

JANUARY 1994

PROVINCIAL EXAMINATION

• **MINISTRY OF EDUCATION** •

BIOLOGY 12

GENERAL INSTRUCTIONS

1. Insert the stickers with your Student I.D. Number in the allotted spaces above. **Under no circumstance is your name or identification, other than your Student I.D. Number, to appear on this paper.**
2. Take the separate Answer Sheet and follow the directions on its front page.
3. Be sure you have an HB pencil and an eraser for completing your Answer Sheet. Follow the directions on the Answer Sheet when answering multiple-choice questions.
4. For each of the written-response questions, write your answer **IN INK** in the space provided. 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 Answer Sheet inside the front cover of this booklet and return the booklet and your Answer Sheet to the supervisor.

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FOR OFFICE USE ONLY

← INSERT STUDENT I.D. NUMBER →
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**BIOLOGY 12 JANUARY 1994 PROVINCIAL
(BIP)**

1. _____
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7. _____
(6)

OPTIONS: Score in **ONLY TWO** of the following optional sections.

Option I. 8. _____
(10)

Option IV. 11. _____
(10)

Option II. 9. _____
(10)

Option V. 12. _____
(10)

Option III. 10. _____
(10)

Option VI. 13. _____
(10)

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BIOLOGY 12 PROVINCIAL EXAMINATION

	Value	Suggested Time
1. This examination consists of three parts:		
PART A: 52 multiple-choice questions	52	40
PART B: 7 written-response questions	28	50
PART C: Optional areas consisting of only written-response questions. Answer ONLY TWO sections. Each section is worth 10 marks.	20	30
	Total	
	<u>100 marks</u>	<u>120 minutes</u>

2. **ORGANIZATION AND PLANNING SPACE HAS BEEN INCORPORATED INTO THE SPACE ALLOWED FOR ANSWERING EACH QUESTION.**

3. **YOU MAY NOT NEED ALL OF THE SPACE PROVIDED TO ANSWER EACH QUESTION.**

4. You have **TWO HOURS** to complete this examination.

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PART A: MULTIPLE-CHOICE QUESTIONS

Value: 52 marks (one mark per question)

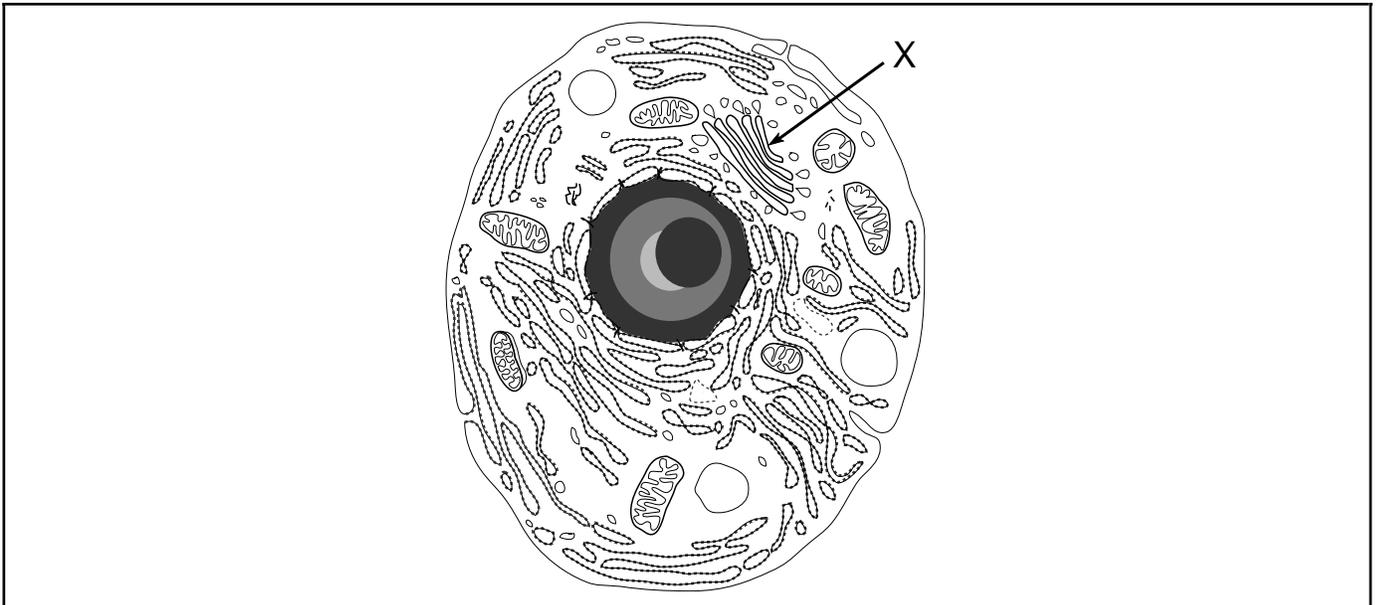
Suggested Time: 40 minutes

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

1. An explanation for observed phenomena that is supported by many experiments is called
 - A. a theory.
 - B. a control.
 - C. homeostasis.
 - D. an hypothesis.

2. A group of people was used to test the effectiveness of a new toothpaste compared to their regular toothpaste. Which of the following procedures represents a controlled test?
 - A. Have everyone in the group brush with the new toothpaste.
 - B. Have everyone brush with both their regular toothpaste and the new toothpaste.
 - C. Have half the group brush with the new toothpaste and the other half not brush their teeth.
 - D. Have half the group brush with the new toothpaste and the other half with their regular toothpaste.

Use the following diagram to answer question 3.



3. Structure X in the diagram represents a
 - A. vesicle.
 - B. nucleus.
 - C. mitochondrion.
 - D. Golgi apparatus.

OVER

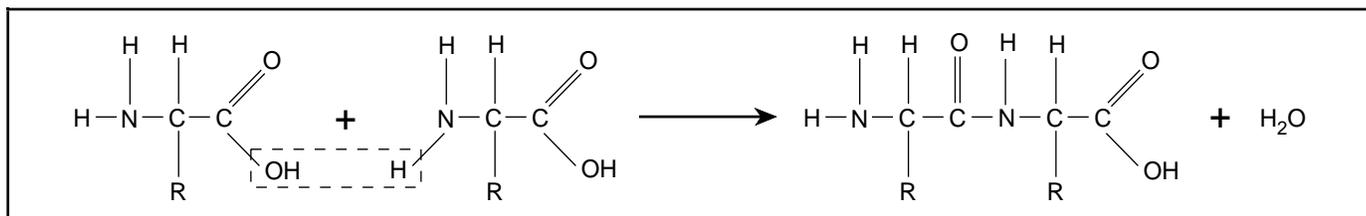
4. In which one of the following organelles is light energy used to produce simple sugars?
- Lysosomes.
 - Chloroplasts.
 - Mitochondria.
 - Endoplasmic reticulum.
5. Which of the following is the correct matching of base pairs in DNA?
- Adenine–Guanine and Thymine–Uracil.
 - Guanine–Cytosine and Adenine–Uracil.
 - Adenine–Thymine and Guanine–Cytosine.
 - Guanine–Thymine and Adenine–Cytosine.
6. The unit molecule of a protein is
- glucose.
 - glycerol.
 - a fatty acid.
 - an amino acid.
7. Four discs, cut from the same potato, were placed into four different sucrose solutions for one hour. Which solution was hypertonic to the potato cells?

Sucrose Solution	Original Mass of Potato Disc (g)	Final Mass of Potato Disc (g)
A.	2.0	1.8
B.	2.0	2.0
C.	2.0	2.1
D.	2.0	2.3

8. Fatty acids containing double bonds are found in
- proteins.
 - saturated lipids.
 - polysaccharides.
 - unsaturated lipids.
9. The bending and folding of a protein molecule would produce a
- tertiary structure.
 - primary structure.
 - secondary structure.
 - linear sequence of amino acids.

10. What is the sequence of organelles that a secreted protein would have passed through on its journey out of a cell?
- Mitochondria, Golgi apparatus, cell membrane.
 - Cell membrane, mitochondria, Golgi apparatus.
 - Golgi apparatus, rough endoplasmic reticulum, cell membrane.
 - Rough endoplasmic reticulum, Golgi apparatus, cell membrane.

