

JANUARY 1998

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 and on the **back** cover of this booklet. **Under no** circumstance is your name or identification, other than your Student I.D. Number, to appear on this booklet.
- 2. Ensure that in addition to this examination booklet, you have an **Examination Response Form**. Follow the directions on the front of the Response Form.
- 3. **Disqualification** from the examination will result if you bring books, paper, notes or unauthorized electronic devices into the examination room.
- 4. All multiple-choice answers must be entered on the Response Form using an **HB pencil**. Multiple-choice answers entered in this examination booklet will **not** be marked.
- 5. For each of the written-response questions, write your answer in **ink** in the space provided in this booklet.
- 6. 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.

7. At the end of the examination, place your Response Form inside the front cover of this booklet and return the booklet and your Response Form to the supervisor.

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BIOLOGY 12 PROVINCIAL EXAMINATION

			Value	Suggested Time
1.	This exam	ination consists of two parts:		
	PART A:	50 multiple-choice questions	50	45
	PART B:	10 written-response questions	50	75
			Total: 100 marks	s 120 minutes

- 2. Electronic devices, including dictionaries and pagers, are **not** permitted in the examination room.
- 3. The time allotted for this examination is **two hours**.

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PART A: MULTIPLE CHOICE

Value: 50 marks	Suggested Time: 45 minutes
INSTRUCTIONS:	For each question, select the best answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle that has the letter corresponding to your answer.

Use the following diagram to answer question 1.



- 1. The cell organelle labelled \mathbf{X} in the diagram is a
 - A. vacuole.
 - B. lysosome.
 - C. Golgi body.
 - D. mitochondrion.

- 2. Lysosomes can be expected to be present in large numbers in cells which
 - A. have cilia.
 - B. produce centrioles.
 - C. are actively dividing.
 - D. carry out phagocytosis.



Use the following diagram to answer question 3.

- 3. The structure labelled **X** is a
 - A. nucleus.
 - B. vacuole.
 - C. nucleolus.
 - D. chromosome.
- 4. A function of smooth endoplasmic reticulum is to
 - A. form ribosomes.
 - B. synthesize lipids.
 - C. store nucleic acid.
 - D. breakdown carbohydrates.
- 5. The polarity of a water molecule results from
 - A. more of the protons being in the hydrogen nucleus.
 - B. more of the electrons being near the hydrogen nucleus.
 - C. the equal numbers of protons in hydrogen and oxygen.
 - D. the unequal sharing of electrons between hydrogen and oxygen.

- 6. The pH of blood is slightly basic. Which of the following would be the pH of blood?
 - A. 2.0
 - B. 6.8
 - C. 7.4
 - D. 10.3
- 7. The bonding of a glucose molecule and a maltose molecule would result in a
 - A. triglyceride.
 - B. disaccharide.
 - C. phospholipid.
 - D. polysaccharide.
- 8. Energy released from the breakdown of monosaccharides in the cytoplasm is stored in
 - A. ATP.
 - B. RNA.
 - C. DNA.
 - D. ADH.
- 9. Which of the following is **not** a part of a nucleotide?
 - A. Sugar.
 - B. Glycerol.
 - C. Phosphate.
 - D. Nitrogen base.

Use the following diagram to answer question 10.



- 10. The process shown in the diagram above is

 - A. hydrolysis.B. translation.
 - C. replication.
 - D. transcription.

Three-letter codo	Three-letter codons of messenger RNA, and the amino acids specified by the codons				
AAU Asparagine	CAU Histidine	GAU Asparatic acid	UAU Tyrosine		
AAA AAG Lysine	CAA CAG Glutamine	GAA Glutamic acid	UAA UAG Stop		
ACU ACC ACA ACG	CCU CCC CCA CCG	GCU GCC GCA GCG	UCU UCC UCA UCG		
AGU - Serine AGC - Arginine AGA - Arginine	CGU CGC CGA CGG	GGU GGC GGA GGG	UGU Cysteine UGC Stop UGA – Stop UGG – Tryptophan		
AUU AUC AUA AUG – Methionine	CUU CUC CUA CUG	GUU GUC GUA GUG	UUU Phenylalanine UUC Phenylalanine UUA Leucine		

- 11. A tRNA molecule with the anticodon GCU would be carrying the amino acid
 - A. valine.
 - B. alanine.
 - C. tyrosine.
 - D. arginine.

