

JUNE 1995

PROVINCIAL EXAMINATION

MINISTRY OF EDUCATION

BIOLOGY 12

GENERAL INSTRUCTIONS

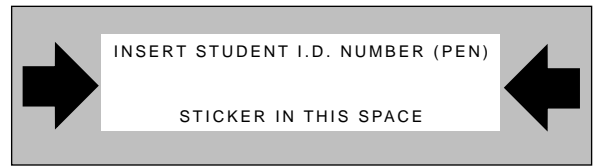
1. Insert the stickers with your Student I.D. Number (PEN) in the allotted spaces above. **Under no circumstance is your name or identification, other than your Student I.D. Number, to appear on this paper.**
2. Take the separate Answer Sheet and follow the directions on its front page.
3. Be sure you 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 JUNE 1995 PROVINCIAL

Course Code = BI Examination Type = P

1. _____
(6)

2. _____
(4)

3. _____
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4. _____
(4)

5. _____
(6)

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

Value: 52 marks

Suggested Time: 40 minutes

INSTRUCTIONS: For each question, choose 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.

Use the following information to answer question 1.

1. State a theory.
2. Collect data.
3. Formulate a hypothesis.
4. Experiment.

1. Which of the following is the correct order for the scientific method?

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

2. Which of the following statements is true for both DNA and RNA?

	DNA	RNA
A. Shape	straight line	helix shaped
B. Thymine	absent	present
C. Kind of sugar	deoxyribose	ribose
D. Number of strands	one	one

3. Which of the following differences between acids and bases is correct?

- A. Acids are harmful, bases are not.
- B. Acids lower the pH, bases raise the pH.
- C. Acids release amino groups, bases release glycerol.
- D. Acids release hydroxide ions, bases release hydrogen ions.

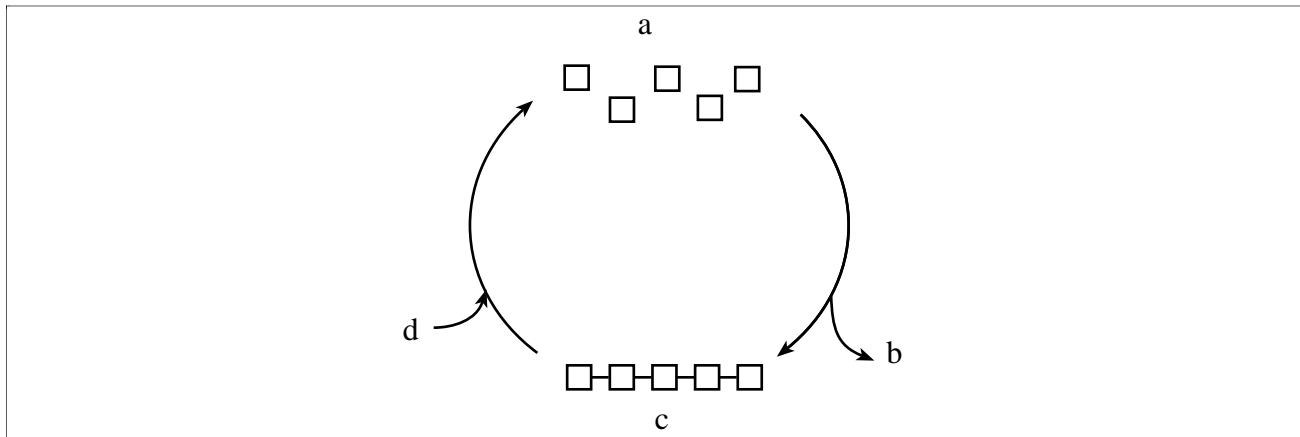
4. Which of the following is a function of some proteins?

- A. Emulsify fats.
- B. Make up genes.
- C. Make up cell walls.
- D. Speed up chemical reactions.

OVER

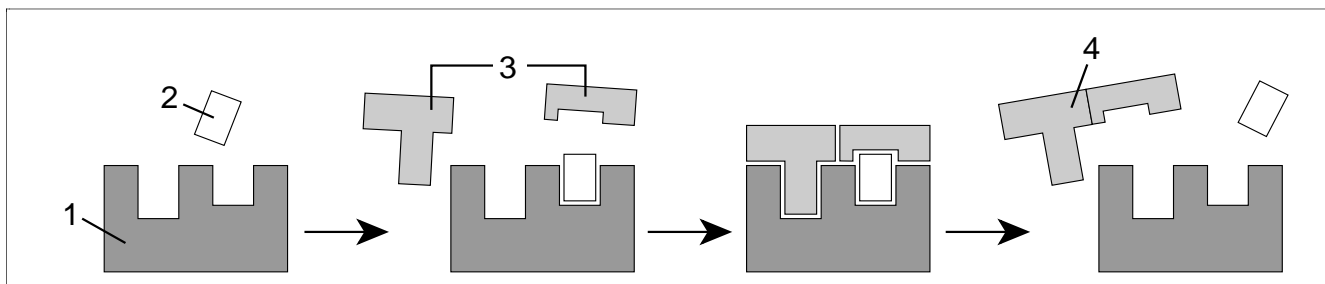
5. Which of the following statements best describes **DNA replication**?
- tRNA, by complementary base pairing with mRNA, produces proteins.
 - RNA nucleotides, by complementary base pairing with DNA, produce DNA.
 - DNA nucleotides, by complementary base pairing with DNA, produce DNA.
 - RNA nucleotides, by complementary base pairing with DNA, produce tRNA.

Use the following diagram to answer question 6.



