
  - B. detoxify alcohol.
  - C. package molecules.
  - D. synthesize nucleic acids.
- 
5. Cells that contain large amounts of smooth endoplasmic reticulum, Golgi bodies and vesicles are found in which of the following?
- A. liver and testes
  - B. testes and alveoli
  - C. stomach and liver
  - D. stomach and alveoli



Use the following diagram to answer question 6.

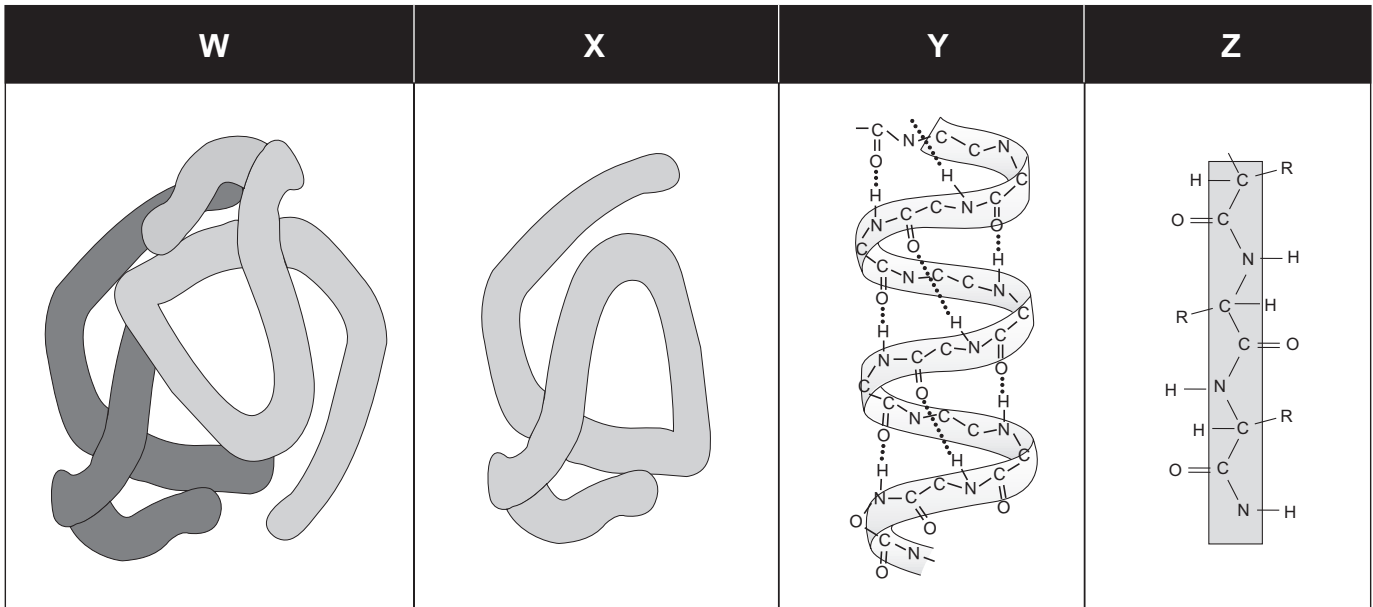


6. The type of bond shown between the two water molecules is
- A. ionic.
  - B. peptide.
  - C. covalent.
  - D. hydrogen.
- 
7. Which substance releases hydrogen ions causing the pH of a solution to decrease?
- A. water
  - B. lipids
  - C. hydrochloric acid
  - D. sodium bicarbonate
8. The type of digestive reactions that take place along the gastro-intestinal tract can be classified as
- A. synthesis.
  - B. hydrolysis.
  - C. dehydration.
  - D. replacement.

9. Cellulose is composed of which of the following substances?

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

Use the following diagrams to answer question 10.



10. Which diagram represents the tertiary structure of a protein?

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

---

11. In a solution of nucleotides made from a ground-up segment of DNA, adenine makes up 33% of the solution. What percentage of the solution would be guanine?

- A. 17%
- B. 33%
- C. 34%
- D. 67%

12. Nucleic acids which have genes from two different organisms are called

- A. transfer RNA.
- B. ribosomal RNA.
- C. messenger RNA.
- D. recombinant DNA.

13. Where is the site of protein synthesis?

- A. nucleus
- B. vacuole
- C. ribosome
- D. Golgi bodies

**Use the following table to answer question 14.**

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

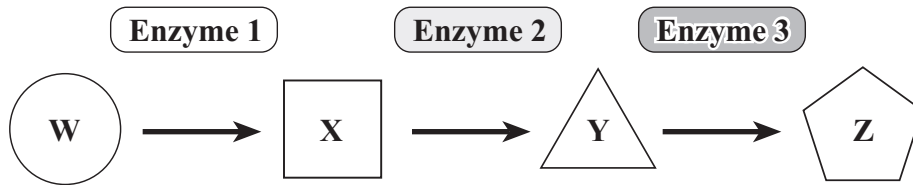
14. A single base mutation causes the amino acid leucine to replace tryptophan in the primary structure of a protein. The base in the **DNA** that changes to cause this mutation is

- A. adenine.
- B. guanine.
- C. cytosine.
- D. thymine.

15. Metastasis is the process whereby
- A. blood vessels grow into a tumour.
  - B. cell growth in a tumour becomes disorganized.
  - C. a proto-oncogene is converted into an oncogene.
  - D. cancer cells detach from a tumour and spread to a new site.
16. An initiator is a factor that causes
- A. metastasis.
  - B. vascularization.
  - C. oncogene expression.
  - D. gene or chromosome mutations.
17. A recognized danger signal that may indicate the presence of colon cancer would be
- A. a shortness of breath.
  - B. difficulty swallowing.
  - C. a change in bowel habits.
  - D. persistent hoarseness or coughing.
18. Facilitated transport may be described as the movement of particles from an area of
- A. low to high concentration using protein carriers.
  - B. low to high concentration without using protein carriers.
  - C. high to low concentration using protein carriers.
  - D. high to low concentration without using protein carriers.
19. As a cell increases in size, the
- A. metabolic rate increases.
  - B. surface area to volume ratio increases.
  - C. volume increases and the surface area increases.
  - D. surface area increases and the volume decreases.