12. Which of the following is a characteristic of cancer cells?

- A. Cellular differentiation.
- B. Loss of contact inhibition.
- C. Decreased oxygen uptake.
- D. Inability to actively transport molecules.

Use the following information to answer question 13.

- 1. Promotion
- 2. Metastasis
- 3. Anaplasia
- 4. Initiation
- 13. Which of the following is the correct sequence for the development of cancer?
 - A. 1, 4, 3, 2
 - B. 3, 4, 2, 1
 - C. 4, 1, 3, 2
 - D. 4, 3, 2, 1

14. Which of the following might indicate the presence of a developing skin cancer?

- A. Persistent coughing.
- B. Change in bowel habits.
- C. Difficulty in swallowing.
- D. A sore that does not heal.

15. How many of the following factors would affect the permeability of the cell membrane?

- Size of molecules.
- Lipid solubility of molecules.
- Presence of transport channels.
- Presence of ATP inside the cell.

- A. One.
- B. Two.
- C. Three.
- D. Four.

16. Two identical plant cell samples of equal mass were taken from the same plant and were prepared for an experiment. Each sample was placed in a different solution. The percent change in mass was recorded and graphed over an eight hour period as shown below.



Given the results, which of the following statements is accurate?

- A. Solution A was hypotonic to the plant cells.
- B. Both solutions were isotonic to the plant cells.
- C. Both solutions were hypertonic to the plant cells.
- D. Solution A was hypertonic and solution B was hypotonic to the plant cells.
- 17. A non-protein molecule that aids the action of an enzyme to which it is loosely bound is called a(n)
 - A. initiator.
 - B. coenzyme.
 - C. competitive inhibitor.
 - D. enzyme-substrate complex.



- 18. The two digestive enzymes shown in the graph have the same substrate. What would the substrate be?
 - A. Starch.
 - B. Protein.
 - C. Maltose.
 - D. Peptides.

19. The function of the pyloric sphincter is to prevent the backflow of material from the

- A. esophagus to the mouth.
- B. duodenum to the stomach.
- C. stomach to the esophagus.
- D. colon to the small intestine.
- 20. Blood glucose levels are lowered by insulin because it stimulates
 - A. gluconeogenesis.
 - B. the uptake of glucose by cells.
 - C. the conversion of glucose to fatty acids.
 - D. the conversion of glucose to amino acids.

Use the following diagram to answer question 21.



- 21. The breakdown of some poisonous substances found in the blood occurs in organ
 - A. W
 - B. X

 - C. Y D. Z

Use the following graph to answer question 22.



- 22. The graph shows blood pressure and cross-sectional area of vessels in various parts of the circulatory system. What kind of blood vessel would have the characteristics found in area **Z**?
 - A. Vein.
 - B. Artery.
 - C. Arteriole.
 - D. Capillary.

Use the following diagram to answer question 23.



- 23. The blood vessel labelled **X** is called the
 - A. subclavian vein.
 - B. mesenteric artery.
 - C. anterior vena cava.
 - D. posterior vena cava.
- 24. A red blood cell leaves the aorta, makes a circuit through the body and arrives back in the capillaries of the alveoli. The correct sequence of organs through which the cell may have travelled is
 - A. lungs, heart, small intestine, liver.
 - B. small intestine, heart, liver, lungs.
 - C. liver, lungs, small intestine, heart.
 - D. small intestine, liver, heart, lungs.

- 25. Rapid production of lymphocytes in the lymph nodes would indicate the presence of
 - A. an infection.
 - B. hypotension.
 - C. hypertension.
 - D. capillary fluid exchange.



Use the following diagram to answer question 26.

