

JANUARY 1995

PROVINCIAL EXAMINATION

MINISTRY OF EDUCATION

BIOLOGY 12

GENERAL INSTRUCTIONS

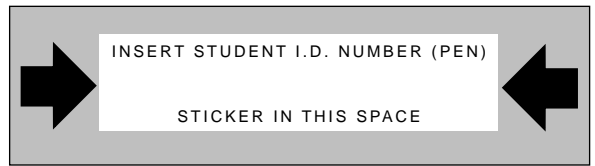
1. Insert the stickers with your Student I.D. Number (PEN) in the allotted spaces above. **Under no circumstance is your name or identification, other than your Student I.D. Number, to appear on this paper.**
2. Take the separate Answer Sheet and follow the directions on its front page.
3. Be sure you 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.
5. 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.

6. 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



_____ - _____

**BIOLOGY 12 JANUARY 1995 PROVINCIAL
(BIP)**

1. _____
(6)

2. _____
(5)

3. _____
(3)

4. _____
(6)

5. _____
(3)

6. _____
(5)

OPTIONS: Score **only two** of the following optional sections.

Option I. 7. _____
(10)

Option IV. 10. _____
(10)

Option II. 8. _____
(10)

Option V. 11. _____
(10)

Option III. 9. _____
(10)

Option VI. 12. _____
(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: 6 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 | 100 marks |
| | | 120 minutes |

- Multiple-choice questions must be answered in HB pencil on the answer sheet provided. All other questions are to be answered in INK in the spaces provided in this booklet.
- For written-response questions, organization and planning space has been incorporated into the space allowed for answering each question.
- You have **two hours** to complete this examination.

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PART A: MULTIPLE-CHOICE QUESTIONS

Value: 52 marks

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.

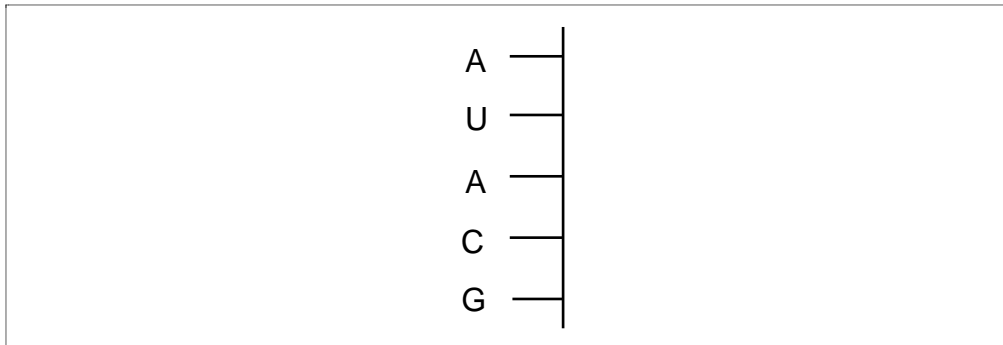
1. The part of an experiment that is subjected to all of the procedures **except** the one being tested is called the
 - A. data.
 - B. control.
 - C. test sample.
 - D. dependent variable.

2. Which of the following is an example of negative feedback?
 - A. Flipping a switch turns on a light.
 - B. Turning on the lights increases the rate of plant growth.
 - C. Turning up a dial on the oven increases the temperature.
 - D. The thermostat shuts off the furnace as the room temperature reaches 20° C.

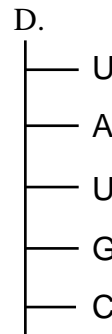
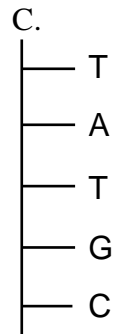
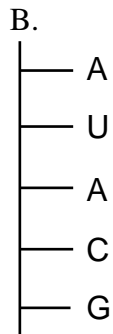
3. Some biologically-important molecules dissolve easily in water because the water molecule is
 - A. polar.
 - B. organic.
 - C. saturated.
 - D. a polymer.

4. The base found in RNA nucleotides but **not** in DNA nucleotides is
 - A. uracil (U).
 - B. adenine (A).
 - C. guanine (G).
 - D. cytosine (C).

Use the following diagram to answer question 5.



5. The diagram above shows the base sequence of a part of a strand of mRNA. Which of the following DNA strands would be complementary to the strand above?



6. Glycogen is **not** normally found in the blood because

- A. free glucose molecules are stored as starch.
- B. free glucose molecules are converted to amino acids.
- C. glycogen can be structurally incorporated directly into the cell wall.
- D. glycogen molecules are unable to diffuse through the cell membrane.

7. Prokaryotic cells are different from eukaryotic cells in that prokaryotic cells lack

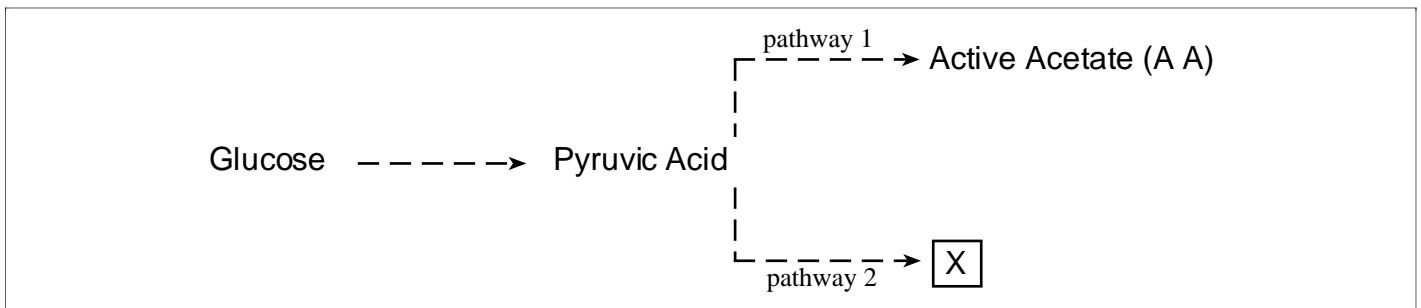
- A. cell walls.
- B. ribosomes.
- C. mitochondria.
- D. cell membranes.

8. The cells that make up an organ that is active in producing steroid hormones have abundant numbers of which of the following organelles?

- A. Ribosomes and lysosomes.
- B. Chloroplasts and mitochondria.
- C. Nucleoli and rough endoplasmic reticulum.
- D. Smooth endoplasmic reticulum and Golgi bodies.

9. The cell process which uses ATP to bring substances into the cell is
- osmosis.
 - diffusion.
 - active transport.
 - facilitated transport.
10. If the solute concentration of solution **A** is greater than solution **B**, then solution **A** is said to be
- isotonic to solution B.
 - osmotic to solution B.
 - hypotonic to solution B.
 - hypertonic to solution B.
11. The equation $\text{NAD} + \text{H}_2 \rightarrow \text{NADH}_2$ shows that NAD has been
- reduced.
 - oxidized.
 - denatured.
 - hydrolyzed.

Use the following diagram to answer question 12.



12. In the diagram above, what are the products of pathway 2 at **X**?
- CO_2 and alcohol.
 - 38 ATP and CO_2 .
 - O_2 and lactic acid.
 - FADH_2 and alcohol.
13. Which metabolic pathway requires oxygen?
- Glycolysis.
 - Fermentation.
 - Respiratory chain.
 - Photophosphorylation.