Use the following diagram to answer question 11.



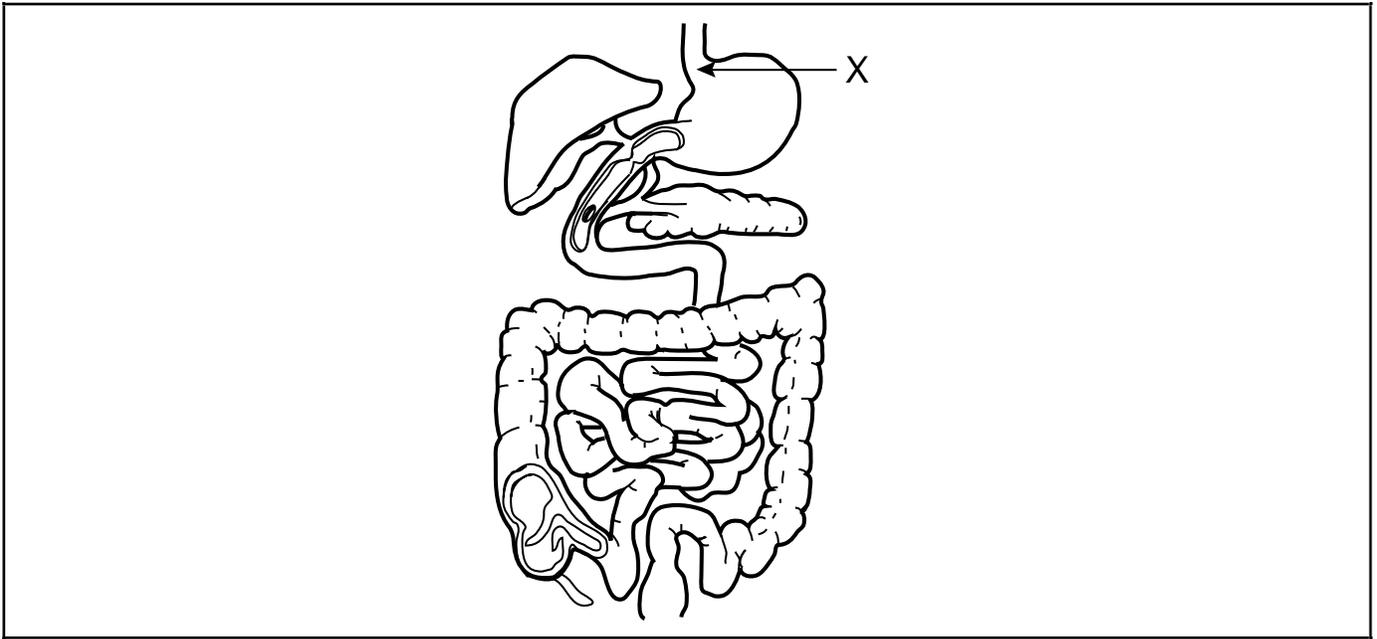
11. The above reaction would take place during the
- digestion of starch.
 - formation of an enzyme.
 - storage of fatty acids as lipids.
 - release of energy from glucose.
12. Which process is common to both aerobic and anaerobic cellular respiration?
- Glycolysis.
 - Kreb's cycle.
 - Respiratory chain.
 - Transition reaction.
13. The oxygen used in aerobic respiration becomes part of
- ATP.
 - water.
 - glucose.
 - carbon dioxide.
14. Which of the following situations in an enzyme-catalyzed reaction will produce the **most** product at the **fastest** rate?

	Concentration of Substrate	Concentration of Enzyme
A.	Low	Low
B.	Low	High
C.	High	Low
D.	High	High

OVER

15. Which of the following is **NOT** involved in cyclic photophosphorylation?
- A. ADP.
 - B. NADPH_2 .
 - C. Chlorophyll.
 - D. Electron transport chain.
16. The products of the light-dependent reactions in photosynthesis combine with PGA to produce
- A. CO_2
 - B. ATP
 - C. PGAL
 - D. NADPH_2
17. Blood is a type of
- A. nervous tissue.
 - B. epithelial tissue.
 - C. muscular tissue.
 - D. connective tissue.
18. Pancreatic juices are
- A. basic.
 - B. acidic.
 - C. the source of secretin.
 - D. unnecessary for the digestion of fat.
19. Which of the following enzymes is correctly matched with its substrate?
- A. Amylase–fat.
 - B. Lipase–starch.
 - C. Pepsin–protein.
 - D. Trypsin–glycogen.

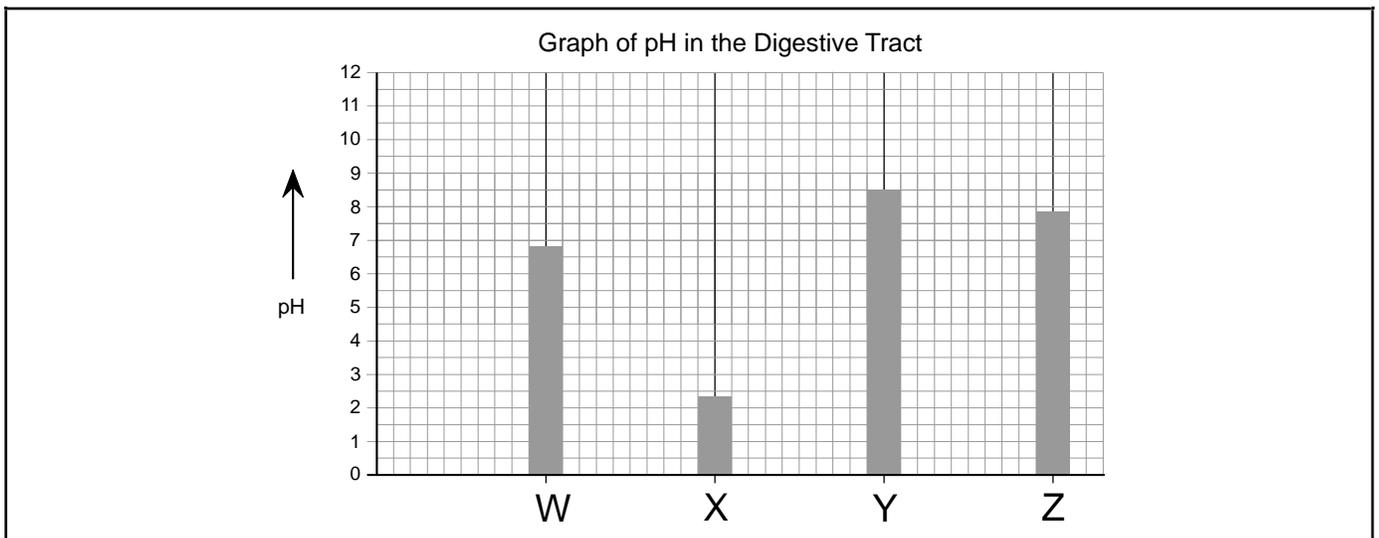
Use the following diagram to answer question 20.



20. The function of the sphincter located at X is to

- A. secrete pepsin.
- B. stimulate peristalsis.
- C. secrete hydrochloric acid.
- D. keep food in the stomach.

Use the following diagram to answer question 21.