6. An example of a specific process that occurs in a manner similar to **c** → **a** in the diagram above is
- dipeptides forming into polypeptides.
 - nucleotides joining together to form DNA.
 - glycerol and fatty acids forming a neutral fat.
 - glycogen molecules being converted into glucose molecules.
7. Which of the following will be affected directly if the mitochondria in a cell are **not** functioning properly?
- Absorption of alcohol by the cell.
 - The movement of water into and out of the cell.
 - The movement of oxygen across the cell membrane.
 - The movement of sugar from a low to a high concentration.
8. A slice of potato placed in distilled water becomes firm after several hours because
- salt has passed into the potato cells.
 - cellulose synthesis in the cell wall has been stimulated.
 - water has passed into the potato cells causing the cells to swell.
 - water has passed out of the potato cells causing the cells to shrink.

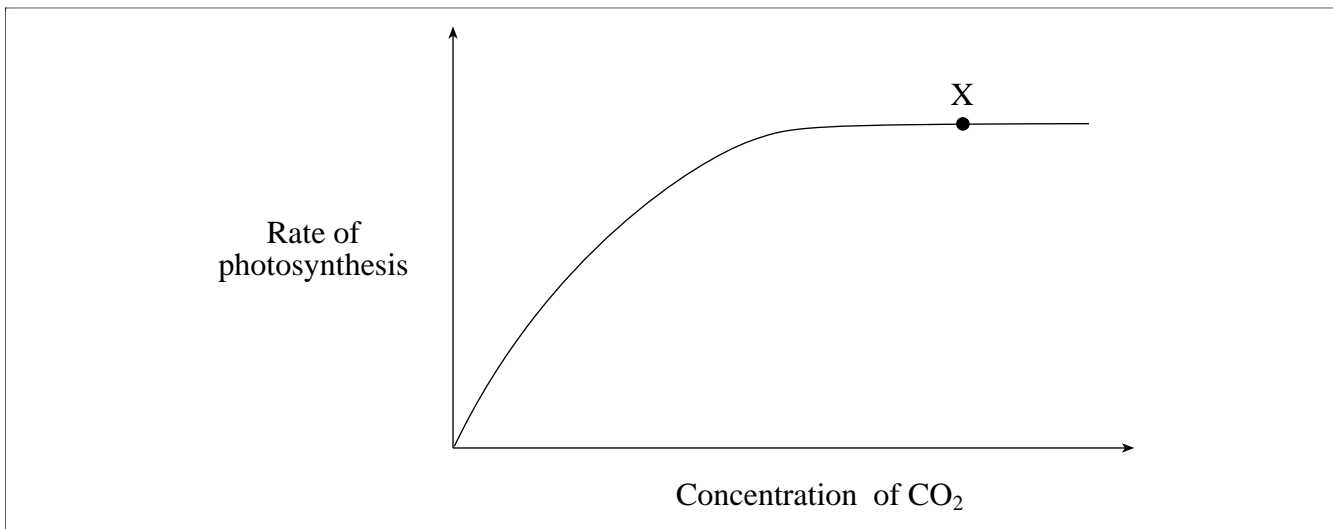
Use the following diagram to answer question 9.



9. Which number represents the substrate of the reaction shown above?
- 1
 - 2
 - 3
 - 4
10. Which of these substances **cannot** pass through cell membranes?
- Starch.
 - Glycerol.
 - Amino acids.
 - Monosaccharides.
11. Which of the following results in the **greatest** amount of ATP being produced during the breakdown of one molecule of glucose?
- Glycolysis.
 - Fermentation.
 - Respiratory chain.
 - Transition reaction.
12. The rate of diffusion across the cell membrane is affected by the
- temperature and pinocytosis.
 - temperature and size of the molecule.
 - membrane structure and phagocytosis.
 - shape of glycolipids and glycoproteins.
13. A poison that denatures enzymes in the mitochondrial matrix is introduced into a cell. Which metabolic pathway would be affected first?
- Glycolysis.
 - Krebs cycle.
 - Calvin cycle.
 - Respiratory chain.

14. The oxygen released during photosynthesis comes from
- A. ATP
 - B. CO_2
 - C. H_2O
 - D. NADPH_2
15. The photosynthetic process reduces
- A. light into ATP.
 - B. light into a polysaccharide.
 - C. CO_2 into monosaccharides.
 - D. CO_2 and O_2 into monosaccharides.
16. Cyclic and noncyclic pathways of photophosphorylation **both**
- A. produce oxygen.
 - B. produce NADPH_2 .
 - C. utilize Photosystem I.
 - D. have CO_2 as a reactant.

