

AUGUST 1997

PROVINCIAL EXAMINATION

MINISTRY OF EDUCATION, SKILLS AND TRAINING

BIOLOGY 12

GENERAL INSTRUCTIONS

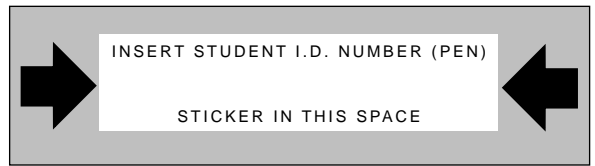
1. Insert the stickers with your Student I.D. Number (PEN) in the allotted spaces above. **Under no circumstance is your name or identification, other than your Student I.D. Number, to appear on this paper.**
2. Take the separate Answer Sheet and follow the directions on its front page.
3. Be sure you 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 AUGUST 1997 PROVINCIAL

Course Code = BI Examination Type = P

1. _____
(4)

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

OPTIONS: Score **only two** of the following options.

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: Option section consisting of only written-response questions. Select only two options. Each option is worth 10 marks.	20	30
	Total: 100 marks	120 minutes
2. 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.		
3. For written-response questions, organization and planning space has been incorporated into the space allowed for answering each question.		
4. 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, 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.

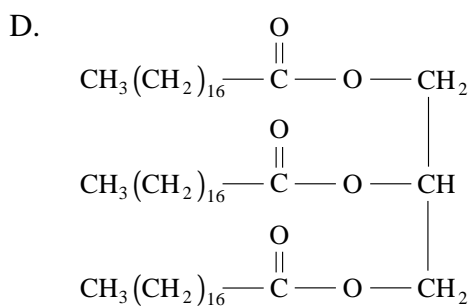
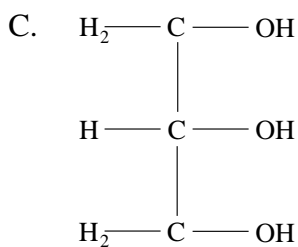
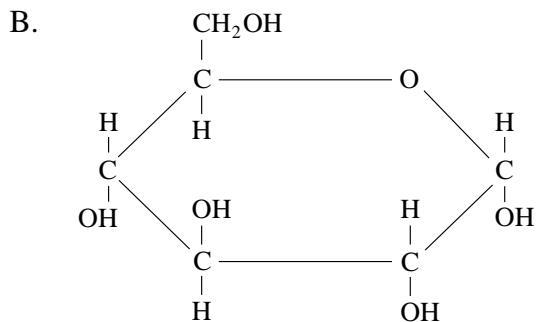
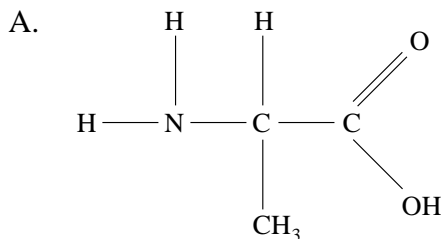
1. A possible explanation for an event that occurs in nature is called a(n)

- A. prediction.
- B. hypothesis.
- C. observation.
- D. analysis of data.

2. Glucose in cells is used **primarily**

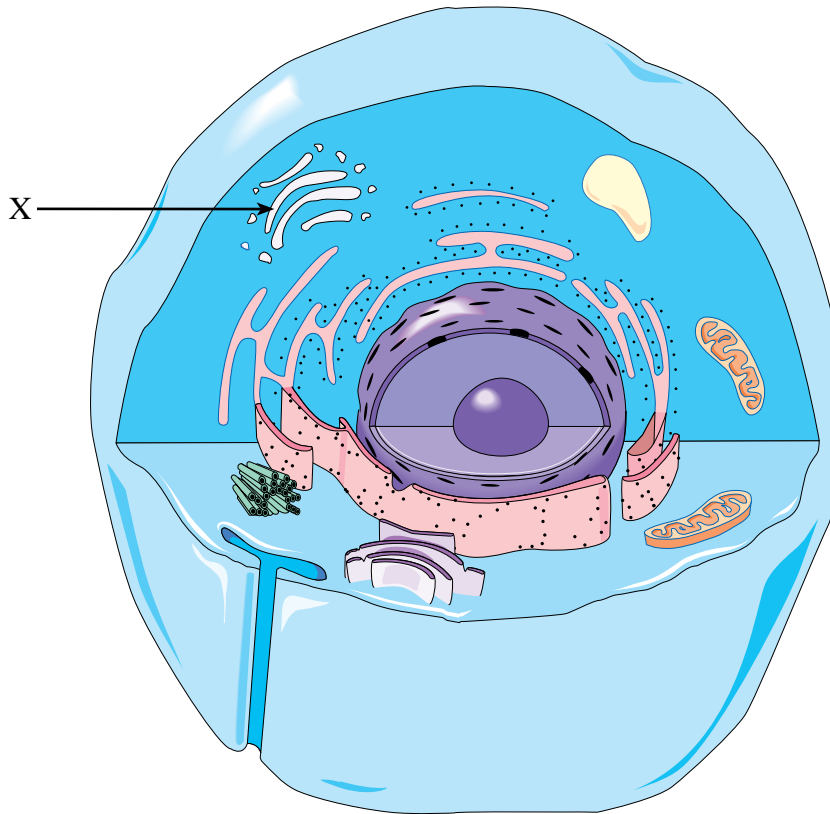
- A. as an energy source.
- B. to produce membranes.
- C. to store genetic material.
- D. to produce enzymes that catalyze reactions.

