Biology 12

June 2003 Provincial Examination

ANSWER KEY / SCORING GUIDE

CURRICULUM:

	Organizers	Sub-Organizers
1.	Cell Biology	A, B, C, D
2.	Cell Processes and Applications	E, F, G, H
3.	Human Biology	I, J, K, L, M, N, O, P

Part A: Multiple Choice

Q	K	C	S	CO	PLO	Q	K	C	S	CO	PLO
1.	A	H	1	1	A1, 3; C11	26.	B	U	1	3	J12
2.	C	K	1	1, 2	A1; G5	27.	C	U	1	3	K4; N3
3.	C	U	1	1	B1, 2	28.	B	K	1	3	L1
4.	B	U	1	1	C1	29.	B	K	1	3	L1; I1
5.	A	H	1	1	C1	30.	D	U	1	3	L4, 5
6.	D	U	1	1	C2, 4	31.	B	U	1	3	L6, 8
7.	A	U	1	1	D1, 2; A1	32.	D	K	1	3	M1
8.	B	U	1	1	D5	33.	B	U	1	3	M3
9.	D	U	1	2	E1	34.	D	U	1	3	M8, 2, 1
10.	D	U	1	2	E1	35.	A	U	1	3	N3
11.	D	H	1	2, 1	E1; D1	36.	A	U	1	3	N4
12.	C	K	1	2	E1	37.	B	U	1	3	N4
13.	A	K	1	2	G1, 3	38.	C	U	1	3	N5
14.	C	K	1	2	G3	39.	B	H	1	3	O2
15.	D	K	1	2	G4	40.	A	U	1	3	O2
16.	C	H	1	2	G5	41.	D	U	1	3	O2
17.	A	K	1	3	I1	42.	D	U	1	3	O2, 5
18.	D	H	1	3	I7; J2	43.	C	H	1	3	O2
19.	D	H	1	3	J1	44.	A	U	1	3	O5
20.	A	H	1	3	J1, 2; K1, 6	45.	D	U	1	3	P3
21.	D	U	1	3	J1	46.	C	H	1	3	P4
22.	C	U	1	3	J2	47.	C	U	1	3	P7
23.	A	H	1	3	J5	48.	D	U	1	3	P8, 10
24.	D	K	1	3	J8	49.	B	H	1	3	P9, 10
25.	C	K	1	3	J11	50.	D	U	1	3	P9, 10; N5

Multiple Choice = 50 marks

Part B: Written Response

Q	B	C	S	CO	PLO
1.	1	U	3	1	A1, 2
2.	2	K	3	1	B2, 3
3.	3	H	2	1, 2	D5, 2; E1
4.	4	U	4	2	F1, 4
5.	5	U	3	2	G3
6.	6	U	6	2	H1, 3, 6
7.	7	U	6	3, 2	I1, 5; G7
8.	8	K	2	3	I4, 6
9.	9	U	4	3	K2
10.	10	H	4	3	L8, 7; J9, 4
11.	11	U	4	3	M2, 1
12.	12	K	4	3	O1
13.	13	U	2	3	P1, 6
14.	14	K	3	3	P5, 6, 8, 10

Written Response = 50 marks

Multiple Choice = 50 (50 questions)
Written Response = 50 (14 questions)
EXAMINATION TOTAL = 100 marks

LEGEND:
Q = Question Number **B** = Score Box Number **S** = Score
K = Keyed Response **C** = Cognitive Level **CO** = Curriculum Organizer
PLO = Prescribed Learning Outcome

PART B: WRITTEN RESPONSE

Value: 50 marks **Suggested Time: 75 minutes**

1. Describe how the function of the cell membrane, vacuoles and lysosomes are related. **(3 marks)**

- **The cell membrane folds in to produce a vacuole.**
- **The vacuole contains food or large particles.**
- **The lysosome binds to the vacuole.**
- **Hydrolytic enzymes in the lysosome break down the molecules within the vacuole.**

