

Biology 12

November 1998 Provincial Examination

ANSWER KEY / SCORING GUIDE

CURRICULUM:

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

Part A: Multiple Choice

Q	K	C	CO	PLO	Q	K	C	CO	PLO
1.	C	U	1	A1, 3	26.	C	U	3	J2
2.	D	U	1	B1	27.	D	H	3	J2, 4
3.	A	K	1	B3	28.	B	U	3	J4
4.	B	U	1	C2	29.	B	U	3	J1, 8
5.	B	H	1	C3	30.	B	K	3	K1
6.	B	U	1	C2, 4	31.	D	U	3	K4, 6
7.	B	H	1	C10	32.	C	U	3	L2
8.	D	H	2	E1	33.	D	H	3	L7, 8
9.	D	H	2	E1, 2	34.	A	K	3	M2, 8; N1
10.	A	K	2	E3, 4	35.	C	U	3	M3
11.	C	K	2	G6	36.	D	U	3	M4
12.	B	U	2	H1	37.	D	U	3	M7
13.	B	K	2	H2	38.	A	U	3	M8
14.	A	U	2	H3	39.	C	U	3	N2
15.	C	U	2	H5	40.	D	U	3	N4
16.	D	H	2	H6	41.	A	K	3	O1
17.	D	U	2	H6	42.	A	U	3	O1
18.	A	K	3	I1	43.	B	H	3	O2
19.	B	K	3	I1	44.	D	H	3	O3, J2
20.	D	U	3	I2	45.	C	H	3	O5
21.	C	U	3	I2	46.	C	K	3	P1
22.	A	K	3	I6	47.	C	K	3	P1
23.	A	H	3	I9	48.	C	U	3	P6
24.	B	K	3	I10	49.	A	K	3	P7
25.	D	K	3	J2	50.	C	H	3	P10

Multiple Choice = 50 marks

Part B: Written Response

Q	B	C	S	CO	PLO
1.	1	U	6	1	A1, 2
2.	2	U	4	1	D1
3.	3	K	3	2	F1
4.	4	U	6	2	G3, 6, 7
5.	5	K	4	3	I2
6.	6	U	6	3	J9
7.	7	U	4	3	L1, 4, 6
8.	8	H	6	3	M6
9.	9	U	5	3	04, 5; N5
10.	10	K	6	3	P4

Written Response = 50 marks

Multiple Choice = 50 (50 questions)

Written Response = 50 (10 questions)

EXAMINATION TOTAL = 100 marks

LEGEND:

Q = Question Number

K = Keyed Response

C = Cognitive Level

B = Score Box Number

S = Score

CO = Curriculum Organizer

PLO = Prescribed Learning Outcome

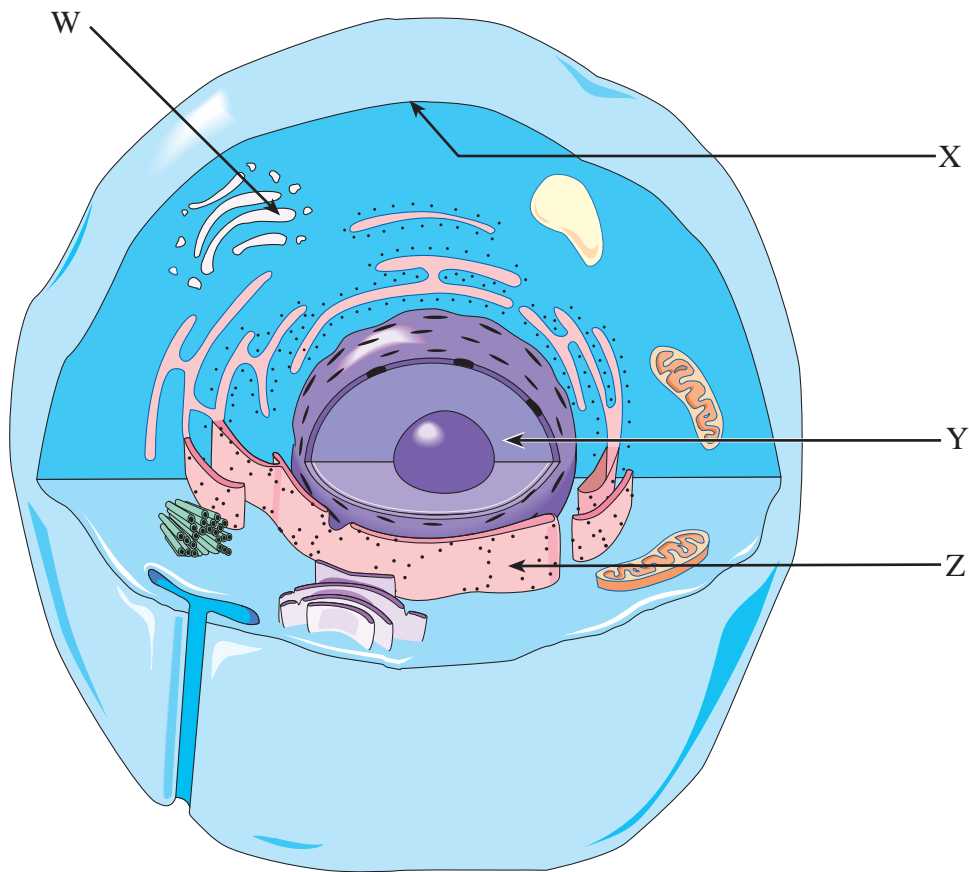
PART B: WRITTEN RESPONSE

Value: 50 marks

Suggested Time: 75 minutes

- INSTRUCTIONS:**
1. Use a **pen** for this part of the examination.
 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 each part of the cell indicated and give **one** role for each structure in the secretion and/or synthesis of a protein. (6 marks: $\frac{1}{2}$ mark for each name; 1 mark for each function)

Part W:

Name: **Golgi bodies.** ($\frac{1}{2}$ mark)

Role: **Package, modify and sort proteins.** (1 mark)

Part X:

Name: **Cell membrane.** ($\frac{1}{2}$ mark)

Role: **Receives vesicles from the Golgi and exports the proteins from the cell through exocytosis.** (1 mark)

Part Y:

Name: **Nucleus.** ($\frac{1}{2}$ mark)

Role: **Contains the DNA and is the site of transcription in protein synthesis.** (1 mark)

OR

Name: **Nucleolus.** ($\frac{1}{2}$ mark)

Role: **Synthesis of rRNA.** (1 mark)

Part Z:

Name: **Rough endoplasmic reticulum.** ($\frac{1}{2}$ mark)

Role: **It is the site of translation in protein synthesis.** (1 mark)

2. Demonstrate your understanding of the structure of DNA by describing the following features of the DNA molecule. You may use drawings in your answers.

a) Describe the **shape** of the DNA molecule. **(1 mark)**

- It is a **double helix**.
 - It is a **“twisted ladder” shape**.
- } **either one for
1 mark**

b) Describe the **structure** of the strands (backbone) of DNA. **(1 mark)**

- It is a **double backbone of alternating sugar/phosphate molecules**. **(1 mark)**

c) **Describe** complementary base pairing. **(1 mark)**

- **In complementary base pairing, adenine is always paired with thymine and guanine is always paired with cytosine**. **(1 mark)**

d) **Describe** the bonding that occurs between bases. **(1 mark)**

- **There is hydrogen bonding between the bases**. **(1 mark)**

3. Give **three** ways in which cancer cells differ from normal cells.

(3 marks)

- **Ability to metastasize.**
- **Lack of differentiation.**
- **Lack of contact inhibition.**
- **Increased frequency of mitosis.**
- **Large nucleus to cytoplasm ratio.**
- **Release growth factors to promote vascularization.**

