Biology 12

January 1996 Provincial Examination

ANSWER KEY / SCORING GUIDE

Topics:

Core:	1.		Methods and Principles
	2.		Cells
	3.		Humans VII, VIII, IX
	4.		Humans X, XI, XII
Options: (Choose **two** of six)	5.	Option I:	Immunology
	6.	Option II:	Skeletal System and Muscles
	7.	Option III:	Reproduction and Embryology
	8.	Option IV:	Genetic Disorders and Engineering
	9.	Option V:	Cancer
	10.	Option VI:	Sensory Receptors

Part A: Multiple-choice

Q	C	T	K	S	CGR	Q	C	T	K	S	CGR
1.	U	1	C	1	I-5	27.	K	3	B	1	VIII-A-9
2.	K	1	D	1	II-A-1	28.	H	3	D	1	IX-A-1, 2
3.	U	2	A	1	III-A-1	29.	K	3	C	1	IX-E-1
4.	K	2	C	1	III-B-1	30.	K	3	A	1	IX-F-1
5.	H	2	C	1	III-C-2, 3	31.	H	3	D	1	IX-F-6
6.	U	2	B	1	III-C-5	32.	U	4	C	1	X-B-1
7.	U	2	B	1	III-C-8	33.	U	4	D	1	X-B-3
8.	K	2	D	1	III-E-1	34.	U	4	B	1	X-B-4
9.	H	2	C	1	III-E-3	35.	U	4	B	1	X-C-1
10.	K	2	D	1	IV-B-1	36.	H	4	A	1	X-C-1, D-1
11.	H	2	B	1	IV-B-1, 2	37.	K	4	A	1	X-D-1
12.	K	2	B	1	IV-B-3	38.	K	4	D	1	X-D-2
13.	K	2	C	1	V-A-2	39.	H	4	C	1	X-D-3/XII-C-1
14.	U	2	C	1	V-A-3	40.	K	4	B	1	X-E-1
15.	H	2	A	1	V-A-2, 3	41.	K	4	C	1	X-E-2
16.	K	2	D	1	V-A-5	42.	U	4	C	1	X-E-1
17.	U	2	A	1	V-D-3	43.	K	4	C	1	XI-A-2
18.	K	2	B	1	VI-B-1	44.	H	4	B	1	XI-A-2
19.	H	2	A	1	VI-C-2	45.	K	4	D	1	XI-B-2
20.	U	3	B	1	VII-1	46.	U	4	A	1	XI-B-1
21.	K	3	C	1	VIII-A-2	47.	K	4	B	1	XI-E-2
22.	H	3	D	1	VIII-A-2	48.	K	4	B	1	XI-G-1
23.	H	3	B	1	VIII-A-3	49.	H	4	B	1	XI-I-2
24.	U	3	C	1	VIII-A-1, 2	50.	H	4	A	1	XII-B-1, C-1
25.	K	3	D	1	VIII-A-4	51.	H	4	D	1	XII-B-2, 3/II-A-2
26.	U	3	A	1	VIII-A-2, 6	52.	U	4	B	1	XII-E-2

Part B: Written-response

Q	B	C	T	S	CGR
1.	1	H	1	6	VIII-A-3, 5, 6
2.	2	U	2	2	III-E-2
3.	3	U	2	4	VI-B-1
4.	4	U	3	3	VIII-A-2, 4, 8
5.	5	U	4	5	IX-F-9
6.	6	U	4	3	XI-A-4
7.	7	U	4	5	XII-A-1, 2

Core written-response total = 28 marks

Part C: Option Section – Score only 2 out of 6 boxes (options) from box 8 to box 13.

	Q	B	C	T	S	CGR
Option I	1–3	8	U	5	10	Option I
Option II	1–3	9	U	6	10	Option II
Option III	1–3	10	U	7	10	Option III
Option IV	1–3	11	U	8	10	Option IV
Option V	1–3	12	U	9	10	Option V
Option VI	1–2	13	U	10	10	Option VI

Option Section written-response total = 20 (2 x 10)

Multiple-choice = 52 (52 questions)
Written-response = 48 (7 questions and 2 options)
Total = 100 marks

LEGEND:

Q = Question Number **C** = Cognitive Level **T** = Topic
K = Keyed Response **S** = Score **CGR** = Curriculum Guide Reference
B = Score Box Number

PART B: WRITTEN-RESPONSE

Value: 28 marks **Suggested Time: 50 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. In an experiment, three different pancreatic enzymes were placed in separate test tubes. Temperature was maintained at 37° C. Vegetable oil, egg white and starch were added to each test tube and the contents were analyzed after 30 minutes.

   a) Test tube A was found to contain glycerol and fatty acids. The enzyme added was **(1 mark)**