3. Which of the following molecules would be produced by the hydrolysis of an enzyme?



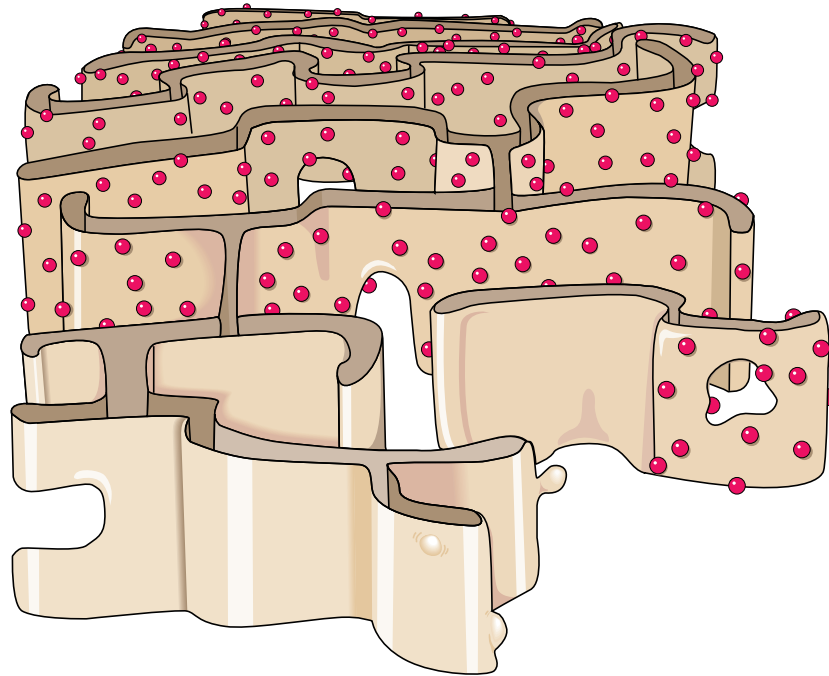
4. The chemical reactions in the small intestine take place in a basic (alkaline) environment. Which number indicates this basic pH?
- A. 2.5
 - B. 4.6
 - C. 6.9
 - D. 8.5
5. The **main** difference between cellulose and starch molecules is
- A. the type of linkage between glucose subunits.
 - B. that only cellulose contains ribose building blocks.
 - C. that only starch is made from glucose building blocks.
 - D. the type of monosaccharide used to form these polymers.
6. The tRNA anticodon for the DNA sequence AGT would be
- A. UCA.
 - B. AGU.
 - C. TCA.
 - D. AGT.

Use the following diagram to answer question 7.



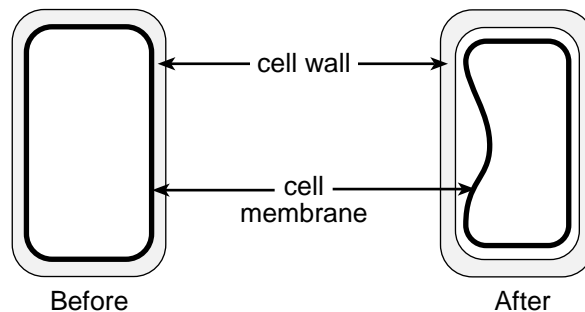
7. The organelle labelled **X** is involved in
- A. energy production.
 - B. producing proteins.
 - C. packaging materials.
 - D. the division of genetic material.

Use the following diagram to answer question 8.



8. The structure shown above functions in all of the following processes **except** in
- A. protein transport.
 - B. DNA transcription.
 - C. production of vesicles.
 - D. detoxification of drugs.
-

9. The diagram below is a student drawing of an onion cell before and after it was placed in a solution.

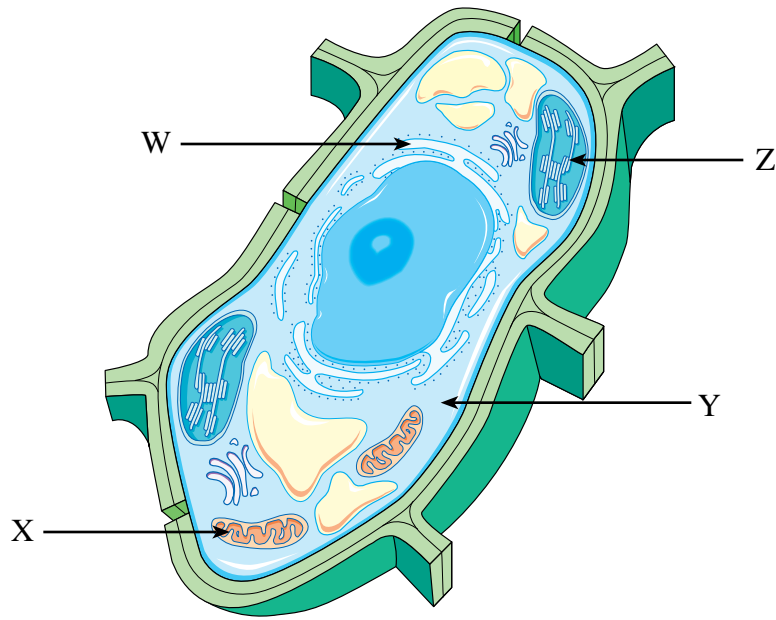


The solution

- A. caused the cell to gain water by osmosis.
- B. increased the rate of active transport of ions.
- C. resulted in a hypertonic environment for the cell.
- D. ruptured the cell membrane, releasing cytoplasm.

