

**Biology 12**  
 January 2001 Provincial Examination  
**ANSWER KEY / SCORING GUIDE**

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**CURRICULUM:**

<b>Organizers</b>	<b>Sub-Organizers</b>
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**

<b>Q</b>	<b>K</b>	<b>C</b>	<b>S</b>	<b>CO</b>	<b>PLO</b>	<b>Q</b>	<b>K</b>	<b>C</b>	<b>S</b>	<b>CO</b>	<b>PLO</b>
1.	A	K	1	1	A1	26.	D	K	1	3	I1, 9
2.	A	U	1	1	A1	27.	A	U	1	3	I1
3.	A	H	1	1, 2	A1; D2; E1	28.	B	U	1	3	I2
4.	C	U	1	1	A1, 3	29.	C	H	1	3	I4
5.	A	U	1	1	A1	30.	B	U	1	3	J2
6.	D	U	1	1	B1	31.	A	K	1	3	J5, 2
7.	C	U	1	1	B3	32.	C	U	1	3	K1
8.	B	U	1	1	C1	33.	D	U	1	3	L4, 5
9.	A	K	1	1	C2, 4	34.	D	U	1	3	L6
10.	B	U	1	1	C10	35.	B	H	1	3	L6
11.	A	H	1	1	D1	36.	D	H	1	3, 2	L7; G7; J2
12.	D	K	1	1	D3	37.	D	K	1	3	M2
13.	C	K	1	2, 1	E1; A1	38.	C	K	1	3	M8
14.	C	H	1	2	E2, 4	39.	B	U	1	3	O1
15.	D	K	1	2	F1	40.	A	K	1	3	O1
16.	D	K	1	2	F4	41.	C	U	1	3	O1, 2
17.	C	K	1	2, 3	F2; I1	42.	A	H	1	3	O2
18.	C	K	1	2	G3	43.	D	U	1	3	P1
19.	C	U	1	2	G8	44.	D	K	1	3	P1, 3
20.	D	U	1	2	H6, 3	45.	D	K	1	3	P4
21.	B	U	1	2	H1, 2	46.	B	U	1	3	P7
22.	D	U	1	2	H1, 3	47.	C	H	1	3	P8, 9, 10; N5
23.	D	H	1	2	H6	48.	D	K	1	3	P9, 10
24.	A	K	1	3	I1	49.	C	H	1	3	P9, 10
25.	B	K	1	3	I1	50.	D	U	1	3	P9, 10

**Multiple Choice = 50 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	2	1	D1
2.	2	U	2	2	E1
3.	3	U	5	2	G3, 6, 7
4.	4	U	6	3, 2, 1	I1, 2, 4; G7; B3
5.	5	H	4	3	K1; J4, 6
6.	6	U	7	3	J2, 5
7.	7	U	3	3	L3
8.	8	U	6	3	M3, 5, 6, 1
9.	9	U	6	3	M3
10.	10	H	2	3	O2, 3
11.	11	H	4	3, 1	O5, 4; B3
12.	12	K	3	3	P7

**Written Response = 50 marks**

Multiple Choice = 50 (50 questions)

Written Response = 50 (12 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

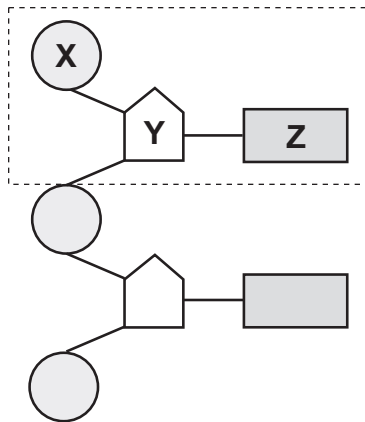
**PART B: WRITTEN RESPONSE**

**Value: 50 marks**

**Suggested Time: 75 minutes**

- INSTRUCTIONS:**
1. Use a **pen** for this part of the examination unless otherwise instructed.
  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 diagram to answer question 1.**



1. Identify the structure made up of parts **X**, **Y** and **Z** and state its function.  
**(2 marks: 1 mark for name; 1 mark for function)**

Name: **nucleotide (1 mark)**

Function:

- **It forms RNA or DNA.**
- **It is a monomer / building block / unit molecule of nucleic acids.**
- **It joins with other nucleotides by complementary base pairing to produce DNA and mRNA.**

} **any one for  
1 mark**

2. What is produced as a result of each of the following during protein synthesis?

RNA bases and DNA bases join together by complementary base pairing.