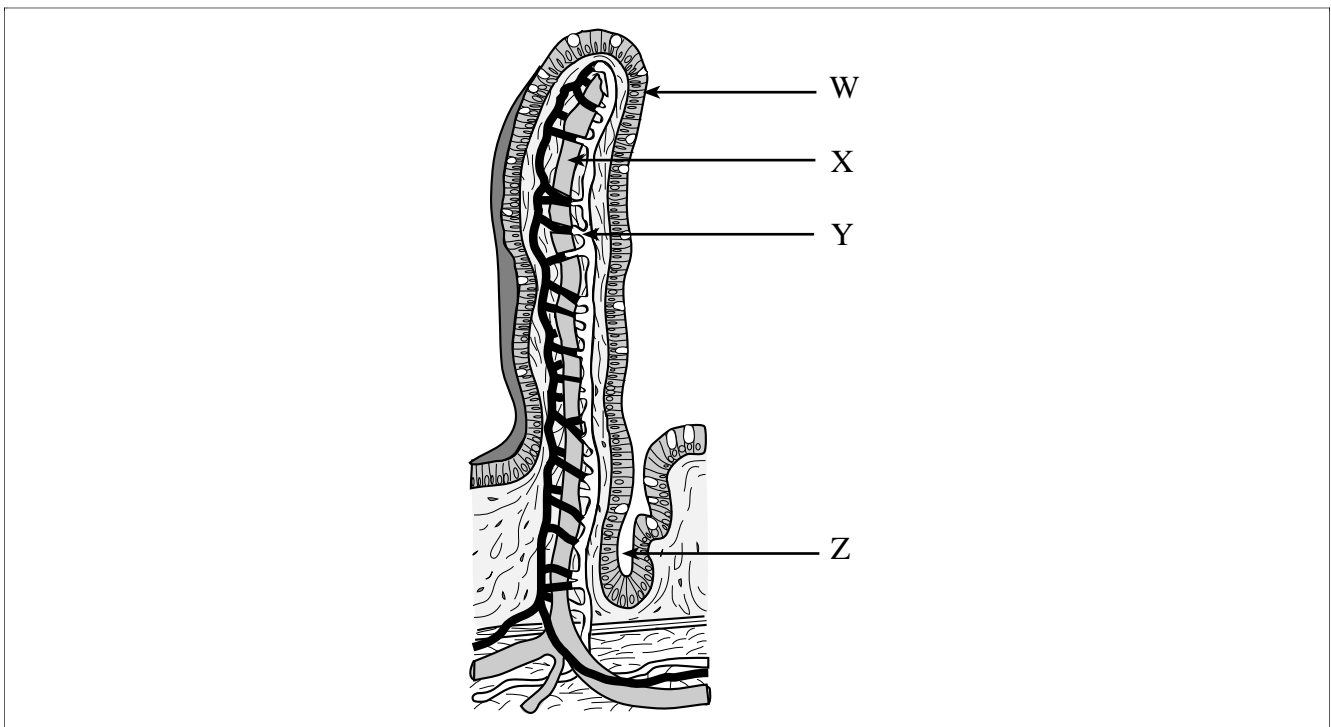
Use the following graph to answer question 17.



17. Which of the following factors will increase the rate of photosynthesis a point X?
- A. Decreasing H_2O levels.
 - B. Increasing light intensity.
 - C. Decreasing the concentration of O_2 .
 - D. Increasing the concentration of CO_2 .

18. Cells that line the esophagus are called
- neurons.
 - muscle cells.
 - epithelial cells.
 - connective cells.
19. The part of the digestive tract where starch **first** undergoes chemical digestion is the
- mouth.
 - stomach.
 - large intestine.
 - small intestine.
20. Which of the following enzymes is correctly matched with its source?
- Amylase – stomach.
 - Peptidase – pancreas.
 - Trypsin – small intestine.
 - Maltase – small intestine.

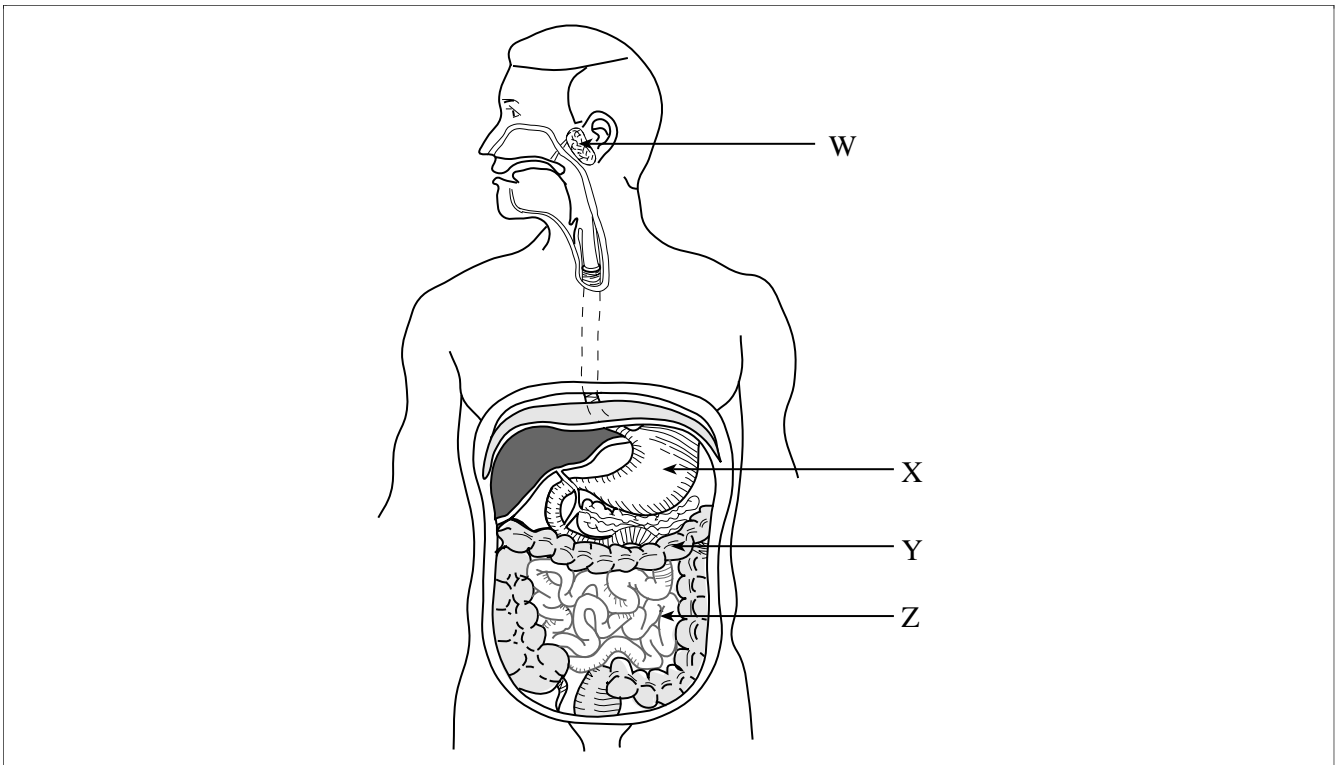
Use the following diagram to answer question 21.