10. Which organelle would be required in large numbers by a cell whose membrane is often depolarized?
- A. Ribosome.
 - B. Lysosome.
 - C. Mitochondrion.
 - D. Endoplasmic reticulum.
11. In aerobic cellular respiration, the final electron acceptor is
- A. ADP.
 - B. NAD.
 - C. oxygen.
 - D. alcohol.
12. In cellular respiration, 34 ATP are produced in the respiratory chain from one glucose molecule. The remaining 4 ATP are produced in the
- A. matrix and on the cristae of the mitochondria.
 - B. cytoplasm of the cell and on the cristae of the mitochondria.
 - C. cytoplasm of the cell and in the matrix of the mitochondria.
 - D. cytoplasm of the cell and on the outer membrane of the mitochondria.

Use the following diagram to answer question 13.



13. The three subpathways of aerobic respiration take place in structures

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

14. The molecule that fits into the enzyme's active site is the

- A. codon.
- B. vitamin.
- C. substrate.
- D. coenzyme.

15. The energy released during the Krebs cycle originates from

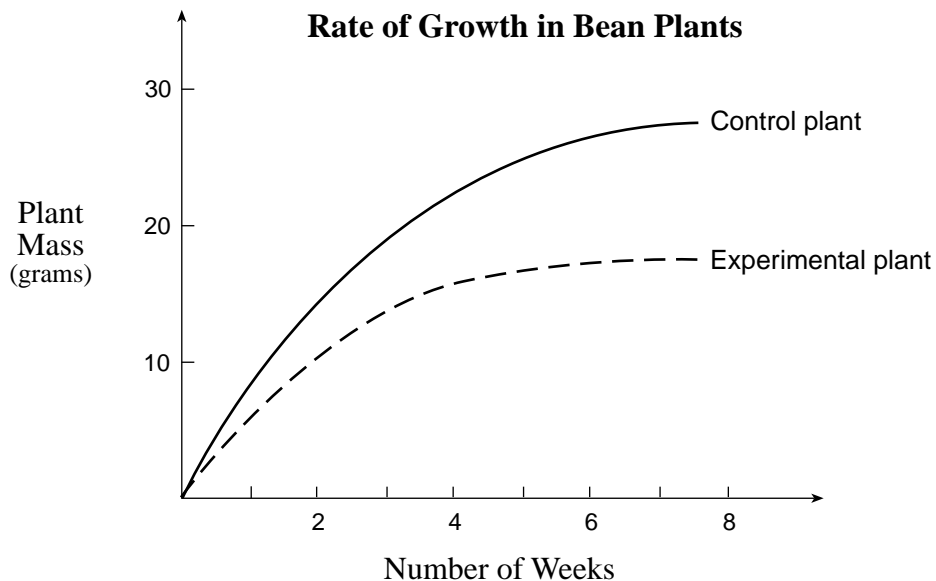
- A. NAD.
- B. water.
- C. oxygen.
- D. glucose.

16. Eating which of the following would slow the rate of chemical digestion in the mouth?
- Cheese.
 - Ice cream.
 - Potato chips.
 - Bread with butter.
17. Chlorophyll molecules absorbing light energy can be found in the
- grana.
 - cristae.
 - stroma.
 - cell wall.
18. Which of the following cellular processes occurs in cyclic photophosphorylation?

CELLULAR PROCESS	REACTANT	PRODUCT
W	water	O ₂
X	NADPH ₂	glucose
Y	O ₂	CO ₂
Z	ADP	ATP

- W
- X
- Y
- Z

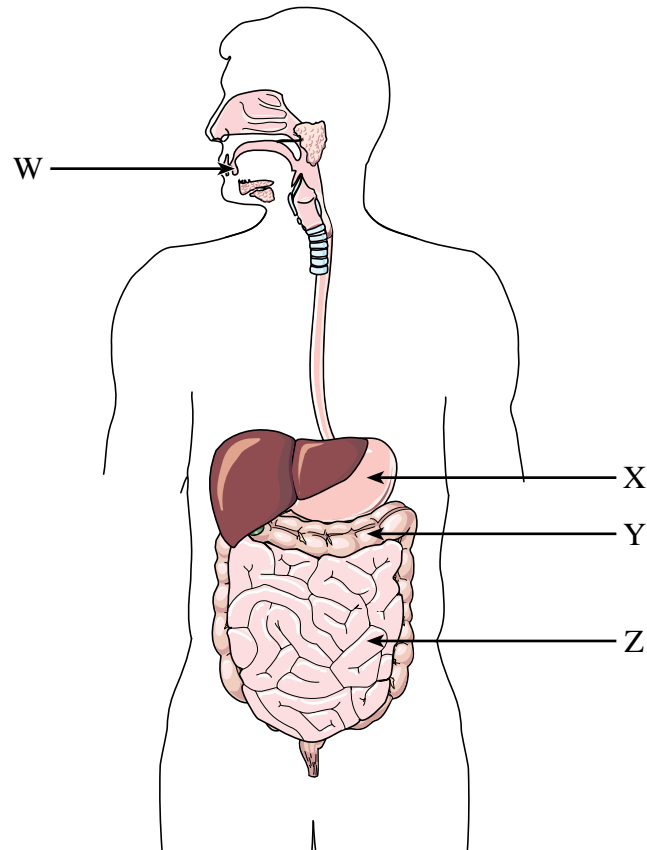
19. An experiment was conducted to measure environmental factors that affected two bean plants grown hydroponically (in water) over a two-month period. Plant mass was measured every two weeks and plotted on the graph below.



Which of the following was different in the environment of the experimental plant?

- A. Glucose was added to the water.
 - B. Chlorophyll was added to the water.
 - C. Green light was used instead of white light.
 - D. The intensity (amount) of light was increased.
20. Which of the following is a reactant in the carbon dioxide reducing reactions (Calvin-Benson cycle)?
- A. Light.
 - B. Water.
 - C. Glucose.
 - D. NADPH_2 .