**(1 mark)**

- **The joining of RNA and DNA bases by complementary base pairing produces mRNA which carries the genetic blueprint to the cytoplasm. (1 mark)**

Transfer RNA joins to messenger RNA at the ribosome.

**(1 mark)**

- **Amino acids form peptide bonds in the production of a polypeptide chain (or protein). (1 mark)**

3. An experiment was devised in which blood cells were placed in three beakers containing solutions of different concentrations. The results are given below.

BEAKER	% SOLUTE IN RED BLOOD CELLS	% SOLUTE IN THE SOLUTION
A	2	2
B	2	1
C	2	3

a) Describe what happened to the cells in beaker **B** and explain the results. **(2 marks)**

• **The cells in beaker B underwent hemolysis (swelled or burst) (1 mark)**

• **due to water moving into the cell from an area of greater concentration of water to an area of lower concentration of water (or moving from an area of lower concentration to a greater concentration).**

• **because the solution is hypotonic to the cells (osmosis occurs).**

} either one for  
1 mark

b) Describe what happened to the cells in beaker **C** and explain the results. **(2 marks)**

• **The cells in beaker C underwent crenation or shrunk (1 mark)**

• **due to water leaving the cells and moving into the area of greater concentration (or water moving from an area of higher concentration to an area of lower concentration of water).**

• **because the solution is hypertonic to the cells.**

} either one for  
1 mark

c) Explain why the solution in beaker **A** is isotonic to the red blood cells. **(1 mark)**

• **The solute concentration is the same as that of the red blood cells. (1 mark)**

4. A piece of living small intestine was placed in a solution containing maltose, egg white, and fats. In order to ensure that the piece of intestine functioned normally, oxygen was bubbled through the solution and the pH was maintained at 8.2. After one hour the solution was analyzed.

a) Explain why glucose was found in the solution.

(1 mark)

• **Maltase from the intestinal glands breaks down the maltose into glucose. (1 mark)**

b) Products from the breakdown of fat were **not** found. Explain why.

(1 mark)

• **There was no lipase present to break down the fat. (1 mark)**

c) Why was the solution buffered to pH 8.2?

(1 mark)

• **This is the optimum pH for intestinal enzymes to function. (1 mark)**

d) In a variation of this experiment, trypsin was also added to the solution. Describe the results of this new experiment after one hour.

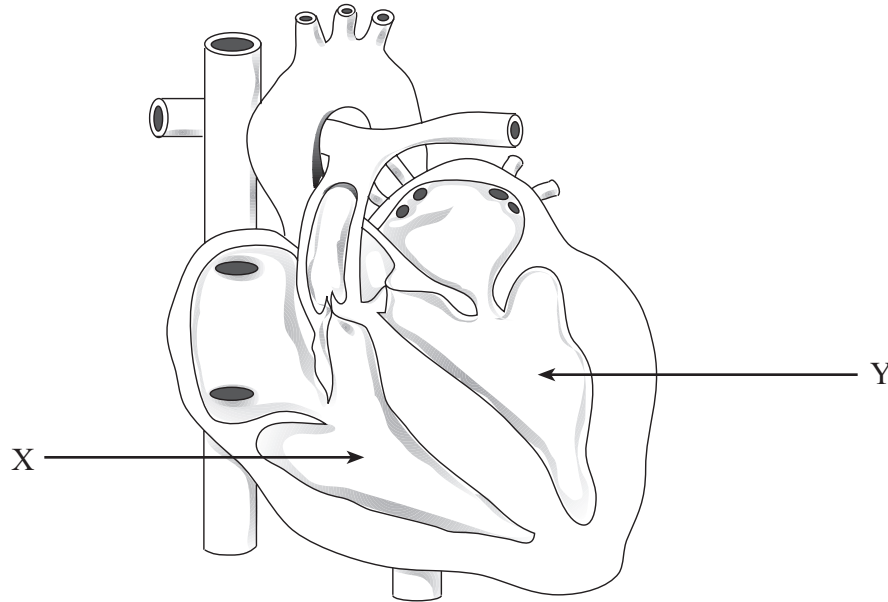
(3 marks)

• **Trypsin broke down the egg white into peptides. (1 mark)**

• **Peptidase is produced by the intestinal glands. (1 mark)**

• **The peptides were then broken down into amino acids. (1 mark)**

Use the following diagram to answer question 5.