Use the following data to answer question 14.

| TEST TUBE | CONTENTS | TEMP. (°C) | pH |
|-----------|-------------------------------|------------|----|
| W | starch and pancreatic amylase | 35 | 6 |
| X | starch and pancreatic amylase | 37 | 9 |
| Y | starch and pancreatic amylase | 60 | 7 |
| Z | starch and pancreatic amylase | 37 | 3 |

14. The above experiment measures the effect of temperature and pH on pancreatic amylase. Which tube will eventually contain the **highest** product concentration?
- A. W
 - B. X
 - C. Y
 - D. Z
15. The rate of photosynthesis would be **highest** if green plants were exposed to
- A. microwaves.
 - B. infrared light.
 - C. blue and red light.
 - D. green and yellow light.
16. During daylight hours green plants carry on
- A. respiration only.
 - B. photosynthesis only.
 - C. respiration and fermentation.
 - D. photosynthesis and respiration.
17. The function of photolysis is to
- A. excite the electrons in chlorophyll.
 - B. provide the substrate for the next reaction.
 - C. provide replacement electrons for chlorophyll.
 - D. release energy from excited electrons at the cytochromes.

Use the following information to answer question 18.

- | |
|-----------------|
| 1. Organ |
| 2. Cell |
| 3. Organ system |
| 4. Tissue |

18. From left to right, the sequence that represents increasing complexity is

- A. 1, 3, 2, 4
- B. 2, 1, 3, 4
- C. 2, 4, 1, 3
- D. 2, 4, 3, 1

19. Digestion is defined as the process whereby

- A. glucose is converted to glycogen.
- B. carbon dioxide is reduced to carbohydrate.
- C. proteins are absorbed into the bloodstream.
- D. food is chemically and physically broken down.

20. In humans, the bacteria *E. coli* are **normally** found within the

- A. colon.
- B. mouth.
- C. pancreas.
- D. small intestine.

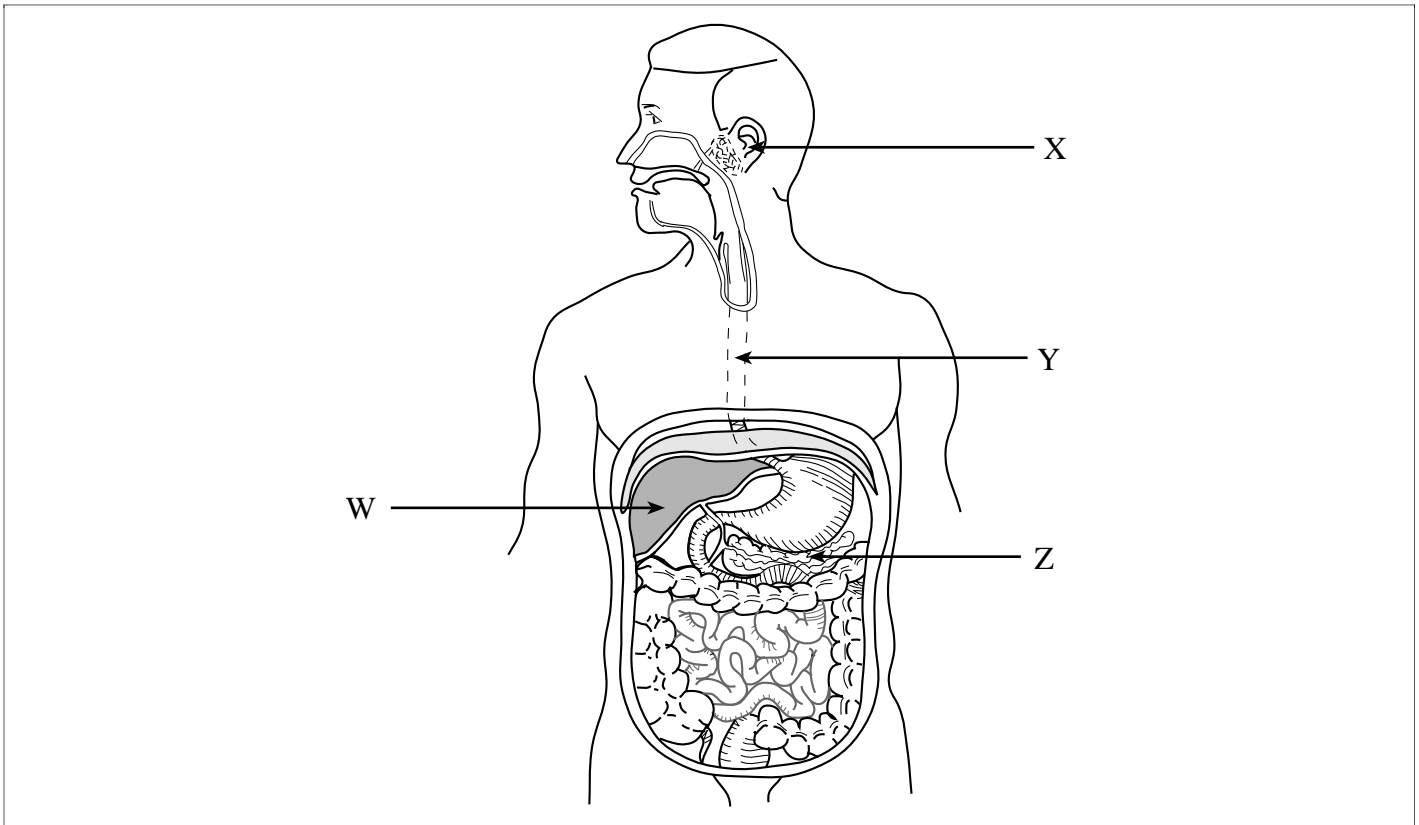
Use the following data to answer question 21.

| SAMPLE | SUBSTRATE | ENZYME |
|--------|-----------|---------|
| W | starch | pepsin |
| X | protein | trypsin |
| Y | glycogen | lipase |
| Z | maltose | amylase |

21. All of the samples above are placed in water baths maintained at 37° C. In which of the samples will digestion occur?