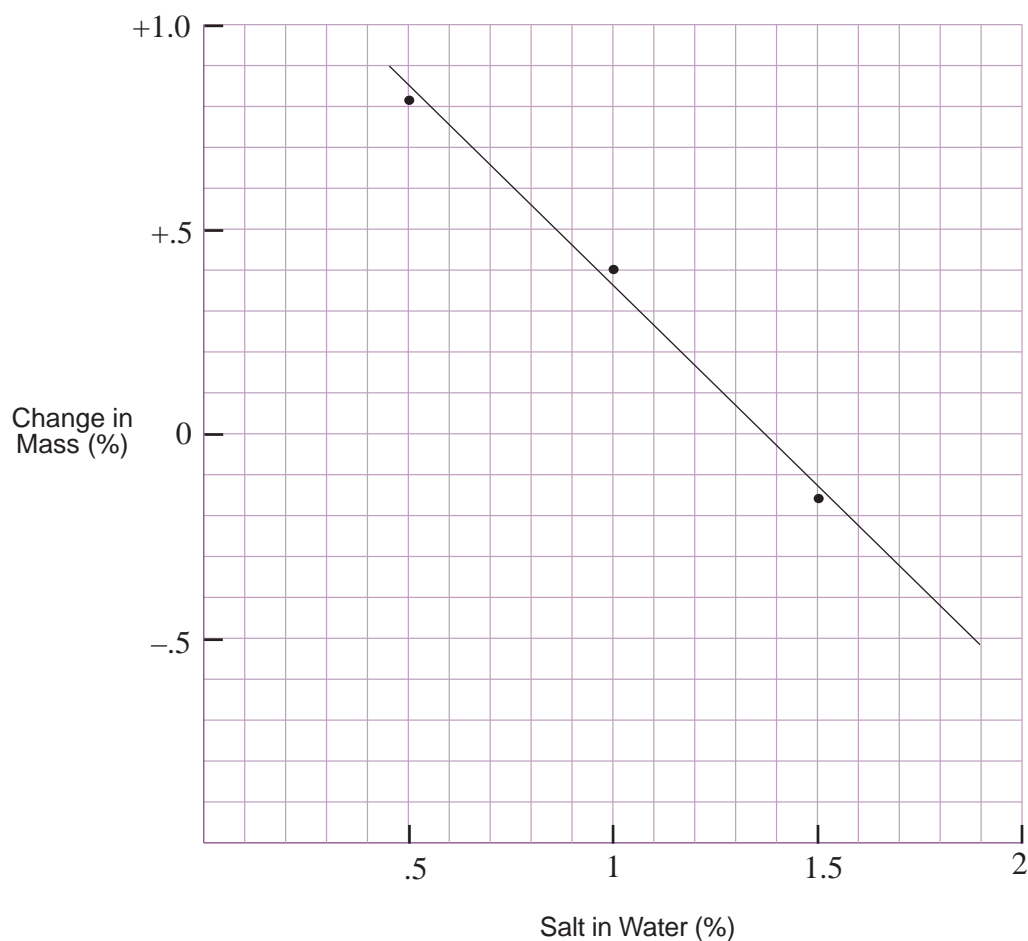
} any three for
1 mark each

4. An experiment was designed to determine the correct salinity of water (percentage of salt in water) required to successfully clone certain cells using tissue culture. Three cell samples were placed in three different salt solutions and their change in mass was recorded in the data table shown below.

SALT IN WATER (%)	CHANGE IN MASS OF CELLS (%)
0.5	+0.82
1.0	+0.40
1.5	-0.15

- a) Use the grid provided to graph the data above. Label the x -axis as salt in water (%).

(2 marks)



(1 mark for correct scale and labels; 1 mark for plot and line of best fit.)