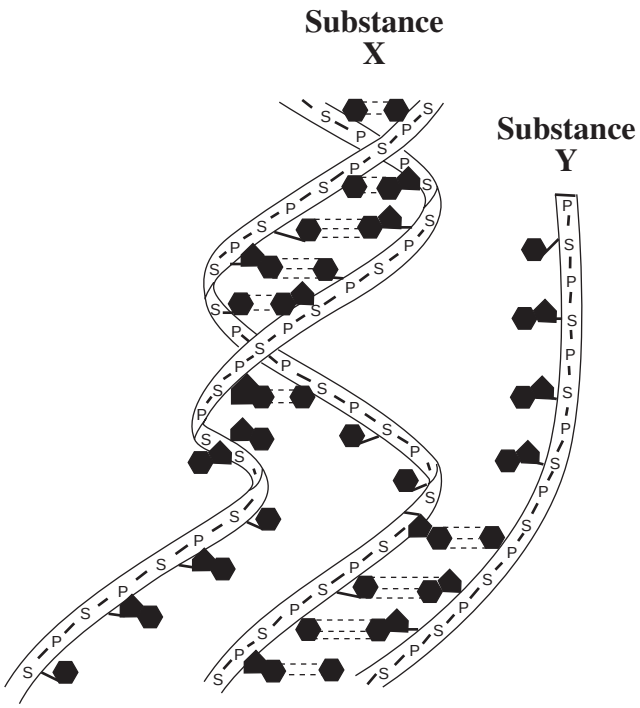
any three for 1 mark each

2. Describe **three** ways that water is important to living organisms. **(3 marks)**

- **serves as a solvent**
- **acts as a lubricant**
- **regulates temperature**
- **helps hydrolytic reactions**
- **is used in chemical reactions/hydrolysis**
- **protects aquatic organisms from freezing**
- **freezes on top, which insulates fish/underwater organisms over the winter**

any three for 1 mark each

Use the following diagram to answer question 3.



3. A radioactive molecule is added to a cell culture where the process shown in the diagram is taking place. Upon analysis, it is found that substance **Y** is radioactive but substance **X** is not. Give a possible identity for the radioactive molecule which was added and explain why it is only in substance **Y**. **(2 marks: 1 mark for molecule; 1 mark for explanation)**

molecule: **radioactive uracil (1 mark)**

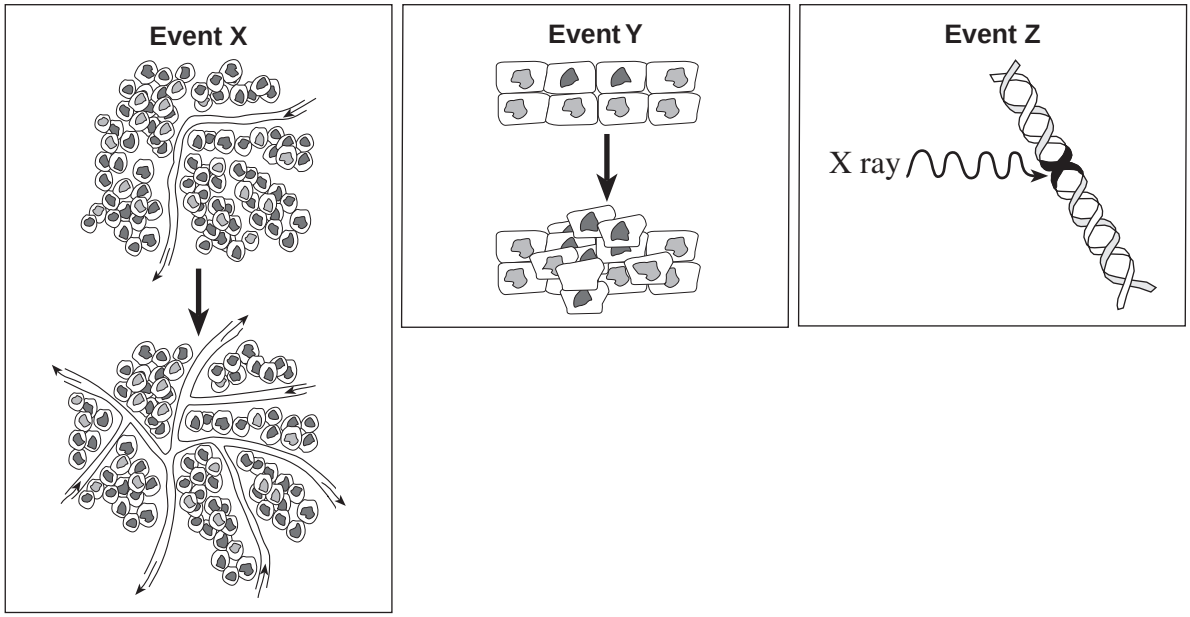
explanation: **The radioactive uracil was incorporated into the mRNA during complementary base pairing during transcription. (1 mark)**

OR

molecule: **radioactive ribose (1 mark)**

explanation: **RNA contains ribose while DNA contains deoxyribose. (1 mark)**

4. Each of the following diagrams illustrates an event in the growth and development of cancer in the body.



a) Place the events in the correct order from the start of carcinogenesis. **(1 mark)**

- **event Z → event Y → event X (1 mark)**

b) Explain what is occurring in each of the events. **(3 marks: 1 mark each)**

event **X**:

- **vascularization**
- **blood vessels are growing**

} **either one for 1 mark**

event **Y**:

- **anaplasia**
- **mitosis**
- **neoplasia**
- **rapid cell division**
- **cells reproduce without contact inhibition**
- **cancerous cells begin to divide rapidly**
- **cells grow in disorganized layers**
- **tumour formation**

} **any one for 1 mark**

event **Z**:

- **mutation**
- **initiation**
- **promotion**
- **oncogene is expressed**
- **X ray causes change in cell's DNA**
- **proto-oncogene is converted into an oncogene**
- **carcinogenesis**

} **any one for 1 mark**

5. Compare the process of facilitated transport with that of active transport. **(3 marks)**

- **Facilitated transport does not use energy (ATP).**
- **Active transport uses energy (ATP).**

either one for 1 mark

- **Facilitated transport uses protein carriers and active transport uses protein carriers. (1 mark)**

- **During facilitated transport material moves from an area of higher concentration to an area of lower concentration (with the concentration gradient).**
- **During active transport material moves from an area of lower concentration to an area of higher concentration (against the concentration gradient).**

either one for 1 mark

- **Both move amino acids and glucose. (1 mark)**

6. Explain how each of the following affects the rate of an enzyme-catalyzed reaction that occurs in the mouth. **(6 marks: 2 marks each)**

adding more enzyme:

- **increase the number of active sites available**
- **increase the number of collisions between enzyme and substrate**

either one for 1 mark

- **this would increase the rate of the reaction (1 mark)**

changing the pH from 7.2 to 12:

- **this would denature the enzyme**
- **this would decrease the number of active sites available**

either one for 1 mark

- **this would decrease the rate of the reaction (1 mark)**

lowering the temperature from 37°C to 10°C:

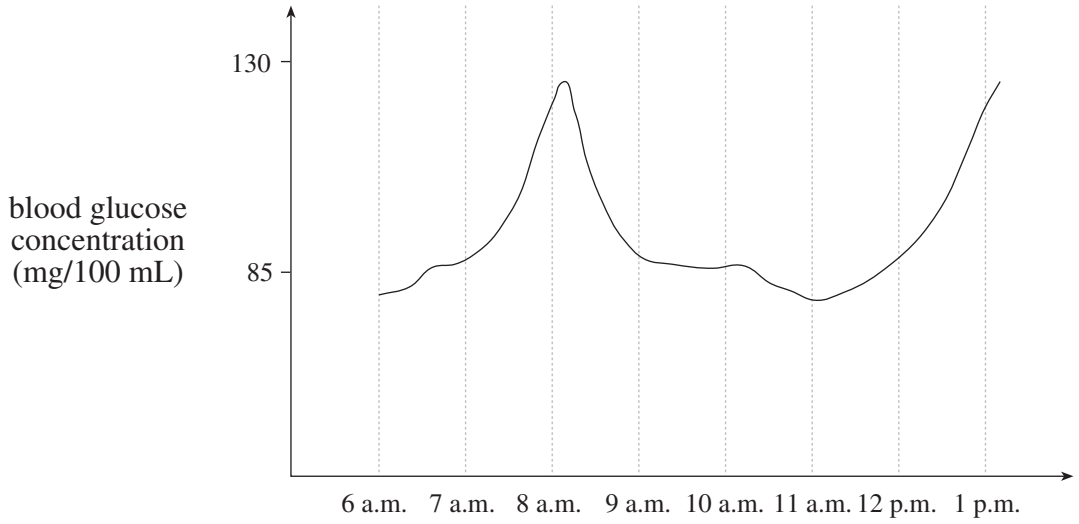
- **decreasing temperature slows down the particles**
- **fewer particles have energy of activation**
- **less kinetic energy**
- **fewer effective collisions between substrate and enzyme**

any one for 1 mark

- **this would decrease the rate of the reaction (1 mark)**

Use the following graph to answer question 7.

Blood Glucose Concentration vs. Time of Day



7. A person eats a well-balanced meal at 7 a.m. and again at 12 p.m. Explain the changes that occur in blood glucose concentration at each of the times indicated below.

(6 marks: 2 marks each)

between 7 a.m. and 8 a.m.

- **Following the ingestion of food, carbohydrates are digested into glucose. (1 mark)**
- **Glucose is absorbed from the small intestine into the blood causing an increase in blood glucose concentration. (1 mark)**

between 8 a.m. and 9 a.m.

- **The liver decreases blood glucose concentration.**
- **Glucose is converted into glycogen which is stored in the liver.**
- **Insulin levels are high.**
- **Body cells become permeable to glucose.**

any two for 1 mark each

between 11 a.m. and 12 p.m.

