

NOVEMBER 1995

PROVINCIAL EXAMINATION

MINISTRY OF EDUCATION

BIOLOGY 12

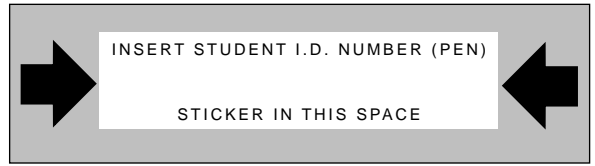
GENERAL INSTRUCTIONS

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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_____ - _____

BIOLOGY 12 NOVEMBER 1995 PROVINCIAL

Course Code = BI Examination Type = P

1. _____
(4)

2. _____
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3. _____
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4. _____
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5. _____
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6. _____
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7. _____
(3)

OPTIONS: Score **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:	
		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 examination 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

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. Which of the following is the **best** definition of a hypothesis?
 - A. A theory.
 - B. An experiment with only one variable factor.
 - C. A conclusion based on the result of experiments.
 - D. A possible explanation of an observed phenomenon.

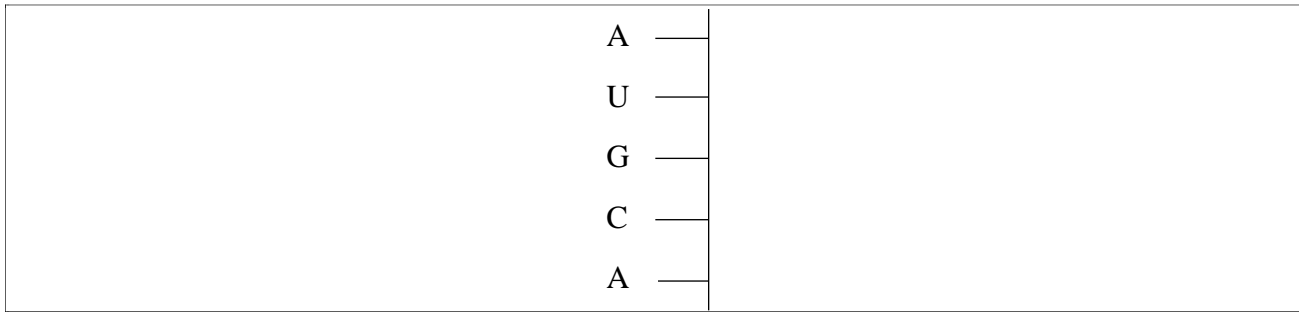
2. Which of the following is an example of complementary base pairing?
 - A. Thymine – uracil.
 - B. Guanine – adenine.
 - C. Adenine – thymine.
 - D. Cytosine – thymine.

3. Which of the following is made up of glucose molecules?
 - A. Fats.
 - B. DNA.
 - C. Proteins.
 - D. Cellulose.

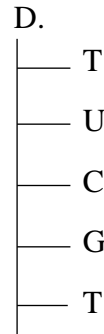
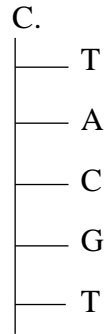
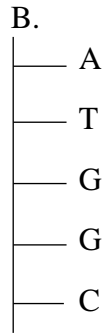
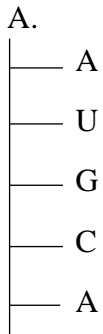
4. Which of the following represents the structure of a nucleotide?
 - A. Salt – lipid – base.
 - B. Glucose – glucose – glucose.
 - C. Phosphate – sugar – nitrogenous base.
 - D. Amino acid – amino acid – amino acid.

5. Which of the following is an example of denaturation?
 - A. Water freezing.
 - B. Sugar dissolving in water.
 - C. Egg white forming a solid when heated.
 - D. Butter changing from a solid to a liquid.

Use the following diagram to answer question 6.



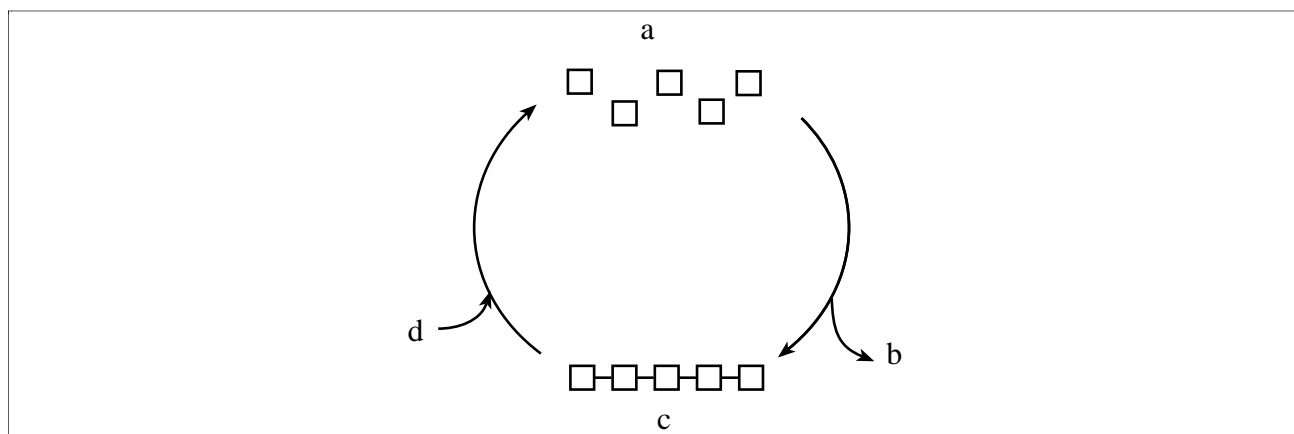
6. The diagram above shows the base sequence of a part of a strand of messenger RNA (mRNA). Which of the following DNA strands is complementary to the strand above?



7. Which of the following **best** describes the function of mRNA?

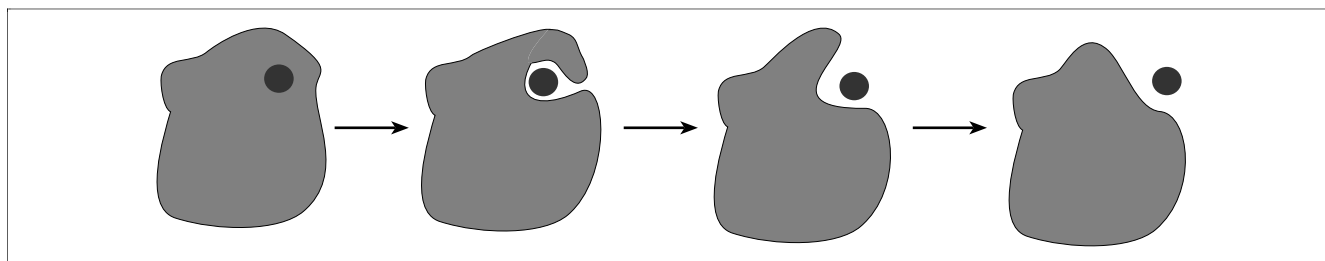
- A. It stays in the nucleus and is copied by DNA.
- B. It carries amino acids to the growing polypeptide chain.
- C. It makes up the ribosomes and provides the site for protein synthesis.
- D. It is transcribed from the DNA and carries the information to the ribosome.

Use the following diagram to answer question 8.



8. An example of a specific process that occurs from **a** → **c** in the diagram above would be:
- A. amino acids form a protein.
 - B. glycerol is formed from fats.
 - C. nucleotides are formed from nucleic acids.
 - D. egg white coagulates when acid is added to it.
9. A radioactive element is sometimes used to trace the pathway of chemical reactions in the cell. If newly synthesized proteins are radioactive, the radioactive element used could be
- A. sodium.
 - B. chlorine.
 - C. nitrogen.
 - D. potassium.
10. In the cell, enzymes act as
- A. buffers.
 - B. catalysts.
 - C. neurotransmitters.
 - D. emulsifying agents.
11. The anaerobic respiration of one molecule of glucose results in the **net** production of
- A. 2 ATP.
 - B. 4 ATP.
 - C. 6 ATP.
 - D. 38 ATP.

Use the following diagram to answer question 12.



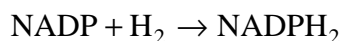
12. The diagram above represents a cell excreting materials by a process called

- A. diffusion.
- B. exocytosis.
- C. phagocytosis.
- D. facilitated transport.

13. During aerobic respiration, the respiratory chain produces

- A. active acetate.
- B. CO_2 and ATP.
- C. ATP and H_2O .
- D. ATP and pyruvic acid (pyruvate).

14. Consider the following:



According to the equation above, which of the following statements is correct?

