

Biology 12

January 1999 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.	D	K	1	A1, 3	26.	B	U	3	K1
2.	C	H	1	A1; H1	27.	B	H	3	K2
3.	D	U	1	A1	28.	D	U	3	K1, 6
4.	D	H	1	A1, 2; G5	29.	C	U	3	L1
5.	C	K	1	B3	30.	D	K	3	L1
6.	C	H	1	B3	31.	C	U	3	L1, 5
7.	C	U	1	C1, 2	32.	D	K	3	L7
8.	D	K	1	C2; D1	33.	A	U	3	L8; J2
9.	B	K	1	C2, 8; G1	34.	D	U	3	N2
10.	C	U	1	C3	35.	C	K	3	N3
11.	A	K	1	C9	36.	A	K	3	N4
12.	D	K	1	C2, 12	37.	A	U	3	N4
13.	B	H	1	D2	38.	A	K	3	O1
14.	B	K	2	G1	39.	B	U	3	O2
15.	A	H	2	G3, 4	40.	C	H	3	O2, 4, 5
16.	C	H	2	G4, 8	41.	DELETED			
17.	C	H	2	G6	42.	D	K	3	O4
18.	D	U	2	H3	43.	D	K	3	P1
19.	D	U	3	I1, 2	44.	C	K	3	P1
20.	C	U	3	I1, 2	45.	D	K	3	P3
21.	D	U	3	I1, 9	46.	B	K	3	P4
22.	A	U	3	I2	47.	C	H	3	P5, 6
23.	B	U	3	I2	48.	C	H	3	P9, 10
24.	B	U	3	I2	49.	A	U	3	P10
25.	C	K	3	J1	50.	B	K	3	P7, 9, 10

Multiple Choice = 50 marks

Part B: Written Response

Q	B	C	S	CO	PLO
1.	1	K	4	1	D1
2.	2	U	3	2	E1
3.	3	U	4	2	F4
4.	4	H	8	2	H6; I2, 4
5.	5	U	10	3	J2, 5, 6
6.	6	U	3	3	L2
7.	7	U	8	3	M3, 4
8.	8	U	6	3	O1, 2
9.	9	K	4	3	P7

Written Response = 50 marks

Multiple Choice = 50 (50 questions)
Written Response = 50 (9 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.
 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. Describe the structure of DNA. (You may use a labelled diagram to answer this question.)

(4 marks)

- **It consists of two polynucleotide strands.**
- **It is a double helix OR ladder configuration.**
- **Its sugar is deoxyribose.**
- **It has bases A, T, C and G.**
- **There is hydrogen bonding between the complementary bases (A–T, C–G) on the two polynucleotides.**
- **It is composed of nucleotides.**
- **Each nucleotide is composed of sugar, phosphate and base.**
- **It has a sugar-phosphate backbone.**

**any four for
1 mark each**

2. State **one** role for each of the following molecules in the process of protein synthesis.

(3 marks)

DNA:

- **Contains the genetic code for protein synthesis.**
- **Serves as a template for the transcription of mRNA.**

} **either one for
1 mark**

mRNA:

- **Carries the transcribed code to the ribosome for translation.**
- **Determines the amino acid sequence of the polypeptide produced.**

} **either one for
1 mark**

tRNA:

- **Carries specific amino acid to a codon on the mRNA.**
- **Binds to a specific amino acid.**
- **Ensures the correct amino acid sequence in the new polypeptide through complementary base pairing of codons and anticodons.**

} **any one for
1 mark**

3. Describe the process of carcinogenesis.

(4 marks)

- **During initiation, a carcinogen brings about a mutation.**
- **During promotion, cancerous growth is triggered.**
- **Vascularization occurs.**
- **A mutagen converts a proto-oncogene to an oncogene.**
- **Metastasis occurs (cancer spreads to other sites).**
- **There is a loss of contact inhibition between the cells.**
- **The cells develop abnormal nuclei.**
- **The cytoskeleton of the cells is altered.**

} any four for
1 mark each

4. In an experiment designed to test the effects of environmental conditions on the ability of enzymes to digest food, the following steps are carried out:

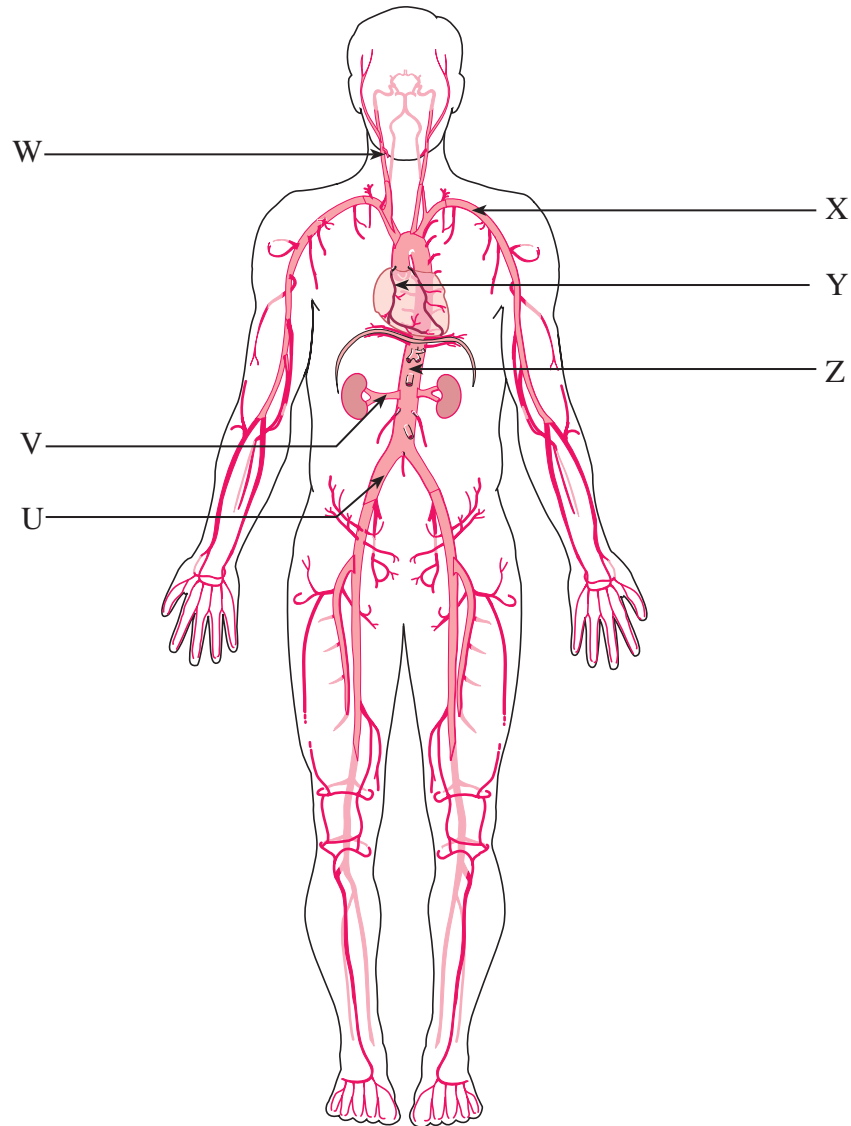
- Four test tubes are labelled A, B, C and D.
- All tubes contain distilled water and a small amount of egg white (protein).
- Individual tubes have additional contents as shown in the table below.
- All tubes are to be incubated at 37°C for one hour.

For each tube, explain what will happen and why.

(8 marks: 1 mark each for result; 1 mark each for explanation)

TUBE	INITIAL CONTENTS	ADDITIONAL CONTENTS	RESULT AND EXPLANATION
A	distilled water + egg white	none	No digestion occurs (1 mark) because no enzyme is present. (1 mark)
B	distilled water + egg white	pepsin	Little or no digestion occurs (1 mark) because pH is not optimum. (1 mark)
C	distilled water + egg white	pepsin + hydrochloric acid (at pH 3)	Digestion occurs Peptides are produced } either one for 1 mark because the correct enzyme and optimum pH are present. (1 mark)
D	distilled water + egg white	hydrochloric acid (at pH 3)	Little or no digestion occurs (1 mark) because no enzyme is present. (1 mark) (There is limited hydrolysis by HCl at 37°C.)

Use the following diagram to answer question 5a).