*Note: Students will **not** be penalized for reversing the axis.*

b) If the cells must be cultured in a solution that does not cause them to shrink or swell, estimate the percentage of salt in water that would be best for culturing the cells. **(1 mark)**

• **1.35 – 1.39. (1 mark)**

c) Why do the cells in the 1.5% salt solution lose mass? **(1 mark)**

- **Water leaves the cells because the solution is hypertonic to the cells.**
 - **Water leaves the cells because the cells are hypotonic to the solution.**
- } **either one for 1 mark**

d) Name the process and explain how each of the following nutrients, when added to any of the solutions, would enter the cells in the culture. **(2 marks)**

Glucose:

- Name of Process:
- **Active transport.**
 - **Facilitated transport.**
- } **either one for $\frac{1}{2}$ mark**

Explanation: **Using a carrier protein. ($\frac{1}{2}$ mark)**

Oxygen:

Name of Process: • **Diffusion. ($\frac{1}{2}$ mark)**

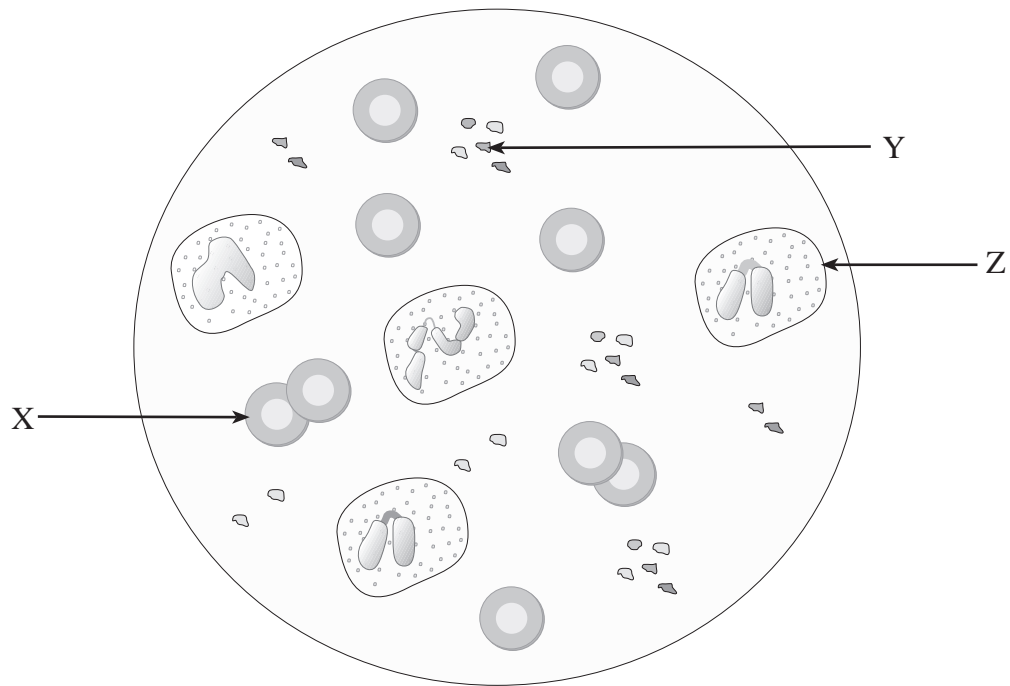
- Explanation:
- **Moves through the membrane down a concentration gradient.**
 - **Moves from an area of high concentration to an area of low concentration.**
- } **either one for $\frac{1}{2}$ mark**

5. Complete the following table for the digestive system.

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

SOURCE OF ENZYME	ENZYME	SUBSTRATE
Stomach	Pepsin	Protein
Pancreas	Lipase	Lipid
Pancreas	Trypsin	Protein
Small intestine	Maltase	Maltose

Use the following blood-smear diagram to answer question 6.



6. Name structures **X**, **Y** and **Z** and provide a function of each.
(6 marks: 1 mark for each name; 1 mark for each function)

Structure **X**:

Name: **Red blood cells. (1 mark)**

Function: • **Carry oxygen.**
• **Carry carbon dioxide.**
• **Carry hydrogen ions.** } any one for 1 mark

Structure **Y**:

Name: **Platelets. (1 mark)**

Function: **Initiate blood clotting. (1 mark)**

Structure **Z**:

Name: **White blood cells. (1 mark)**

Function: • **Fight infection.**
• **Phagocytize bacteria and worn-out red blood cells.** } either one for 1 mark

7. a) Explain how each of the following structures functions in the process of inhalation.