Use the following diagram to answer question 21.



21. Which structure would have a pH that would destroy most bacteria?

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

22. Products of the liver include

- A. pepsin, gastrin and bile.
- B. bile, proteases and urea.
- C. bile, urea and blood proteins.
- D. proteases, amylases and lipase.

23. The following events take place after eating a protein-rich meal.

1. The pancreas releases sodium bicarbonate (NaHCO_3).
2. Pepsinogen is converted into pepsin.
3. Gastrin is released into the bloodstream.
4. Acid chyme stimulates the release of secretin.

Place these events in the correct order for digestion.

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

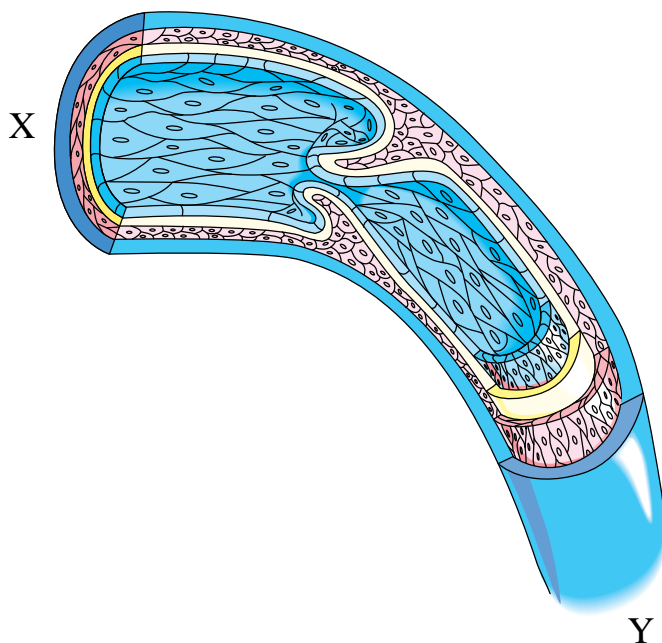
24. The enzyme amylase is produced by which organs?

- A. Liver and duodenum.
- B. Duodenum and pancreas.
- C. Salivary glands and liver.
- D. Pancreas and salivary glands.

25. Blood reaches the lungs from the heart through the

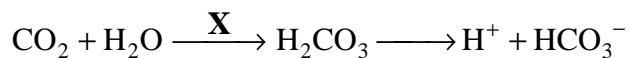
- A. aorta.
- B. pulmonary vein.
- C. pulmonary arteries.
- D. superior vena cava.

Use the following diagram to answer question 26.



26. The blood vessel shown carries blood between organs at locations **X** and **Y**. Blood flow through the vessel would be from the
- A. heart at **X** to the kidneys at **Y**.
 - B. intestine at **Y** to the liver at **X**.
 - C. heart at **Y** to the kidneys at **X**.
 - D. intestine at **X** to the liver at **Y**.

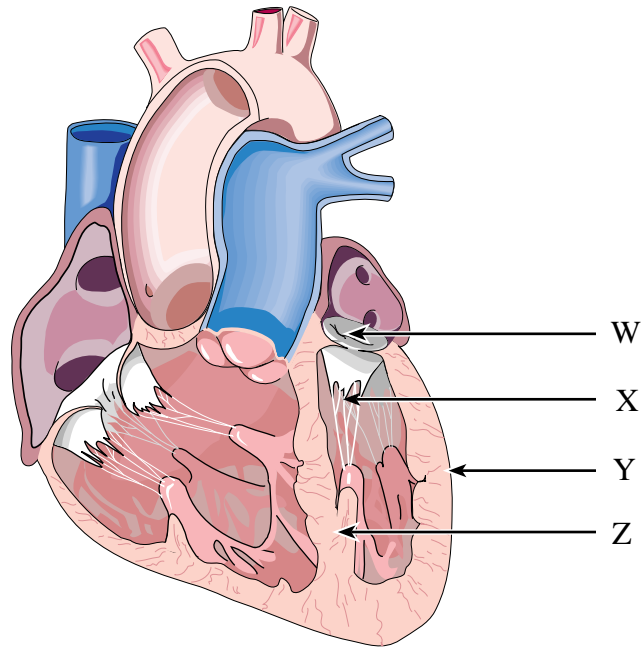
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27. The following reaction takes place in the blood:



Substance **X** would be

- A. thrombin.
- B. calcium ions.
- C. carbonic anhydrase.
- D. prothrombin activator.

Use the following diagram to answer question 28.



28. The chordae tendineae are indicated by the letter

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

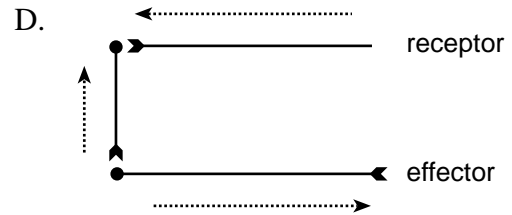
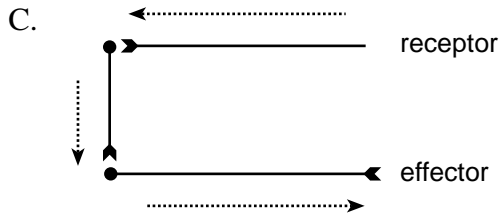
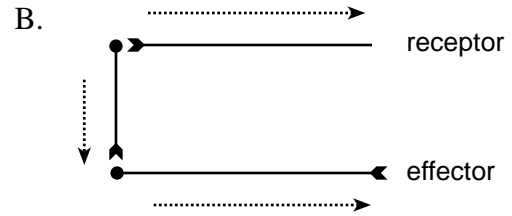
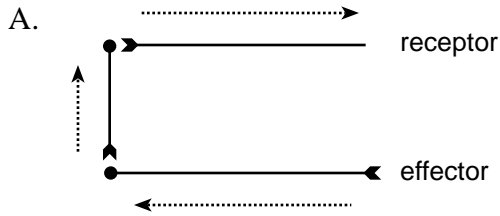
29. A person with type AB blood has

- A. A antigens and B antibodies.
- B. both A and B antigens and A and B antibodies.
- C. no A or B antigens but both A and B antibodies.
- D. both A and B antigens but no A or B antibodies.