21. Which of the structures in the diagram above is part of the lymphatic system?
- W
 - X
 - Y
 - Z

22. If sodium bicarbonate (NaHCO_3) is **not** released as part of the pancreatic juice, the pH of the
- stomach will remain basic.
 - pancreas will become acidic.
 - large intestine will become basic.
 - small intestine will remain acidic.
23. Structures of the small intestine that aid in the absorption of nutrients include
- villi.
 - cilia.
 - E. Coli*.
 - sphincters.
24. The secretion of cholecystokinin (CCK) will be stimulated by the presence of
- polypeptides and glucose.
 - partially digested protein and fats.
 - partially digested starch and water.
 - completely digested carbohydrates and water.

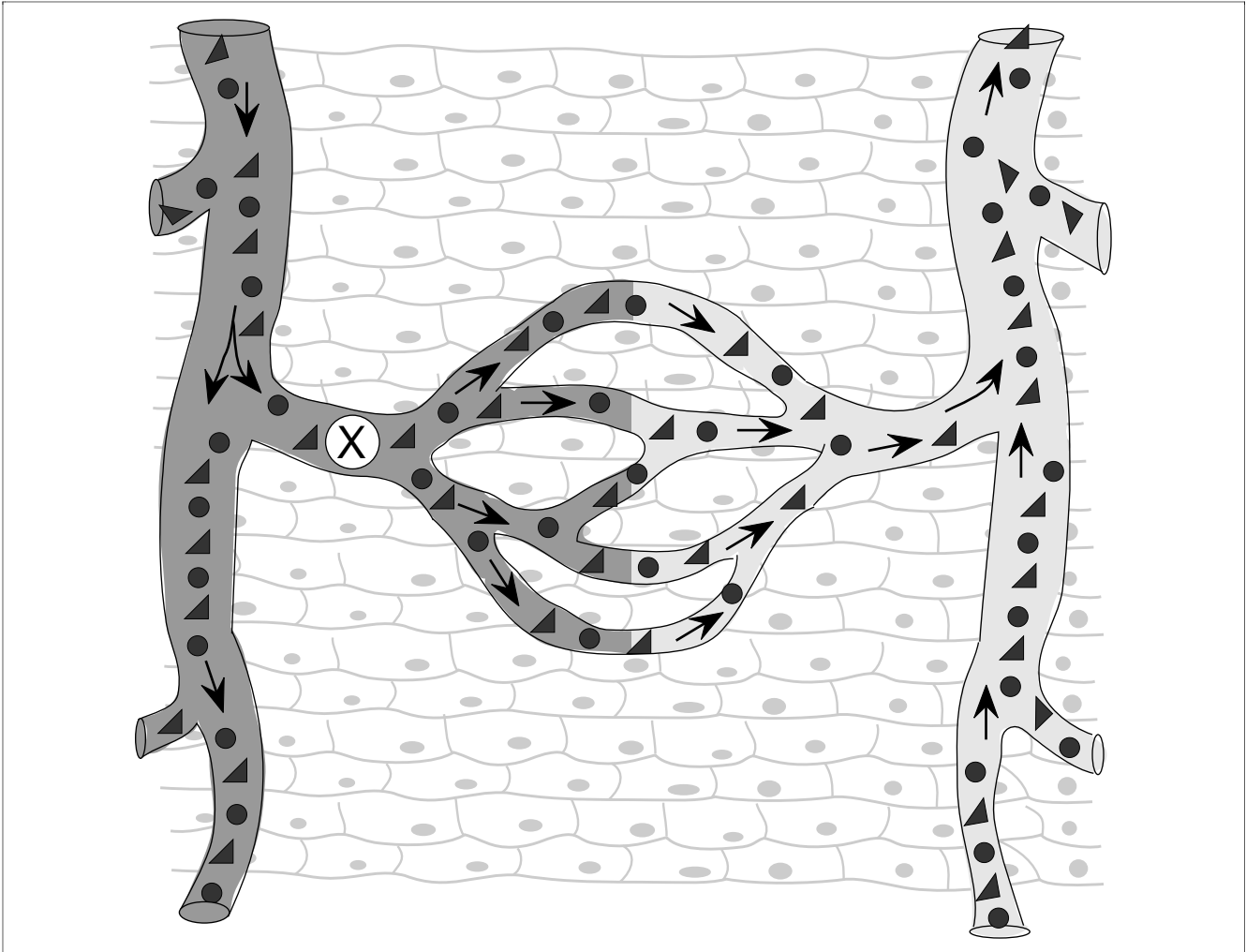
Use the following diagram to answer question 25.