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

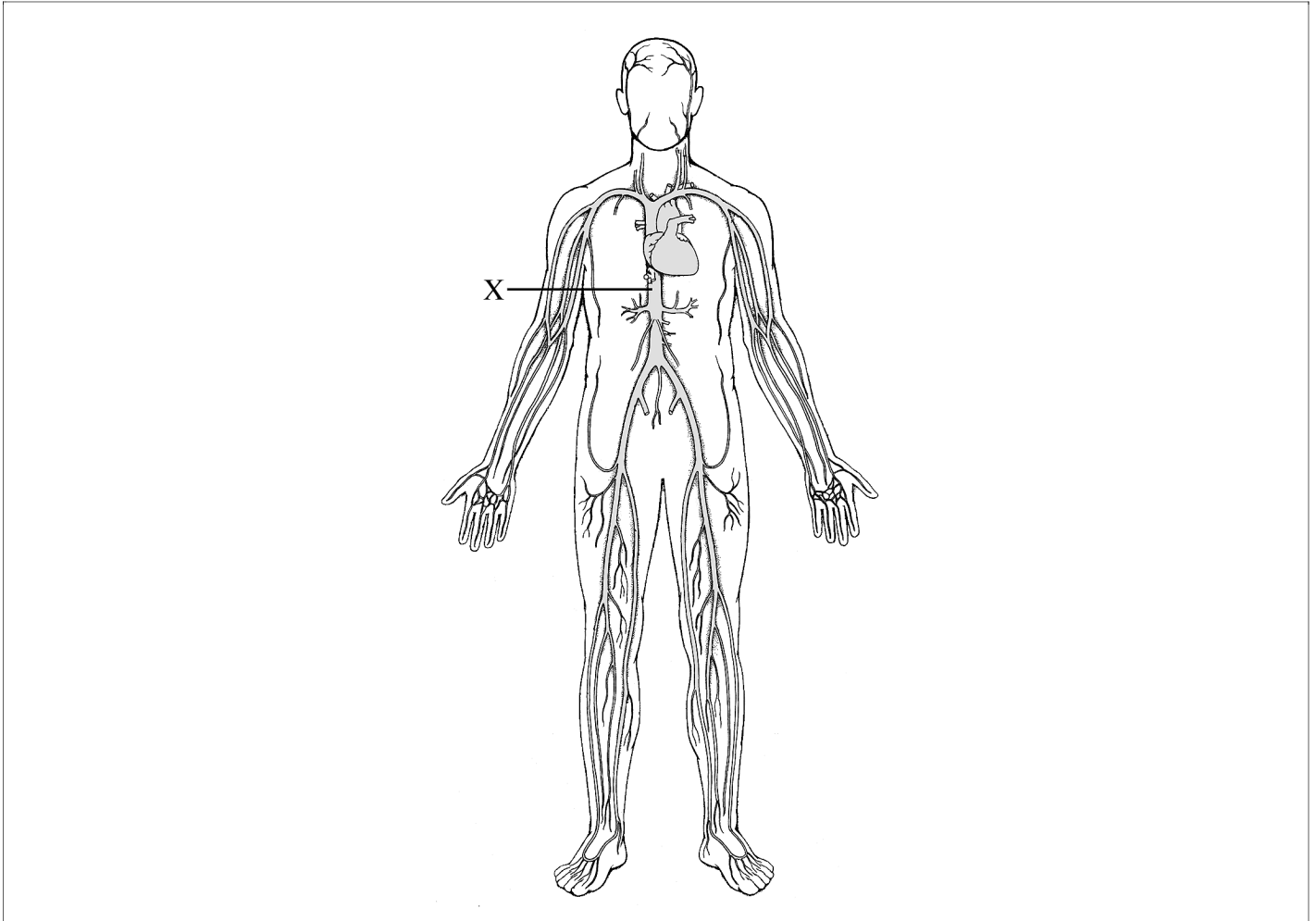
Use the following diagram to answer question 22.



22. Which arrow in the diagram above indicates a site at which peristalsis occurs?

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

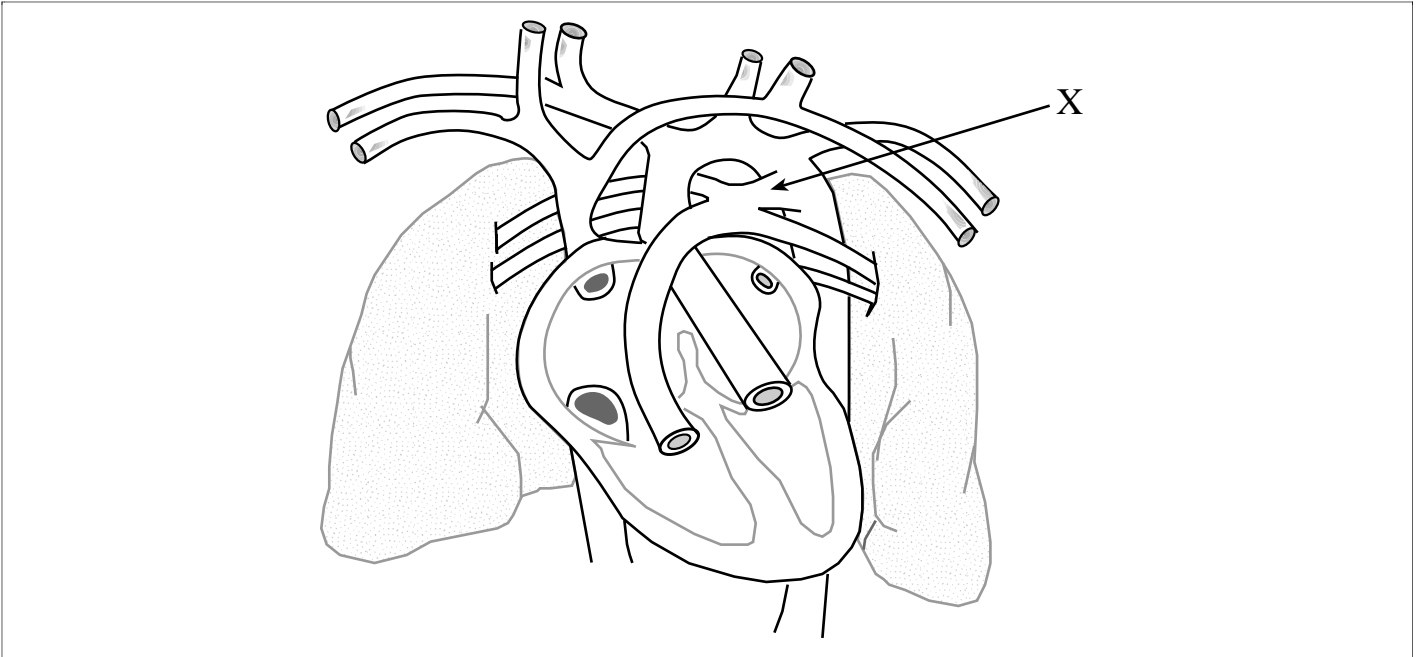
Use the following diagram to answer question 23.



23. The structure labelled **X** in the above diagram is the

- A. hepatic vein.
- B. carotid artery.
- C. coronary artery.
- D. posterior vena cava.

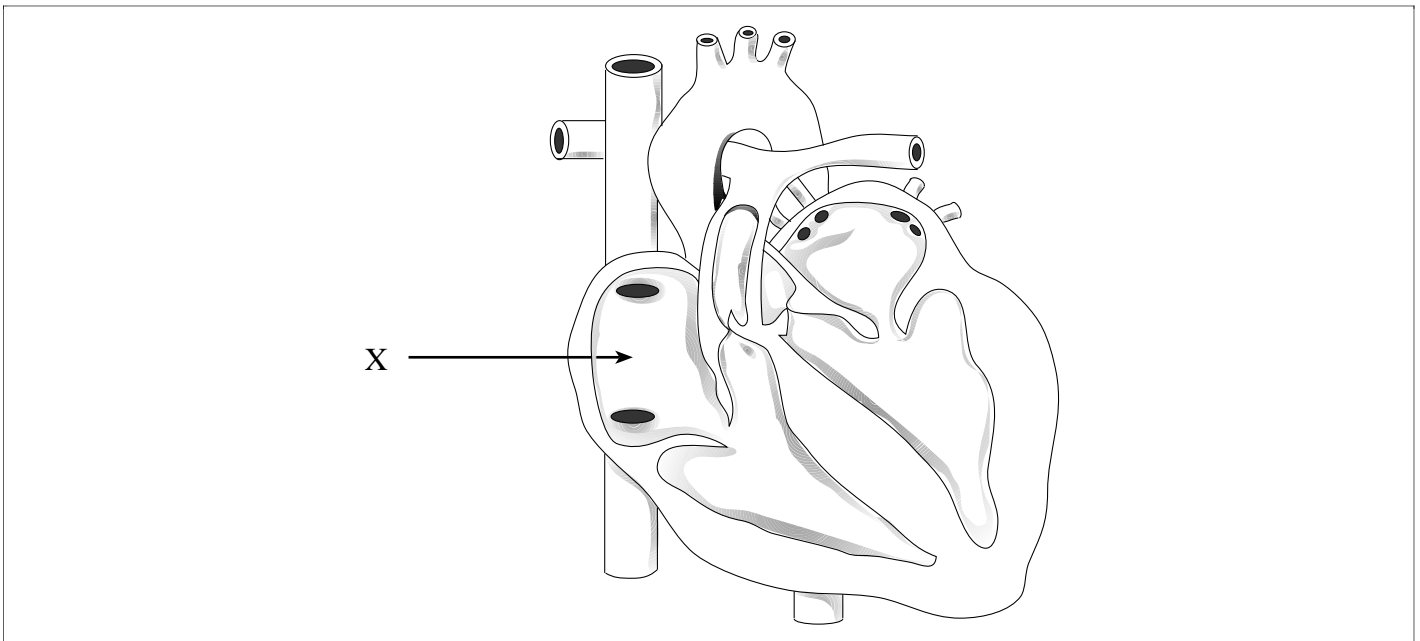
Use the following diagram to answer question 24.