(2 marks)

Diaphragm:

- **The diaphragm moves down to increase the volume of the thoracic cavity, decreasing pressure, causing air to rush in. (1 mark)**

Ribs:

- **The ribs move up and out to increase the volume of the thoracic cavity, decreasing pressure, causing air to rush into the lungs. (1 mark)**

b) What role does each of the following have in breathing?

(2 marks)

Medulla oblongata:

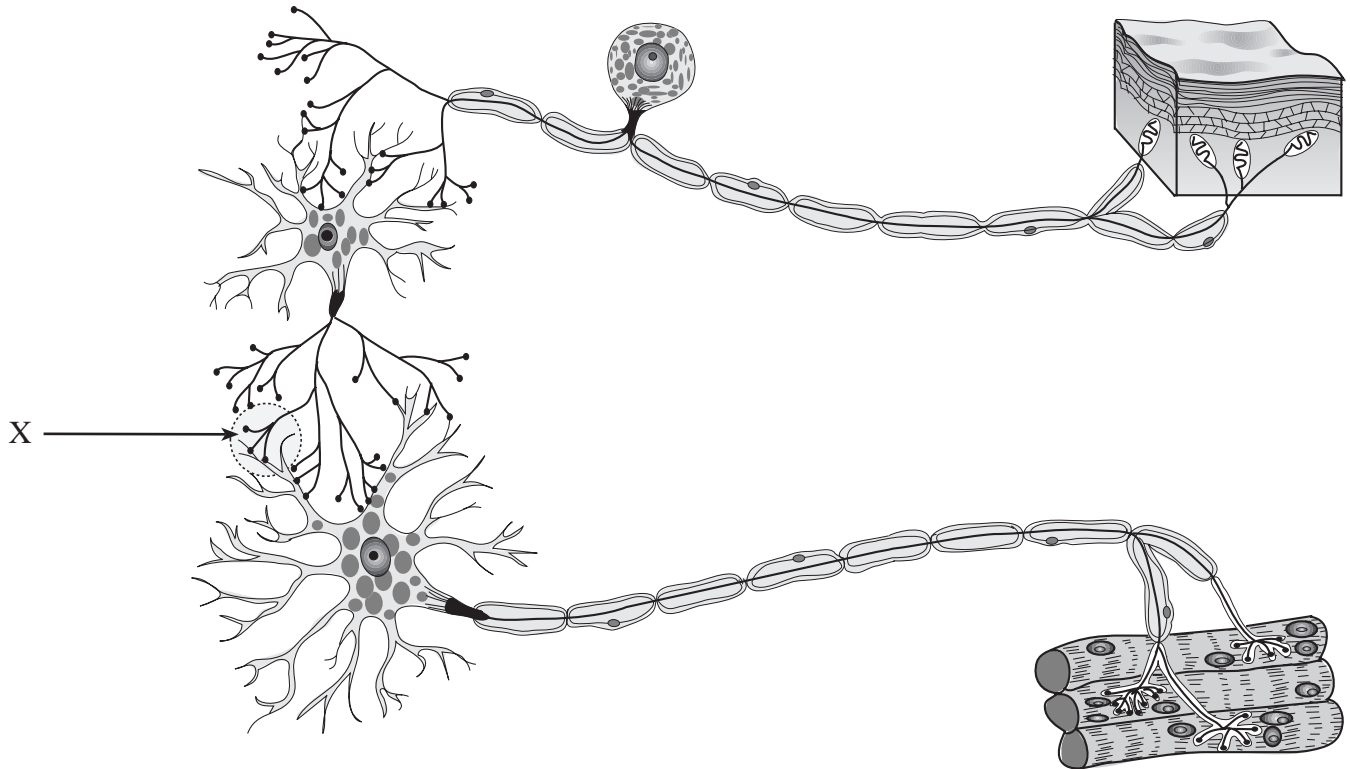
- **The medulla oblongata controls the breathing rate. (1 mark)**

Pleural membranes:

- **The pleural membranes ensure that the thoracic cavity is sealed so that pressure remains low during breathing.**
- **They allow the lungs to move freely within the thoracic cavity.**
- **They reduce friction between lung tissue and the rib cage.**
- **They create a partial vacuum and negative pressure.**

} any one for
1 mark

Use the following diagram to answer question 8.