30. The myelin sheath is a protective covering that surrounds

- A. only motor neurons.
- B. all types of neurons.
- C. only sensory neurons.
- D. both motor and sensory neurons.

31. Which diagram below represents the path taken by an action potential in a reflex arc as shown by the arrows?



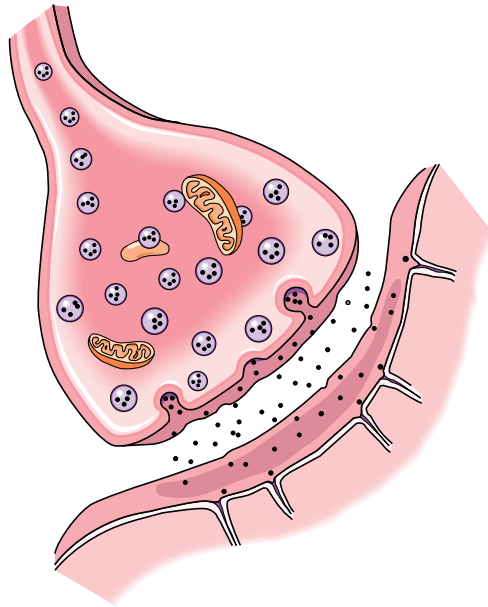
32. A chemical produced by the puffer fish prevents the opening of sodium gates in neurons but has no effect on chemical synapses. In which location on a sensory neuron would impulse transmission initially be stopped when this chemical is injected into the foot?

- A. Cell body.
- B. Myelin sheath.
- C. Node of Ranvier.
- D. Terminal knob of an axon.

33. The sympathetic nervous system would be most active while a person is

- A. digesting a large meal.
- B. in an athletic competition.
- C. recovering from an illness.
- D. writing biology definitions.

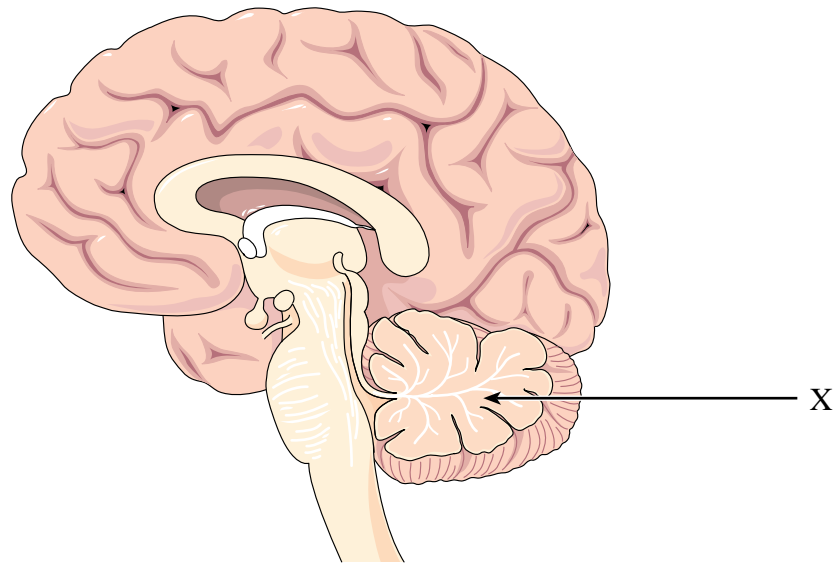
34. The diagram below shows a synapse in the parasympathetic nervous system during the transmission of an impulse.



What is the substance being released into the cleft?

- A. Sodium ions.
 - B. Noradrenalin.
 - C. Calcium ions.
 - D. Acetylcholine.
35. The cerebral lobe of the brain that contains areas responsible for the sensations of touch, temperature, pressure and pain, and for the understanding of speech is the
- A. frontal.
 - B. parietal.
 - C. occipital.
 - D. temporal.

Use the following diagram to answer question 36.



36. The structure labelled **X** is the

- A. cerebrum.
 - B. cerebellum.
 - C. corpus callosum.
 - D. medulla oblongata.
-