- 26. The blood cells shown in the diagram would **not** be able to
 - A. carry oxygen.
 - B. fight infection.
 - C. initiate a blood clot.
 - D. carry carbon dioxide.

- 27. Blood pressure will be at its highest when
 - A. atria relaxes.
 - B. atria contracts.
 - C. ventricles relax.
 - D. ventricles contract.
- 28. A foreign substance entering the circulatory system is called a(n)
 - A. platelet.
 - B. antigen.
 - C. antibody.
 - D. hormone.

Use the following	data table for a	capillary bed in	the lungs to	answer question 29.
		· · · · · · · · · · · · · · · · · · ·		1 1

PATIENT	NET BLOOD PRESSURE IN THE ARTERIOLE (mm of Hg)	NET OSMOTIC PRESSURE IN THE VENULE (mm of Hg)
W	15	15
X	17	15
Y	15	17
Z	14	16

- 29. Which patient has pulmonary edema, a condition where tissue fluid accumulates in the lungs?
 - A. W
 - B. X
 - C. Y
 - D. Z

30. The coordinating structure responsible for an intrinsic heart beat is the

- A. cerebellum.
- B. sinoatrial node.
- C. chordae tendineae.
- D. sympathetic nervous system.

Use the following diagram to answer question 31.





- 31. Systole of the ventricles is occurring at
 - A. W
 - B. X
 - C. Y
 - D. Z

Use the following diagram to answer question 32.



- 32. Which of the following substances would be found at its highest concentration in blood leaving the capillaries shown in the diagram?
 - A. Oxyhemoglobin.
 - B. Bicarbonate ions.
 - C. Reduced hemoglobin.
 - D. Carbaminohemoglobin.
- 33. Air pressure is reduced inside the thoracic cavity when
 - A. the rib muscles relax.
 - B. the diaphragm moves up.
 - C. the rib cage moves up and out.
 - D. the pleural membranes collapse.
- 34. The level of CO_2 in the blood is monitored by the
 - A. cerebellum.
 - B. hypothalamus.
 - C. cerebral cortex.
 - D. medulla oblongata.

- 35. Most hemoglobin becomes reduced inside a(n)
 - A. artery.
 - B. venule.
 - C. arteriole.
 - D. capillary.
- 36. The type of neuron that is found **only** in the central nervous system is the
 - A. interneuron.
 - B. motor neuron.
 - C. mixed neuron.
 - D. sensory neuron.
- 37. An axon was stimulated at one place and the voltage changes across the membrane were recorded as shown in the following graph.



What would be the effect if the intensity (amount) of stimulus was increased?

- A. The frequency of impulses would increase.
- B. The resting potential would increase from -60 mV to -40 mV.
- C. Each action potential would increase from +40 mV to +60 mV.
- D. Polarity changes would occur during the recovery (refractory) period.

- 38. In an axon, the nerve impulses normally travel
 - A. in both directions.
 - B. toward the cell body.
 - C. away from the cell body.
 - D. faster as they are unmyelinated.
- 39. Which of the following substances would **not** be found in synaptic clefts?
 - A. Noradrenalin.
 - B. Acetylcholine.
 - C. Cholinesterase.
 - D. Carbonic anhydrase.
- 40. The hormone that initiates the "fight or flight" response is produced by the
 - A. adrenal gland.
 - B. hypothalamus.
 - C. pituitary gland.
 - D. medulla oblongata.
- 41. Sharing of information between the two cerebral hemispheres is possible because of the
 - A. cerebellum.
 - B. hypothalamus.
 - C. corpus callosum.
 - D. medulla oblongata.
- 42. Which of the following interacts with the pituitary gland as the neuroendocrine control centre?
 - A. Thalamus.
 - B. Cerebellum.
 - C. Hypothalamus.
 - D. Medulla oblongata.
- 43. If the blood becomes acidic, the kidneys will maintain homeostasis by actively excreting
 - A. penicillin.
 - B. histamine.
 - C. calcium ions.
 - D. hydrogen ions.