24. The function of the structure labelled **X** in the above diagram of a fetal heart is to
- A. carry waste to the mother.
 - B. allow some blood to bypass the lungs.
 - C. deliver oxygenated blood to the lungs.
 - D. prevent mixing of oxygenated and deoxygenated blood.
25. Which of the following **best** describes an artery?
- A. Thin-walled, elastic and supplied with nerves.
 - B. Thick-walled, elastic and supplied with valves.
 - C. Thick-walled, elastic and supplied with nerves.
 - D. Thin-walled, and supplied with valves and nerves.
26. Which of the following makes up the **largest** component of blood by volume?
- A. Lymph.
 - B. Plasma.
 - C. Red cells.
 - D. White cells.
27. The first indication of a malfunctioning SA node would **likely** be
- A. an irregular heart beat.
 - B. degeneration of the heart muscle.
 - C. increased oxygen content in the arterial blood.
 - D. back flow of blood from the pulmonary artery to the ventricle.

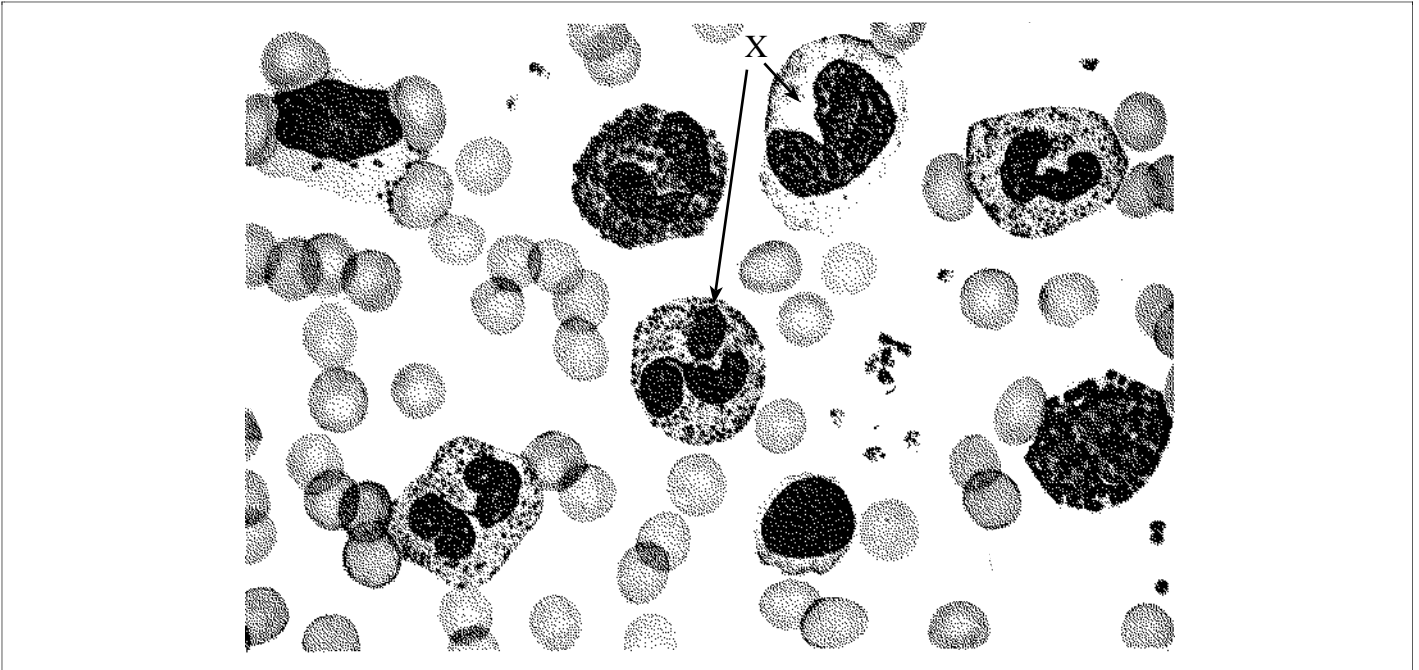
28. A person complains of constant fatigue and a lack of energy. The **most likely** cause of these symptoms is not enough
- A. fibrin.
 - B. calcium.
 - C. histamine.
 - D. hemoglobin.
29. Which of the following blood vessels provides nutrients to the heart tissue?
- A. Aorta.
 - B. Carotid artery.
 - C. Coronary artery.
 - D. Inferior vena cava.
30. Which of the following are needed to begin blood clotting?
- A. Red cells and platelets.
 - B. White cells and red cells.
 - C. Platelets and plasma proteins.
 - D. White cells and plasma proteins.

Use the following diagram to answer question 31.



31. Identify the structure indicated on the diagram above of a human heart.
- A. Left atrium.
 - B. Right atrium.
 - C. Left ventricle.
 - D. Right ventricle.

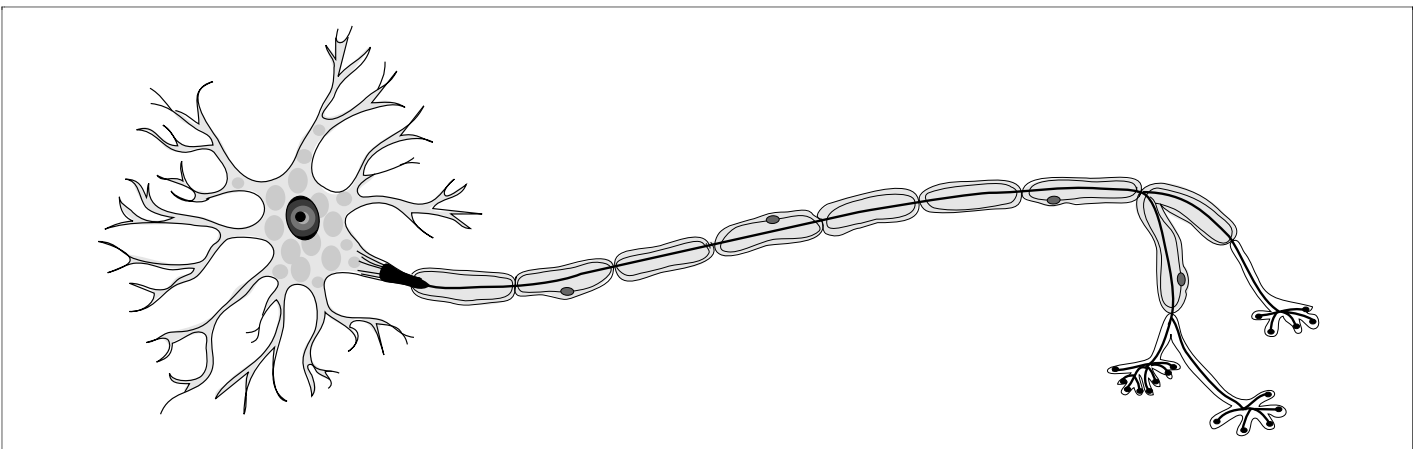
Use the following diagram to answer question 32.