5. a) Compare the composition of the blood in structures **X** and **Y**.

**(2 marks)**

Structure **X**:

- **The right ventricle has blood with a higher concentration of carbon dioxide (carbaminohemoglobin, bicarbonate ions, reduced hemoglobin) and a lower concentration of oxygen. (1 mark)**

Structure **Y**:

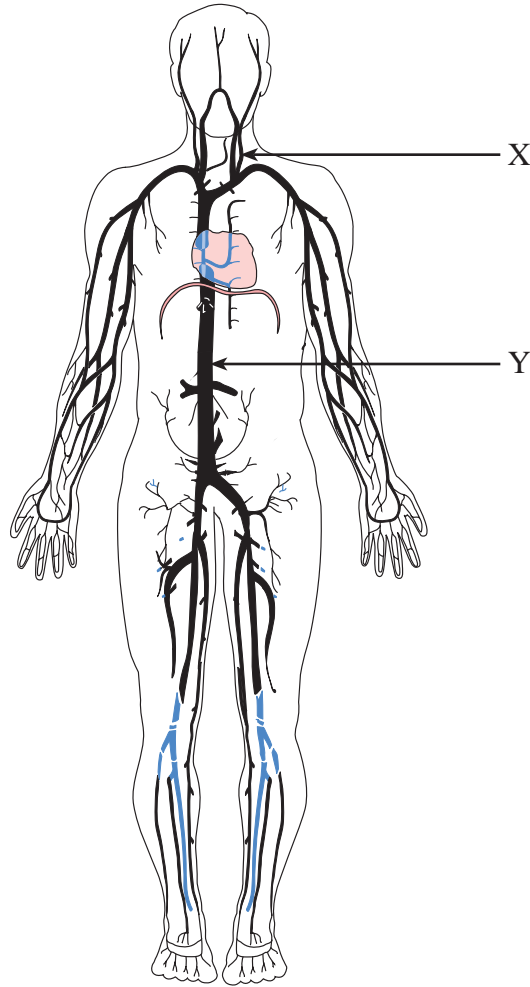
- **The left ventricle has blood with a lower concentration of carbon dioxide (carbaminohemoglobin, bicarbonate ions, reduced hemoglobin) and a higher concentration of oxygen. (1 mark)**

b) Relate the difference in the structure of **X** and **Y** to their functions.

**(2 marks)**

- **The left ventricle is thicker-walled and more muscular (1 mark) to contract and send blood with increased pressure throughout the body because the blood has a greater distance to cover than blood leaving the right ventricle (1 mark).**

Use the following diagram to answer question 6.



6. a) Identify each of the labelled veins and give **one** function of each.  
(4 marks: 1 mark each for name; 1 mark each for function)

Vein X:

Name: **jugular vein (1 mark)**

Function:

- **to carry blood from the head to the anterior (superior) vena cava (1 mark)**

Vein Y:

Name: **posterior (inferior) vena cava (1 mark)**

Function:

- **to carry blood from the legs and lower body to the heart (1 mark)**



b) i) Give the location of the oval opening (foramen ovale) in the circulatory system of the fetus and state its function.

(2 marks: 1 mark for location; 1 mark for function)

Location:

- **It is between the right and left atria. (1 mark)**

Function:

- **to allow blood to bypass the lungs**
  - **to reduce blood flow to the uninflated lungs**
- } either one for  
1 mark

ii) Describe what would occur if the oval opening (foramen ovale) failed to close at birth.

(1 mark)

- **Blood low in oxygen from the right side of the heart would mix with oxygenated blood from the left side of the heart.**
- **Less blood would flow to the lungs.**
- **The baby's skin would have a bluish tinge ("blue baby").**

} any one for  
1 mark

7. Describe **three** ways in which the structure of the alveoli facilitates their function.

**(3 marks)**

- **They are moist which increases the rate of diffusion of gases.**
- **They are highly vascularized which allows more exchange of gases.**
- **The thin walls of the alveoli allow materials to be exchanged quickly and easily.**
- **A layer of lipoprotein reduces surface tension and prevents the alveoli from collapsing.**
- **They are small and number in the millions. This increases their surface area and allows for speedy gas exchange.**
- **Stretch receptors in their walls signal medulla oblongata to stop inhalation.**

