

# Biology 12

August 2004 Provincial Examination

## ANSWER KEY / SCORING GUIDE

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### 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	U	1	1	A1; C11	35.	B	H	1	3	J5
2.	C	H	1	1	A1, 2, 3	36.	D	U	1	3	J7, 9
3.	B	U	1	1	C1, 9	37.	B	U	1	3	J12
4.	A	U	1	1	C1	38.	C	U	1	3	K1; J4
5.	C	U	1	1	C1, 2	39.	B	U	1	3	K2
6.	B	K	1	1	C2	40.	D	K	1	3	K2
7.	D	U	1	1	C2, 1, 5	41.	D	K	1	3	L1
8.	C	U	1	1	C2	42.	A	U	1	3	L1
9.	B	H	1	1	C2, 8, 1	43.	B	U	1	3	L7
10.	A	U	1	1	C12	44.	A	H	1	3, 2	L4, 5; G7
11.	B	U	1	1	D5	45.	A	K	1	3	L1
12.	C	U	1	1	D1; C1	46.	A	U	1	3, 2	L7; G7
13.	D	H	1	1	D2	47.	B	U	1	3	M3
14.	D	K	1	2	E1	48.	D	U	1	3	M8, 2
15.	B	H	1	2	E1	49.	B	K	1	3	M2
16.	A	K	1	2	G1	50.	D	U	1	3	N2, 3
17.	A	K	1	2	G3	51.	D	U	1	3	N2
18.	D	U	1	2	G4	52.	D	U	1	3	N4
19.	D	U	1	2	G5	53.	D	U	1	3	N4
20.	B	U	1	2	G6	54.	D	U	1	3	N5
21.	A	U	1	2	H2	55.	D	K	1	3	O1
22.	A	H	1	2, 3	H6; I2	56.	B	K	1	3	O1, 3
23.	C	K	1	3	I1	57.	B	H	1	3	O1, 2, 3
24.	A	U	1	3	I1, 6, 7	58.	A	U	1	3	O2
25.	C	U	1	3	I1, 2, 4	59.	B	K	1	3	O2
26.	D	U	1	3	I1, 2, 4	60.	A	H	1	3	O2, 4, 5
27.	D	H	1	3	I2, 4	61.	A	K	1	3	P1, 2
28.	D	H	1	3	I2	62.	C	K	1	3	P3
29.	C	U	1	3	I9	63.	C	U	1	3	P4
30.	B	K	1	3	I9	64.	C	U	1	3	P6
31.	A	K	1	3	J2	65.	B	U	1	3	P10
32.	C	U	1	3	J2	66.	C	H	1	3	P10, 9, 7
33.	D	K	1	3	J2	67.	B	U	1	3	P12
34.	D	K	1	3	J2						

Multiple Choice = 67 marks

**Part B: Written Response**

<b>Q</b>	<b>B</b>	<b>C</b>	<b>S</b>	<b>CO</b>	<b>PLO</b>
1.	1	U	4	1	A1; C11; G1
2.	2	U	2	2	E1
3.	3	U	5	2	G7; H6, 1
4.	4	U	4	3	J12; K1
5.	5	H	2	3	M8
6.	6	U	3	3	O5
7.	7	U	3	3	P6

**Written Response = 23 marks**

Multiple Choice = 67 (67 questions)  
Written Response = 23 (7 questions)  
**EXAMINATION TOTAL = 90 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: 23 marks

Suggested Time: 40 minutes

1. Describe **four** different functions of proteins found in the cell membrane.

**(4 marks)**

- **Enzymatic proteins act as enzymes to catalyze reactions.**
- **Carrier proteins transport molecules or ions across the cell membrane.**
- **Receptor proteins bind to external molecules and then activate cellular activity.**
- **Channel proteins allow the passage of molecules or ions through a pore in the cell membrane.**
- **Cell recognition proteins (glycoproteins) serve as markers on the cell membrane for identification (as antigens).**

**any four for  
1 mark each**

2. Explain how the following are involved in protein synthesis.

(2 marks: 1 mark each)

nucleolus:

- **The nucleolus is where rRNA, a component of ribosomes, is made. (1 mark)**

enzymes:

- **Enzymes are used to create peptide bonds between amino acids.**
- **Enzymes are used to attach adjacent nucleotides in mRNA synthesis.**
- **Enzymes are used to break hydrogen bonds in DNA during transcription.**
- **Enzymes are used to ensure the proper sequence of bases in mRNA during transcription.**

} any one for  
1 mark

Use the following data to answer question 3.