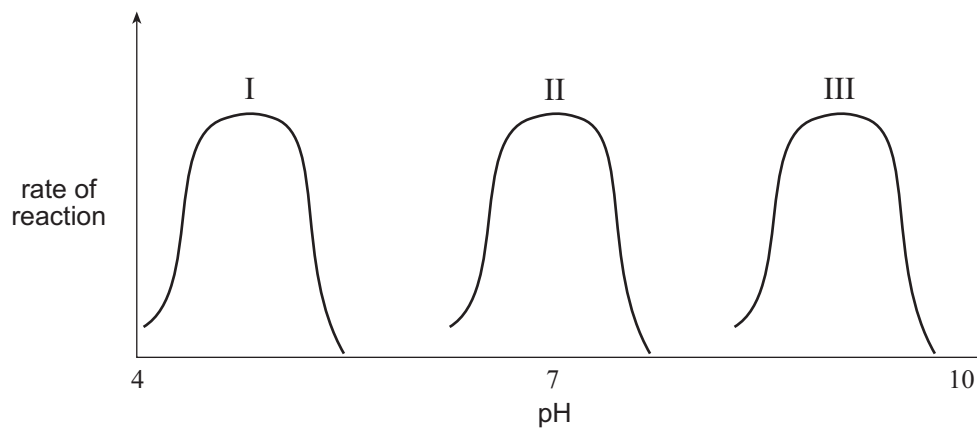
Use the following diagram to answer question 20.

### Metabolic Pathway



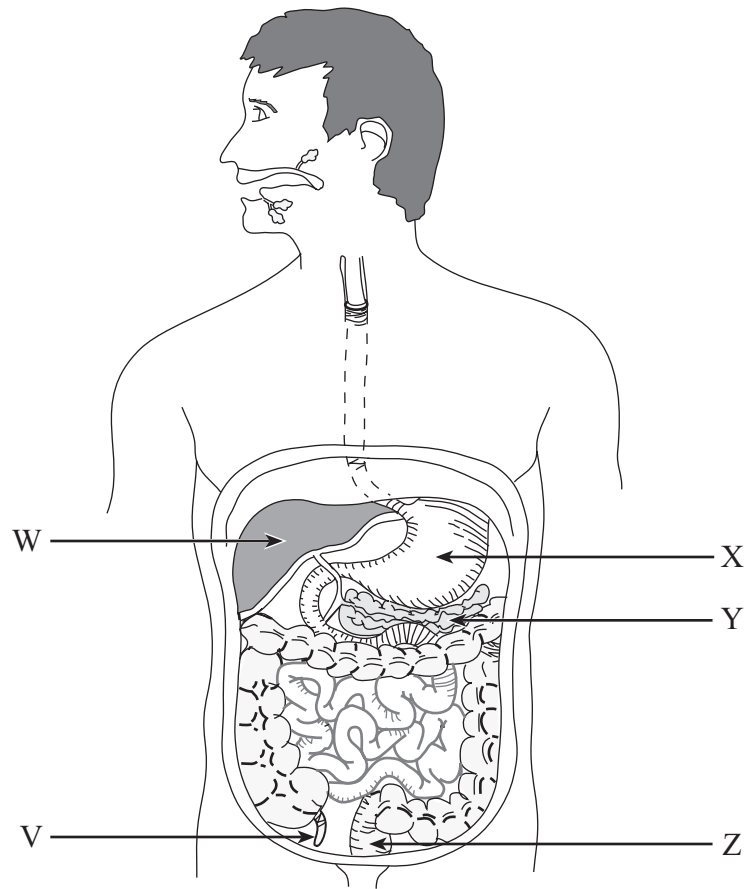
20. If substance **Z** inhibits enzyme **2**, this will in turn inhibit the production of
- A. enzyme 1.
  - B. enzyme 2.
  - C. substance W.
  - D. substance Y.
- 
21. Which of the following is a function of thyroxin?
- A. to decrease body temperature
  - B. to increase the amount of ATP used by the cells
  - C. to increase the reabsorption of water by the kidneys
  - D. to decrease the breakdown of proteins in the small intestine
22. Which of the following is **not** a part of the theory of how an enzyme functions?
- A. The shape of the active site facilitates a reaction.
  - B. The enzyme and substrate fit like a lock and key.
  - C. The enzyme lowers the activation energy required for the reaction.
  - D. The shape of the enzyme is permanently changed by the chemical reaction.

Use the following graph to answer question 23.



23. The graph shows the effect of pH on three different enzyme-catalyzed reactions. Which of the following would **best** describe the effect of pH on enzyme-catalyzed reactions?
- A. enzyme action increases as pH increases
  - B. enzyme action decreases as pH increases
  - C. enzymes work best in an acid environment
  - D. each enzyme works best within a specific pH range

Use the following diagram to answer questions 24 and 25.



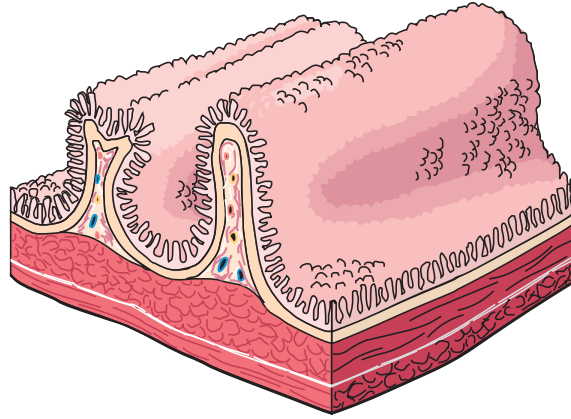
24. Which letter indicates the appendix?