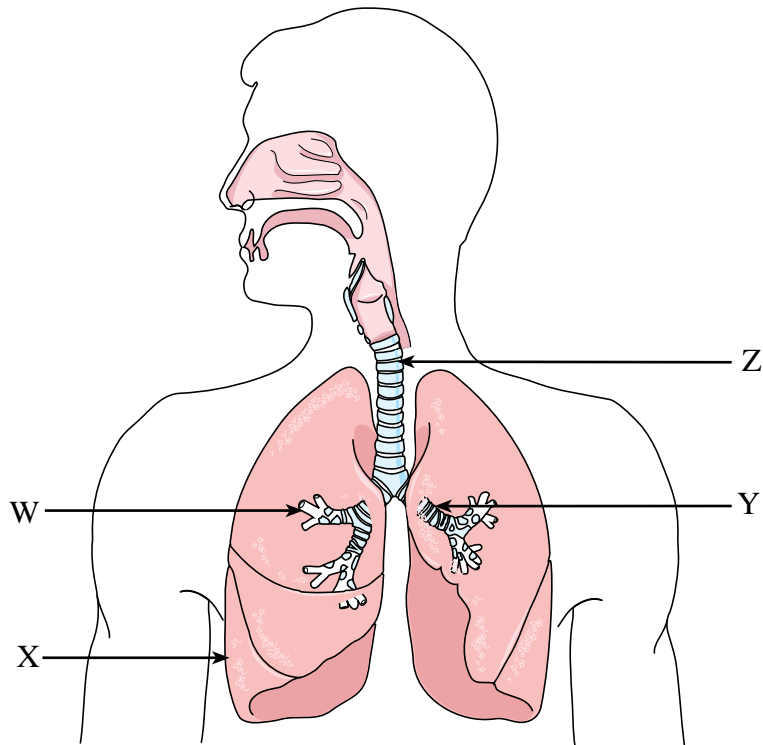
37. The part of the brain that would help you to concentrate on this examination even when other sensory stimuli are present is the

- A. thalamus.
- B. cerebellum.
- C. hypothalamus.
- D. medulla oblongata.

38. Which of the following would occur if there were a decreased level of hemoglobin in the blood?

- A. Breathing rate would decline.
- B. Tissues would become more acidic.
- C. Carbonic anhydrase would be more effective.
- D. Carbaminohemoglobin levels would increase.

Use the following diagram to answer question 39.



39. The bronchus is indicated by the letter

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

40. The pleural membranes begin to expand and stretch when

- A. both the diaphragm and rib muscles relax.
- B. both the diaphragm and rib muscles contract.
- C. the diaphragm contracts and the rib muscles relax.
- D. the diaphragm relaxes and the rib muscles contract.

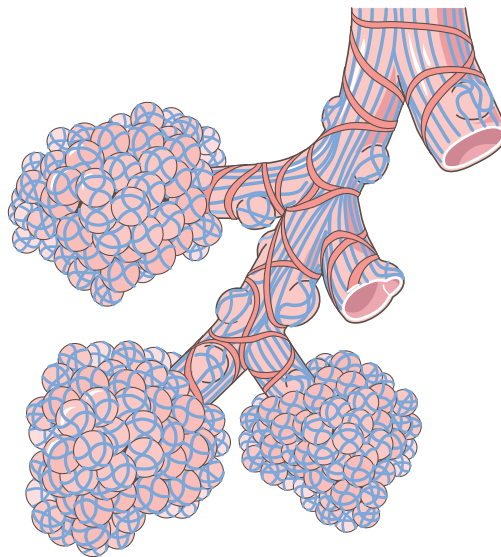
Use the following data table to answer question 41.

SUBJECT	HEMOGLOBIN (g/100 mL of blood)	O ₂ CONTENT OF ARTERIAL BLOOD (mL O ₂ /100 mL of blood)	O ₂ CONTENT OF VENOUS BLOOD (mL O ₂ /100 mL of blood)	CARDIAC OUTPUT (L/min)
Normal	15	19	15	5.0
W Hypoxia	15	13	10	6.6
X Hypoxia	10	13	10	7.0
Y Hypoxia	16	20	13	3.0
Z Hypoxia	15	19	18	unknown

Note: Hypoxia is a deficiency in the amount of O₂ reaching the tissues of the body.

41. Which subject would be suffering from pneumonia, a condition resulting from fluid accumulating in the alveoli of the lungs?
- A. W
 - B. X
 - C. Y
 - D. Z

Use the following diagram to answer question 42.

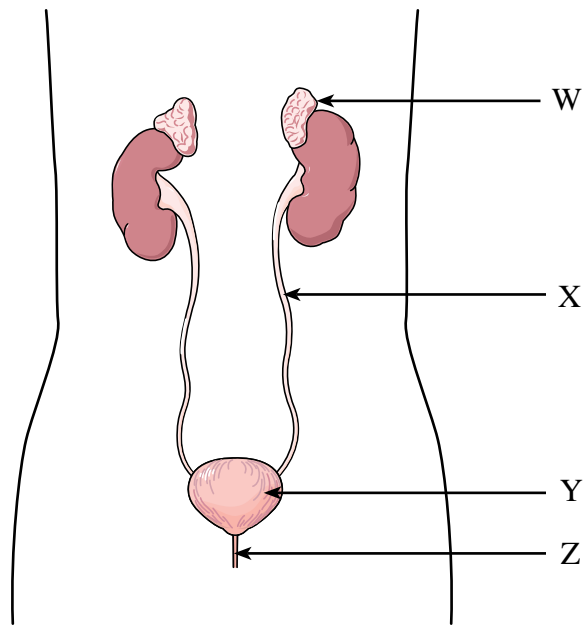


42. The process of gas exchange that takes place in the structures above is referred to as
- A. breathing.
 - B. cellular respiration.
 - C. internal respiration.
 - D. external respiration.

OVER

43. The cilia found in the respiratory system function to
- A. bring air into the lungs.
 - B. force air out of the lungs.
 - C. initiate the coughing reflex.
 - D. move mucus towards the glottis.
44. Which of the following is **not** a function of the kidneys?
- A. Maintaining a constant blood pH.
 - B. Producing urea from protein metabolism.
 - C. Removing metabolic wastes from the blood.
 - D. Regulating the amount of water in the body.