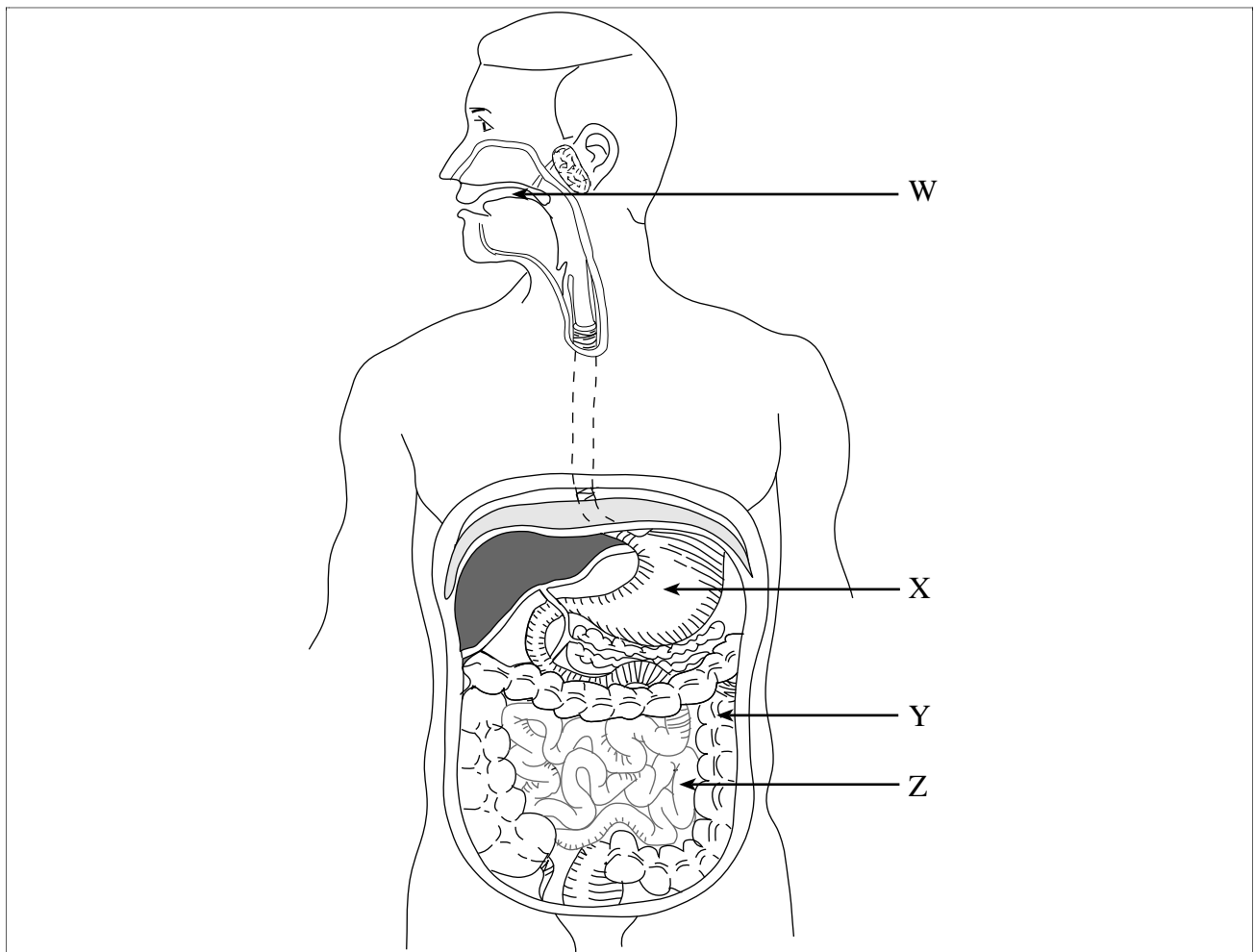
- A. NADP is reduced to NADPH_2 .
- B. NADP is oxidized to NADPH_2 .
- C. Hydrogen is reduced to NADPH_2 .
- D. Hydrogen is oxidized to NADPH_2 .

15. Organisms which carry out photophosphorylation are able to produce

- A. light using NADPH_2 .
- B. ATP using NADPH_2 .
- C. oxygen gas from CO_2 .
- D. ATP using light energy.

16. Some plants will store food energy as oil. The oil is produced as a result of the
- A. conversion of PGAL to lipid.
 - B. conversion of chlorophyll to lipid.
 - C. digestion of neutral fats to fatty acids.
 - D. digestion of cellulose to monosaccharides.
17. Tissues that hold structures together and provide support and protection are
- A. nerve tissues.
 - B. epithelial tissues.
 - C. epidermis tissues.
 - D. connective tissues.

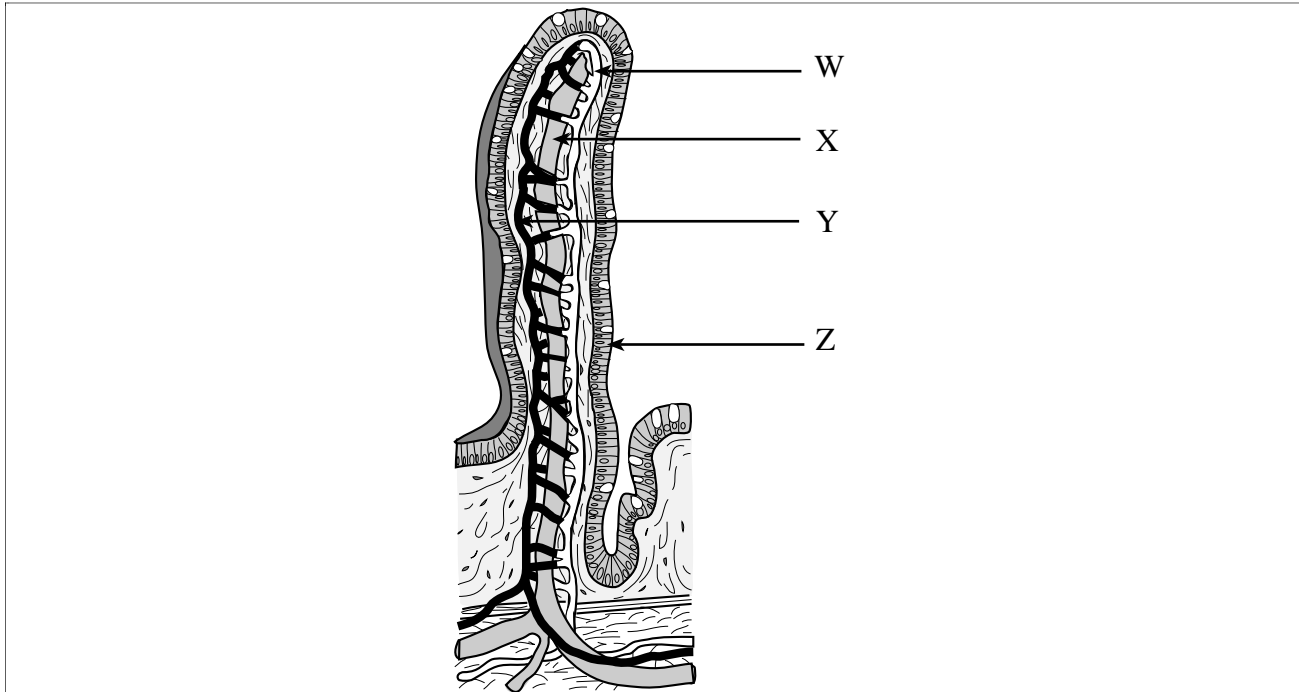
Use the following diagram to answer question 18.