32. A function of the cells labelled X is to

- A. carry oxygen.
- B. fight infection.
- C. promote clotting.
- D. carry dissolved nutrients.

Use the following diagram to answer question 33.

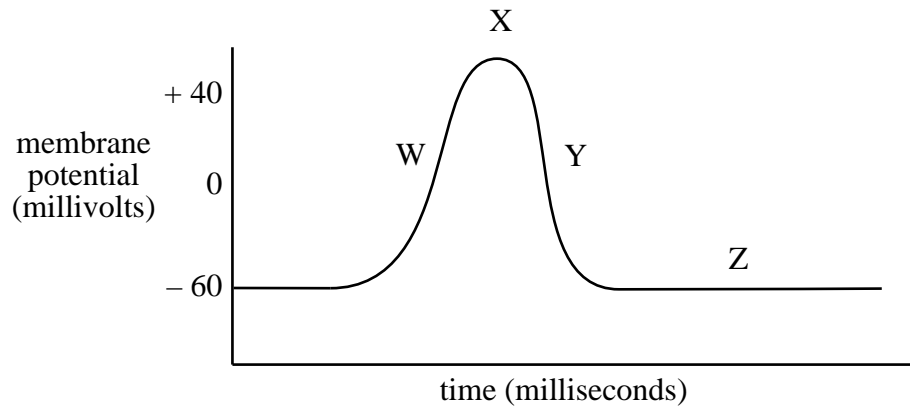


33. The neuron above carries messages

- A. to a muscle fibre.
- B. to a sensory receptor.
- C. to the central nervous system.
- D. within the central nervous system.

34. The neurotransmitter used by the sympathetic nervous system is
- gastrin.
 - noradrenalin.
 - acetylcholine.
 - acetylcholinesterase.

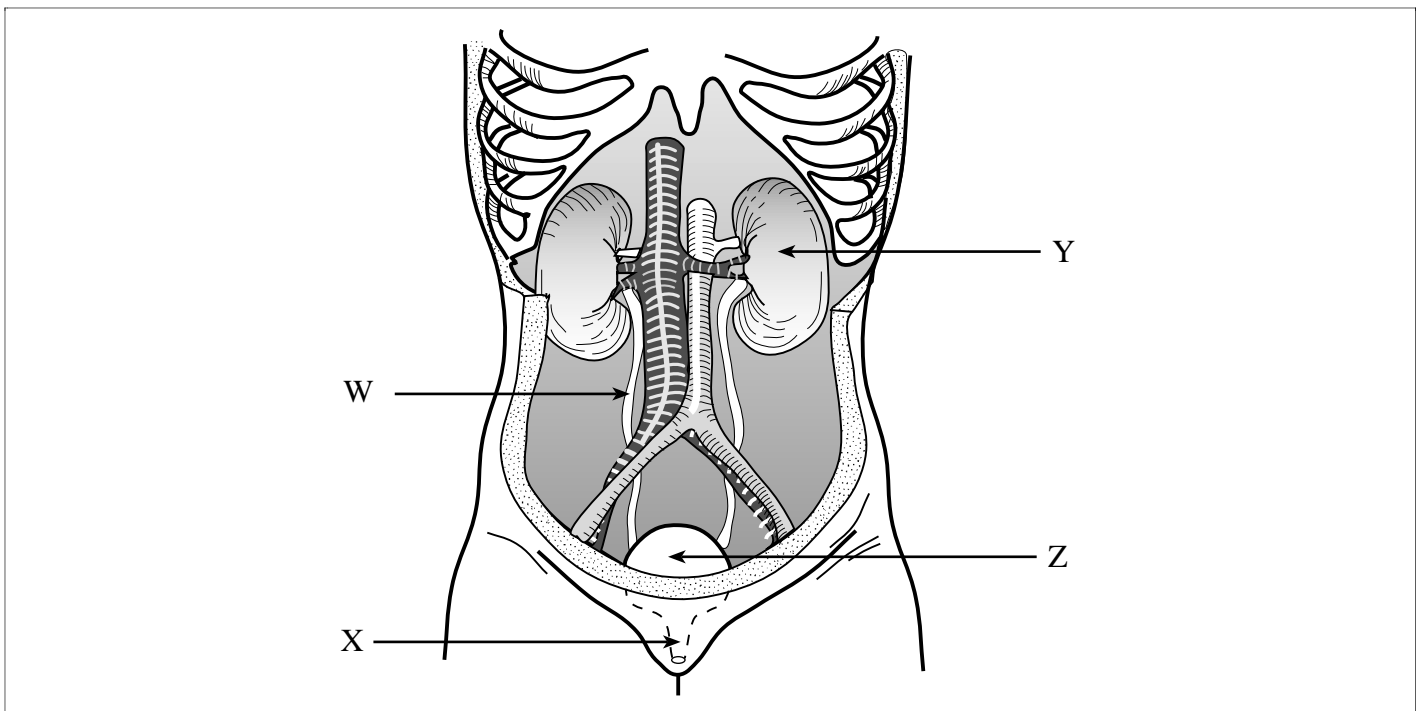
Use the following diagram to answer question 35.



35. At what point can an action potential be initiated?
- W
 - X
 - Y
 - Z
36. The distribution of sodium and potassium ions across the membrane of an axon is maintained by
- diffusion.
 - exocytosis.
 - phagocytosis.
 - active transport.
37. Once a neurotransmitter has been released, it has only a short time to act because
- enzymes inactivate it.
 - receptor sites break down.
 - calcium ions flow into the cleft.
 - the postsynaptic membrane closes.
38. Which of the following statements about the autonomic nervous system is **false**?
- It controls the internal organs.
 - It functions in a voluntary manner.
 - It is responsible for the “fight or flight” response.
 - Each impulse travels through two motor neurons and one ganglion.

39. Where does external respiration take place?
- Alveoli.
 - Trachea.
 - Bronchi.
 - Bronchioles.
40. The part of the brain that controls the rate and depth of breathing is the
- cerebrum.
 - cerebellum.
 - hypothalamus.
 - medulla oblongata.
41. Red blood cells are broken down in the
- skin.
 - liver.
 - lungs.
 - kidneys.

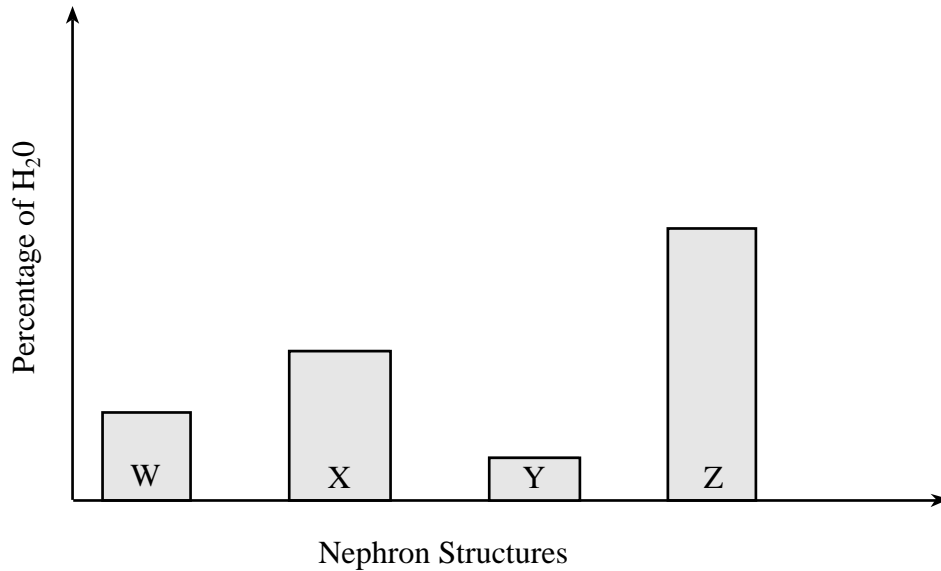
Use the following diagram to answer question 42.