- **In the liver cells, glycogen is converted to glucose.**
- **Insulin secretion is reduced.**
- **Glucagon levels are high.**

any two for 1 mark each

8. a) Name the substance which emulsifies fat in the digestive system. **(1 mark)**

- **bile**
- **bile salts**

either one for 1 mark

b) Explain how emulsification assists in the chemical digestion of fat. **(1 mark)**

- **Bile produces fat droplets from fat.**
- **This increases the surface area.**
- **Fat digestion is more efficient if the enzyme lipase can act on a substrate with a larger surface area.**
- **Emulsification also causes fat droplets to disperse in water.**

any one for 1 mark

9. a) What is the name of the pacemaker of the heart and where in the heart is it located? **(2 marks)**

name: **SA node (1 mark)**

location: **right atrium (1 mark)**

b) Explain how the Purkinje fibres function to control heartbeat. **(2 marks)**

- **The AV node stimulates the Purkinje fibres.**
- **The Purkinje fibres stimulate the ventricles.**
- **This causes the ventricles to contract.**

any two for 1 mark each

10. a) State **three** functions of hemoglobin. **(3 marks)**

- **to act as a buffer**
- **to carry oxygen / form oxyhemoglobin**
- **to carry hydrogen ions / form reduced hemoglobin**
- **to carry carbon dioxide / form carbaminohemoglobin**
- **to increase the pH of the blood by picking up hydrogen ions**

any three for 1 mark each

b) How does the hemoglobin found in the pulmonary artery differ from the hemoglobin found in the pulmonary vein? **(1 mark)**

- **The pulmonary artery will have more reduced hemoglobin than the pulmonary vein. / The pulmonary vein will have less reduced hemoglobin than the pulmonary artery.**
- **The pulmonary artery will have more carbaminohemoglobin than the pulmonary vein. / The pulmonary vein will have less carbaminohemoglobin than the pulmonary artery.**
- **The pulmonary vein will have more oxyhemoglobin and the pulmonary artery will have less oxyhemoglobin.**

any one for 1 mark

11. Compare the structural similarities and differences of motor and sensory neurons.
(4 marks: 2 marks for similarities; 2 marks for differences)

similarities:

- **both have axons**
- **both have dendrites**
- **both are myelinated**
- **both have cell bodies**
- **both have long fibres**
- **both have myelinated fibres**

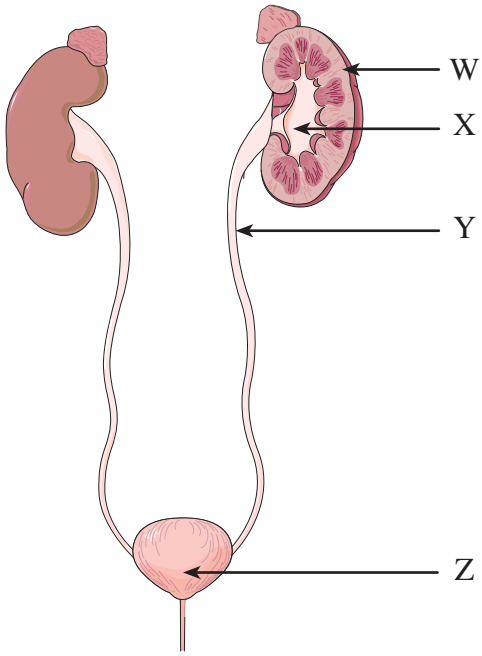
any two for 1 mark each

differences:

- **Motor neurons have branched dendrites on the cell body.**
- **Sensory neurons have shorter axons / motor neurons have longer axons.**
- **Sensory neurons have longer dendrites / motor neurons have shorter dendrites.**
- **Sensory neurons have a myelinated dendrite and axon / motor neurons only have a myelinated axon.**

any two for 1 mark each

Use the following diagram to answer question 12.



12. Identify each of the labelled regions or structures. **(4 marks)**

region **W**: **renal cortex (1 mark)**

region **X**: **renal pelvis (1 mark)**

structure **Y**: **ureter (1 mark)**

structure **Z**: **bladder (1 mark)**

13. Identify the source of follicle-stimulating hormone (FSH) in males and describe its effect on the testes. **(2 marks)**

source:

- **anterior pituitary**
- **pituitary gland**

} **either one for 1 mark**

effect:

- **stimulates the testes to produce sperm**
- **stimulates the testes to produce inhibin**

} **either one for 1 mark**

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

testosterone:

- **stimulates the production of sperm**
- **responsible for secondary sex characteristics in males**

either one for 1 mark

progesterone:

- **causes the uterine glands to mature**
- **causes the uterine lining to increase in thickness**
- **causes the uterine glands to produce a thick mucous secretion**
- **causes negative feedback on the anterior pituitary and hypothalamus to reduce luteinizing hormone**

any one for 1 mark

oxytocin:

- **causes uterine contractions**
- **causes release of milk from the breasts**

either one for 1 mark

END OF KEY