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

25. The structure labelled **Z** is the

- A. anus.
- B. rectum.
- C. duodenum.
- D. small intestine.

Use the following diagram to answer question 26.



26. The section of tissue shown in the diagram was taken from the
- A. colon.
  - B. stomach.
  - C. pancreas.
  - D. small intestine.
- 
27. The structure that prevents regurgitation of food from the intestine back into the stomach is the
- A. pyloric sphincter.
  - B. cardiac sphincter.
  - C. duodenal sphincter.
  - D. atrioventricular valve.
28. The chemical digestion of polysaccharides begins in the
- A. colon.
  - B. mouth.
  - C. stomach.
  - D. small intestine.



Use the following information to answer question 29.

- bacteria cells are destroyed
- amylase becomes denatured
- pepsinogen becomes activated
- trypsinogen changes into trypsin

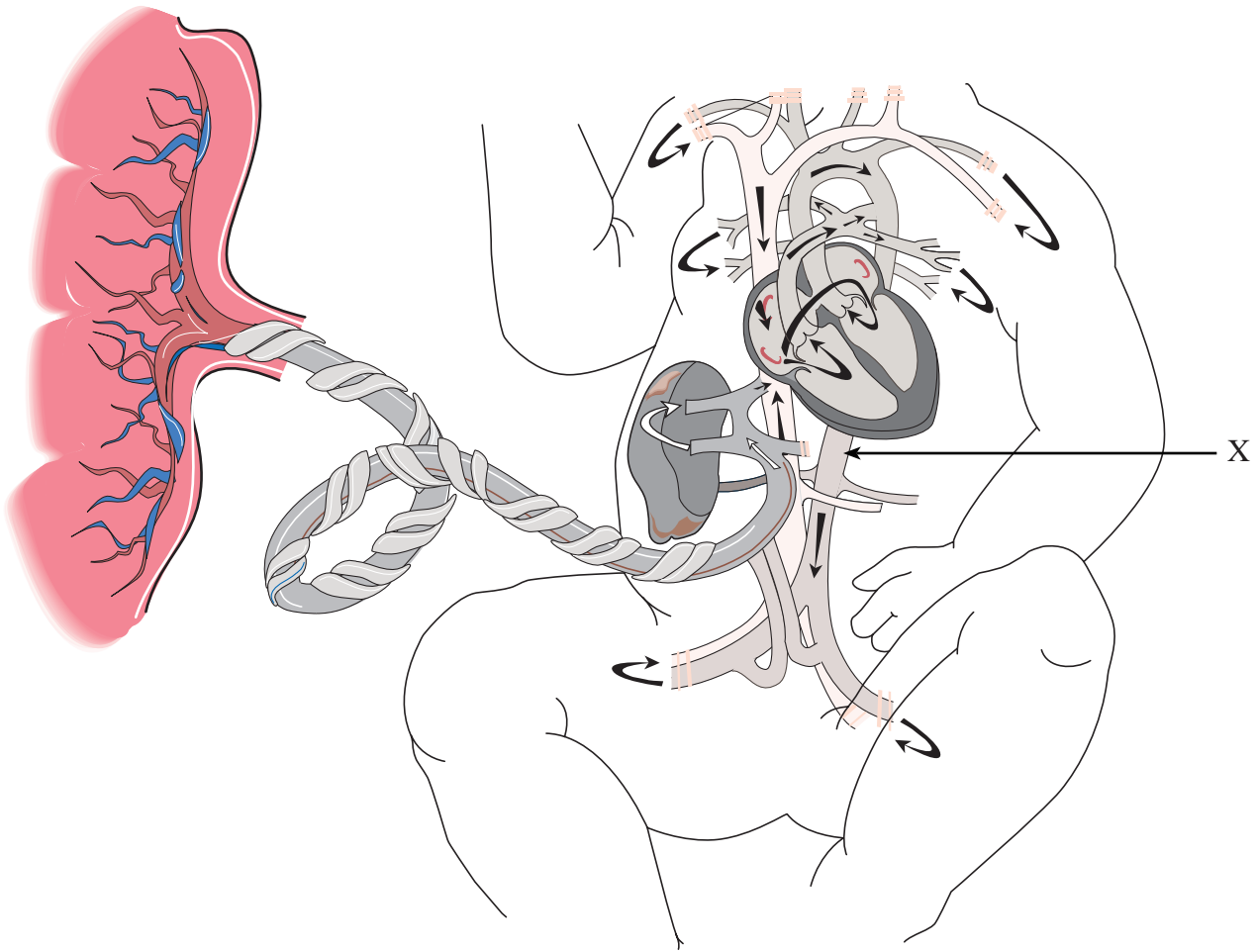
29. How many of the results above are from the action of gastric juice?

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

30. The coronary arteries carry

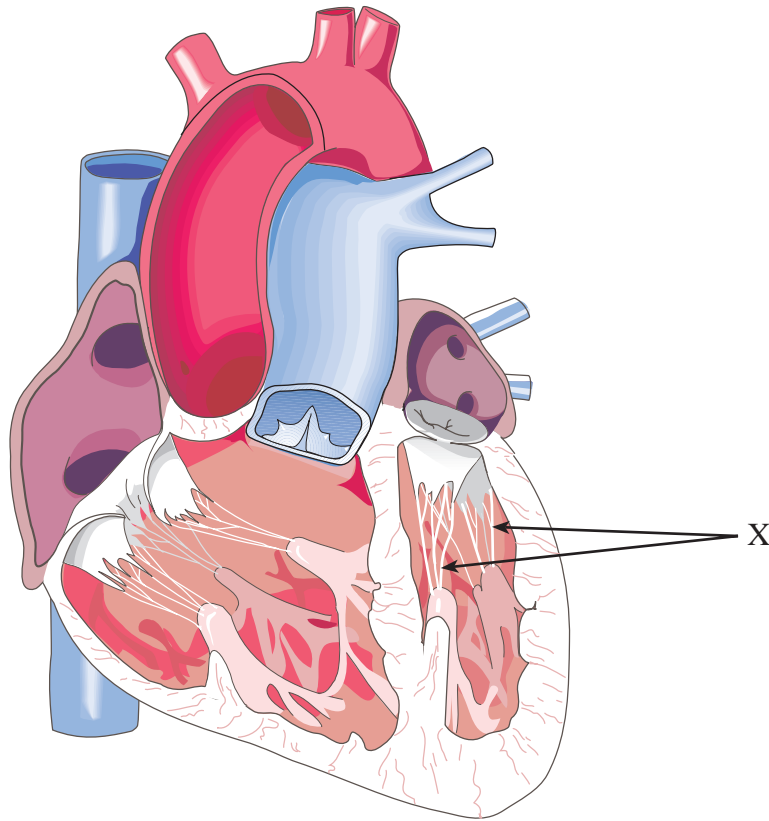
- A. blood to the aorta.
- B. nutrients to the heart cells.
- C. oxygenated blood to the head.
- D. deoxygenated blood to the lungs.