25. Which letter points to the structure where *E. coli* are commonly found?
- W
 - X
 - Y
 - Z

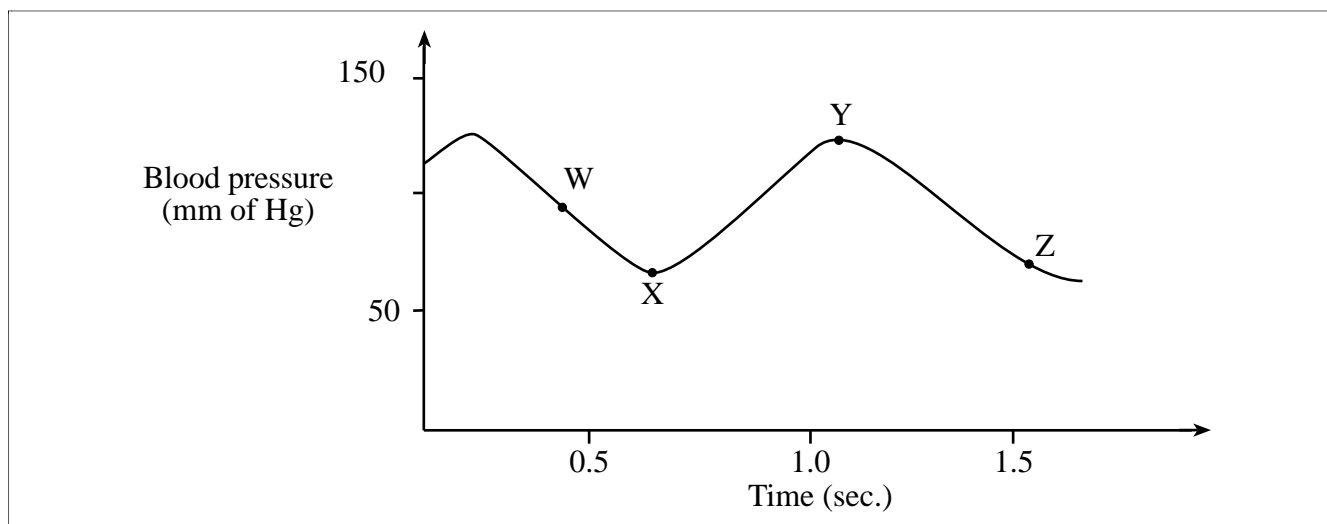
26. The presence of large numbers of mitochondria in the cells which line the small intestine allow the small intestine to
- A. engulf fats.
 - B. digest proteins.
 - C. absorb glucose.
 - D. synthesize vitamins.
27. The **main** function of platelets is to
- A. fight disease.
 - B. carry oxygen.
 - C. carry nutrients.
 - D. aid in blood clotting.
28. Which of the following blood transfusions is compatible?
- A. Donor type A and recipient type O.
 - B. Donor type A and recipient type B.
 - C. Donor type O and recipient type B.
 - D. Donor type AB and recipient type O.
29. An important function of white blood cells is to
- A. buffer blood.
 - B. carry oxygen.
 - C. fight infection.
 - D. carry carbon dioxide.

Use the following diagram to answer question 30.



30. In the diagram above, the blood at point **X** would **likely** contain a relatively high concentration of
- A. urea.
 - B. oxygen.
 - C. carbon dioxide.
 - D. bicarbonate ions.
31. In which of the following vessels would blood contain the **highest** concentration of carbon dioxide?
- A. Aorta.
 - B. Carotid artery.
 - C. Pulmonary vein.
 - D. Pulmonary artery.

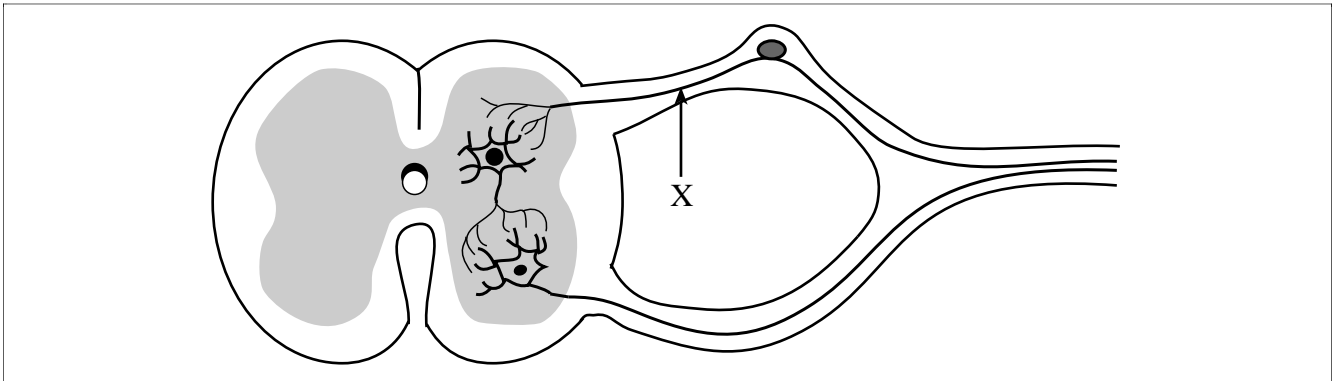
Use the following graph to answer question 32.



32. The graph above shows changes in arterial blood pressure over time. Which letter would indicate ventricular systole?
- A. W
 - B. X
 - C. Y
 - D. Z
33. Which of the following is a characteristic of systemic circulation?
- A. Highly oxygenated arterial blood.
 - B. Increased blood pressure in the veins.
 - C. Low carbon dioxide concentration in the veins.
 - D. Increased concentration of reduced hemoglobin (HHb) in the arterial blood.
34. Nerve cells are called
- A. axons.
 - B. neurons.
 - C. dendrites.
 - D. meninges.
35. Depolarization of a nerve cell is caused by
- A. the sodium potassium pump.
 - B. sodium ions entering the cell.
 - C. the opening of the potassium gates.
 - D. a return of membrane potential to -60mV .