- 44. Movement of fluids from the glomerulus to Bowman's capsule is due to
 - A. osmosis.
 - B. secretion.
 - C. active transport.
 - D. pressure filtration.
- 45. The site of tubular excretion is the
 - A. loop of Henle.
 - B. Bowman's capsule.
 - C. distal convoluted tubule.
 - D. proximal convoluted tubule.
- 46. The concentration of sodium in the blood would increase with increased plasma levels of a hormone from the
 - A. thyroid gland.
 - B. adrenal gland.
 - C. prostate gland.
 - D. anterior pituitary gland.
- 47. Which of the following store sperm cells and eliminate those that have major genetic defects?
 - A. Epididymis.
 - B. Interstitial cells.
 - C. Seminal vesicles.
 - D. Seminiferous tubules.

Use the following diagram to answer question 48.



- 48. Which structure would contain the greatest concentration of mitochondria?
 - A. W
 - B. X
 - C. Y
 - D. Z
- 49. The carbon dioxide produced by a developing fetus is removed by the
 - A. cervix.
 - B. placenta.
 - C. oviducts.
 - D. corpus luteum.
- 50. Which hormone triggers the release of the egg from the developing follicle?
 - A. Estrogen.
 - B. Progesterone.
 - C. Luteinizing hormone (LH).
 - D. Follicle stimulating hormone (FSH).

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: 50 marks	Suggested Time: 75 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. Draw a generalized amino acid and label the amine, acid (carboxyl) and R groups. (4 marks) (You may use a pencil for your drawing.)

Give one role	of each of the following in the production of a protein.	(4 marks: 1 mark each)
DNA:		
-		
mRNA:		
tRNA:		
rRNA:		

3. State how each of the following transport mechanisms functions to move materials into a cell. (4 marks: 1 mark each)

Diffusion:		
Osmosis:		
Facilitated transport:		
Active transport:		

- 4. An experiment was conducted to determine the effects of pH on pepsin. The following steps were performed:
 - 1. Five test tubes were numbered and equal amounts of egg white and water were added to each.
 - 2. A buffer was added to each test tube to maintain its pH at the level given in the table below.
 - 3. An equal amount of pepsin was added to each test tube.

After one hour, the mass of egg white **remaining** in each test tube was determined. The results are recorded below:

TEST TUBE	pH	MASS OF EGG WHITE (in grams)
1	1	2.8
2	2	1.3
3	3	2.7
4	5	3.9
5	7	5.8

a) Draw a graph that compares the pH to the amount of egg white remaining in each test tube. Label the *x*-axis (horizontal axis) as pH. (2 marks)



c) Explain what happens to pepsin at a pH of 7, and why this affects its activity. (2 marks)

5. Give three functions of the bicarbonate ion (HCO_3^-) in the body and identify one specific location of each function. (6 marks: 2 marks each)

i)	Function:	
	Location:	
ii)	Function:	
	Location:	
iii)	Function:	
	Location:	

6. Describe how the small intestine is specialized for digestion and absorption.

(2 marks)
(2 marks)

7. How is the structure of the alveoli ideally suited to the exchange of gases with the blood? (4 marks)



Use the following diagram to answer question 8.



8. The diagram above represents a simple reflex arc. Identify structures **V**, **W**, **X**, **Y** and **Z** and give **one** function of each structure.

(5 marks: $\frac{1}{2}$ mark for each name,	$\frac{1}{2}$ mark for each function)
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STRUCTURE	NAME	FUNCTION
V		
W		
X		
Y		
Z		

9. Plasma from a student was analyzed before and after a ten kilometre cross-country run. During the run, the student became dehydrated. Explain how the resulting lowered blood volume is detected by the body and describe a homeostatic mechanism by which it is returned to normal. (6 marks)



(8 marks)

Iestosterone: (three effects)
i)
ii)
ii)
u)
Estrogen: (three effects)
i)
ii)
ii)
Follicle stimulating hormone: (two effects)
i)
ii)

END OF EXAMINATION

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