42. In the diagram above of the human excretory system, which arrow indicates the structure which stores urine until it is released?
- W
 - X
 - Y
 - Z

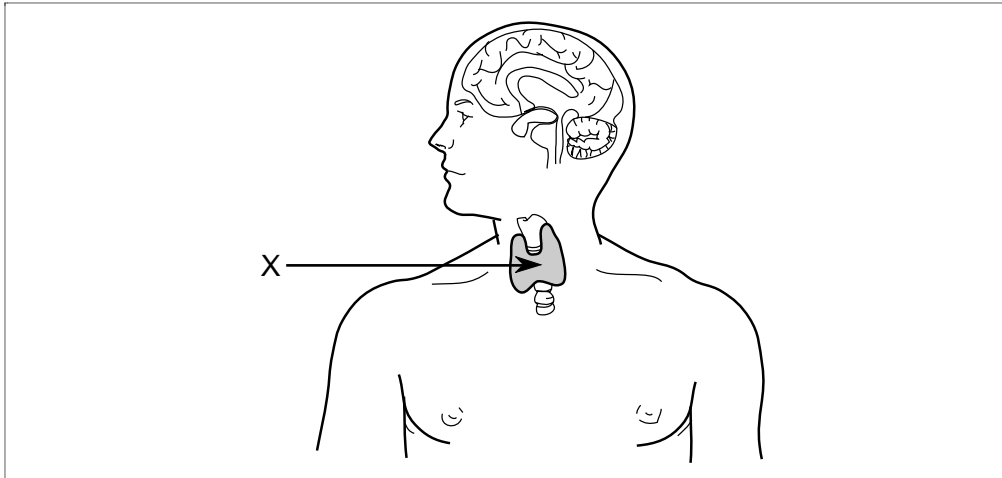
43. Which of the following is a valid comparison between the composition of plasma and urine?
- A. In plasma, the insulin concentration is lower, while in urine it is higher.
 - B. In plasma, the glucose concentration is lower, while in urine it is higher.
 - C. In plasma, the carbon dioxide concentration is lower, while in urine it is higher.
 - D. In plasma, the metabolic waste concentration is lower, while in urine it is higher.

Use the following graph to answer question 44.



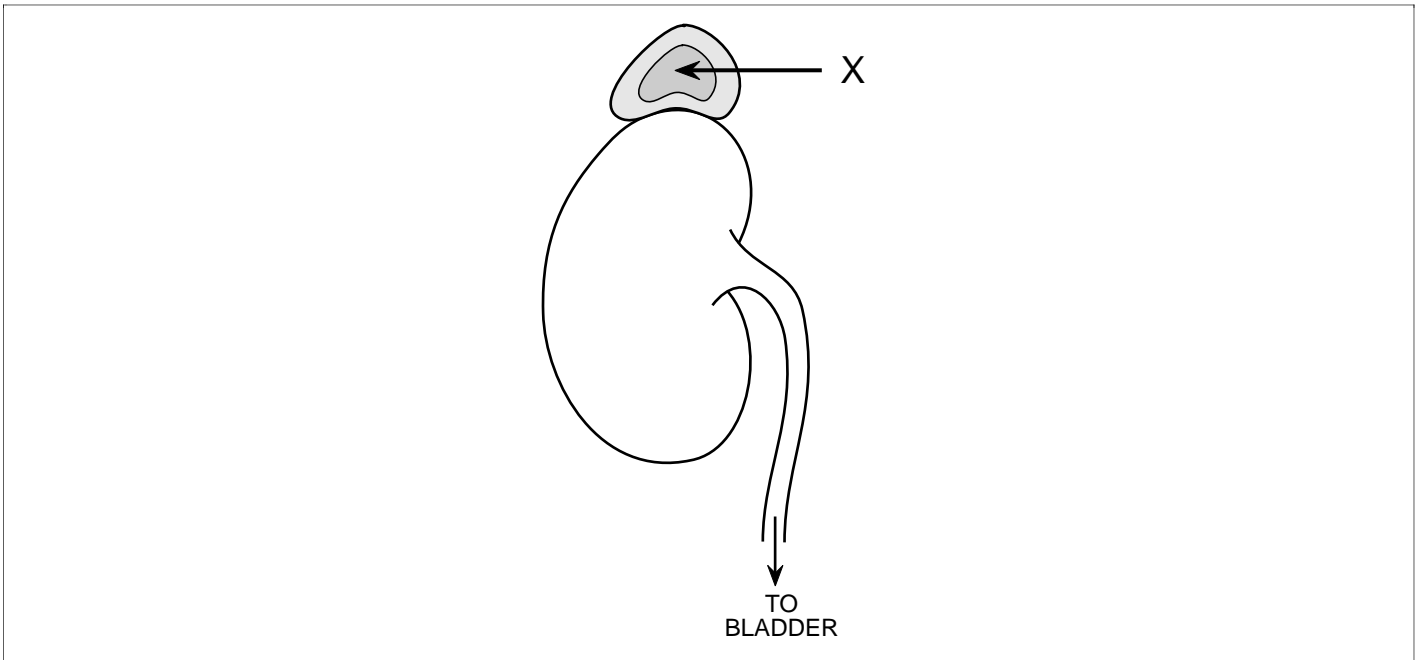
44. The graph above shows the percentages of H₂O in the filtrate within various structures of the nephron. Which structure is **likely** the collecting duct?
- A. W
 - B. X
 - C. Y
 - D. Z
45. The two categories of hormones are
- A. fats and vitamins.
 - B. lipids and antigens.
 - C. sugars and enzymes.
 - D. peptides and steroids.
46. Reduced parathyroid hormone (PTH) secretion leads to
- A. increased metabolic rate.
 - B. decreased thyroxin production.
 - C. increased blood glucose concentration.
 - D. decreased blood calcium concentration.

Use the following diagram to answer question 47.



47. The gland labelled **X** secretes
- A. calcitonin.
 - B. aldosterone.
 - C. growth hormone (GH).
 - D. lactogenic hormone (LTH).
48. Which of the following is produced in response to a high solute concentration in the blood?
- A. Insulin.
 - B. Adrenalin.
 - C. Aldosterone.
 - D. Antidiuretic hormone (ADH).
49. Adrenocorticotrophic hormone (ACTH) is released in response to
- A. stress.
 - B. growth.
 - C. low pulse rate.
 - D. increased sodium levels.

Use the following diagram to answer question 50.