18. Which letter points to the structure where protein **first** undergoes chemical digestion?
- A. W
 - B. X
 - C. Y
 - D. Z

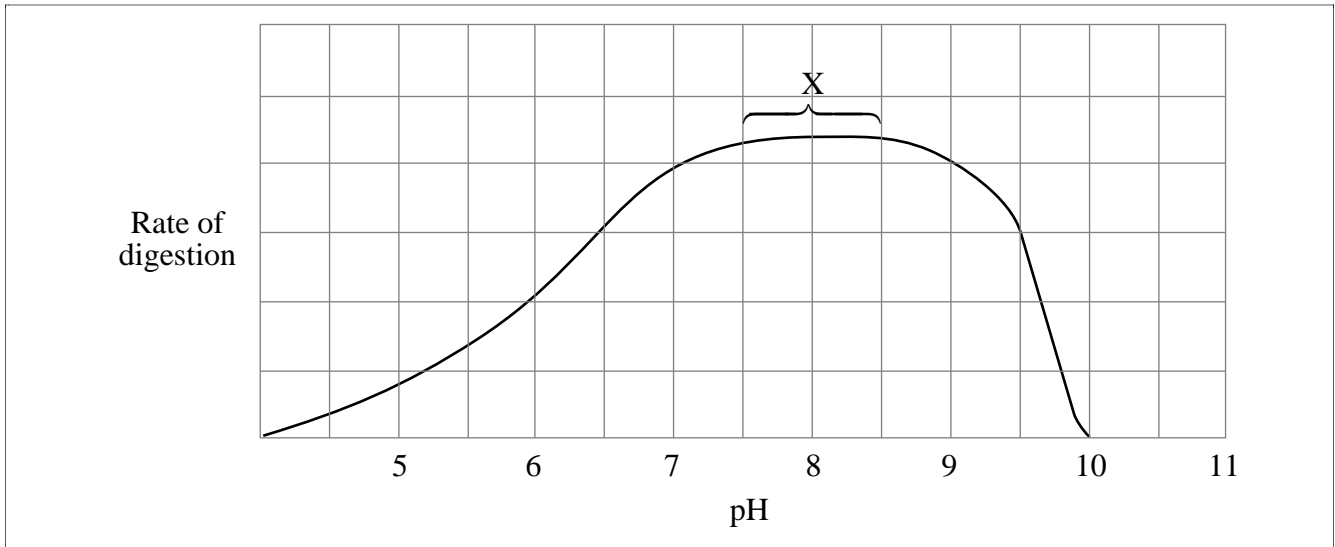
19. The role of bile during digestion is to
- A. stimulate the release of glycogen.
 - B. hydrolyze neutral fats into fatty acids.
 - C. catalyze the breakdown of peptides into amino acids.
 - D. break fat into droplets thereby increasing surface area.

Use the following diagram to answer question 20.



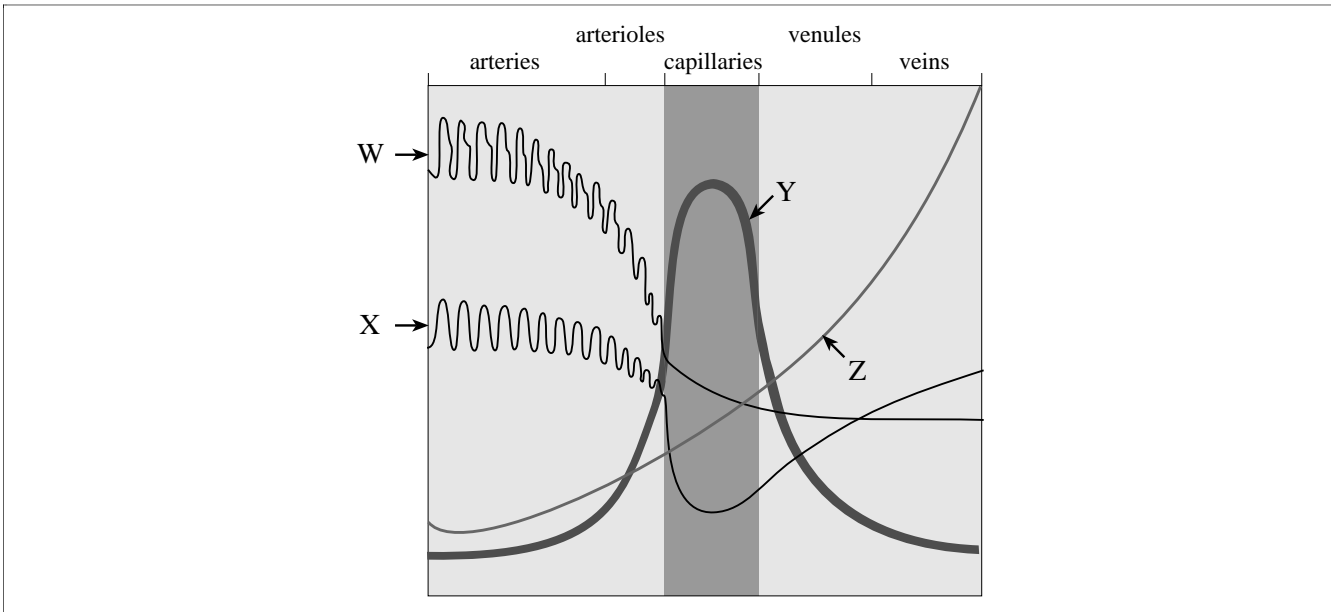
20. Which lettered structure indicates where active transport of amino acids would begin?
- A. W
 - B. X
 - C. Y
 - D. Z
21. If a person's liver fails, which process listed below would stop?
- A. Digestion of proteins.
 - B. Destruction of red blood cells.
 - C. Storage of starch between meals.
 - D. Reabsorption of water from the digestive tract.

Use the following graph to answer question 22.



22. The letter **X** on the graph above refers to the
- A. colon.
 - B. stomach.
 - C. esophagus.
 - D. small intestine.
23. The presence of large numbers of mitochondria in the cells lining the small intestine allows it to
- A. release HCl.
 - B. produce bile.
 - C. absorb glucose.
 - D. synthesize vitamins.
24. Which of the following is a characteristic of systemic circulation?
- A. Highly oxygenated arterial blood.
 - B. Highly oxygenated venous blood.
 - C. Increased blood pressure in the veins.
 - D. Decreased blood pressure in the arteries.

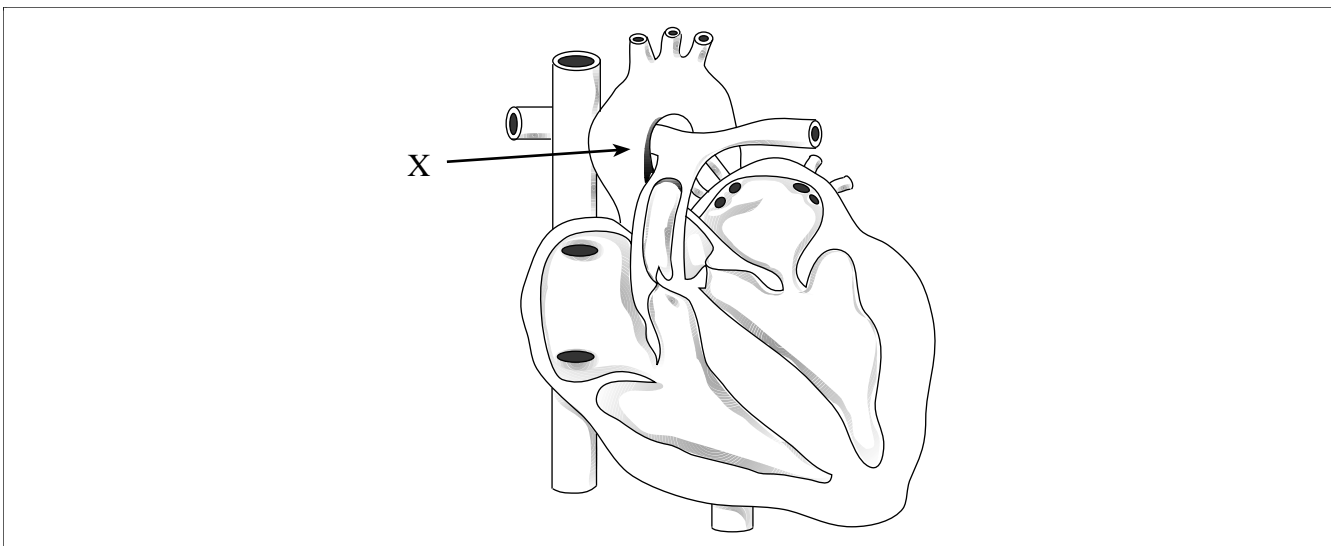
Use the following graph to answer question 25.



25. Which letter represents a graph indicating the total cross-sectional area of the body's blood vessels?

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

Use the following diagram to answer question 26.