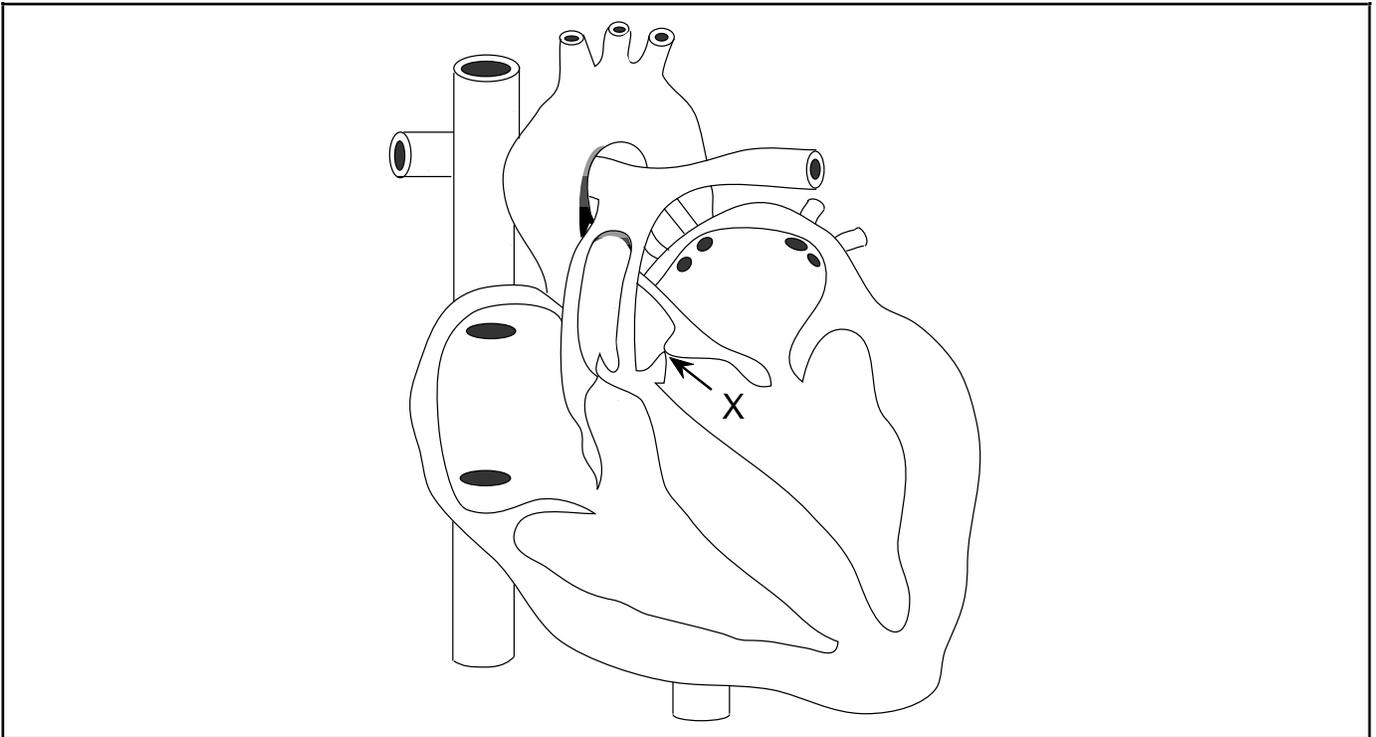


21. The pH of various areas within the digestive tract was taken and plotted on a graph as shown above. The reading labelled X was most likely obtained from the

- A. mouth.
- B. stomach.
- C. large intestine.
- D. small intestine.

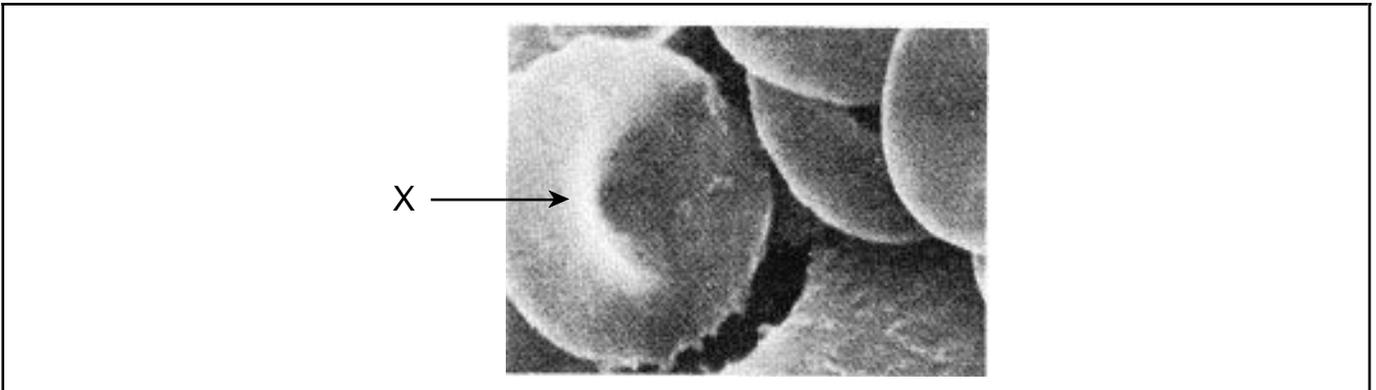
22. A piece of stomach wall is grafted into the skin of a mammal. The presence of food in the stomach causes this patch of stomach wall on the skin to produce gastric juices. This is evidence that the secretion of gastric juice is most likely brought about by
- A. peristalsis.
 - B. nervous stimulation.
 - C. the secretion of a hormone.
 - D. mechanical stimulation of the stomach wall.
23. The SA node (pacemaker) of the heart is located in the wall of the
- A. left atrium.
 - B. right atrium.
 - C. left ventricle.
 - D. right ventricle.
24. Most of the carbon dioxide in the blood is carried in the form of
- A. bicarbonate ions.
 - B. carbon dioxide gas.
 - C. carbonic anhydrase.
 - D. carbaminohemoglobin.
25. The function of an artery is to
- A. transport blood toward the heart.
 - B. transport blood away from the heart.
 - C. connect the right and left atria directly.
 - D. carry carbon dioxide to the tissue cells.

Use the following diagram to answer question 26.



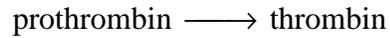
26. Under which of the following conditions will the structure labelled X be open?
- A. The aorta is constricting.
 - B. The atrium is contracting.
 - C. The ventricle is contracting.
 - D. The pulmonary vein is constricting.

Use the following diagram to answer question 27.



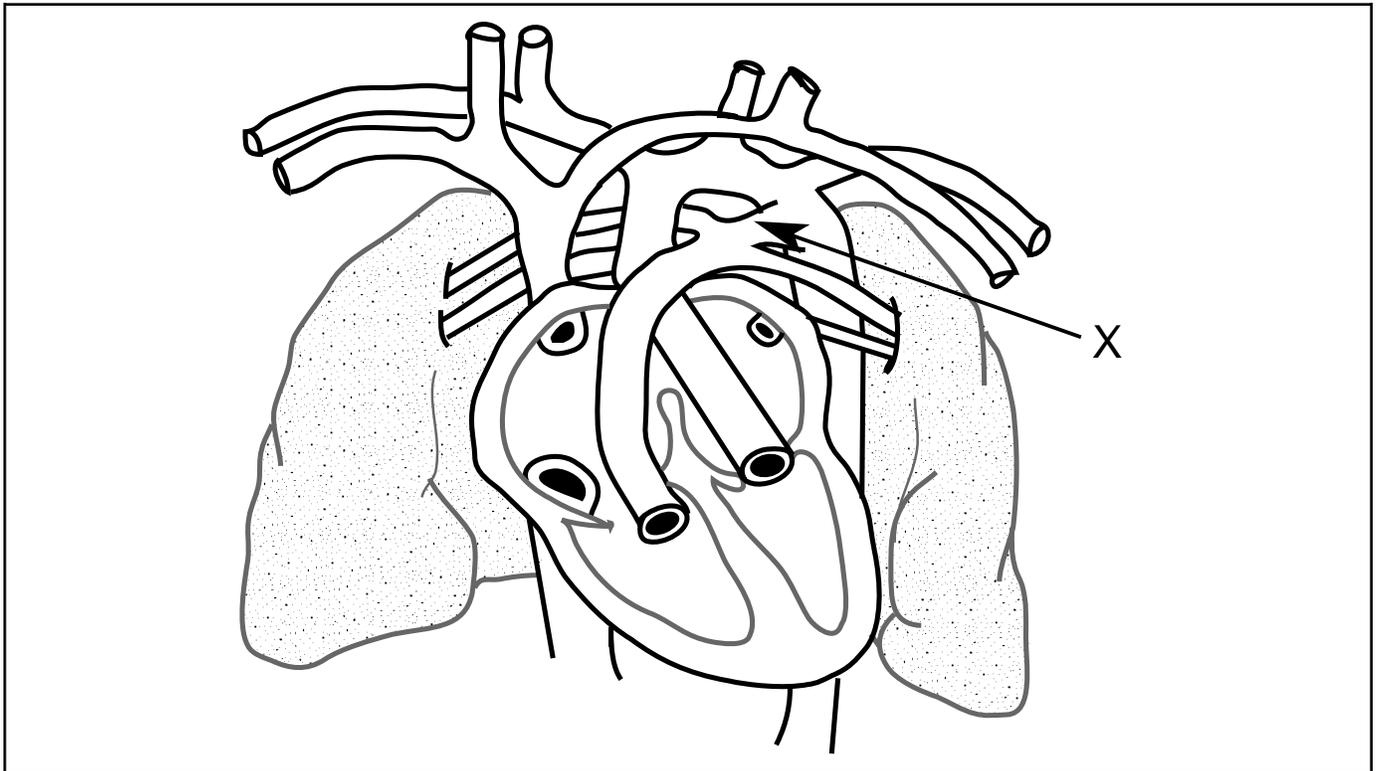
27. The blood cell labelled X in the diagram above
- A. releases thrombin.
 - B. transports H^+ ions.
 - C. produces antibodies.
 - D. is formed in the lymphatic tissue.