8. Describe the process which occurs at the circled area labelled **X** when a nerve impulse travels through this area. **(6 marks)**

- A wave of depolarization reaches the synaptic ending.
 - The presynaptic membrane becomes permeable to calcium.
 - Calcium ions move into the ending.
 - Calcium ions interact with contractile proteins.
 - Synaptic vesicles move to the presynaptic membrane.
 - Vesicles release a neurotransmitter into the cleft.
 - Neurotransmitter diffuses across the synaptic cleft.
 - Neurotransmitter attaches to receptors on the postsynaptic membrane.
 - Depolarization of the postsynaptic membrane occurs.
 - Enzymes in the cleft destroy extra neurotransmitter.
- OR
- Neurotransmitter is absorbed in the pre-synaptic membrane.

any six for
1 mark each

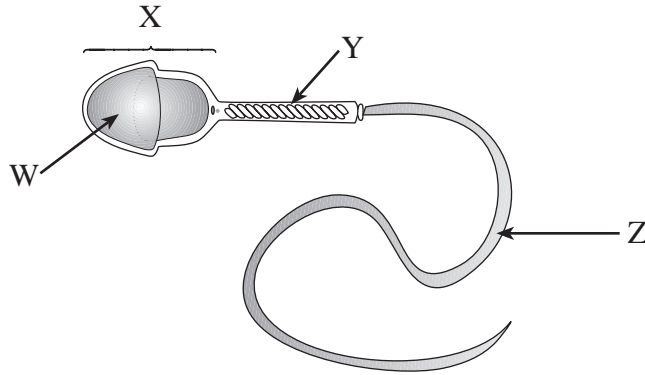
9. Demonstrate your understanding of negative feedback by describing how the kidneys and the hypothalamus work together to regulate blood volume. **(5 marks)**

- **Hypothalamus senses high osmotic pressure. (1 mark)**

 - **ADH is released. (1 mark)**

 - **Kidneys increase their retention of H₂O.**
 - **Distal tubule becomes more permeable to water.**
 - **Collecting duct becomes more permeable to water.**
- } **any one for
1 mark**
-
- **Results in increased blood volume.**
 - **Results in decreased osmotic pressure.**
- } **either one for
1 mark**
-
- **Negative feedback occurs in the posterior pituitary which stops ADH secretion.**
 - **Negative feedback occurs in the hypothalamus which stops ADH secretion.**
- } **either one for
1 mark**

Use the following diagram to answer question 10.



10. Identify the labelled structures in the diagram above and give **one** function of each.
(6 marks: $\frac{1}{2}$ mark for each name; 1 mark for each function)

Structure **W**:

Name: **Acrosome.** ($\frac{1}{2}$ mark)

Function: **Contains acrosome enzymes which aid the sperm in reaching the surface of the egg and allow a single sperm to penetrate the egg.** (1 mark)

Structure **X**:

Name: **Head.** ($\frac{1}{2}$ mark)

Function: **Stores genetic material (or DNA) required to produce a new human being.** (1 mark)

Structure **Y**:

Name: **Mid-piece.** ($\frac{1}{2}$ mark)

Function: **Makes ATP required for propulsion in the tail.** (1 mark)

Structure **Z**:

Name: **Tail.** ($\frac{1}{2}$ mark)

Function: **Provides the locomotion needed by the sperm to reach the egg (so that fertilization can occur).** (1 mark)

END OF KEY