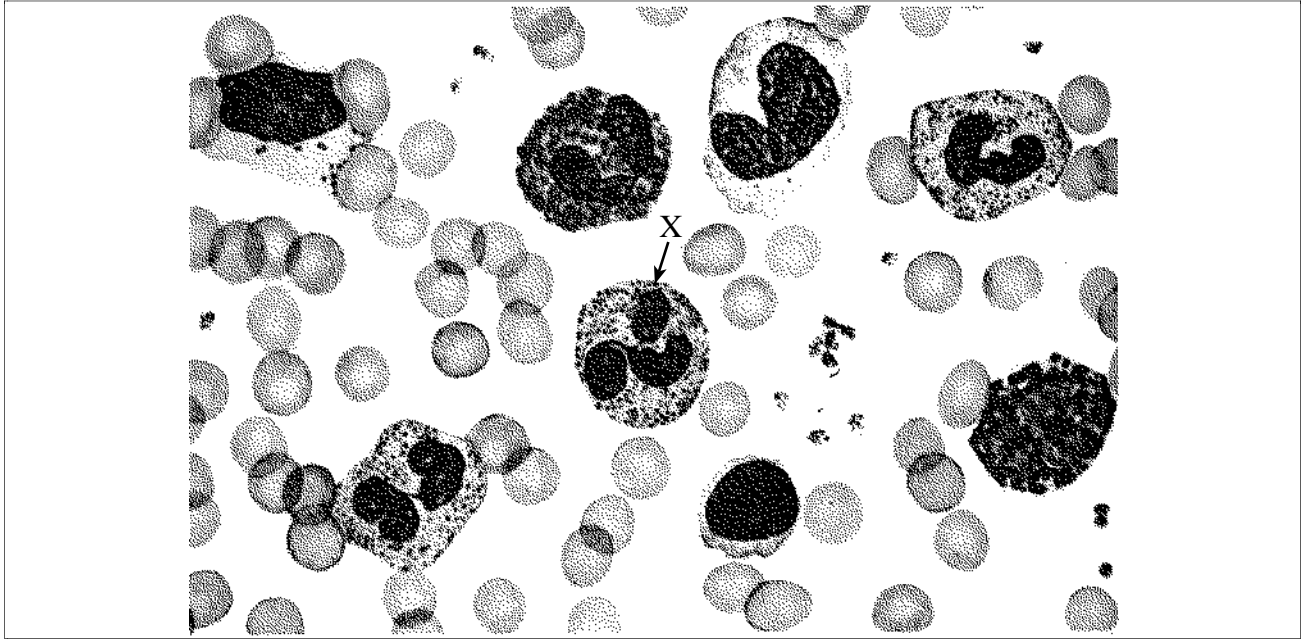


26. Identify the structure indicated on the above diagram of a human heart.

- A. Aorta.
- B. Septum.
- C. Arterial duct.
- D. Pulmonary trunk.

27. The vena cava delivers blood to the
- A. heart.
 - B. lungs.
 - C. capillaries.
 - D. body tissues.

Use the following diagram to answer question 28.



28. The structure labelled X is a
- A. platelet.
 - B. stem cell.
 - C. red blood cell.
 - D. white blood cell.

Use the following information to answer question 29.

1. Calcium activates an enzyme.
2. Fibrin binds platelets to form a “plug.”
3. Thrombin converts fibrinogen to fibrin.
4. Platelets and damaged cells release an activator.

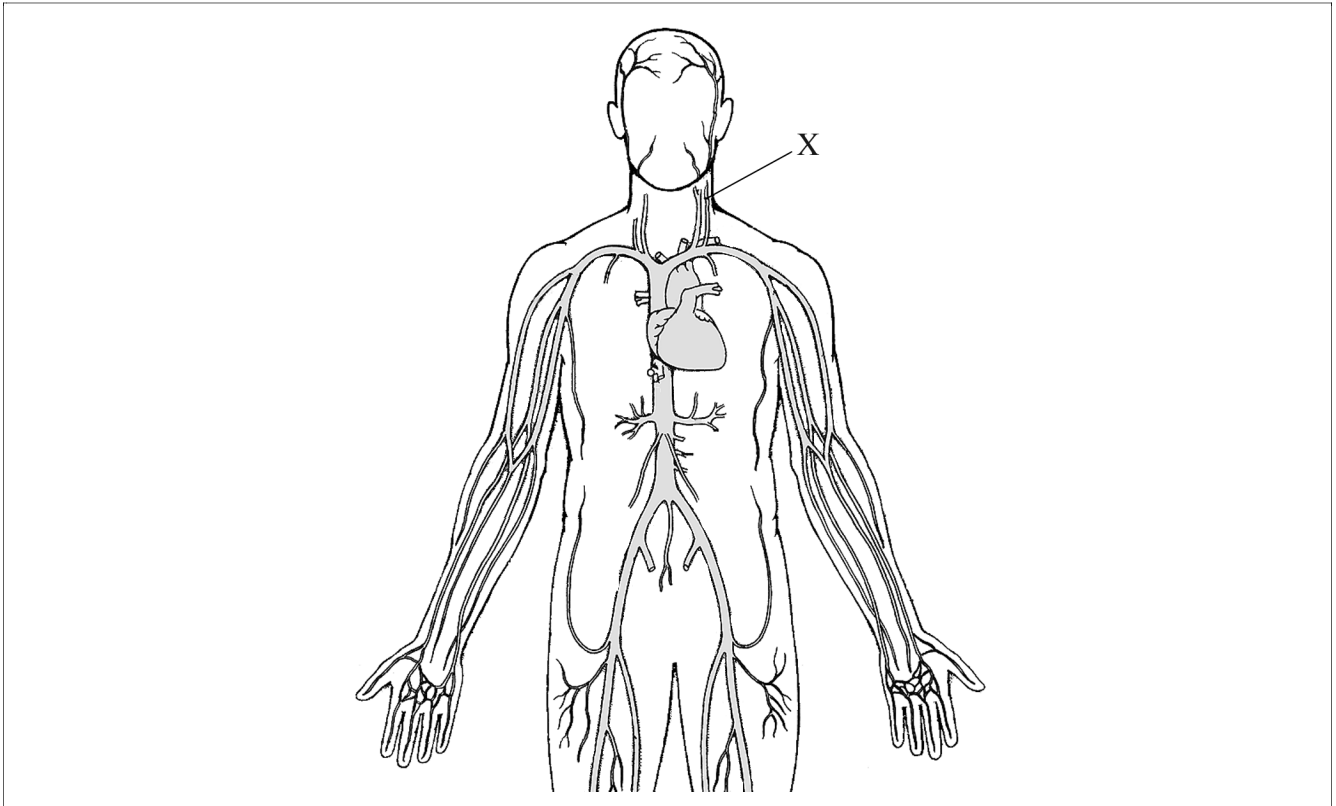
29. The correct sequence of events leading to the formation of a blood clot is
- A. 1, 2, 3, 4.
 - B. 2, 1, 3, 4.
 - C. 3, 4, 1, 2.
 - D. 4, 1, 3, 2.

Use the following data to answer question 30.

Bicarbonate Ions	Urea	Glucose	Oxygen
low	high	high	high

30. The above data show the relative concentrations of various substances in the blood contained by a major blood vessel. The vessel is **likely** the
- A. renal artery.
 - B. hepatic vein.
 - C. pulmonary artery.
 - D. inferior vena cava.
31. Which of the following **best** describes a vein?
- A. Thin-walled, elastic, and equipped with valves.
 - B. Thick-walled, elastic, and equipped with valves.
 - C. Thin-walled, muscular, and supplied with nerves.
 - D. Thick-walled, muscular, and supplied with nerves.

Use the following diagram to answer question 32.



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

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

33. Sensory neurons carry messages to

- A. glands.
- B. interneurons.
- C. sense organs.
- D. muscle fibres.

34. The somatic nervous system includes nerves that serve the
- A. heart.
 - B. intestines.
 - C. salivary glands.
 - D. skeletal muscles.

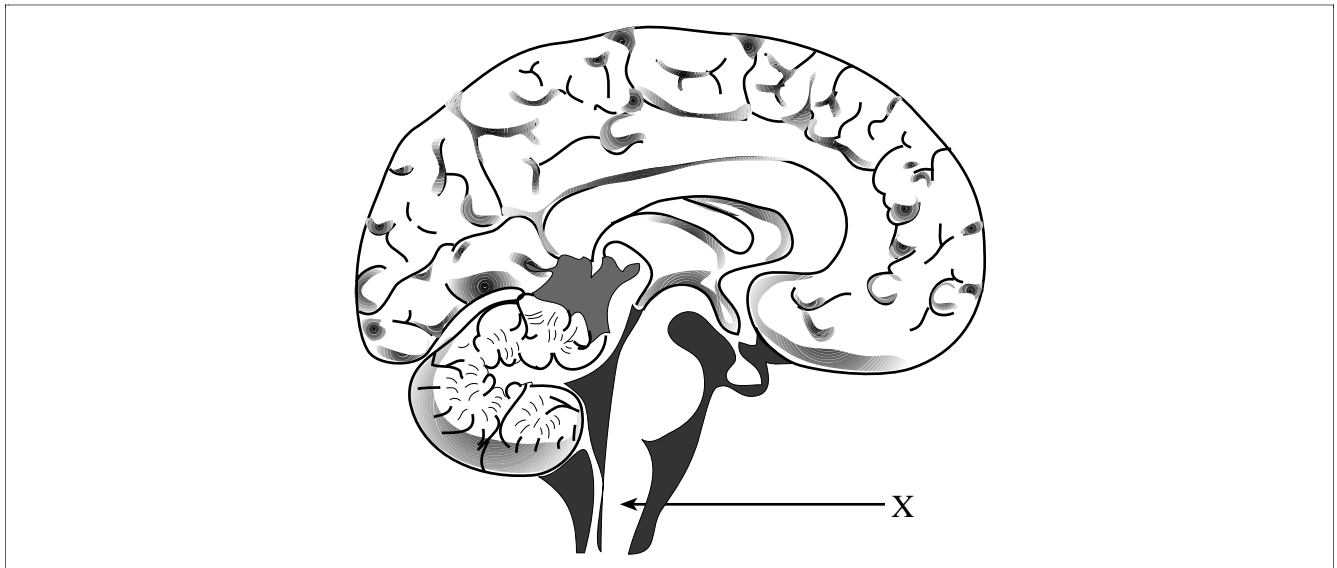
Use the following information to answer question 35.