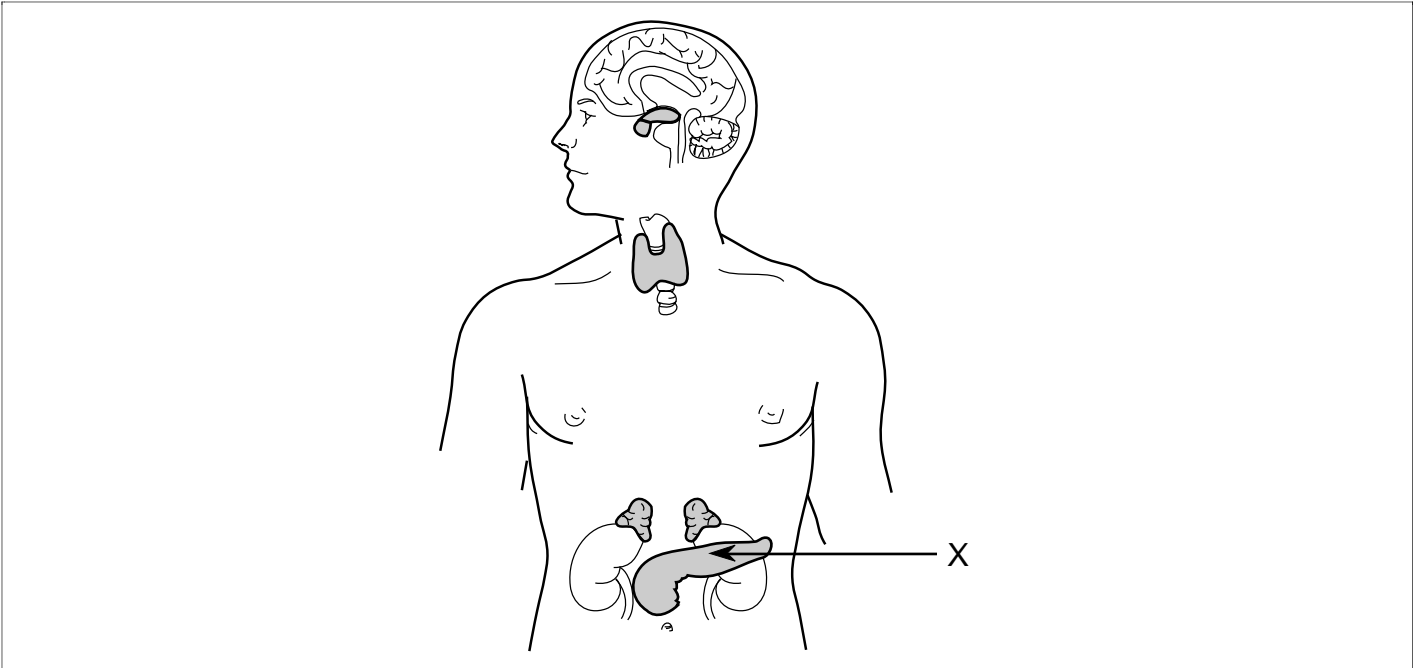
50. The inner portion (labelled X) of the endocrine gland above secretes

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

51. Which of the following causes the release of aldosterone?

- A. High iron levels in the blood.
- B. Low sodium levels in the blood.
- C. High calcium levels in the blood.
- D. Low potassium levels in the blood.

Use the following diagram to answer question 52.



52. A hormone secreted by the gland labelled **X** is

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

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

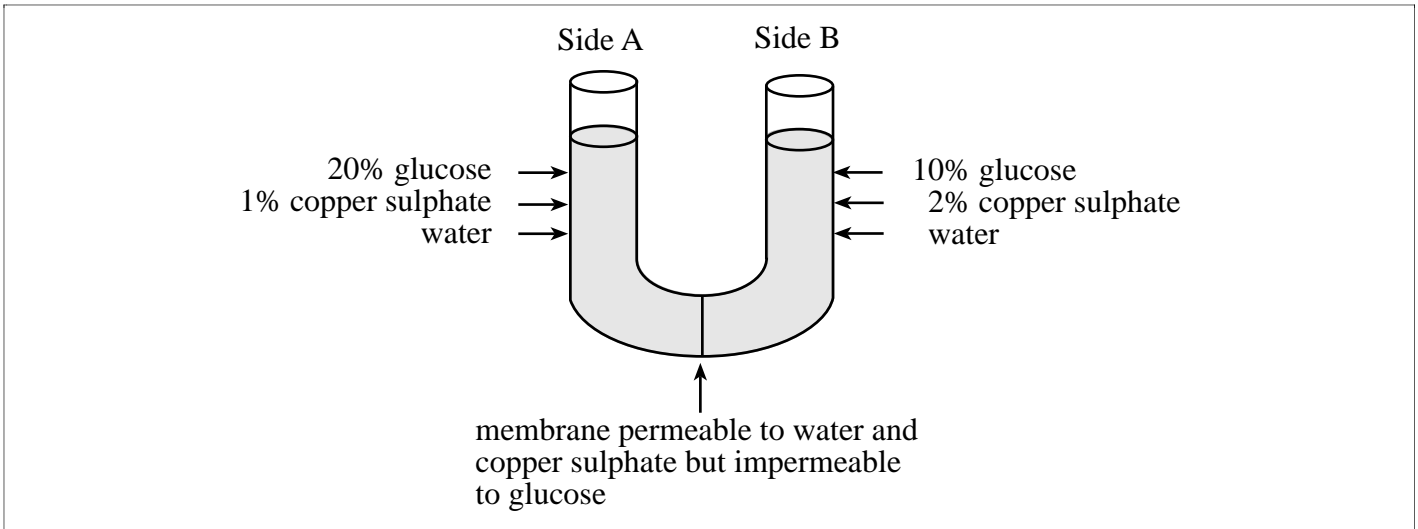
PART B: WRITTEN-RESPONSE

Total 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) Describe what happens to the concentration of the glucose solution on side A. Explain your answer. (2 marks)

- b) Describe what happens to the concentration of the copper sulphate solution on side A. Explain. (2 marks)

- c) Describe **two** ways to increase the rate of diffusion across the membrane. (2 marks)

Score for Question 1.

1. _____
(6)

2. State **one** role of each of the following in the synthesis of a protein.
(5 marks: 1 mark each)

a) DNA _____

b) mRNA _____

c) Ribosomes _____

d) tRNA _____

e) Amino acids _____

| |
|---|
| Score for Question 2. 2. _____ (5) |
|---|

3. Complete the following table contrasting cyclic and non-cyclic photophosphorylation. (3 marks: 1 mark each)

| | Cyclic Photophosphorylation | Non-cyclic Photophosphorylation |
|----------------------------|--------------------------------|------------------------------------|
| Location in chloroplast | thylakoid membrane | |
| Photosystem(s) utilized | | photosystems I and II |
| Product(s) | ATP | |

Score for
Question 3.

3.
(3)

4. Explain how digestion would be affected if the digestive functions of each of the following organs did **not** occur. **(6 marks)**