**any three for  
1 mark each**

8. Describe how each of the following is important to the passage of a nerve impulse.

sodium/potassium pump:

(2 marks)

- **It re-establishes the distribution of ions across the membrane. (1 mark)**
- **This allows the axon to be polarized by pumping potassium ions ( $K^+$ ) back into the axoplasm and sodium ions ( $Na^+$ ) out of the axoplasm. (1 mark)**

synaptic vesicles:

(2 marks)

- **They store neurotransmitters.**
- **They migrate to the pre-synaptic membrane and exocytosis occurs.**
- **The neurotransmitters diffuse across the synapse and fit into the post-synaptic membrane which generates a nerve impulse.**

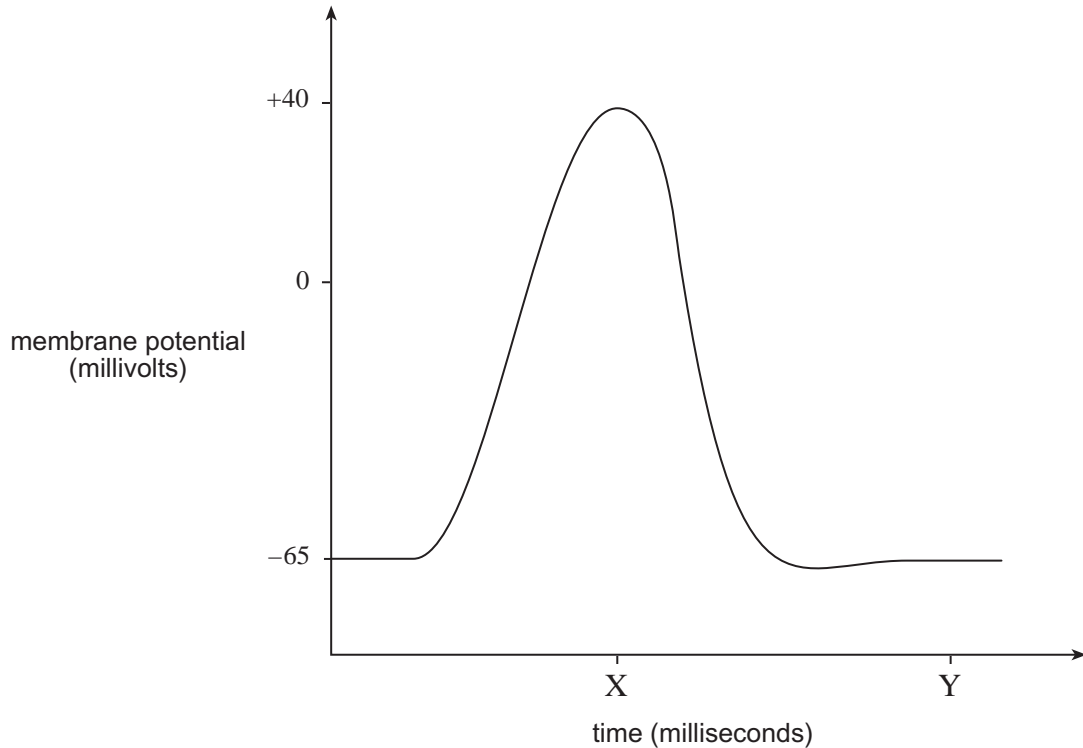
} any two for  
1 mark each

myelinated axon:

(2 marks)

- **Myelination speeds conduction of the impulse along the axon. (1 mark)**
- **Saltatory (node-to-node) conduction occurs along the length of the axon. (1 mark)**

Use the following graph to answer question 9.



9. a) Describe what is occurring at the neuron between time **X** and time **Y**. (4 marks)

- Potassium ion ( $K^+$ ) gates open.
- Potassium ions ( $K^+$ ) diffuse out of the axoplasm.
- The polarity inside the axoplasm changes from positive to negative.
- The membrane potential changes from +40 mV to  $\pm 65$  mV.
- Repolarization occurs.
- The sodium/potassium pump operates.
- The original ion concentrations are restored.