- 1. Sodium ions move into the axon.
- 2. Potassium ions move out of the axon.
- 3. Depolarization of the membrane occurs.
- 4. Repolarization of the membrane occurs.

35. Select the correct order of the above events to describe an action potential.
- A. 1, 3, 2, 4
 - B. 2, 3, 4, 1
 - C. 3, 2, 4, 1
 - D. 1, 4, 3, 2
36. Transmission across a synapse is one-way because
- A. the axon is myelinated.
 - B. the potassium gates are open.
 - C. the interior of the axon contains negative ions.
 - D. the receptor sites are on the postsynaptic membrane.
37. Which of the following is **not** a part of the cerebrum?
- A. Cortex.
 - B. Cerebellum.
 - C. Occipital lobe.
 - D. Temporal lobe.
38. Reflexes involve the
- A. autonomic nervous system and the brain.
 - B. sympathetic and central nervous systems.
 - C. peripheral nervous system and the spinal cord.
 - D. parasympathetic nervous system and the cerebrum.

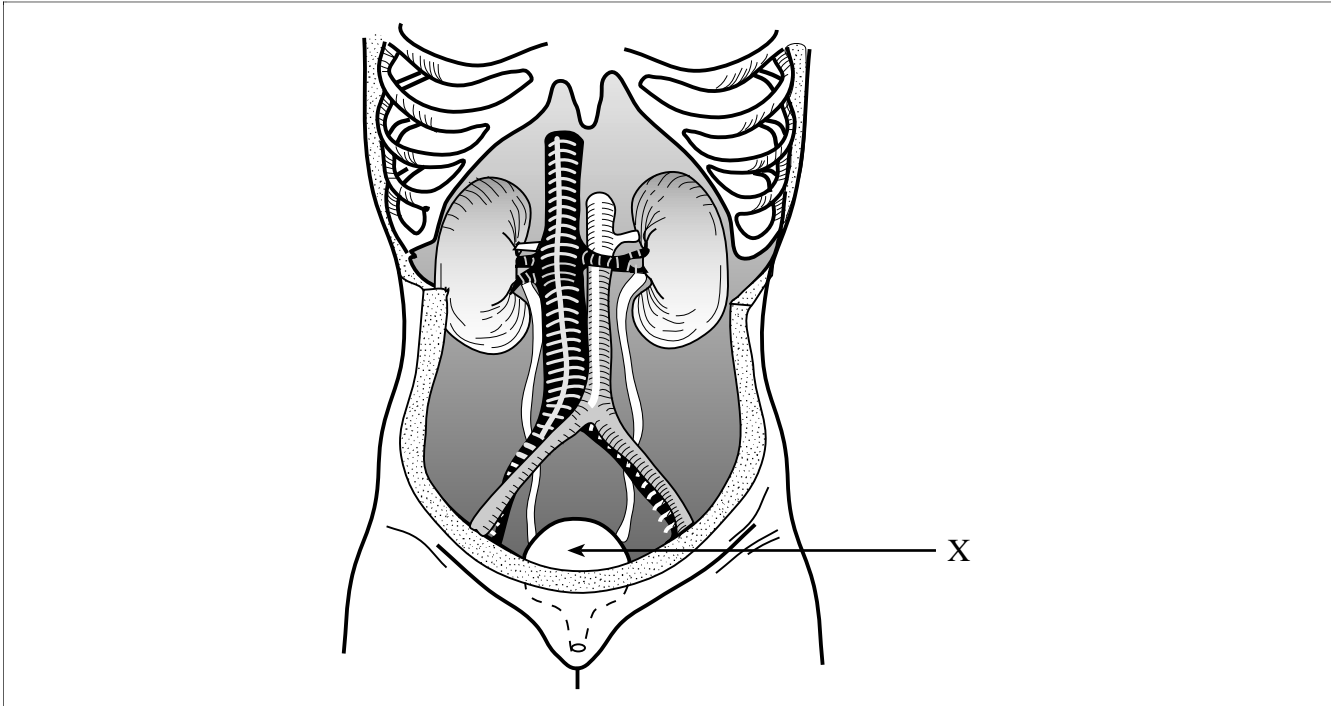
39. Which of the following will occur as a result of parasympathetic nervous system stimulation?
- A. Increased heart rate.
 - B. Secretion of adrenalin.
 - C. Increased breathing rate.
 - D. Secretion of digestive enzymes.
40. The type of sensation a person experiences depends on the
- A. speed of the impulse.
 - B. length of the dendrites.
 - C. part of the brain stimulated.
 - D. amount of myelin on the neuron.

Use the following diagram to answer question 41.



41. Structure **X** contains centres responsible for
- A. hunger.
 - B. heart rate.
 - C. water balance.
 - D. body temperature.

Use the following diagram to answer question 42.



42. In the diagram of the human excretory system, the arrow labelled **X** indicates the
- A. ureter.
 - B. kidney.
 - C. urethra.
 - D. urinary bladder.

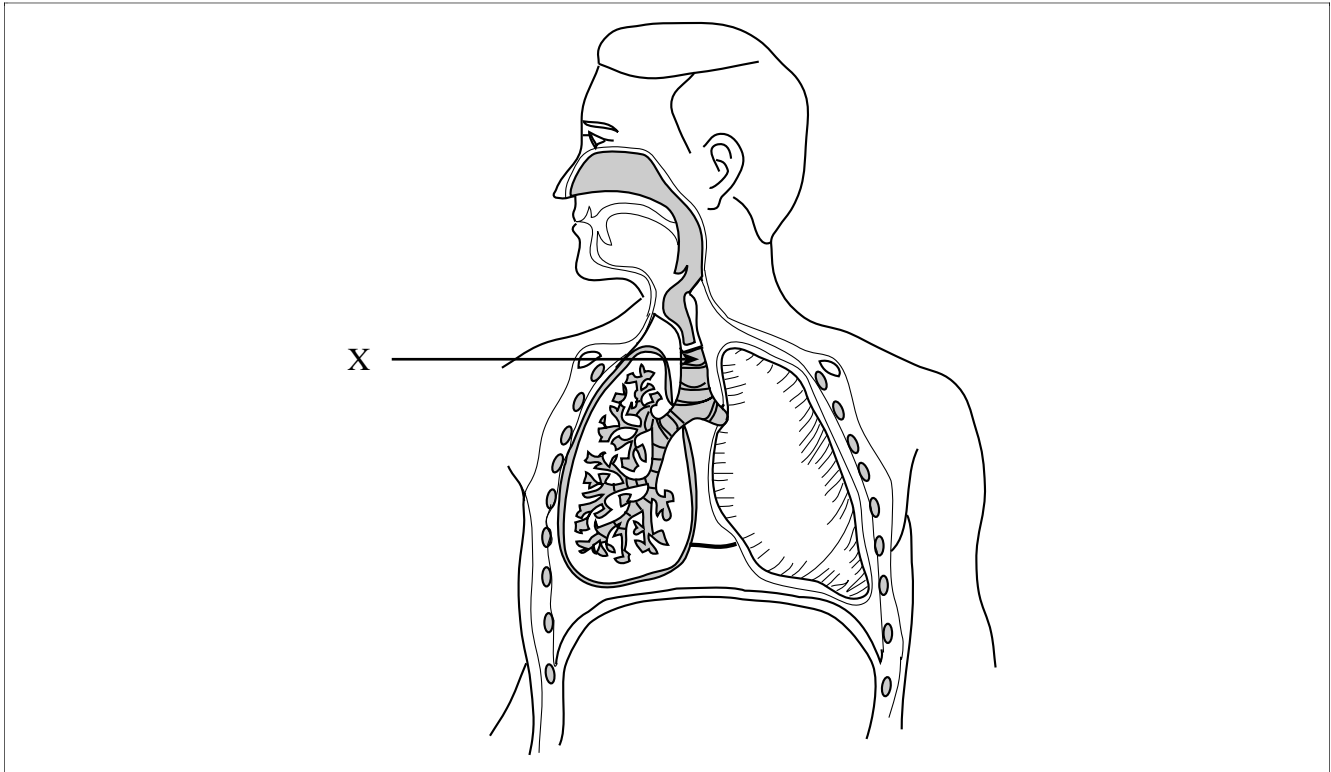
Use the following data to answer question 43.