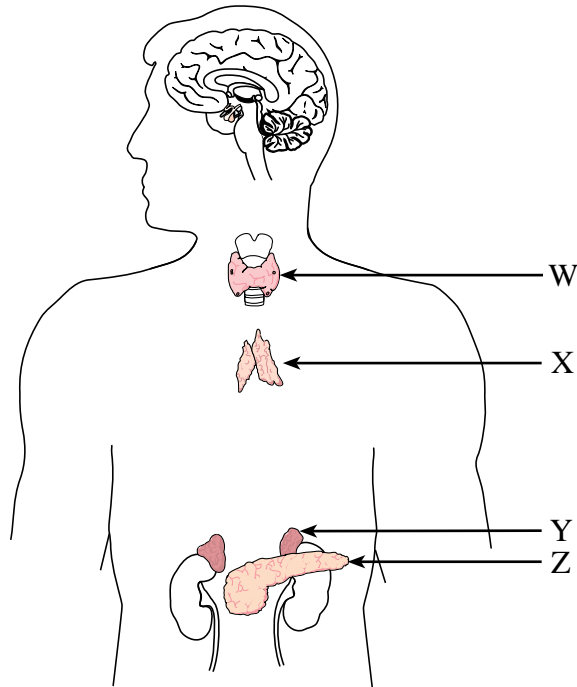
Use the following diagram to answer question 45.



45. Which letter indicates the urethra?
- A. W
 - B. X
 - C. Y
 - D. Z

46. The sequence of structures that urea passes through in the nephron is
- A. glomerulus, proximal tubule, distal tubule, loop of Henle.
 - B. glomerulus, proximal tubule, capillary network, renal vein.
 - C. proximal tubule, loop of Henle, distal tubule, collecting duct.
 - D. proximal tubule, distal tubule, loop of Henle, collecting duct.
47. When the level of ADH (antidiuretic hormone) increases in the blood,
- A. less water is reabsorbed and urine output increases.
 - B. less water is reabsorbed and urine output decreases.
 - C. more water is reabsorbed and urine output decreases.
 - D. more water is reabsorbed and urine output increases.
48. Most of the blood glucose entering the nephron returns to the plasma by the process of
- A. osmosis in the loop of Henle.
 - B. tubular excretion in the distal tubule.
 - C. active transport in the proximal tubule.
 - D. facilitated transport in the distal tubule.

Use the following diagram to answer question 49.



49. Digested polysaccharides are taken in by cells in the presence of a hormone secreted from the gland labelled

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

50. Thyroxin treatment can be used to stimulate weight loss in some people with an endocrine deficiency. This treatment will

- A. cause a loss of appetite.
- B. increase the metabolic rate.
- C. prevent the conversion of fatty acids to fat.
- D. accelerate the conversion of glucose to glycogen.

51. ACTH is carried by
- A. ducts throughout the body and is effective in all cells.
 - B. blood throughout the body and is effective in all cells.
 - C. ducts throughout the body and is effective in certain cells.
 - D. blood throughout the body and is effective in certain cells.
52. Which of the following is a characteristic of protein (peptide) hormones?
- A. They can freely enter the cell.
 - B. They are derived from cholesterol.
 - C. They bind with DNA in the nucleus.
 - D. They bind to receptors on the cell surface.

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

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.

Use the following table to answer question 1.

Body Part	BLOOD FLOW (in mL/min)			
	At Rest	Light Exercise	Fairly Strenuous Exercise	Maximum Exertion
Skeletal muscles	1 200	4 500	12 500	22 000
Intestine	1 400	1 100	600	300
Skin	500	1 500	1 900	1 600
Brain	750	750	750	750
All other regions	600	400	400	100

1. The table above shows the changes in blood flow to various parts of the body while at rest and during different levels of exercise. Explain the blood flow to the following organs at the different levels of exercise. **(4 marks: 1 mark each)**

Skeletal muscles:

Intestine:

Skin:

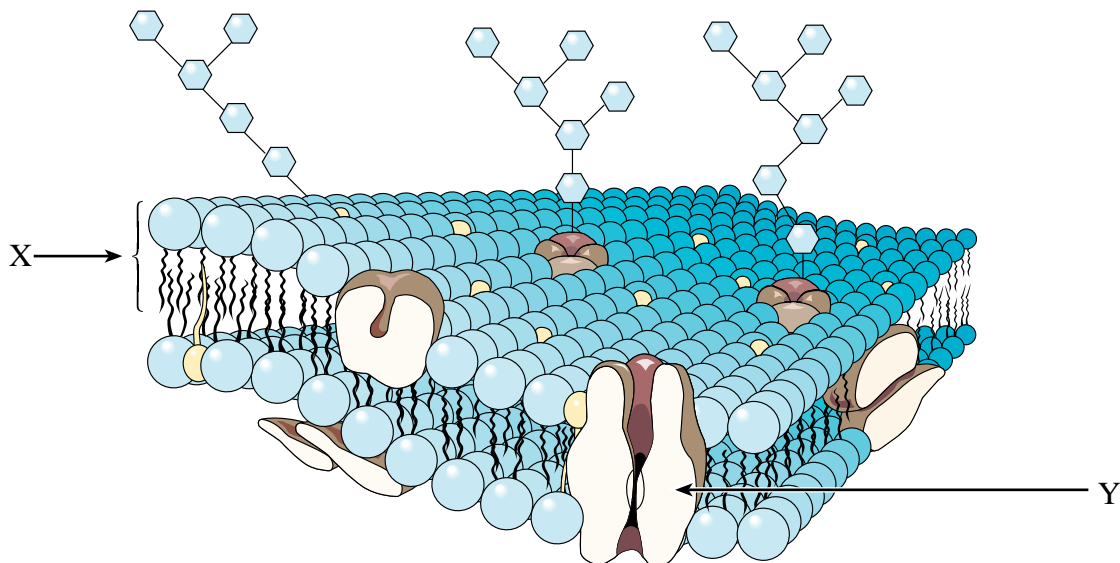
Brain:

Score for
Question 1:

1. $\frac{\quad}{(4)}$

OVER

Use the following diagram to answer question 3.