Use the following reaction to answer question 28.



28. For the above reaction to occur, which of the following are necessary?
- A. Platelets and fibrinogen.
 - B. Calcium ions and vitamin C.
 - C. Platelets and white blood cells.
 - D. Calcium ions and thromboplastin (prothrombin activator).
29. If blood pressure is recorded as 120/80, the 120 figure represents the pressure on the artery wall when the
- A. left atria has contracted.
 - B. left ventricle has contracted.
 - C. diameter of the artery is at its minimum.
 - D. atrial and ventricular pressure are equal.

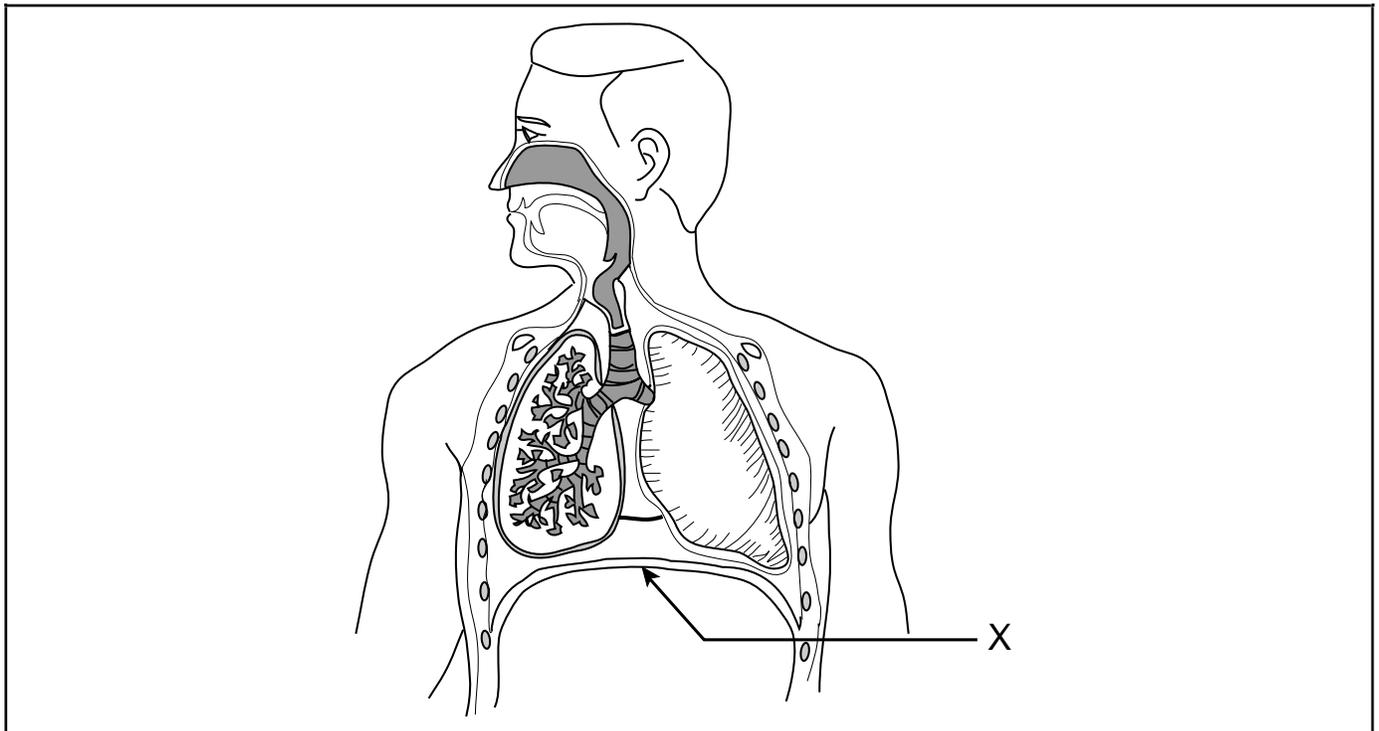
Use the following diagram to answer question 30.



30. The function of the structure labelled X in a fetus is to
- A. allow blood to bypass the lungs.
 - B. increase the supply of blood to the lungs.
 - C. allow blood to flow from the aorta to the ventricle.
 - D. equalize the pressure between the left and right atria.

31. An Rh negative mother is pregnant for the first time with an Rh positive fetus. Just prior to birth some fetal blood cells cross the placenta into the mother. Which of the following will occur?
- A. The fetus will die before birth.
 - B. The mother will become Rh positive.
 - C. The mother will produce Rh antibodies.
 - D. The fetal red blood cells will become Rh negative.
32. Pleural membranes
- A. line the alveoli.
 - B. surround the lungs.
 - C. prevent the collapse of the trachea.
 - D. collapse the lungs between breaths.
33. The function of the cilia lining the trachea is to
- A. secrete mucus.
 - B. move air in and out of the lungs.
 - C. move mucus away from the lungs.
 - D. increase the surface area for gas exchange.

Use the following diagram to answer question 34.



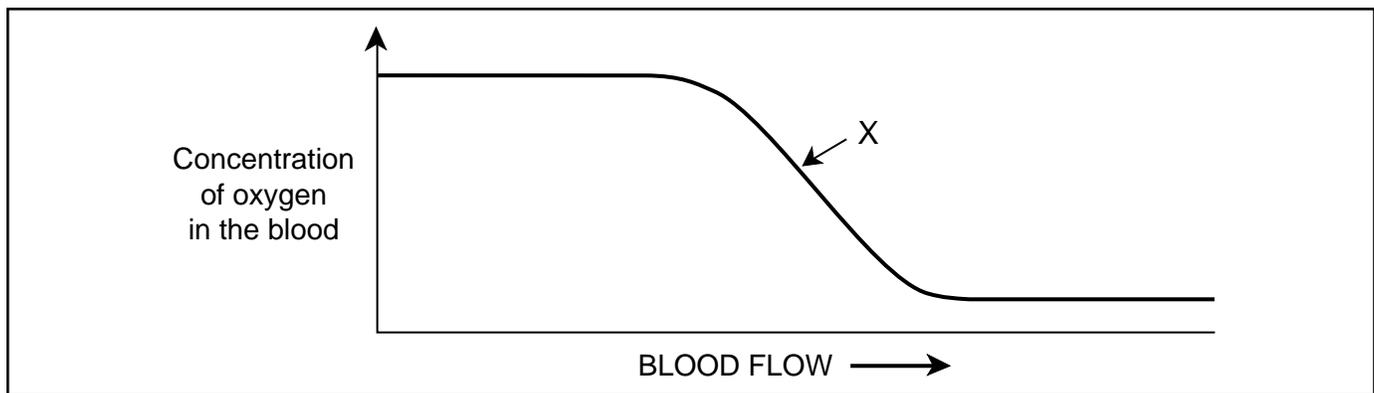
34. When the structure labelled X contracts
- A. exhalation occurs.
 - B. the epiglottis closes.
 - C. the volume of the thoracic cavity increases.
 - D. the pressure in the thoracic cavity increases.