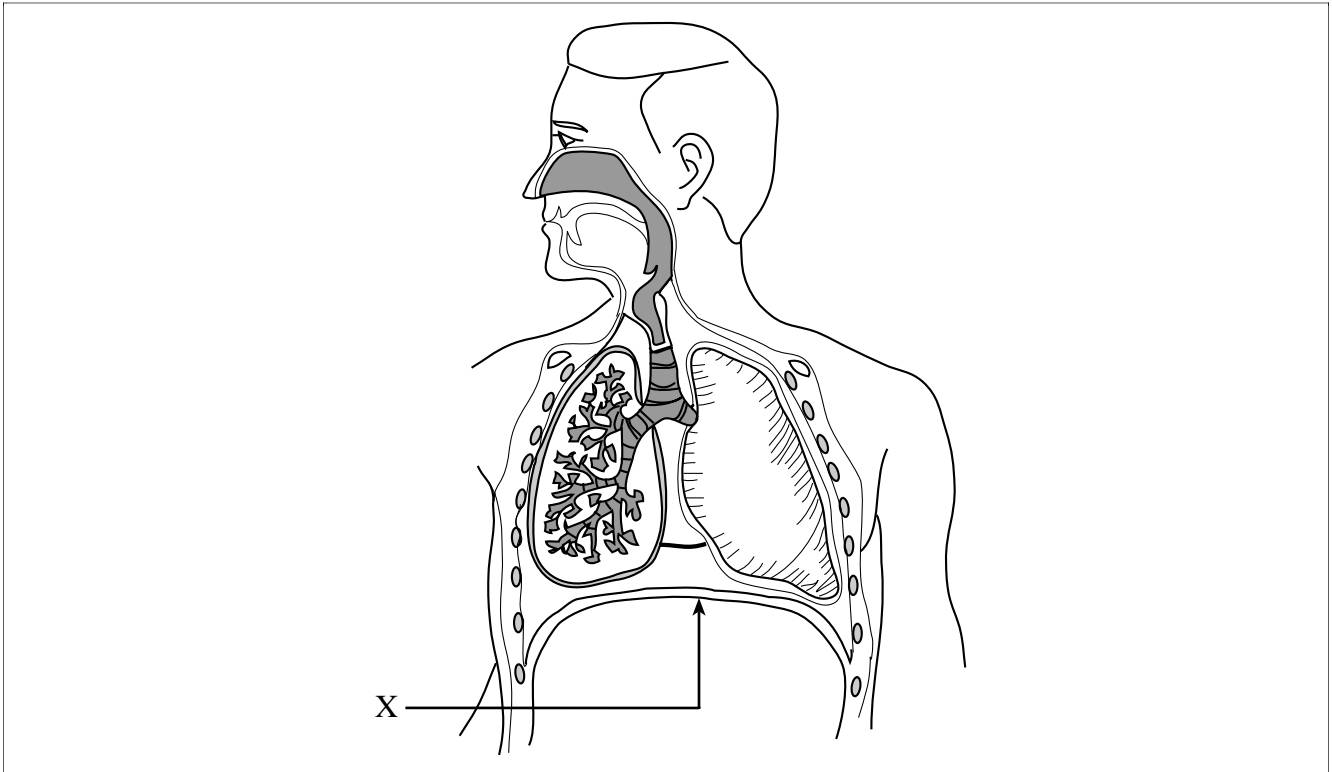
36. Neurotransmitters may create an action potential when they
- A. fit into receptor sites.
 - B. move through protein pores.
 - C. are broken down in the synapse.
 - D. excite the presynaptic membrane.

Use the following diagram to answer question 37.



37. What would be the effect of cutting the neuron at point X?
- A. The organism would die.
 - B. Some sensation would be lost.
 - C. The ability to move would be lost.
 - D. An interneuron would take over the lost function.

Use the following diagram to answer question 38.