3. Identify molecules **X** and **Y** in the diagram above. For each molecule, give **one** function and name its unit molecules (building blocks). **(6 marks: 1 mark each)**

Molecule X: _____

Function of X: _____

Unit molecules of X: _____

Molecule Y: _____

Function of Y: _____

Unit molecules of Y: _____

Score for
Question 3:

3. _____
(6)

OVER

4. Give **one** role of each of the following in the transmission of a nerve impulse.

(3 marks: 1 mark each)

Na⁺/K⁺ pump:

Sodium gate:

Myelin sheath:

Score for
Question 4:

4.
(3)

5. a) State **one** function of each of the following substances. (2 marks: 1 mark each)

Glucagon:

Lipase:

b) Name the organ which secretes glucagon and lipase.

(1 mark)

Score for
Question 5:

5. _____
(3)

6. How is the structure of the alveoli ideally suited to their function?

(3 marks)

Score for
Question 6:

6. _____
(3)

OVER

7. Complete the following table for the endocrine system.

(3 marks: $\frac{1}{2}$ mark each)

ENDOCRINE GLAND	NAME OF ONE HORMONE SECRETED	ONE FUNCTION
	Growth hormone (GH)	
Adrenal cortex		
		Water retention by the kidneys

Score for
Question 7:

7.
(3)

PART C: OPTION SECTION

Value: 20 marks

Suggested Time: 30 minutes

- INSTRUCTIONS:**
1. Select **two** options from the six options listed below.
 2. Answer **all** of the questions in each option that you select.
 3. If you answer questions in more than two options, only the **first two** 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
allergy	
macrophage	a) multiple sclerosis _____
antigen	b) causes a secondary immune response _____
interferon	c) results in shock in severe cases _____
antibody	d) prevents viral replication _____
leukotrene	e) a product of plasma cells _____
auto immune disease	f) capable of phagocytosis _____
booster shot	

2. Identify **three** kinds of T lymphocytes, and give a function of each.

(3 marks: $\frac{1}{2}$ mark each for names, $\frac{1}{2}$ mark each for functions)

Name: _____

Function: _____

Name: _____

Function: _____

Name: _____

Function: _____

3. Give **one** use for monoclonal antibodies in passive immunity.

(1 mark)

Score for
Option I:

8. _____
(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
cartilage	
tendon	a) attaches muscles to bones _____
ligament	b) weak bones caused by mineral deficiency _____
spongy bone	c) contains Haversian canals _____
compact bone	d) found in tip of the nose _____
scoliosis	e) binds two bones together _____
osteomyelitis	f) curvature of the spine _____
osteoporosis	

2. Give the role of the following in muscle contraction. **(3 marks: 1 mark each)**

Ca⁺⁺:

Actin:

Sarcoplasmic reticulum:

3. What is the function of creatine phosphate? **(1 mark)**

Score for Option II:
9. _____ (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	
ovary	a) location for spermatogenesis _____
epididymis	b) has enzymes used to penetrate egg _____
seminiferous tubule	c) sperm mature here _____
uterus	d) secretes progesterone _____
fallopian tube	e) location of the developing fetus _____
ductus (vas) deferens	f) provides nutrients for sperm _____
acrosome	

2. Describe the following stages or processes of embryonic development. **(3 marks: 1 mark each)**

Cleavage:

Morphogenesis:

Neurula:

3. What kind of organism causes gonorrhoea? **(1 mark)**

Score for Option III: 10. _____ (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
ligase	
protoplast	a) division of cytoplasm contents _____
restriction enzyme	b) virus carries DNA to a cell _____
somaclonal variant	c) used to seal in foreign DNA _____
transduction	d) plant cell lacking a cell wall _____
conjugation	e) plant cell cultures containing mutations _____
DNA probe	f) sexual exchange of DNA in bacteria _____
cytokinesis	

2. Give **one** phenotype characteristic of each of the following genetic disorders. **(3 marks: 1 mark each)**

Klinefelter syndrome (Trisomy XXY):

Down syndrome:

Turner syndrome:

3. Give **one** use of recombinant DNA in humans. **(1 mark)**

Score for Option IV: 11. _____ (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
carcinoma	
leukemia	a) new growth of cancer cells _____
sarcoma	b) spreading of cancer cells _____
metastasis	c) epithelial skin cancer is one example _____
interleukin	d) activates immune system _____
neoplasia	e) cancer of the blood _____
macrophage	f) cancer of connective tissue _____
initiator	

2. a) State **two** ways by which the spread of cancer is hindered by the lymphatic system. **(2 marks: 1 mark each)**

i) _____

ii) _____

- b) State **one** way by which the spread of cancer is assisted by the lymphatic system. **(1 mark)**

3. What is a proto-oncogene? **(1 mark)**

Score for Option V:
12. _____ (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
retina	
otolith	a) fills cavity behind lens _____
cornea	b) contains cells for colour vision _____
rod cell	c) change in the shape of the lens _____
olfaction	d) regulates light entrance _____
accommodation	e) initiated by chemoreceptors _____
humor	f) where light rays enter the eye _____
iris	

2. Explain how the ear detects frequency (pitch) and amplitude (volume) differences.

Frequency: **(2 marks)**

Amplitude: **(1 mark)**

3. What is the cause of glaucoma? **(1 mark)**

Score for Option VI: 13. _____ (10)
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END OF EXAMINATION