Use the following diagram to answer question 31.



31. The blood vessel labelled **X** is the
- A. aorta.
  - B. ductus venosus (venous duct).
  - C. foramen ovale (oval opening).
  - D. ductus arteriosus (arterial duct).

Use the following diagram to answer question 32.

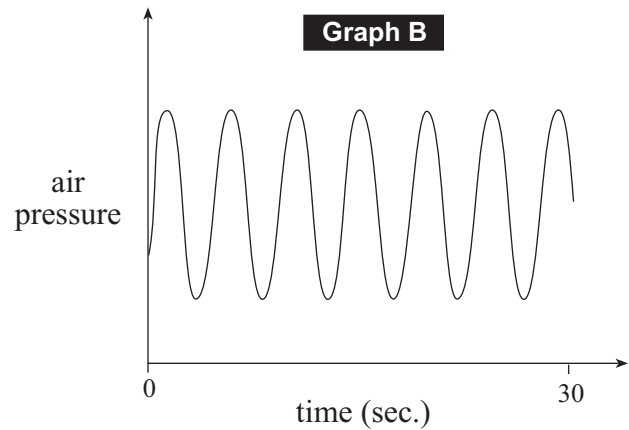
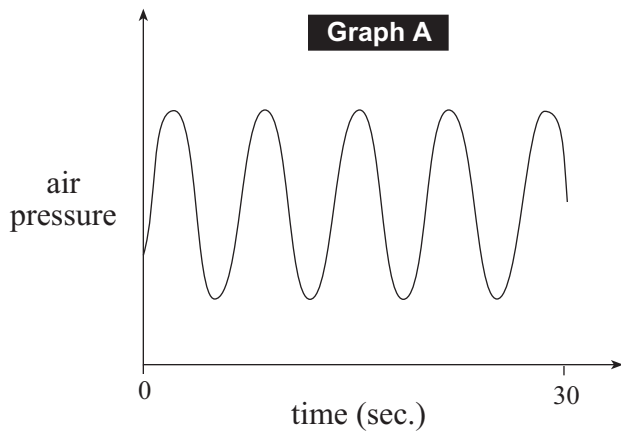


32. The function of structure **X** is to
- A. initiate the atrial contraction.
  - B. act as the pacemaker of the heart.
  - C. prevent the atrioventricular (AV) valve from inverting.
  - D. open the atrioventricular (AV) valve when stimulated by an electrical impulse.
- 

33. During inhalation,
- A. the diaphragm contracts and the rib muscles relax.
  - B. the diaphragm relaxes and the rib muscles contract.
  - C. air pressure in the lungs increases and outside air rushes in.
  - D. air pressure in the lungs decreases and outside air rushes in.

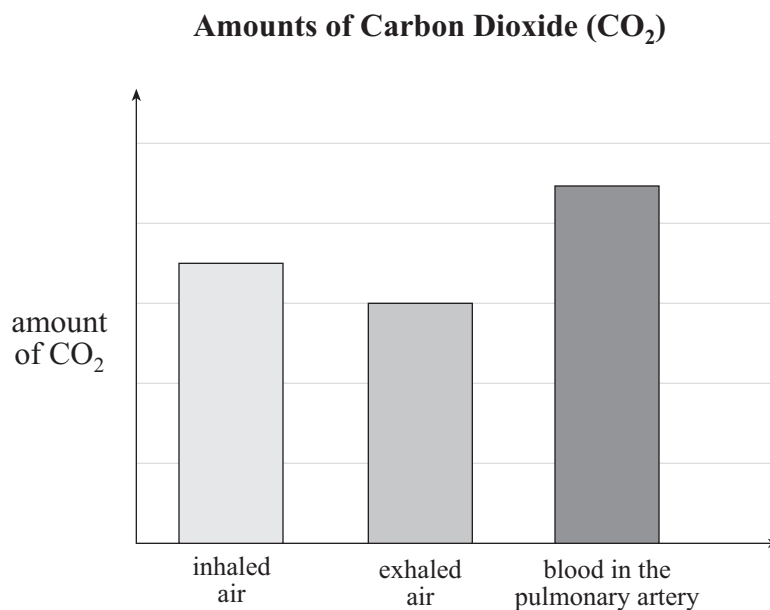
34. Which part of the brain initiates the resumption of breathing when someone holds their breath?
- A. cerebellum
  - B. hypothalamus
  - C. corpus callosum
  - D. medulla oblongata

Use the following graphs to answer question 35.