38. The structure labelled **X** is

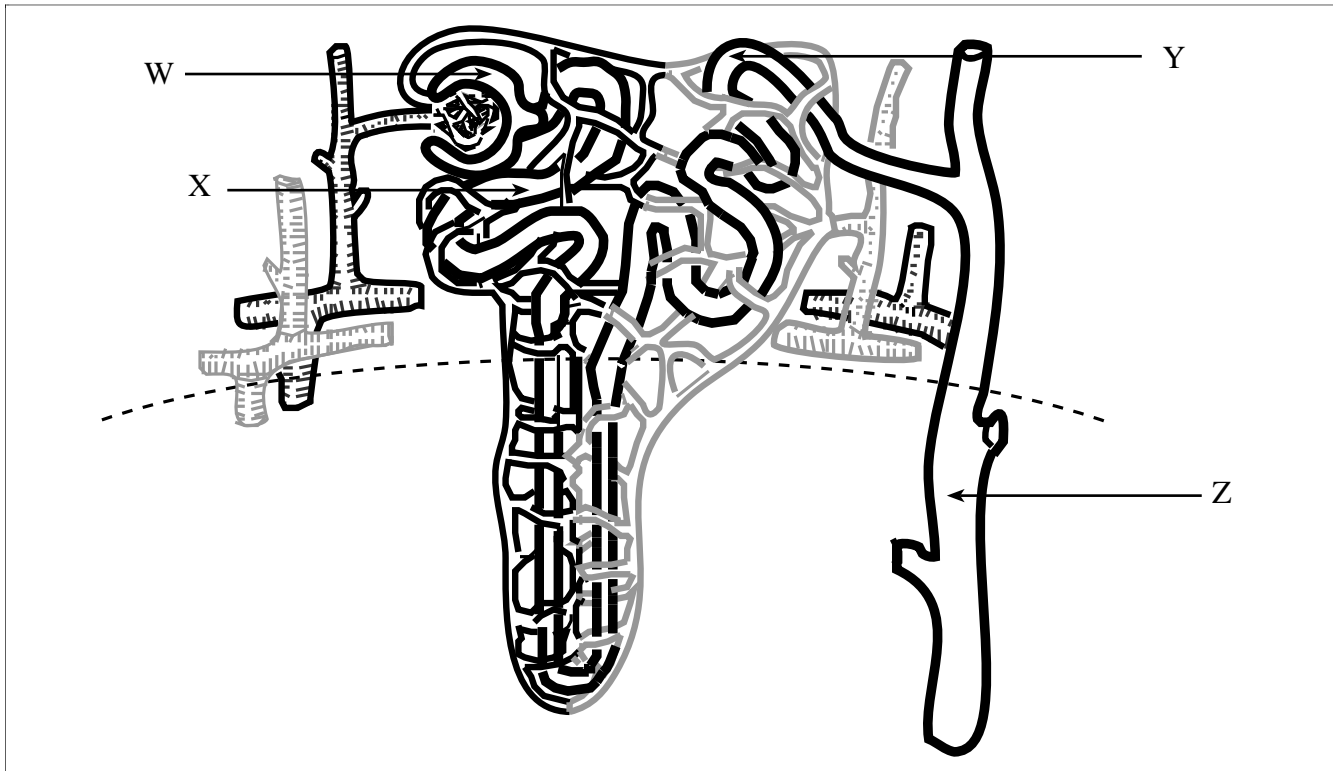
- A. a lung.
- B. the pharynx.
- C. a bronchiole.
- D. the diaphragm.

39. High concentrations of bicarbonate ion (HCO_3^-) in the blood will result in

- A. increased rate of breathing.
- B. decreased rate of breathing.
- C. increased pressure in the chest cavity.
- D. decreased nervous stimulation of the diaphragm.

40. Which of the following occurs during expiration?
- Diaphragm and rib muscles contract.
 - Diaphragm contracts and rib cage lifts.
 - Diaphragm relaxes and rib muscles contract.
 - Diaphragm relaxes and rib cage moves down.

Use the following diagram to answer question 41.



41. In the above diagram of the nephron, which arrow indicates Bowman's capsule?
- W
 - X
 - Y
 - Z
42. High concentrations of ADH (antidiuretic hormone) in the blood will result in
- increased excretion of H_2O .
 - decreased pressure filtration.
 - decreased reabsorption of glucose.
 - increased solute concentration of the urine.

Use the following information to answer question 43.

1. H₂O reabsorption.
2. Tubular excretion.
3. Pressure filtration.
4. Selective reabsorption.

43. Using the above information, which of the following gives the correct order of urine formation?
- A. 1, 3, 4, 2
 - B. 2, 4, 1, 3
 - C. 3, 2, 1, 4
 - D. 3, 4, 1, 2
44. Which of the following describes the tissues surrounding the loop of Henle?
- A. High H⁺ concentration, high K⁺ concentration.
 - B. Low water concentration, low salt concentration.
 - C. High salt concentration, low water concentration.
 - D. High water concentration, low K⁺ concentration.
45. If the blood is excessively acidic, it will **likely** lead to urine
- A. of increased pH.
 - B. of decreased pH.
 - C. with increased Na⁺ concentration.
 - D. with decreased NH₃ concentration.
46. Which capillaries are enclosed by Bowman's capsule?
- A. Distal.
 - B. Proximal.
 - C. Peritubular.
 - D. Glomerular.
47. Which of the following symptoms might be an indication of kidney failure?
- A. Salt in the urine.
 - B. Urea in the urine.
 - C. Protein in the urine.
 - D. Uric acid in the urine.

48. Where in the nephron does pressure filtration of the blood occur?
- A. Loop of Henle.
 - B. Collecting duct.
 - C. Proximal tubule.
 - D. Bowman's capsule.
49. The concentration of glucose in the glomerular filtrate is **greater** than in the urine because glucose is
- A. excreted.
 - B. reabsorbed.
 - C. a large molecule.
 - D. used to provide energy for reabsorption.
50. The posterior pituitary gland secretes
- A. oxytocin.
 - B. glucagon.
 - C. adrenalin.
 - D. growth hormone (GH).
51. Increased secretion of thyroid-stimulating hormone (TSH) leads to
- A. increased metabolic rate.
 - B. decreased glucose uptake.
 - C. decreased carbon dioxide production.
 - D. increased speed of nerve impulse transmission.
52. Prostaglandins cause the
- A. growth of bones.
 - B. uterus to contract.
 - C. breasts to secrete milk.
 - D. blood calcium level to increase.

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

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PART B: WRITTEN-RESPONSE

Value: 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. Living animal cells are added to a solution containing oxygen, carbon dioxide, amino acids and glucose. After four hours, the solution surrounding the cells is sampled and the concentration of each substance is measured.

a) Predict the change in the concentrations of carbon dioxide and glucose in the solution surrounding the cells. **(2 marks: 1 mark each)**

Carbon Dioxide: _____

Glucose: _____

b) Using your knowledge of membrane structure, explain the mechanisms that account for these changes in carbon dioxide and glucose concentration. **(4 marks)**

Carbon Dioxide: _____

Glucose: _____

Score for
Question 1.