OVER

35. Blood supply to an arm is cut off. Blood in the arm is sampled after five minutes and analyzed. Which of the following would occur?

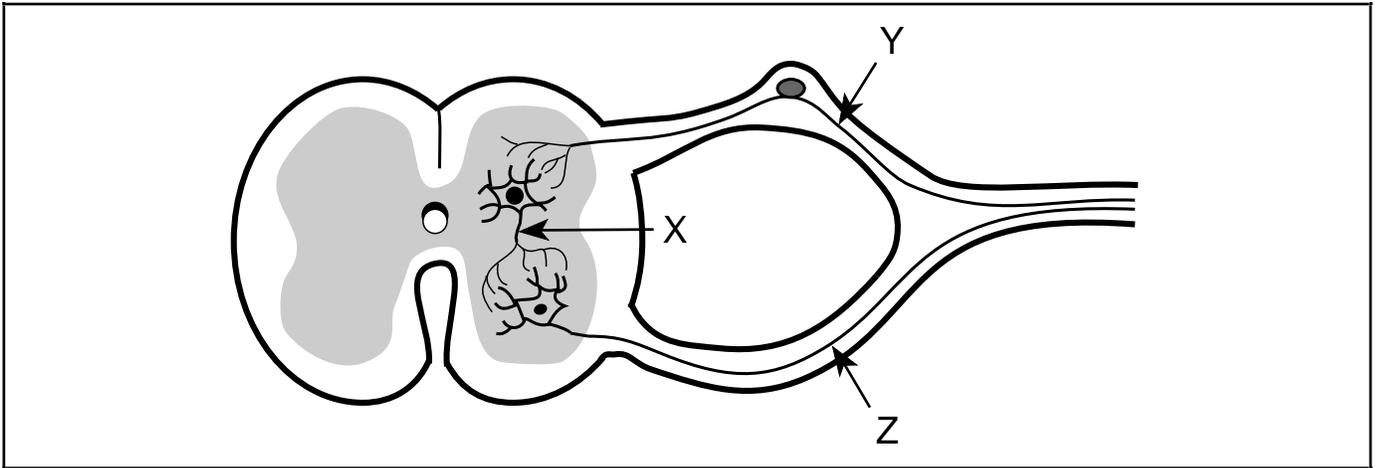
	Concentration of HHb	Concentration of HbO ₂	Concentration of HCO ₃ ⁻
A.	Low	High	Low
B.	Low	Low	High
C.	High	Low	High
D.	High	High	Low

Use the following diagram to answer question 36.



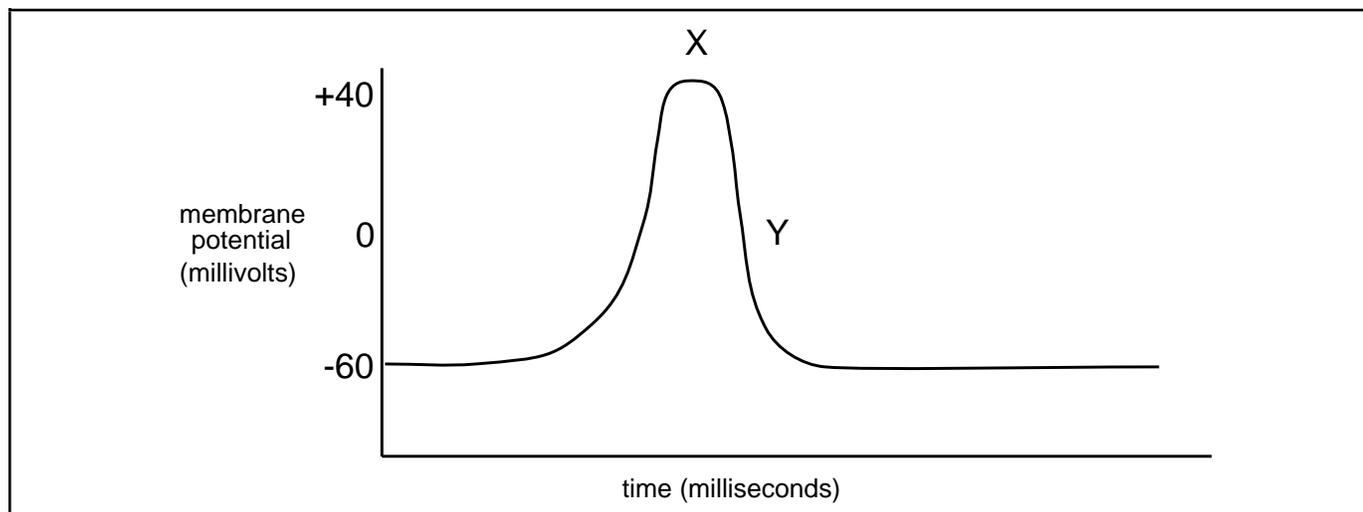
36. The above graph represents the levels of oxygen in the blood as it flows through the body. At point X the blood is flowing in a/an
- artery.
 - venule.
 - arteriole.
 - capillary.
37. Which of the following most accurately describes the function of the nodes of Ranvier?
- Release neurotransmitters.
 - Nourish and protect the neuron.
 - Cause the 'all or none' response.
 - Speed the transmission of nerve impulses.
38. A nerve to the heart is severed, resulting in a decreased heart rate. The severed nerve was likely a
- cranial nerve.
 - somatic nerve.
 - sympathetic nerve.
 - parasympathetic nerve.

Use the following diagram to answer question 39.



39. If an action potential was initiated at neuron X, an impulse would be generated in
- A. X only.
 - B. X and Y.
 - C. X and Z.
 - D. Y and Z.
40. Sensory receptors initiate nerve impulses in
- A. long axons.
 - B. short axons.
 - C. long dendrites.
 - D. short dendrites.
41. Due to a head injury, a patient's ability to breathe has been impaired. Where has the damage likely occurred?
- A. The cerebrum.
 - B. The cerebellum.
 - C. The hypothalamus.
 - D. The medulla oblongata.
42. In which lobe of the brain are sensory areas for hearing and smelling located?
- A. Frontal.
 - B. Parietal.
 - C. Occipital.
 - D. Temporal.

Use the following diagram to answer question 43.



43. What is occurring within the neuron between areas X and Y?

- A. Sodium ions are moving into the cell.
- B. Sodium ions are moving out of the cell.
- C. Potassium ions are moving out of the cell.
- D. The sodium/potassium pump is in operation.

44. Which of the following is excreted by the lungs?

- A. Urea.
- B. Ammonia.
- C. Bile pigments.
- D. Carbon dioxide.