5. a) For each blood vessel listed in the table below, write the letter from the diagram which indicates the vessel's location. **(2 marks: $\frac{1}{2}$ mark each)**

BLOOD VESSEL	LETTER FROM DIAGRAM
Iliac artery	U
Aorta	Z
Carotid artery	W
Subclavian artery	X

b) In the table below, contrast the structure and/or function of the hepatic vein versus the hepatic portal vein.

(4 marks)

	HEPATIC VEIN	HEPATIC PORTAL VEIN
CONTRASTS	<ul style="list-style-type: none"> • Joins the liver and the inferior vena cava. 	<ul style="list-style-type: none"> • Joins the digestive tract and the liver.
	<ul style="list-style-type: none"> • After a meal, carries blood lower in glucose than the hepatic portal vein. 	<ul style="list-style-type: none"> • After a meal, carries blood higher in glucose than the hepatic vein.
	<ul style="list-style-type: none"> • Between meals, carries blood higher in glucose than the hepatic portal vein. 	<ul style="list-style-type: none"> • Between meals, carries blood lower in glucose than the hepatic vein.
	<ul style="list-style-type: none"> • Starts in a capillary bed and ends in a vessel. 	<ul style="list-style-type: none"> • Starts and ends in capillary beds.
	<ul style="list-style-type: none"> • Carries blood higher in urea than the hepatic portal vein. 	<ul style="list-style-type: none"> • Carries blood lower in urea than the hepatic vein.
	<ul style="list-style-type: none"> • Larger in diameter. 	<ul style="list-style-type: none"> • Smaller in diameter.
	<ul style="list-style-type: none"> • Carries purified blood away from the liver. 	<ul style="list-style-type: none"> • Carries blood containing poisons to the liver.
	<ul style="list-style-type: none"> • Part of systemic circulatory system. 	<ul style="list-style-type: none"> • Part of portal system.

any two contrasting pairs for 2 marks per pair

Note to markers: Students must show a valid contrast. No single marks should be given if student fills in only one of the pair of boxes.

c) Name **two** structures present in fetal but **not** in adult circulatory systems and describe the function of each. **(4 marks: 1 mark each for name; 1 mark each for function)**

Students may choose any **two** of the following:

Name: **oval opening**

Function: **Allows blood to move from the right to the left atrium, bypassing the pulmonary circuit.**

Name: **arterial duct**

Function: **Allows blood to move from the pulmonary artery and the aorta, bypassing the pulmonary circuit.**

Name: **umbilical arteries**

Function: **Take blood containing wastes to the placenta.**

Name: **umbilical vein**

Function: **Brings nutrient-rich blood from the placenta.**

Name: **venous duct**

Function: **Allows blood to flow from the umbilical vein to the inferior vena cava.**

Name: **umbilical cord**

Function: **Carries O₂ / nutrients from the placenta; carries wastes to the placenta.**

6. Describe how the upper respiratory tract is specialized to keep the lungs free of debris.

(3 marks)

- **Mucus traps debris.**
- **Cilia sweep debris back up to the glottis.**
- **Cilia filter the air.**
- **Hairs in the nasal passages filter the air.**
- **Coughing moves debris up and out of the respiratory tract.**
- **Epiglottis blocks food from entering the lungs.**
- **Saliva traps particles.**

} **any three for
1 mark each**

7. Describe the transmission of a nerve impulse through a neuron.

(8 marks)

Through a neuron:

- Depolarization of postsynaptic membrane occurs.
- OR
- Neurotransmitter attaches to receptors on the postsynaptic membrane.
- Membrane is polarized.
- Sodium ion gates open.
- Sodium ions diffuse into the neuron.
- Depolarization occurs.
- Membrane potential is +40mV (upswing).
- Sodium ion gates close.
- Potassium ion gates open.
- Potassium ions diffuse out of the neuron.
- Repolarization occurs.
- Membrane potential is -65mV (downswing).
- Myelinated fibres allow faster transmission because the action potential travels from node to node.
- Sodium-potassium pump re-establishes resting potential.
- Transmission occurs in one direction only.

any eight for
1 mark each

At the synapse:

- Action potential reaches the end of the axon.
- Presynaptic membrane becomes permeable to calcium.
- Calcium ions cause microfilaments to pull synaptic vesicles to inner surface of presynaptic membrane.
- Vesicles release neurotransmitter into the synaptic cleft.