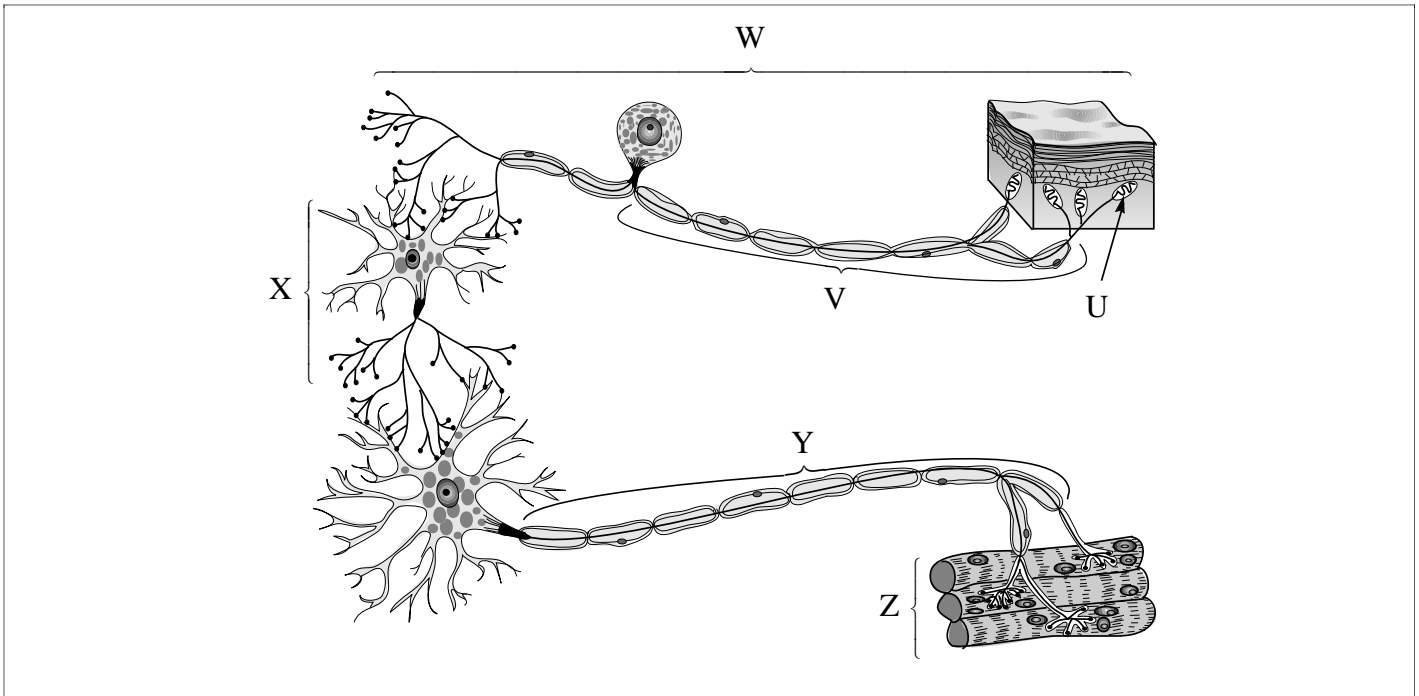
a) Salivary glands **(1 mark)**

b) Stomach **(2 marks)**

c) Pancreas **(3 marks)**

| |
|---|
| Score for Question 4. 4. _____ (6) |
|---|

Use the following diagram to answer question 5.



5. The diagram above represents a simple reflex arc.

Identify the structures **U** through **Z** in the spaces provided below. (3 marks: $\frac{1}{2}$ mark each)

U _____

V _____

W _____

X _____

Y _____

Z _____

| |
|---|
| Score for Question 5. 5. _____ (3) |
|---|

6. State a function for each of the following during the formation of urine.
(5 marks: 1 mark each)

a) Bowman's capsule _____

b) Proximal convoluted tubule _____

c) Loop of Henle _____

d) Distal convoluted tubule _____

e) Collecting duct _____

| |
|---|
| Score for Question 6. 6. _____ (5) |
|---|

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PART C: OPTIONAL AREAS

Total Value: 20 marks

Suggested Time: 30 minutes

- INSTRUCTIONS:**
1. Choose **two** sections from the optional areas in this part of the examination.
 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 |
|-----------------------|---|
| active immunity | |
| B cell | a) produces antibodies _____ |
| antigen | b) foreign substance in the body _____ |
| lymphokine | c) results from overactive immune system _____ |
| allergy | d) causes macrophages to become activated _____ |
| passive immunity | e) produced by hybridoma cells _____ |
| T cell | f) short-term immunity to disease _____ |
| monoclonal antibodies | |

2. Give **two** functions of a macrophage in defending the body against disease. **(2 marks: 1 mark each)**

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

| |
|--|
| Score for Option I. 7. <u> </u> <u> </u> tens units (10) |
|--|

OPTION II: SKELETAL SYSTEMS AND MUSCLE

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 |
|------------------------|--|
| tendon | |
| cartilage | a) solid, yet flexible connective tissue _____ |
| actin | b) involuntary and non-striated tissue _____ |
| smooth muscle | c) has calcium-storage sacs _____ |
| ligament | d) thin, contractile filament _____ |
| scoliosis | e) joins bone to bone _____ |
| bone | f) characterized by curvature of the spine _____ |
| sarcoplasmic reticulum | |

2. Give **two** functions for each of the following. **(2 marks: $\frac{1}{2}$ mark each function)**

a) Axial skeleton.

b) Appendicular skeleton.

3. Arrange these terms in order of **increasing** size. **(2 marks: $\frac{1}{2}$ mark each)**

sarcomere myosin muscle fibre myofibril

smallest _____

largest _____

| |
|---|
| Score for Option II. 8. _____ 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 |
|------------------------|---|
| syphilis | |
| urethra | a) promotes spermatogenesis _____ |
| LH | b) conducts sperm _____ |
| FSH | c) produces sex hormones _____ |
| in vitro fertilization | d) promotes development of corpus luteum _____ |
| chlamydia | e) symptoms include vaginal or urethral discharge _____ |
| implantation | f) zygote embeds into endometrial lining _____ |
| ovary | |

2. Draw a mature sperm and identify the location of the chromosomes it carries. **(2 marks)**

3. Give **two** physiological changes that cause the erection of the penis. **(2 marks)**

| |
|--|
| Score for Option III. 9. <u> </u> <u> </u> tens units (10) |
|--|

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 |
|--------------------|--|
| interphase | |
| cytokinesis | a) a viral transfer of bacterial DNA between cells _____ |
| Turner's syndrome | b) a way to check for fetal genetic defects _____ |
| restriction enzyme | c) period between cell divisions _____ |
| amniocentesis | d) cell fission _____ |
| Down's syndrome | e) results from an extra 21st chromosome _____ |
| metaphase | f) used to "cut up" viral DNA _____ |
| transduction | |

2. Describe the function of the following in mitosis. **(2 marks: 1 mark each)**

a) Spindle fibres

b) Centromere

3. Distinguish between *conjugation* and *transformation*. **(2 marks)**

| |
|---|
| Score for Option IV. 10. ___ ___ 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 |
|---------------|---|
| helper T cell | |
| chemotherapy | a) spreading of cancer cells _____ |
| sarcoma | b) cancer of connective tissues _____ |
| metastasis | c) a surgical treatment for cervical cancer _____ |
| enhancer | d) skin cancers are an example of this _____ |
| carcinoma | e) a gene which regulates the activity of an oncogene _____ |
| hysterectomy | f) use of drugs to treat cancer _____ |
| interferon | |

2. List **two** ways in which a proto-oncogene can be transformed into an oncogene. **(2 marks: 1 mark each)**

3. Distinguish between an *initiator* and a *promotor* in cancer development. **(2 marks)**

| |
|--|
| Score for Option V. 11. <u> </u> <u> </u> 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 |
|----------------------|--|
| ossicles | |
| ciliary muscle | a) controls the shape of the lens _____ |
| iris | b) stimulated by dim light _____ |
| chemoreceptor | c) amplify sound vibrations _____ |
| semi-circular canals | d) opening in the centre of the eye _____ |
| rods | e) determine dynamic equilibrium _____ |
| organ of Corti | f) has hair cells that determine pitch _____ |
| pupil | |

2. Describe the changes that would occur in the eye as the focus is changed from something close to something far away. **(2 marks)**

3. State **one** characteristic of and **one** possible corrective measure for conduction deafness. **(2 marks: 1 mark each)**

Characteristic _____

Corrective measure _____

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| Score for Option VI. 12. <u> </u> <u> </u> tens units (10) |
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END OF EXAMINATION