Relative Concentrations in a Human Nephron			
H ₂ O	Glucose	H ⁺	Urea
low	low	high	high

43. Where in the nephron could the conditions indicated in the table above be found?
- A. Distal tubule.
 - B. Loop of Henle.
 - C. Proximal tubule.
 - D. Bowman's capsule.

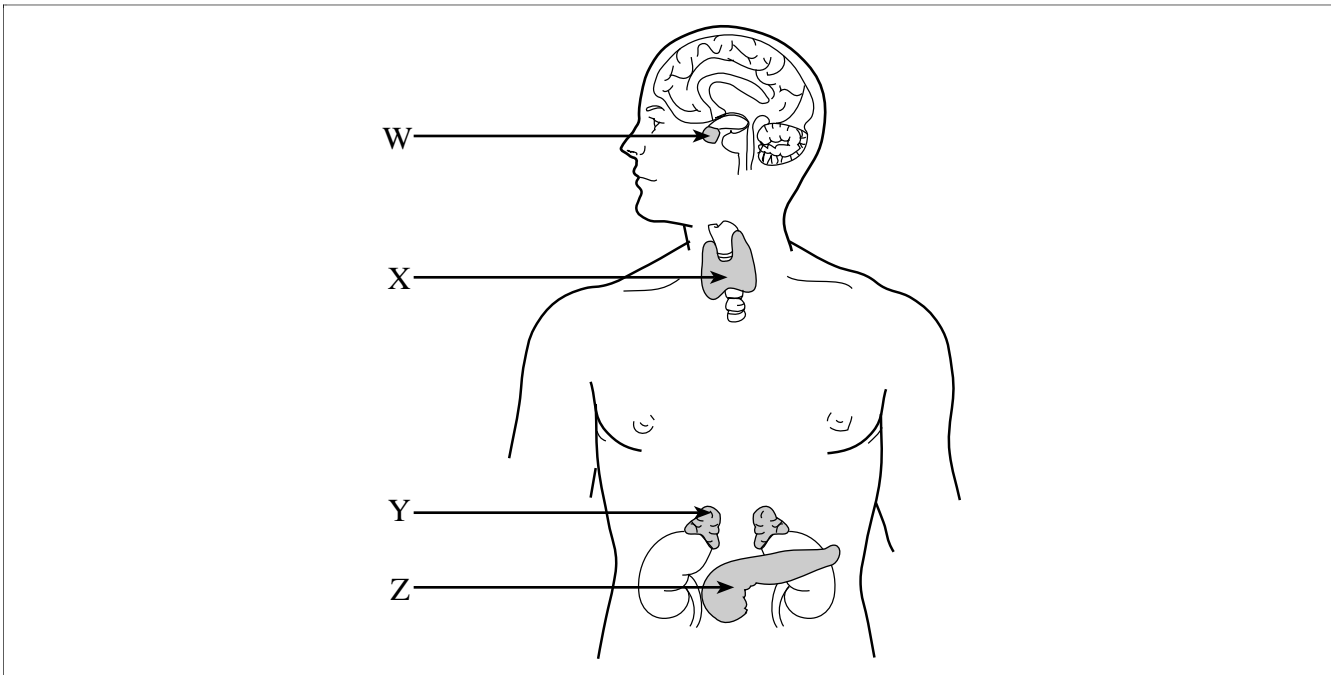
44. The function of the ureter is to
- A. produce urine.
 - B. reabsorb water.
 - C. transport urine from the kidney.
 - D. store urine until it can be released.

Use the following diagram to answer question 45.



45. The structure labelled **X** is the
- A. larynx.
 - B. trachea.
 - C. bronchi.
 - D. pharynx.
46. A build-up of fluid in the lungs will result in a reduced amount of oxygen in the blood returning to the heart from the lungs because
- A. the bronchioles have dilated.
 - B. there is less hemoglobin in the blood.
 - C. the surface area for external respiration has been reduced.
 - D. the permeability of the lung capillaries has been increased.

Use the following diagram to answer question 47.



47. The endocrine gland physically connected to the hypothalamus is labelled as

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

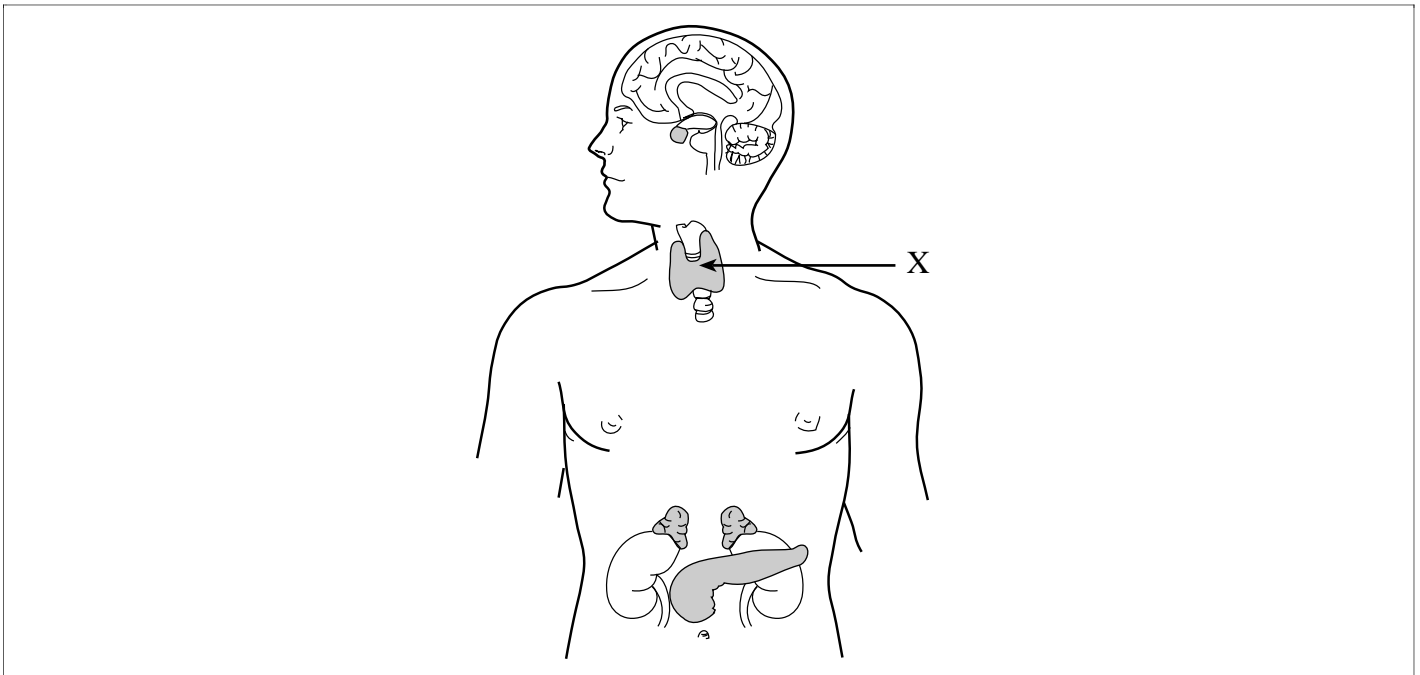
48. The posterior pituitary gland secretes

- A. thyroxin.
- B. oxytocin.
- C. glucagon.
- D. growth hormone.

49. Which condition leads to a high concentration of calcium in the blood?

Blood Concentration of	
Parathyroid Hormone (PTH)	Calcitonin
A. low	low
B. low	high
C. high	low
D. high	high

Use the following diagram to answer question 50.