1. _____
(6)

2. Complete the following table using your knowledge of biological molecules.
(4 marks: $\frac{1}{2}$ mark each box)

BIOLOGICAL MOLECULE	UNIT MOLECULE (Building Block)	EXAMPLE OF BIOLOGICAL MOLECULE
nucleic acid		
		enzyme
		glycogen
	fatty acid and glycerol	

Score for
Question 2.

2. _____
(4)

3. Summarize anaerobic respiration with respect to the following:
(3 marks: 1 mark each)

a) Net number of ATP produced per glucose.

b) Name a product in addition to ATP.

c) Location of reaction(s) in the cell.

Score for
Question 3.

3. _____
(3)

4. Describe white and red blood cells with respect to the following. **(4 marks)**

White blood cells

i) Site of production: _____

ii) Brief description of shape: _____

Red blood cells

iii) Brief description of shape: _____

iv) Function: _____

Score for Question 4. 4. _____ (4)

Use the following diagram to answer question 5.



5. Identify and state **one** function of each part of the brain labelled W, X, Y and Z.
(6 marks: $\frac{1}{2}$ mark each for identification and 1 mark each for function)

Part W: _____

Function: _____

Part X: _____

Function: _____

Part Y: _____

Function: _____

Part Z: _____

Function: _____

Score for Question 5. 5. _____ (6)

6. Complete the following table for hormones secreted by the anterior pituitary gland.
(5 marks: 1 mark each)

HORMONE SECRETED	TARGET ORGAN	PRIMARY ACTION
	thyroid	
	ovaries	
ACTH (adrenocorticotrophic hormone)		stimulates target organ to produce cortisol

Score for
Question 6.

6. _____
(5)

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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 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
interferon	
booster shot	a) obtaining antibodies from breast milk _____
lymphocyte	b) antibodies which react against own tissue _____
autoimmune	c) B or T cell _____
neutrophil	d) monocyte that has swollen to 5 or 10 times its normal size _____
macrophage	e) long lasting immunity to disease _____
active immunity	f) second of two vaccine injections which raises antibody titer to _____
passive immunity	high levels

2. Describe **one** cause of organ rejection and **one** way that it can be controlled. **(2 marks)**

3. Describe where in the body interferon is produced and how it is used in immune therapy. **(2 marks)**

Score for Option I. 7. ___ ___ 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
osteoporosis	
tendon	a) contains blood-producing tissue _____
spongy bone	b) bacterial infection of bone _____
sarcolemma	c) suture of the skull _____
appendicular skeleton	d) membrane surrounding the muscle fibre _____
osteomyelitis	e) joins bone to muscle _____
immovable joint	f) cylindrical contractile portion of a muscle fibre _____
myofibril	

2. For each of the following, give **one** way the vertebral column is designed to provide

a) flexibility. **(1 mark)**

b) resistance to shock. **(1 mark)**

3. Complete this chart comparing types of muscle. **(2 marks: $\frac{1}{2}$ mark each)**

Smooth muscle	internal organs	involuntary	
Cardiac muscle			striated
Skeletal muscle	attached to bones	voluntary	

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

OVER

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
seminiferous tubule	
blastula	a) process that produces male sex cells _____
estrogen	b) produces components of seminal fluid _____
acrosome	c) secreted by the follicle _____
spermatogenesis	d) developmental stage with three cell layers _____
Cowper's gland	e) contains enzymes for penetration of the egg _____
gastrula	f) site of egg production _____
ovary	

2. List **two** effects of testosterone on the body. **(2 marks: 1 mark each)**

3. Describe the location and function of the cervix. **(2 marks: 1 mark each)**

Location: _____

Function: _____

Score for Option III. 9. _____ 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
transformation	
plasmid	a) allows physicians to diagnose genetic diseases _____
<i>E. coli</i>	b) plant cell lacking cell wall _____
vector	c) causes DNA fragments to bind together _____
protoplast	d) the result of joining DNA fragments _____
DNA probe	e) ring of DNA removed from a bacterium _____
recombinant DNA	f) changes the genetic makeup of the cell _____
ligase	

2. Describe the process and purpose of amniocentesis. **(2 marks)**

3. List **two** physical characteristics of individuals with

- a) Turner’s syndrome. **(1 mark: $\frac{1}{2}$ mark for each characteristic)**

- b) Down’s syndrome. **(1 mark: $\frac{1}{2}$ mark for each characteristic)**

Score for Option IV. 10. <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
oncogene	
macrophage	a) a compound which changes DNA _____
initiator	b) new growth of non-differentiating cells _____
neoplasia	c) describes a tumour which does not spread _____
anaplasia	d) epithelial cancer _____
metastasis	e) spreading of cancer cells throughout the body _____
benign	f) a body defence against cancer cells _____
carcinoma	

2. Describe how the lymphatic system

- a) helps the spread of cancer. **(1 mark)**

- b) hinders the spread of cancer. **(1 mark)**

3. List **two** common treatments for cancer. **(2 marks: 1 mark each)**

Score for
Option V.

11. _____ _____
 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
vestibule	
chemoreceptor	a) responds to tastes or smells _____
ciliary body	b) area responsible for detailed vision _____
organ of Corti	c) location of receptors for static equilibrium _____
radioreceptor	d) controls shape of the lens _____
fovea	e) carries impulses from the ear to the brain _____
auditory nerve	f) has hair cells that determine pitch _____
retina	

2. Describe the role of the semicircular canals in maintaining balance. **(2 marks)**

3. Describe **one** role of each of the following in vision. **(2 marks: 1 mark each)**

a) Rods:

b) Cones:

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