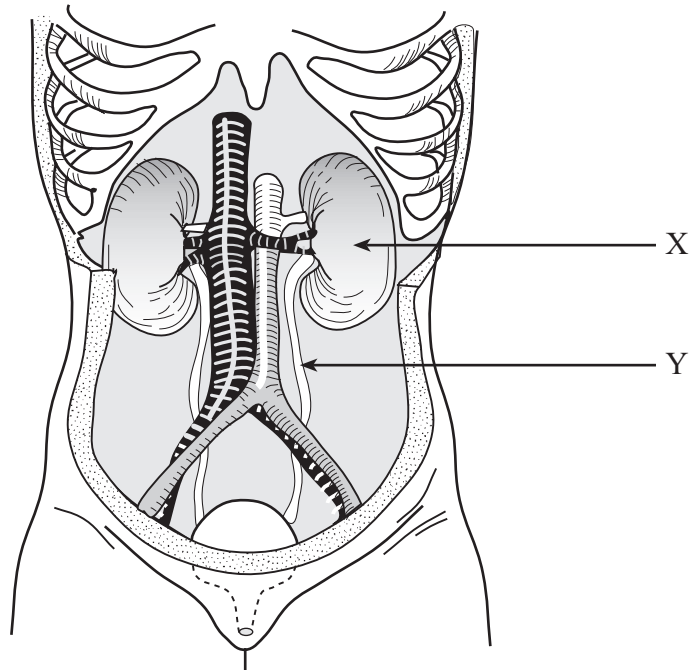
35. In the graphs above, graph **A** represents the change in pressure in the lungs over a 30-second time period. Which of the following would cause, over the same time period, the change as shown in graph **B**?
- A. low concentration of hydrogen ions in the blood
  - B. high concentration of bicarbonate ions in the blood
  - C. decreased nerve impulses sent to the diaphragm from the medulla oblongata
  - D. increased nerve impulses from the stretch receptors in the lungs to the hypothalamus

Use the following graph to answer question 36.



36. The graph above is **incorrect** because the amount of CO<sub>2</sub> should be
- A. highest in inhaled air.
  - B. equal in all three instances.
  - C. lowest in the pulmonary artery.
  - D. higher in exhaled air than in inhaled air.
- 
37. Which of the following is characterized by a short axon and long dendrites?
- A. interneuron
  - B. synaptic cleft
  - C. motor neuron
  - D. sensory neuron
38. When a doctor taps below the kneecap and the lower leg jerks forward involuntarily, the pathway that the nerve impulse travels is
- A. effector → sensory neuron → interneuron → motor neuron → receptor.
  - B. effector → motor neuron → interneuron → sensory neuron → receptor.
  - C. receptor → sensory neuron → interneuron → motor neuron → effector.
  - D. receptor → motor neuron → interneuron → sensory neuron → effector.

Use the following diagram to answer questions 39 and 40.



39. The function of structure **X** is to

- A. produce bile.
- B. produce urine.
- C. produce ADH.
- D. carry urine to the bladder.

40. Structure **Y** is the

- A. ureter.
- B. urethra.
- C. bladder.
- D. afferent arteriole.

---

41. Uric acid is a waste produced during the breakdown of nucleic acids. Higher than normal levels of uric acid that build up in the joints indicate a malfunction of the

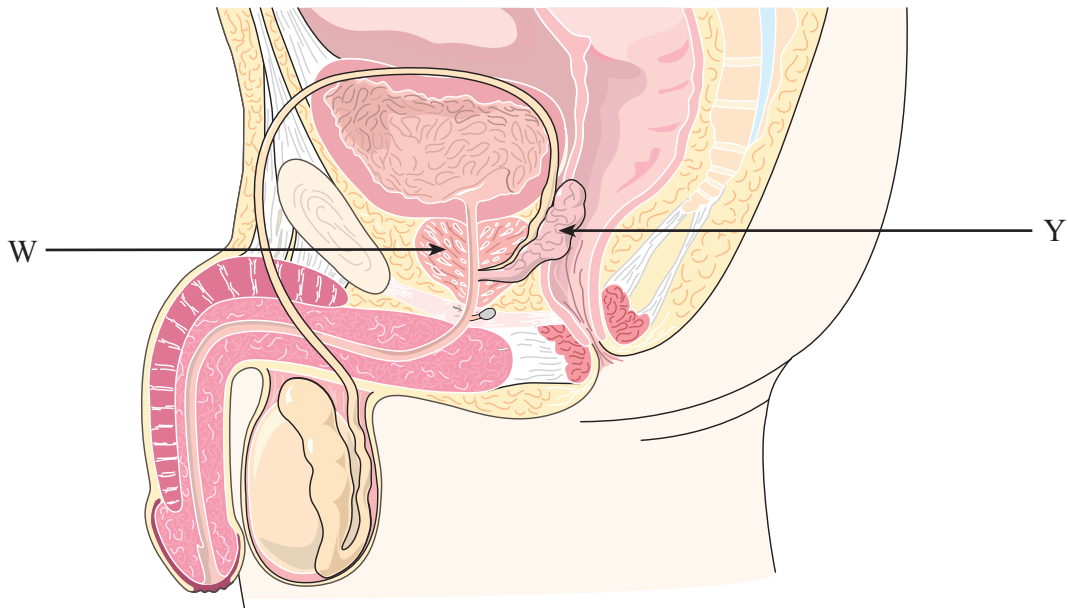
- A. lungs.
- B. colon.
- C. kidneys.
- D. pancreas.

Use the following information to answer question 42.