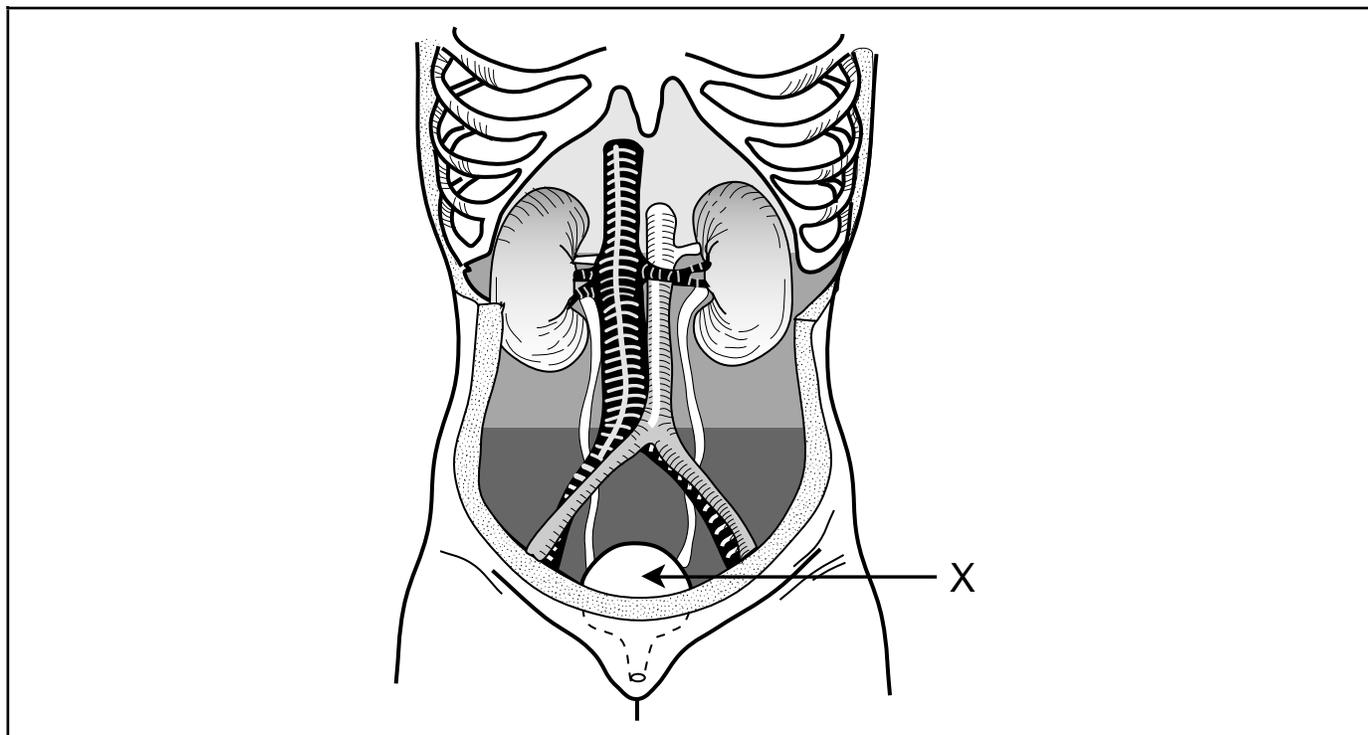
45. The following data were collected from a normal kidney during a one minute period:

Amount of blood entering renal artery	Amount of plasma entering Bowman's capsule	Amount of urine produced
600 mL	120 mL	1 mL

How much blood will enter the renal vein over this one minute period?

- A. 1 mL.
- B. 480 mL.
- C. 599 mL.
- D. 720 mL.

Use the following diagram to answer question 46.



46. Structure X in the diagram represents the

- A. ureter.
- B. kidney.
- C. urethra.
- D. bladder.

47. Which of the following hormones is secreted by the anterior pituitary gland?

- A. ADH.
- B. Cortisol.
- C. Thyroxin.
- D. Growth hormone.

48. Which of the following is a function of insulin?

- A. Initiating the 'fight or flight' response.
- B. Decreasing glucose concentration in the blood.
- C. Increasing the calcium ions concentration in the blood.
- D. Decreasing the sodium ions concentration in the blood.

49. In an experiment, a hormone is injected into the heart muscle of a rat. The response is an increased heart rate. Which of the following glands was the source of the hormone?

- A. Pancreas.
- B. Parathyroids.
- C. Adrenal medulla.
- D. Anterior pituitary.

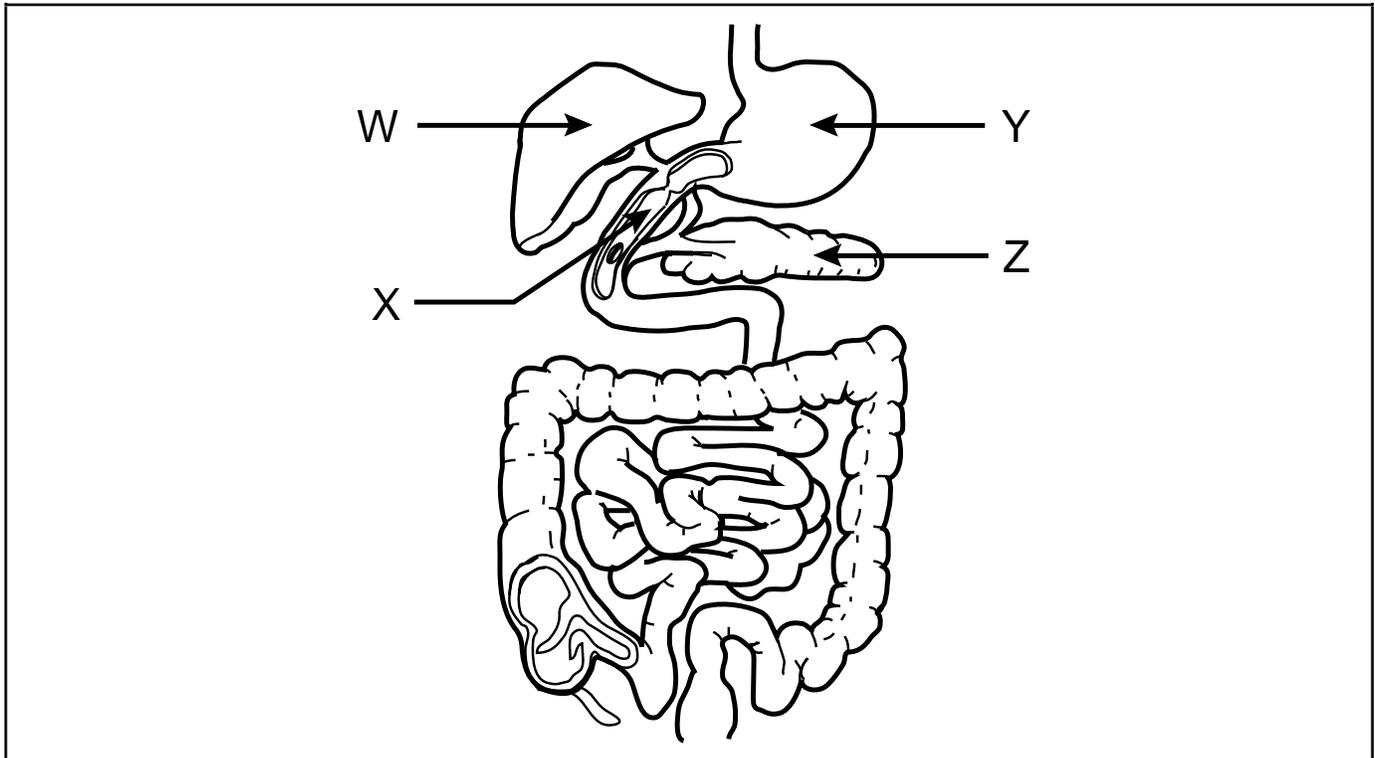
50. Sodium levels in the blood are regulated by

- A. insulin.
- B. cortisol.
- C. thyroxin.
- D. aldosterone.

51. An increase in the secretion of parathyroid hormone (PTH) would lead to increased

- A. metabolic rate.
- B. protein synthesis.
- C. blood sugar level.
- D. calcium level in the blood.

Use the following diagram to answer question 52.