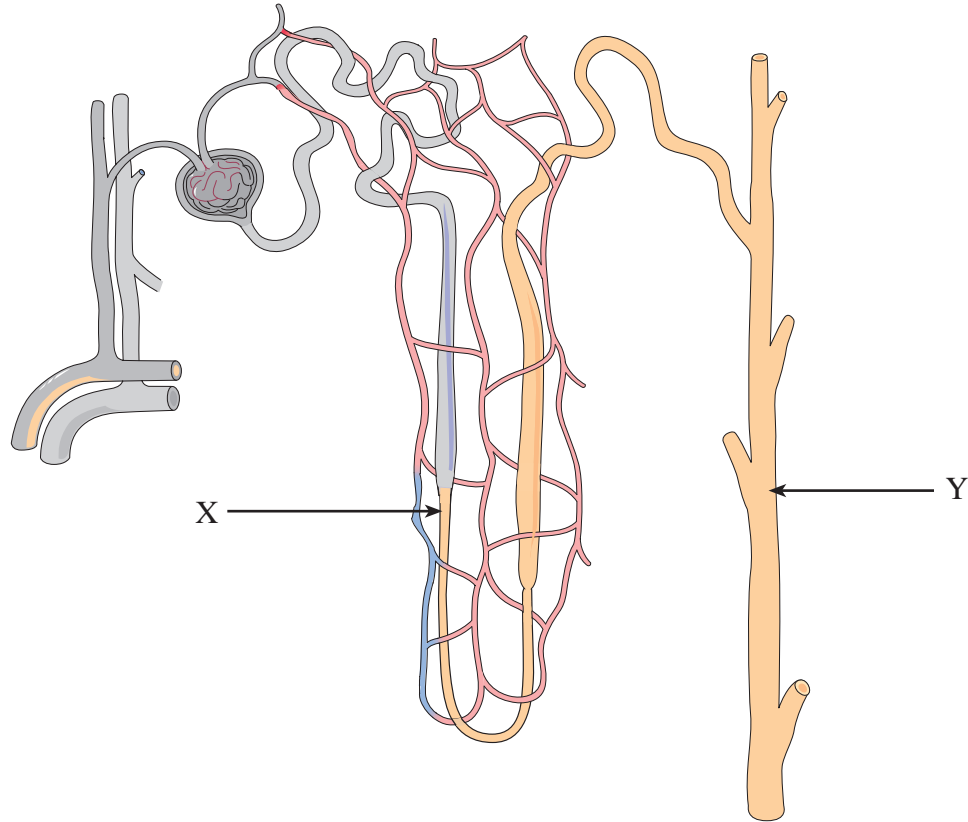
any four for  
1 mark each

b) What would occur if the membrane of the axon became impermeable to potassium ions ( $K^+$ ) at time **X**? (2 marks)

- Potassium ions ( $K^+$ ) would not flow out of the axon.
- The polarity within the axon would remain positively charged.
- The neuron would be unable to re-establish resting potential (or repolarize).

any two for  
1 mark each

Use the following diagram to answer question 10.



10. a) Explain why it would be abnormal to find glucose in structure Y. (1 mark)

- **Glucose is usually reabsorbed from the proximal convoluted tubule. (1 mark)**

b) Explain why structure X is longer in an animal that lives in the desert. (1 mark)

- **The loop of Henle which absorbs water is longer in a desert animal because the added length allows for greater water reabsorption. (1 mark)**

11. Explain what happens in the kidneys in response to each of the following conditions.

a decrease in blood pressure:

(2 marks)

- Aldosterone causes the reabsorption of sodium ions ( $\text{Na}^+$ ) and water follows osmotically.
- The increase in blood solute causes the secretion of ADH which causes the kidneys to reabsorb water.
- Increased blood plasma volume increases blood pressure.
- The juxtaglomerular apparatus detects the drop in blood pressure and produces renin.
- Renin causes the secretion of angiotensin.
- The angiotensin stimulates the adrenal cortex to produce aldosterone.

} any two for  
1 mark each

a decrease in blood pH:

(2 marks)

**The kidney would:**

- excrete ammonia ( $\text{NH}_3$ )
- excrete more hydrogen ions ( $\text{H}^+$ ) ions
- reabsorb more bicarbonate ions ( $\text{HCO}_3^\pm$ )

} any two for  
1 mark each

12. Identify the structure in a female that  
produces an egg.

**(3 marks)**

- ovary
  - ovarian follicle
- } either one for  
1 mark

provides nourishment for the developing embryo.

- placenta
  - endometrium
- } either one for  
1 mark

enables the egg to travel to the uterus.

- oviduct
  - fallopian tubes
  - fimbriae
- } any one for  
1 mark

**END OF KEY**