CONCENTRATIONS OF SUBSTANCE X IN mg PER 100 mL		
PLASMA	GLOMERULAR FILTRATE	URINE
26	26	1 820

42. Substance X is
- A. urea.
  - B. glucose.
  - C. albumin.
  - D. histamine.

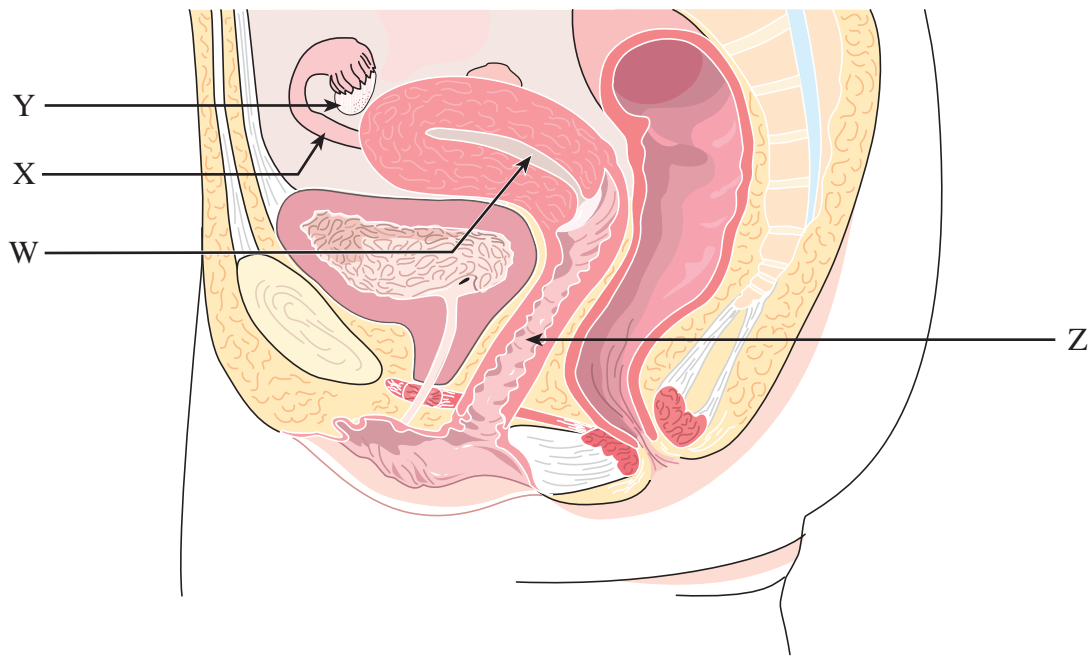
Use the following diagram to answer question 43.



43. The function of structures W and Y is to
- A. produce testosterone.
  - B. mature and store sperm.
  - C. deliver the sperm to the female.
  - D. produce fluids that make up semen.

44. Which gland secretes prostaglandins that aid in the stimulation of uterine contractions?
- adrenal gland
  - hypothalamus
  - pituitary gland
  - seminal vesicle
45. The function of the mid-piece of the sperm is to
- protect the sperm.
  - nourish the sperm.
  - carry genetic material.
  - produce ATP (energy).

Use the following diagram to answer question 46.

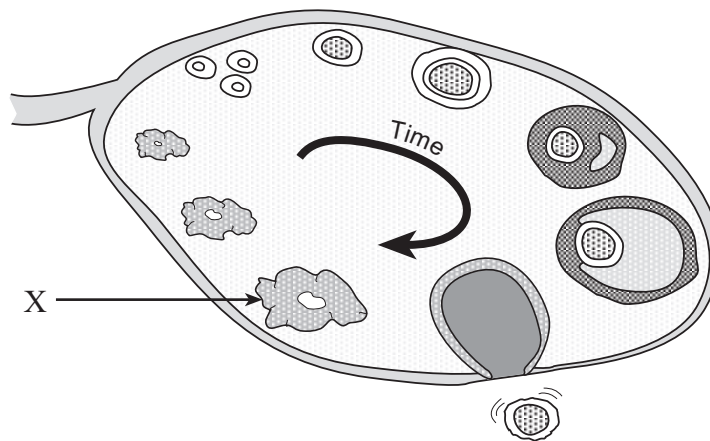


46. In which of the following structures does fertilization normally occur?
- W
  - X
  - Y
  - Z



47. What occurs as a result of the secretion of releasing hormone by the hypothalamus during the first 13 days of the ovarian and uterine cycles?
- the sloughing off of the uterine lining
  - the production of progesterone by the corpus luteum
  - the secretion of large amounts of estrogen by the follicle
  - the release of human chorionic gonadotropin (HCG) by the anterior pituitary
48. Where is luteinizing hormone (LH) produced?
- follicle
  - hypothalamus
  - corpus luteum
  - anterior pituitary

Use the following diagram to answer question 49.



49. The secretions from structure **X** cause
- the uterine lining to slough off.
  - the ovaries to produce a mature egg.
  - the uterine lining to produce a thick mucus.
  - the production of human chorionic gonadotropin (HCG).

50. Elevated levels of which hormone indicate that implantation has occurred?

- A. estrogen
- B. aldosterone
- C. progesterone
- D. human chorionic gonadotropin (HCG)

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

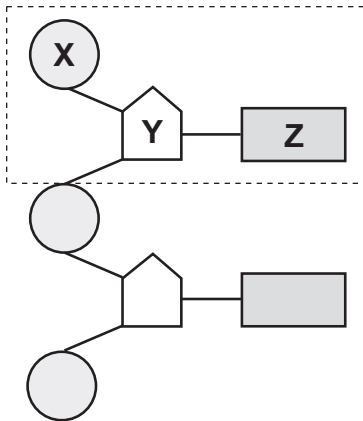
**PART B: WRITTEN RESPONSE**

**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.**



1. Identify the structure made up of parts **X**, **Y** and **Z** and state its function.  
(2 marks: 1 mark for name; 1 mark for function)

Name: \_\_\_\_\_

Function: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. What is produced as a result of each of the following during protein synthesis?

RNA bases and DNA bases join together by complementary base pairing. **(1 mark)**

---

---

Transfer RNA joins to messenger RNA at the ribosome. **(1 mark)**

---

---

3. An experiment was devised in which blood cells were placed in three beakers containing solutions of different concentrations. The results are given below.