52. Which structure indicated in the above diagram produces CCK (cholecystokinin)?

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

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

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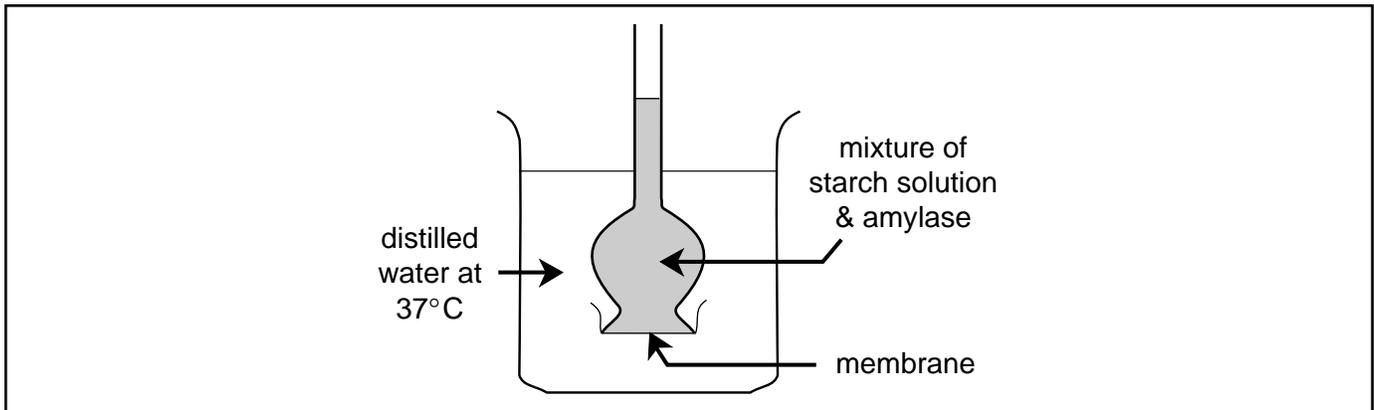
PART B: WRITTEN-RESPONSE QUESTIONS

Value: 28 marks

Suggested Time: 50 minutes

- INSTRUCTIONS:**
1. Use a **PEN** for this part of the examination.
 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. A student set up the experiment illustrated above and kept it at 37°C. After five minutes, the distilled water in the beaker was tested and found to contain a sugar but no starch.

a) What had occurred inside the tube? **(1 mark)**

b) What statement can you make about the permeability of the membrane? **(1 mark)**

- c) An identical experiment was set up and kept at 5°C. After five minutes, how would the amount of sugar found in the water differ between the two beakers? Explain your answer. **(2 marks)**

Score for Question 1.
1. _____ (4)

OVER

2. Explain any **TWO** of the following three phrases. Only your first two attempts will be marked.
(4 marks: 2 marks each)

a) Many different proteins can be constructed from just a few different amino acids.

b) Larger organisms are made of more cells, NOT bigger cells.

c) Mitochondria are the “power houses” of the cell.

Score for Question 2.
2. _____
(4)

3. Give **ONE** role of each of the following RNA molecules in protein synthesis:
(3 marks: 1 mark each)

a) mRNA: _____

b) tRNA: _____

c) Ribosomes (rRNA): _____

Score for Question 3. 3. _____ (3)

OVER

4. State **ONE** role of each of the following in photosynthesis. **(3 marks: 1 mark each)**

a) Chlorophyll: _____

b) Water: _____

c) Stroma: _____

Score for
Question 4.

4. _____
(3)

5. State **TWO** functions of the liver. **(2 marks: 1 mark each)**

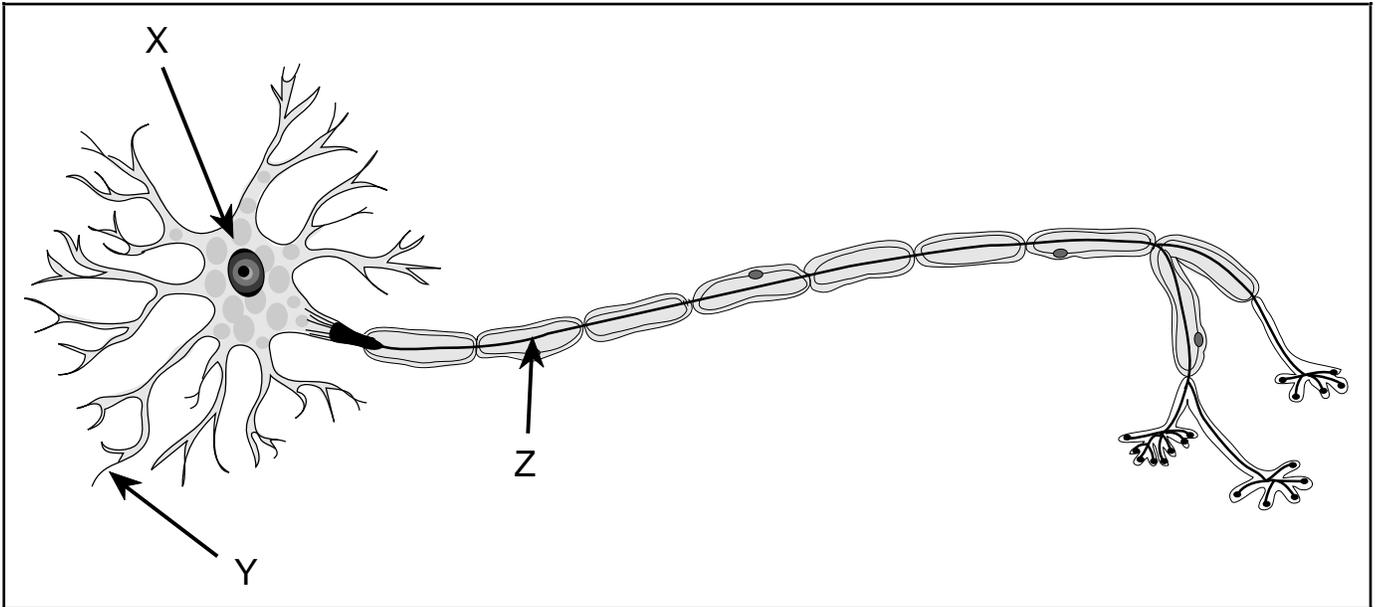
a) _____

b) _____

Score for
Question 5.

5. _____
(2)

Use the following diagram to answer question 6.



6. The above diagram is of a neuron. Name the parts labelled X, Y and Z and give **ONE** function of each. (6 marks: 1 mark for name, 1 mark for function)