50. A hormone secreted by the gland labelled **X**
- A. stimulates the adrenal cortex.
 - B. increases the body's use of oxygen.
 - C. produces the "fight or flight" response.
 - D. promotes water retention by the kidneys.
51. Which hormone is released when the salt concentration in the blood increases?
- A. Gastrin.
 - B. Thyroxin.
 - C. Antidiuretic hormone (ADH).
 - D. Adrenocorticotrop hormone (ACTH).
52. The actions of insulin are opposed by
- A. thyroxin.
 - B. prolactin.
 - C. glucagon.
 - D. calcitonin.

**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

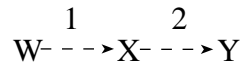
Total Value: 28 marks

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.

1. An experiment investigating enzyme activity was carried out. A test tube was prepared containing substrate solution **W** and enzyme solutions **1** and **2**.

The reactions that occur in the test tube are summarized below:



The letters represent substrates and products and the numbers represent enzymes.

- a) State **two** ways to increase the rate of production of product **Y**. **(2 marks)**

- b) A substance is added to the test tube containing substrate **W**. As a result, no product is formed. Suggest what this substance may be and explain how it achieves these results. **(2 marks)**

Score for
Question 1.

1. _____
(4)

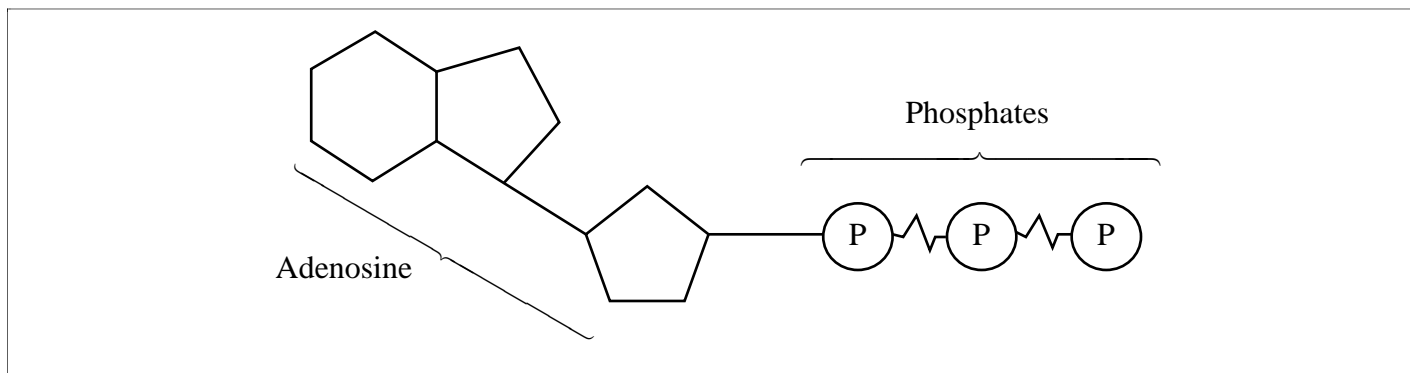
2. Complete the following table using your knowledge of nucleic acids. (3 marks: 1 mark each box)

Characteristic of Molecule	Kind of Nucleic Acid
found in the chromosomes	
single-stranded structure	
acts as an amino acid carrier	

Score for
Question 2.

2. _____
(3)

Use the following diagram to answer question 3.



3. The diagram above represents a molecule found in all living cells.
- a) Name **one** metabolic process in animal cells that produces the above molecule. **(1 mark)**

- b) Name a photosynthetic process whereby this molecule is produced and another photosynthetic process where it is used. **(2 marks)**

Produced: _____

Used: _____

- c) What occurs if **one** phosphate is removed? Why? **(2 marks)**

- d) Name **two** cellular functions that require the above molecule. **(2 marks)**

Score for
Question 3.

3. _____
(7)

4. Give **one** function for each of the following components of the digestive system.
(4 marks: 1 mark each)

a) Colon:

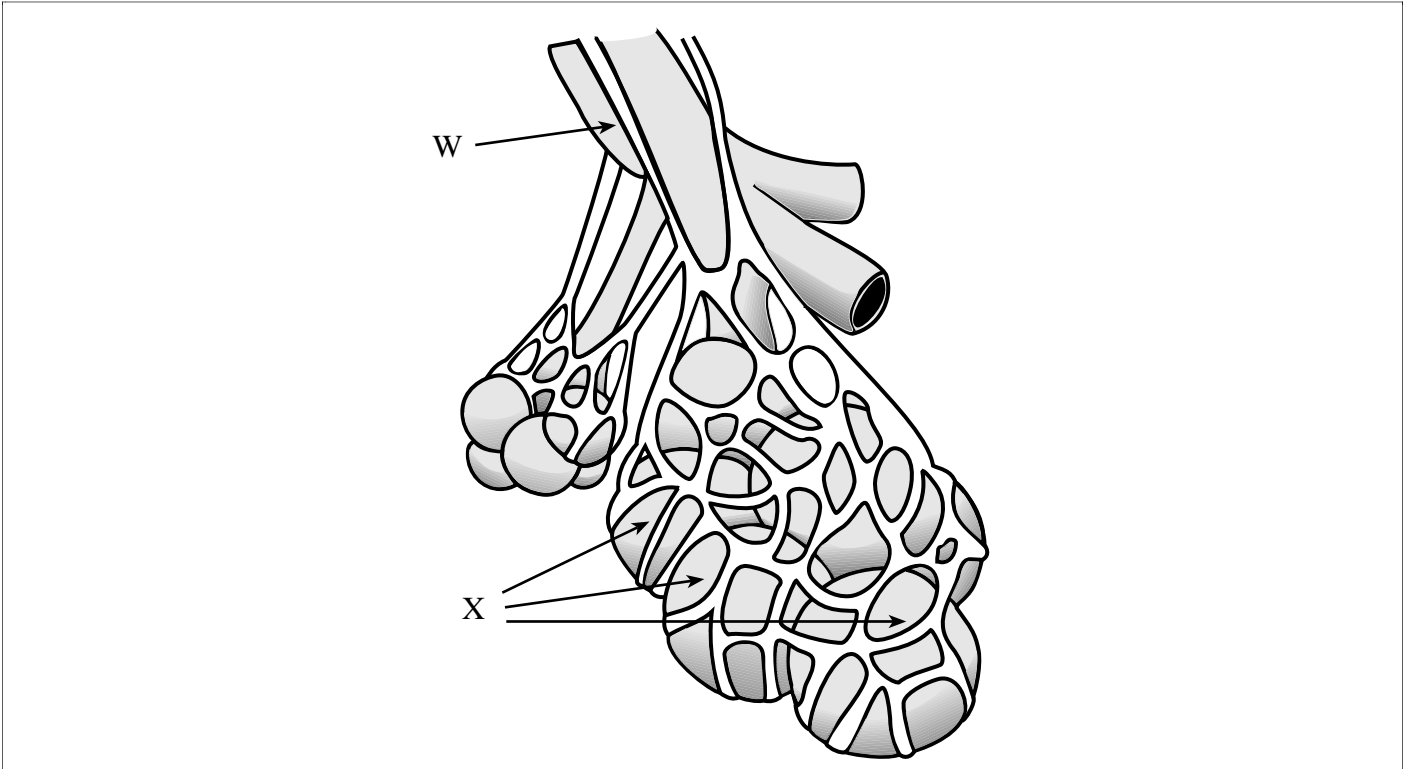
b) Gall bladder:

c) Esophagus:

d) Cardiac sphincter:

Score for Question 4. 4. _____ (4)

Use the following diagram to answer question 5.

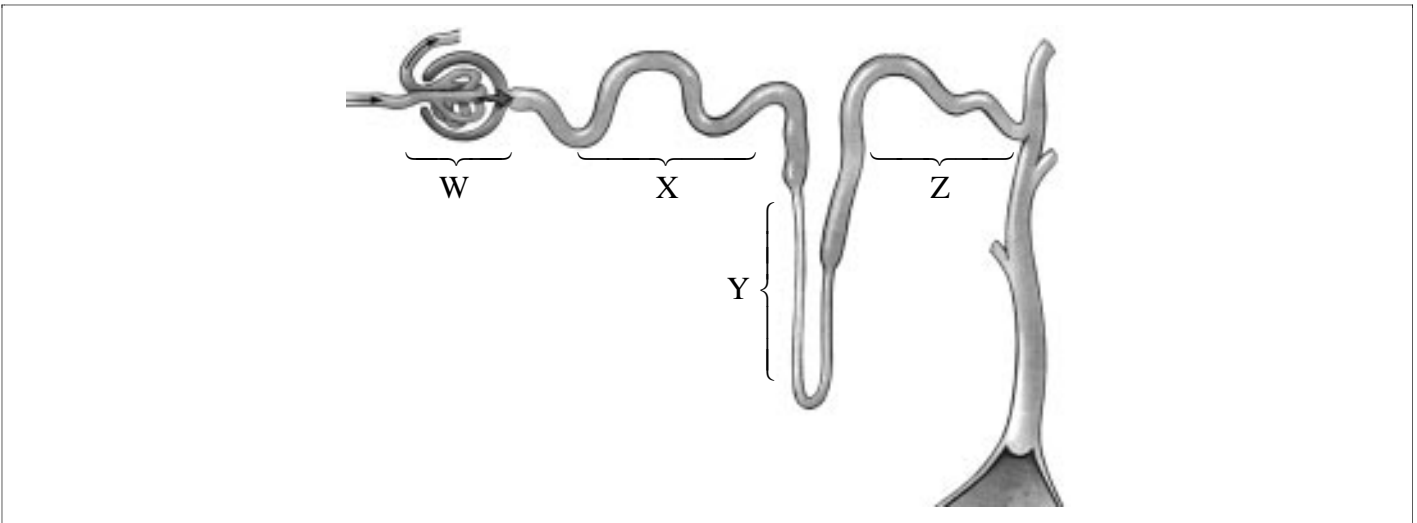


5. a) In the above diagram, structure **W** is a bronchiole. Name structure **X**. (1 mark)

b) Describe **two** processes that occur at structure **X**. (2 marks)