8. Give **two** functions of each of the following urinary system structures.

(6 marks)

Kidney:

- **Helps maintain pH.**
- **Excretes nitrogenous wastes, excess salts and H₂O or produces and excretes urine.**
- **Helps maintain water balance.**
- **Removes histamines, penicillin, etc.**
- **Helps maintain nutrient and mineral balance.**
- **Purifies blood.**
- **Regulates blood volume.**

} any two for
1 mark each

Collecting duct:

- **Reabsorbs water.**
- **Carries urine to the renal pelvis.**
- **Regulation of pH.**
- **Regulates blood volume.**

} any two for
1 mark each

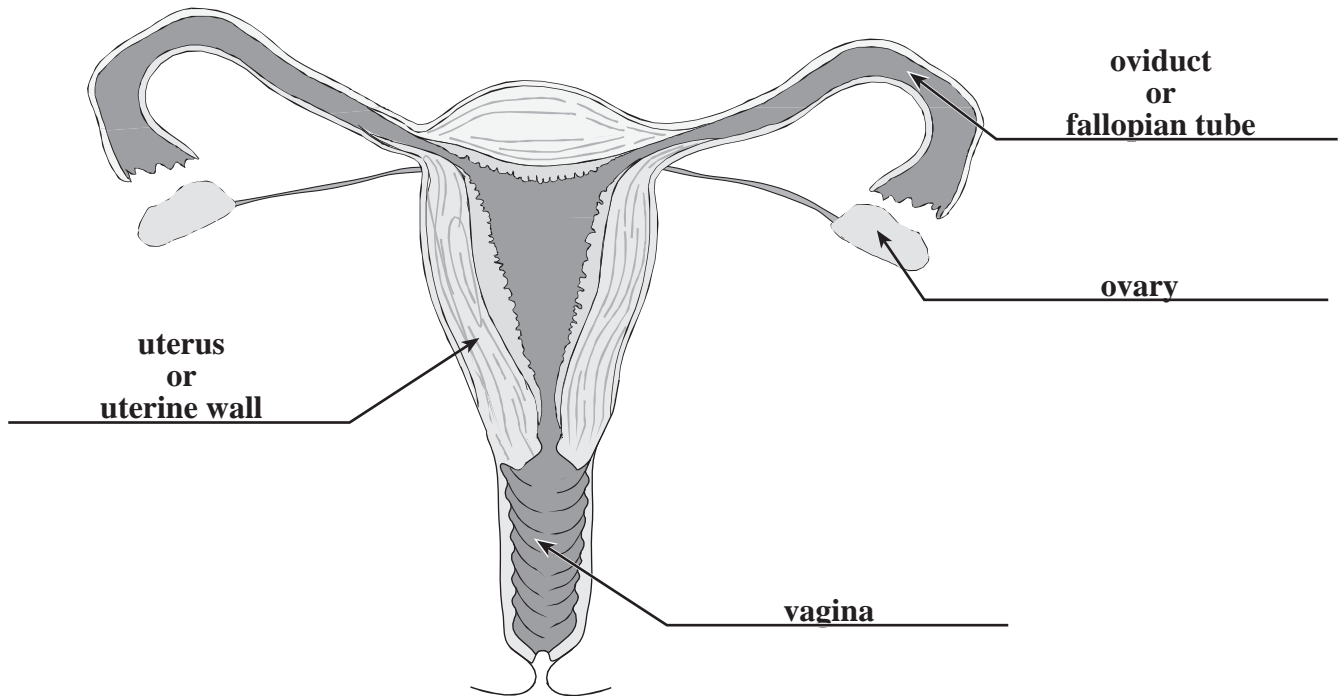
Proximal tubule:

- **Selective reabsorption of salts.**
- **Selective reabsorption of amino acids.**
- **Selective reabsorption of glucose.**
- **Reabsorption of water.**
- **Active transmission of nutrients.**
- **Moves filtrate to the loop of Henle.**

} any two for
1 mark each

9. Label the following diagram in the blanks provided.

(4 marks)



END OF KEY