a) Part X: _____

Function: _____

b) Part Y: _____

Function: _____

c) Part Z: _____

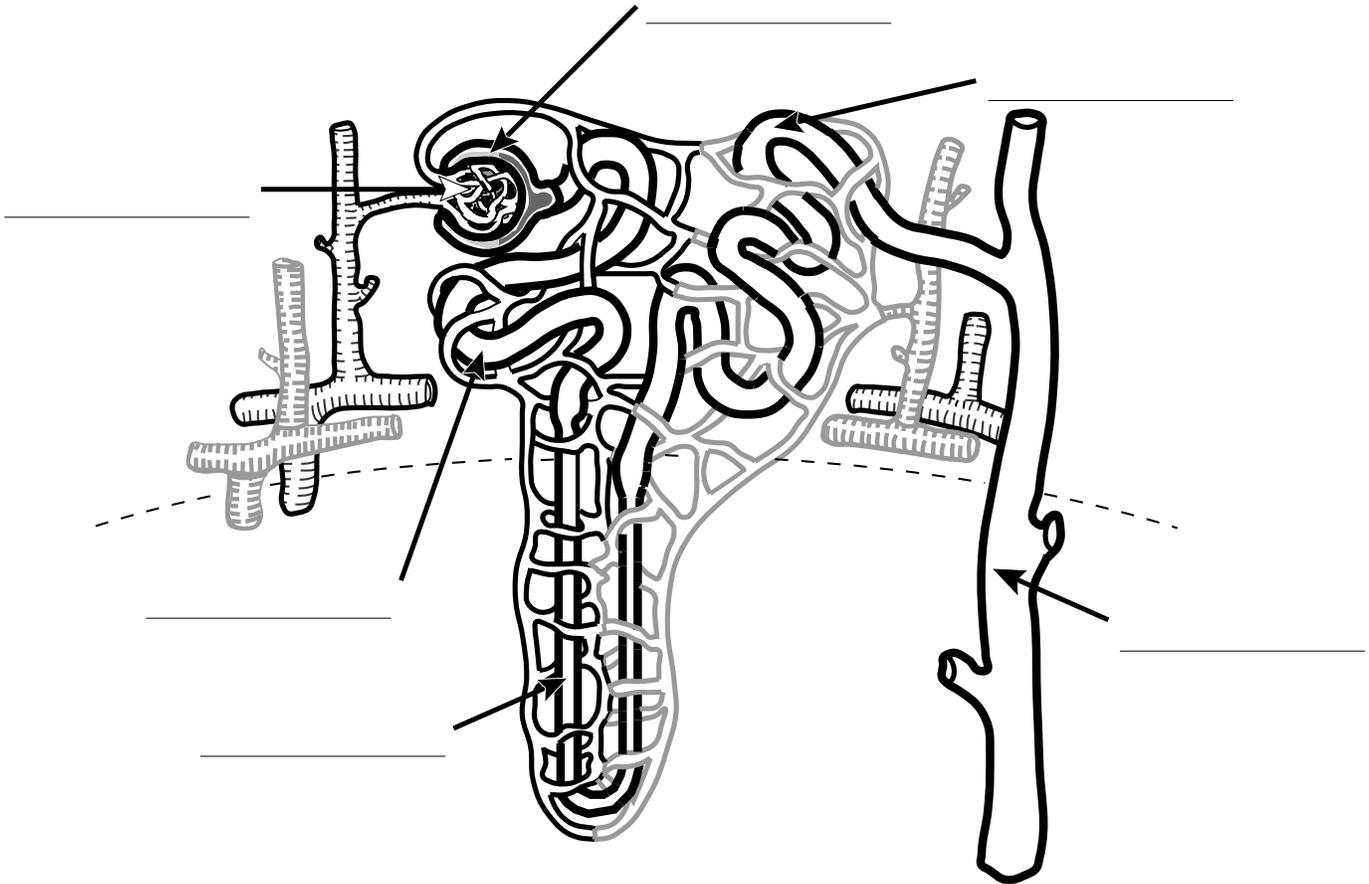
Function: _____

Score for Question 6.
6. _____
(6)

Use the following list to answer question 7.

- Proximal tubule
- Loop of Henle
- Distal tubule
- Bowman's capsule
- Collecting duct
- Glomerulus

7. a) Label the structures indicated on the following diagram using the terms given above.
(3 marks: $\frac{1}{2}$ mark each)



b) Give **ONE** role of each of the following in the production of urine. **(3 marks: 1 mark each)**

i) Glomerulus: _____

ii) Proximal tubule: _____

iii) Distal tubule: _____

Score for Question 7. 7. _____ (6)

OVER

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PART C: OPTIONAL AREAS

Value: 20 marks

Suggested Time: 30 minutes

- INSTRUCTIONS:**
1. Choose **TWO** sections from the optional areas in this part of the exam.
 2. Answer **ALL** of the questions in each section that you choose.
 3. If you answer questions in more than two sections, only the **first two** sections will be marked.
 4. You may not need all of the space provided to answer each question.

OPTION I: IMMUNOLOGY

OPTION II: SKELETAL SYSTEM AND MUSCLES

OPTION III: REPRODUCTION AND EMBRYOLOGY

OPTION IV: GENETIC DISORDERS AND ENGINEERING

OPTION V: CANCER

OPTION VI: SENSORY RECEPTORS

OPTION I: IMMUNOLOGY

1. Select a term from column A that matches its description given in column B. Write the term in the blank beside each description. Each term may be used only once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
B cells	a) foreign substances in the body _____
killer (cytotoxic) T cells	b) results from an overactive immune system _____
passive immunity	c) blow up cells infected with virus _____
active immunity	d) engulf foreign substances _____
allergy	e) memory cells are responsible for _____
macrophages	f) plasma cells that release antibodies _____
antibodies	
antigens	

2. How does a vaccine provide immunity against a disease? **(2 marks)**

3. a) Which virus causes AIDS? **(1 mark)**

- b) How does this virus destroy the body's immune system? **(1 mark)**

Score for Option I. 8. ___ ___ tens units (10)

OPTION II: SKELETAL SYSTEMS AND MUSCLES

1. Select a term from column A that matches its description given in column B. Write the term in the blank beside each description. Each term may be used only once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
appendicular skeleton	a) supports and protects the organs of the head, neck and trunk _____
cardiac muscle	b) has a matrix composed of calcium salts _____
sarcolemma	c) the membrane of a muscle cell _____
axial skeleton	d) provides increased flexibility between vertebrae _____
bone	e) composed of striated, branched cells _____
scoliosis	f) abnormal curvature of the spine _____
slightly-movable joint	
sarcomere	

2. Give the function of the following. **(2 marks: 1 mark each)**

a) Tendons: _____

b) Ligaments: _____

3. Explain the relationship between ATP and myosin. **(2 marks)**

Score for Option II. 9. <u> </u> <u> </u> tens units (10)

OPTION III: REPRODUCTION AND EMBRYOLOGY

1. Select a term from column A that matches its description given in column B. Write the term in the blank beside each description. Each term may be used only once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
prostate gland	a) produce sperm and testosterone _____
oviduct	b) provides energy for movement _____
vasectomy	c) usual site of fertilization _____
testes	d) cutting and tying of the ductus deferens on each side _____
morphogenesis	e) a hollow ball of cells _____
fertilization	f) movement of cells and tissues to establish an organism's shape _____
mid-piece of sperm	
blastula	

2. Name the source and target of luteinizing hormone (LH) in the female. **(2 marks: 1 mark each)**

Source: _____

Target _____

3. a) List **TWO** characteristics of the endometrium of the uterus during the second half of the menstrual cycle. **(1 mark: $\frac{1}{2}$ mark each)**

- b) Name the hormone responsible for these characteristics. **(1 mark)**

Score for Option III. 10. ___ ___ tens units (10)
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OPTION IV: GENETIC DISORDERS AND ENGINEERING

1. Select a term from column A that matches its description given in column B. Write the term in the blank beside each description. Each term may be used only once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
telophase	a) introduces recombinant DNA into a human host cell _____
vector	b) attaches foreign DNA to host DNA _____
plasmid	c) transfer of DNA by viruses _____
protoplast	d) product of plant cell wall removal _____
conjugation	e) when division of cytoplasm occurs _____
transduction	f) genetically identical to parent cell _____
ligase	
clone	

2. Give **ONE** function of each of the following in biotechnology. **(2 marks: 1 mark each)**

a) Plasmid: _____

b) Restriction enzymes: _____

3. State **TWO** uses of recombinant DNA. **(2 marks)**

Score for Option IV. 11. ___ ___ tens units (10)

OPTION V: CANCER

1. Select a term from column A that matches its description given in column B. Write the term in the blank beside each description. Each term may be used only once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
anaplasia	a) increased blood supply to tumour site _____
initiator	b) converts proto-oncogene into oncogene _____
promoter	c) spreading cancer cells to different organs _____
metastasis	d) boosts the immune system's activity _____
sarcoma	e) disorganized growth of cells _____
carcinoma	f) cancers of epithelial tissues _____
interleukin	
vascularization	

2. Give the role of the following cells in fighting cancer. **(2 marks: 1 mark each)**

a) Macrophage: _____

b) B cells: _____

3. Give **ONE** symptom or danger sign for each of the following cancers. **(2 marks: $\frac{1}{2}$ mark each)**

a) Breast: _____
 b) Lung: _____
 c) Colon: _____
 d) Skin: _____

Score for Option V. 12. _____ tens units (10)
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OPTION VI: SENSORY RECEPTORS

1. Select a term from column A that matches its description given in column B. Write the term in the blank beside each description. Each term may be used only once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
radioreceptors	a) base of a semicircular canal _____
mechanoreceptors	b) secretes aqueous humour _____
rods	c) active in bright light _____
cones	d) regulates diameter of pupil _____
iris	e) respond to displacement of tissue _____
ampulla	f) contain rhodopsin _____
sacculles	
ciliary body	

2. State **ONE** characteristic of and **ONE** possible corrective measure for cataracts. **(2 marks: 1 mark each)**

Characteristic: _____

Corrective measure: _____

3. Give **TWO** functions of the ossicles in the ear.. **(2 marks: 1 mark each)**

a) _____

b) _____

Score for Option VI.
13. <u> </u> <u> </u> tens units (10)

END OF EXAMINATION

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