Score for
Question 5.
5. _____
(3)

Use the following diagram to answer question 6.



6. Briefly describe the process that occurs in each of the areas indicated on the above diagram of a nephron. (4 marks: 1 mark each)

a) Area W: _____

b) Area X: _____

c) Area Y: _____

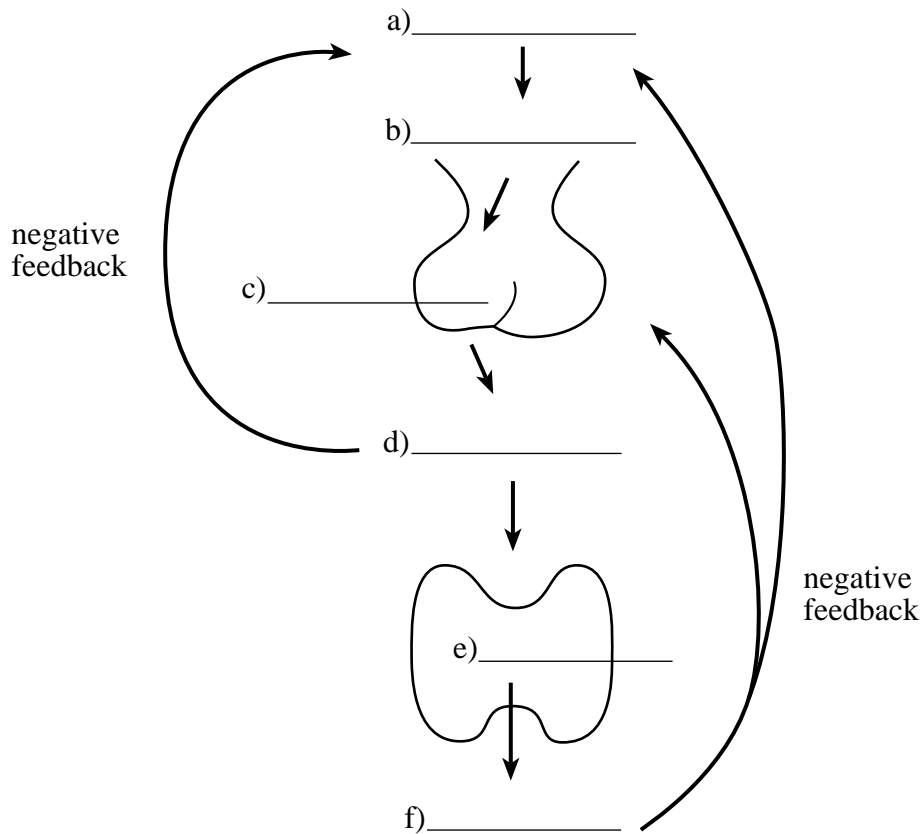
d) Area Z: _____

Score for
Question 6.
6. _____
(4)

Use the following information to answer question 7.

thyroid gland
thyroxin
thyroid-stimulating hormone (TSH)
hypothalamus
releasing hormone
anterior pituitary

7. Label this diagram of a feedback loop by placing the above terms in the blanks provided. Each term may be used **only** once. (3 marks: $\frac{1}{2}$ mark each)



Score for
Question 7.

7. _____
(3)

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PART C: OPTIONAL AREAS

Total Value: 20 marks

Suggested Time: 30 minutes

- INSTRUCTIONS:**
1. Select **two** sections from the optional areas in this part of the examination.
 2. Answer **all** of the questions in each option area that you choose.
 3. If you answer questions in more than two option areas, only the **first two** areas 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
antigen	
B cell	a) second exposure to a vaccine _____
allergy	b) cell which produces antibodies _____
interferon	c) protein molecule which is foreign to the body _____
active immunity	d) sometimes used as a cancer treatment _____
T cell	e) the result of an over-active immune system _____
antibody	f) forms complexes with antigens _____
booster shot	

2. Describe **one** function of _____ **(2 marks: 1 mark each)**

B cells: _____

T cells: _____

3. Define the following terms and give **one** way in which each may be acquired. **(2 marks)**

a) Active immunity: _____

b) Passive immunity: _____

Score for Option I. 8. _____ tens units (10)
--

OPTION II: SKELETAL SYSTEM 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
cardiac muscle	
osteomyelitis	a) thick contractile filament _____
sarcomere	b) striated and involuntary tissue _____
actin	c) connective tissue with poor blood supply _____
myosin	d) weak and thin bones _____
cartilage	e) provides mobility and strength _____
osteoporosis	f) myofibril contractile unit composed of two major proteins _____
appendicular skeleton	

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

a) Compact bone: _____

b) Haversian canals: _____

3. Explain how myosin cross-bridges act to bring about muscle contraction. **(2 marks)**

Score for Option II. 9. _____ 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
testis	
diaphragm	a) hollow ball of cells _____
blastula	b) oviducts are cut and tied _____
gastrula	c) produces sex hormones _____
vasectomy	d) a plastic or rubber cup inserted to cover the cervix _____
estrogen	e) an embryo with three germ layers _____
progesterone	f) responsible for proliferation of endometrium _____
tubal ligation	

2. a) Define spermatogenesis. **(1 mark)**

- b) Where in the testis does spermatogenesis occur? **(1 mark)**

3. Give **one** function for each of the following hormones. **(2 marks: 1 mark each)**

FSH (follicle stimulating hormone):

LH (lutening hormone):

Score for
Option III.

10.
 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
prophase	
protoplast	a) used to introduce recombinant DNA into a host cell _____
vector	b) exchange of DNA between living bacteria _____
ligase	c) plant cell prepared to take up plasmids _____
Turner's syndrome	d) result of having only one sex chromosome _____
clone	e) genetically identical to parent _____
conjugation	f) joins DNA fragments together _____
transformation	

2. List **two** ways in which recombinant DNA technology might be used in human medical treatment. **(2 marks: 1 mark each)**

i) _____

ii) _____

3. Explain the process of amniocentesis. **(2 marks)**

Score for Option IV. 11. <u> </u> <u> </u> tens units (10)
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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
leukemia	
mammograph	a) a portion of DNA which may cause cancer _____
oncogene	b) used to detect cervical cancer _____
vascularization	c) describes a tumor which spreads _____
malignant	d) cancer of blood tissue _____
benign	e) controls the expression of mutated genes _____
pap smear	f) branching of blood vessels into a tumor _____
promoter	

2. List **four** danger signals that may indicate the presence of cancer. **(2 marks: $\frac{1}{2}$ mark each)**

Signal 1: _____

Signal 2: _____

Signal 3: _____

Signal 4: _____

3. Distinguish between the terms *neoplasia* and *anaplasia*. **(2 marks)**

Score for Option V. 12. <u> </u> <u> </u> tens units (10)

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
proprioceptor	
cone	a) responds to heat flow _____
optic nerve	b) cell for colour vision _____
olfactory cell	c) responsible for sense of smell _____
vestibule	d) controls shape of the lens _____
rod	e) carries impulses from the eye to the brain _____
ciliary body	f) sense position and movement of limbs _____
thermoreceptor	

2. State **one** characteristic and **one** possible corrective measure for glaucoma. **(2 marks)**

Characteristic: _____

Corrective measure: _____

3. Give **two** functions of the organ of Corti. **(2 marks: 1 mark each)**

Score for Option VI. 13. ___ ___ tens units (10)

END OF EXAMINATION