BEAKER	% SOLUTE IN RED BLOOD CELLS	% SOLUTE IN THE SOLUTION
A	2	2
B	2	1
C	2	3

- a) Describe what happened to the cells in beaker **B** and explain the results. **(2 marks)**

---

---

---

---

- b) Describe what happened to the cells in beaker **C** and explain the results. **(2 marks)**

---

---

---

---

- c) Explain why the solution in beaker **A** is isotonic to the red blood cells. **(1 mark)**

---

---

4. A piece of living small intestine was placed in a solution containing maltose, egg white, and fats. In order to ensure that the piece of intestine functioned normally, oxygen was bubbled through the solution and the pH was maintained at 8.2. After one hour the solution was analyzed.

a) Explain why glucose was found in the solution. **(1 mark)**

---

---

---

---

b) Products from the breakdown of fat were **not** found. Explain why. **(1 mark)**

---

---

c) Why was the solution buffered to pH 8.2? **(1 mark)**

---

---

d) In a variation of this experiment, trypsin was also added to the solution. Describe the results of this new experiment after one hour. **(3 marks)**

---

---

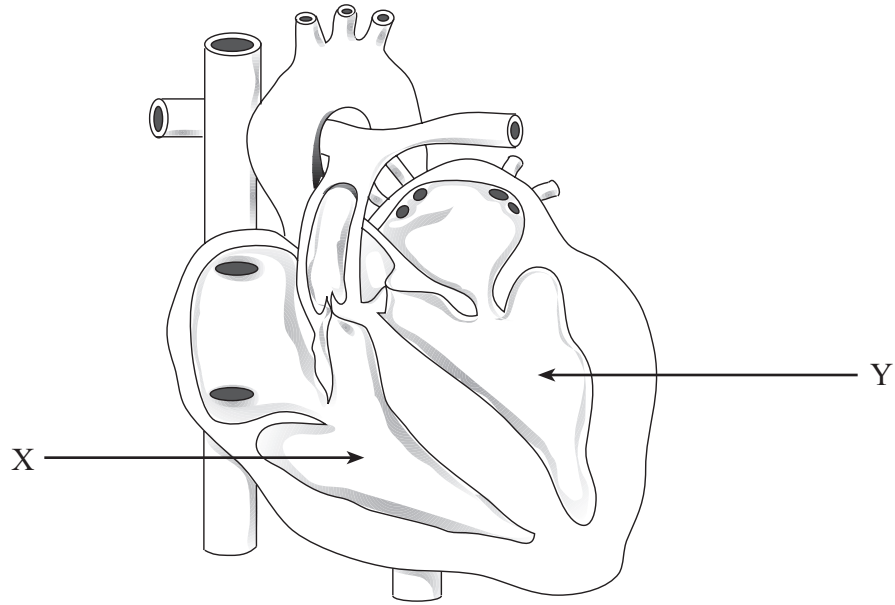
---

---

---

---

Use the following diagram to answer question 5.



5. a) Compare the composition of the blood in structures **X** and **Y**. (2 marks)

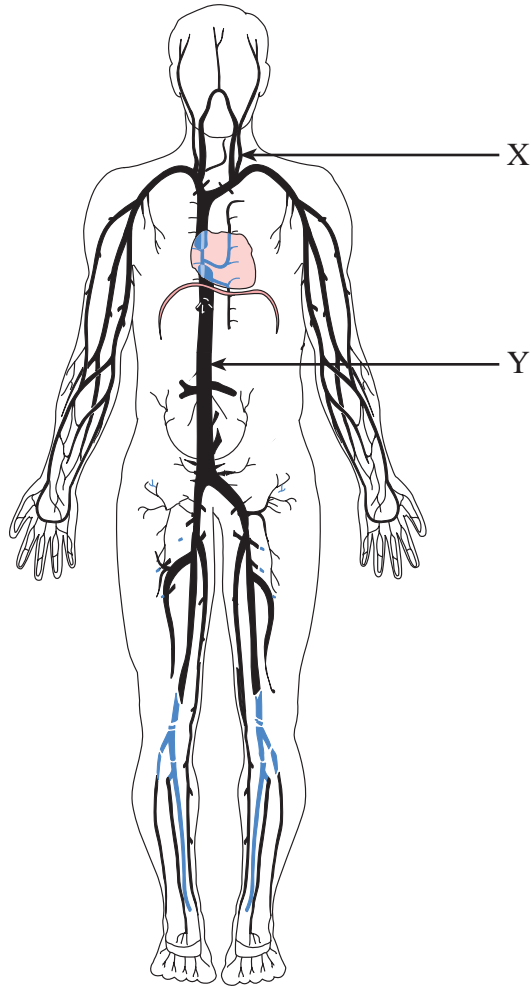
Structure **X**: \_\_\_\_\_  
\_\_\_\_\_

Structure **Y**: \_\_\_\_\_  
\_\_\_\_\_

b) Relate the difference in the structure of **X** and **Y** to their functions. (2 marks)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Use the following diagram to answer question 6.



6. a) Identify each of the labelled veins and give **one** function of each.  
(4 marks: 1 mark each for name; 1 mark each for function)

Vein X:

Name: \_\_\_\_\_

Function: \_\_\_\_\_

Vein Y:

Name: \_\_\_\_\_

Function: \_\_\_\_\_



- b) i) Give the location of the oval opening (foramen ovale) in the circulatory system of the fetus and state its function.  
(2 marks: 1 mark for location; 1 mark for function)

Location: \_\_\_\_\_

\_\_\_\_\_

Function: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- ii) Describe what would occur if the oval opening (foramen ovale) failed to close at birth. (1 mark)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7. Describe **three** ways in which the structure of the alveoli facilitates their function. **(3 marks)**

i) \_\_\_\_\_

\_\_\_\_\_

ii) \_\_\_\_\_

\_\_\_\_\_

iii) \_\_\_\_\_

\_\_\_\_\_

8. Describe how each of the following is important to the passage of a nerve impulse.

sodium/potassium pump:

**(2 marks)**

---

---

---

---

synaptic vesicles:

**(2 marks)**

---

---

---

---

myelinated axon:

**(2 marks)**

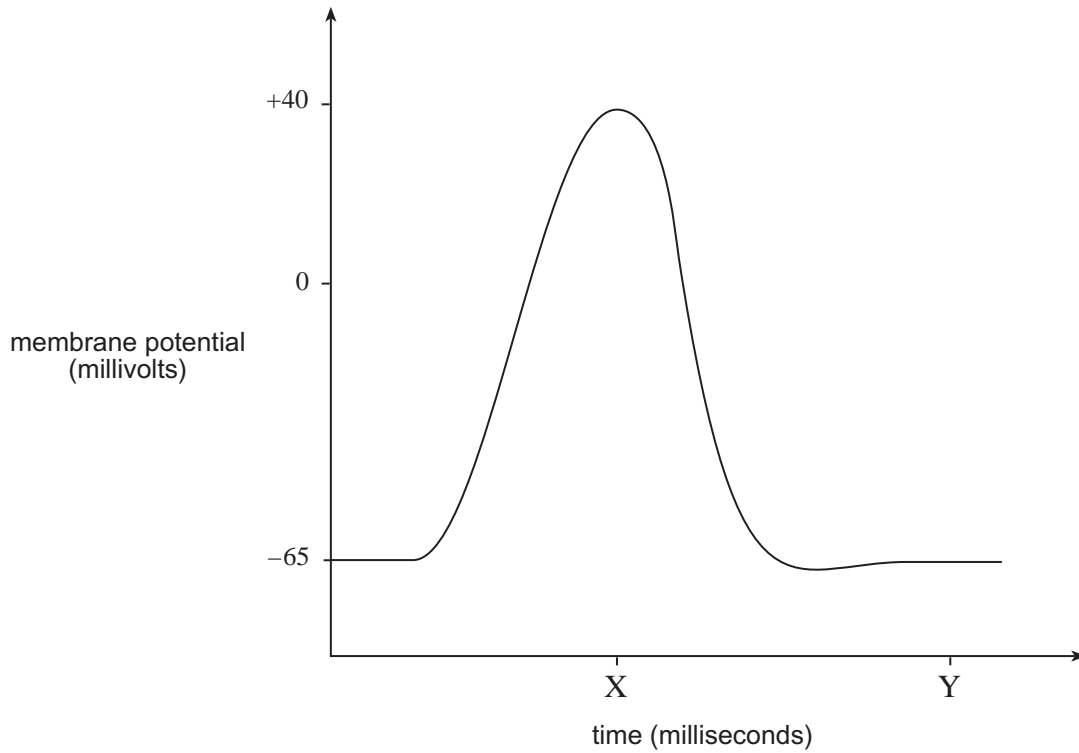
---

---

---

---

Use the following graph to answer question 9.



9. a) Describe what is occurring at the neuron between time X and time Y. (4 marks)

---

---

---

---

---

---

---

---

---

---

b) What would occur if the membrane of the axon became impermeable to potassium ions ( $K^+$ ) at time X? (2 marks)

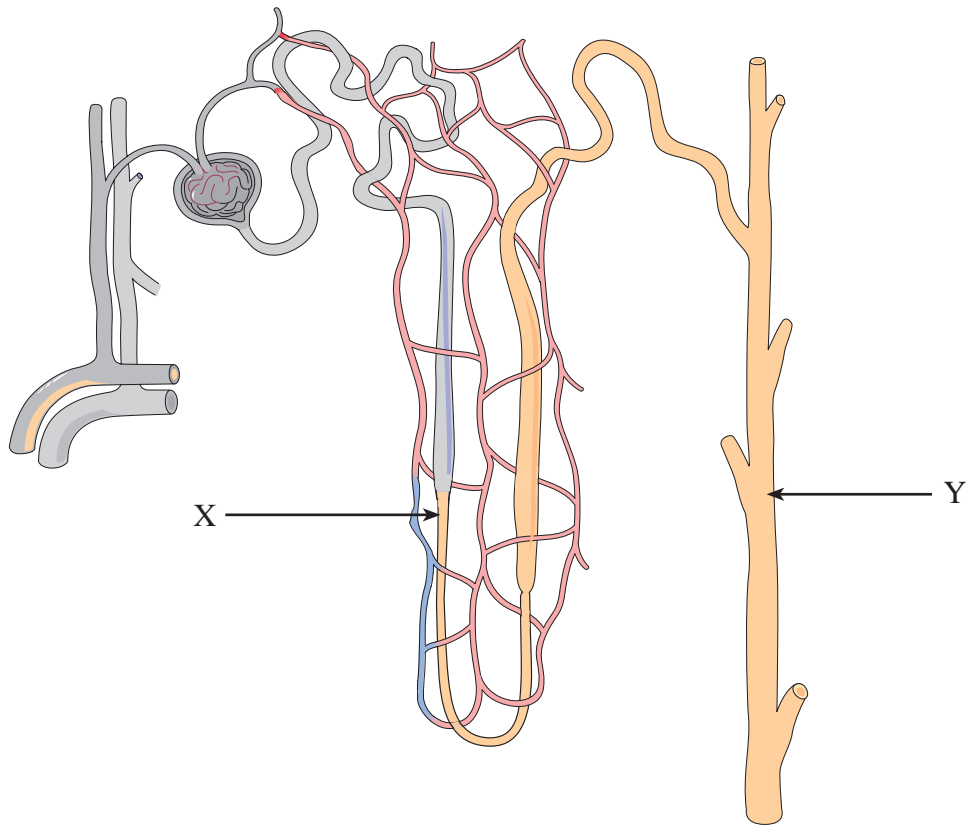
---

---

---

---

Use the following diagram to answer question 10.



10. a) Explain why it would be abnormal to find glucose in structure **Y**. (1 mark)

---

---

b) Explain why structure **X** is longer in an animal that lives in the desert. (1 mark)

---

---

11. Explain what happens in the kidneys in response to each of the following conditions.

a decrease in blood pressure:

**(2 marks)**

---

---

---

---

---

a decrease in blood pH:

**(2 marks)**

---

---

---

---

---

12. Identify the structure in a female that produces an egg.

**(3 marks)**

---

provides nourishment for the developing embryo.

---

enables the egg to travel to the uterus.

---

**END OF EXAMINATION**