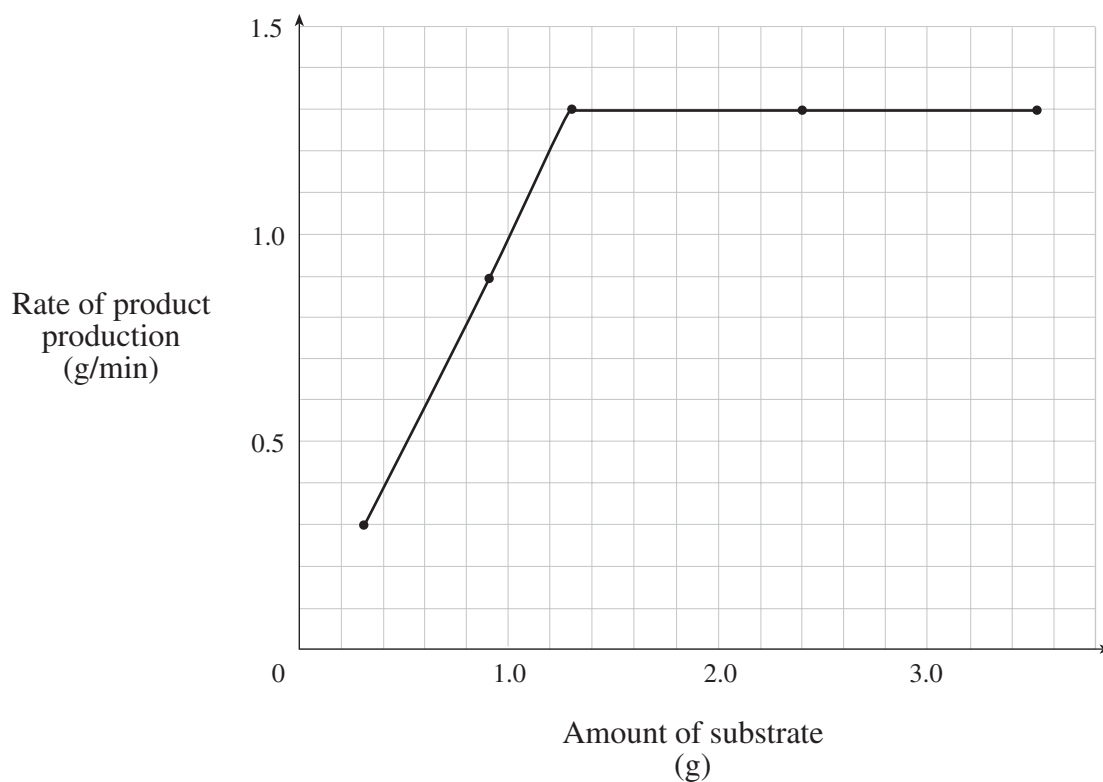
Amount of substrate (g)	Rate of product production (g/min)
0.3	0.3
0.9	0.9
1.3	1.3
2.4	1.3
3.5	1.3

3. In an enzyme-catalyzed reaction, the amount of substrate was measured and compared to the rate of product production. The data is shown above.

a) Graph the data. (Plot the amount of substrate [independent variable] on the  $x$ -axis.)

(2 marks)

Rate of product production vs. Amount of substrate



(1 mark for labels; 1 mark for graph)

b) Explain the observed results.

(2 marks)

- **As the amount of substrate increases, the rate of product production increases since there are more collisions between substrate molecules and the enzyme. (1 mark)**
- **There is a plateau of 1.3 g/min as there are a limited number of active sites available. The rate levels off because all the active sites are temporarily full. (1 mark)**

c) Suggest a way to increase the rate of product production for substrate amounts greater than 3.5 grams.

(1 mark)

- **Add more enzyme.**
  - **Increase the temperature to the optimal temperature.**
- } either one for  
1 mark

4. Explain how a damaged AV valve on the left side of the heart could cause fluids to build up in the lung tissues. **(4 marks)**

- **The valve might leak, causing backflow into the left atrium.**
- **This would cause a buildup in blood pressure in the pulmonary vein.**
- **The high blood pressure at the venule end of the capillary bed would prevent tissue fluid from re-entering the blood (increasing fluid buildup).**
- **Osmotic pressure in the capillary beds will be less than the blood pressure at the venule end of these beds.**
- **This would reduce wastes entering the blood from the tissues.**
- **More fluid would enter by osmosis and the tissues would swell.**
- **There is less water re-entering the bloodstream.**

**any four for  
1 mark each**

5. a) Explain why the knee-jerk reflex still functions in a person with a severed spinal cord.

(1 mark)

- **The reflex is a complete circuit from receptor to muscle, so no control is needed from the brain. (1 mark)**

b) Why is there is no sensation of the stimulus?

(1 mark)

- **No nerves will be able to transmit impulses up the spinal cord past the injury, so the brain can neither sense the stimulus nor can it respond to it. (1 mark)**



6. Explain how ADH secretion affects the composition of the blood.

**(3 marks)**

- **ADH causes the collecting duct to become more permeable to water.**
- **More water is re-absorbed into the blood.**
- **The blood becomes less concentrated.**
- **The volume of the plasma increases.**

} **any three for  
1 mark each**

7. Describe how the secretion of testosterone is regulated in males.

**(3 marks)**

- **When testosterone levels are low, the hypothalamus secretes GnRH.**
- **This causes the anterior pituitary to secrete luteinizing hormone.**
- **Luteinizing hormone causes the interstitial cells to produce testosterone.**

} **any two for  
1 mark each**

**AND**

- **When testosterone levels rise, negative feedback is exerted on the hypothalamus and the anterior pituitary which causes a decrease in testosterone production. (1 mark)**

**END OF KEY**