- **Lipase (1 mark)**

Test tube B contained trypsin. Which product of digestion would it contain? **(1 mark)**

- **Dipeptides**
- **Polypeptides**
- **Peptides**

any one for 1 mark

Identify the enzyme and product of digestion contained in test tube C. **(2 marks: 1 mark each)**

Enzyme: • **amylase (1 mark)**

Product of digestion: • **maltose (1 mark)**

b) Predict the effect on the speed of the reaction in test tube A if bile were added and give a reason for your answer. **(2 marks)**

- **The rate of the reaction increases, since bile emulsifies the fat and increases the surface area.** **(1 mark)**

any one for 1 mark

2. Describe the process of:

a) transcription. **(1 mark)**

- **The process resulting in the production of a strand of mRNA that is complementary to a segment of DNA.**
- **Codon is produced from a code.**

either one for 1 mark

b) translation. **(1 mark)**

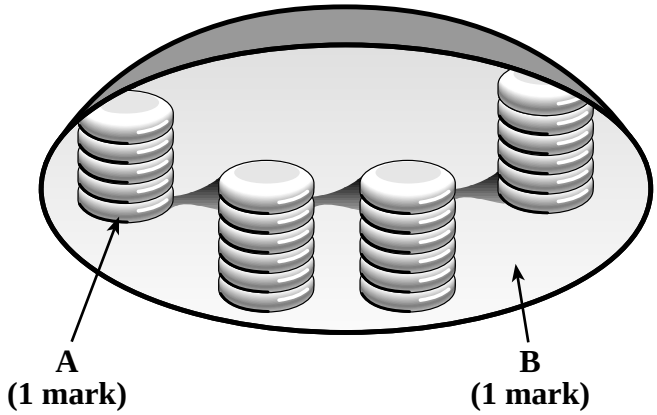
- **The process by which the sequence of codons in mRNA dictates the sequence of amino acids in a polypeptide. (1 mark)**

3. a) Draw the organelle responsible for photosynthesis. Include its internal structure. **(2 marks)**

b) On your diagram:

i) indicate with an **A** where photophosphorylation occurs, and **(1 mark)**

ii) indicate with a **B** where the Calvin Cycle occurs. **(1 mark)**



a)
- **1 mark for shape**
- **1 mark for inclusion of grana and stroma**

b)
- **'A' can point to grana, thylakoid or lamellae**
- **'B' must point to stroma**

4. Describe **three** ways in which surface area is maximized in the digestive system.

(3 marks: 1 mark each)

- **Chewing breaks the food into smaller pieces.**
- **Emulsification of fats by bile.**
- **Folds in the small intestine and walls of the stomach.**
- **Microvilli on the surface of the villi.**
- **Overall length of the digestive tract.**

any three for 1 mark each

5. a) Explain why people with "O" type blood are termed universal donors, yet are limited in the blood they can receive. **(2 marks)**

- **"O" type blood has no antigens on the surface of the blood cells being transfused to a recipient. As such, it is not recognized as foreign.** } **1 mark**

- **"O" type blood has both A and B antibodies, so it cannot accept A, B, or AB type blood or it will react with antigens A and B.** } **1 mark**

b) If an Rh negative $\left(Rh^{-}\right)$ mother has a second Rh positive $\left(Rh^{+}\right)$ child, there may be fetal erythroblastosis.

i) Explain the cause of erythroblastosis. **(2 marks)**

- **Rh^{-} blood responds to Rh^{+} fetal antigen.**
- **Antibody production occurs in mother.**
- **Antibodies travel to fetal blood stream and attack fetal blood cells.**

} **any two for 1 mark each**

ii) State **one** way that erythroblastosis could be prevented. **(1 mark)**

- **An injection of RhoGam after the first Rh^{+} pregnancy.**
- **Destruction of fetal blood cells travelling in mother's blood stream.**
- **Block mother's production of antibodies.**

} **any one for 1 mark**

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

Cilia in the trachea:

Pleural membranes:

Hemoglobin:

Cilia in the trachea:

- **sweep mucus and debris out of the respiratory system. (1 mark)**

Pleural membranes:

- **form a seal in the thoracic cavity.**
- **allow for movement of lungs.**
- **maintain negative pressure.**
- **prevent lung collapse.**

any one for 1 mark

Hemoglobin:

- **carries oxygen in the blood.**
- **acts as a buffer.**
- **carries CO_2.**
- **carries H^+.**

any one for 1 mark

7. a) Define *hormone*. **(1 mark)**

- **A chemical messenger.**
- **A substance produced by an endocrine gland.**

} **either one for 1 mark**

b) Complete the following table: **(2 marks)**

TYPE OF HORMONE	CHEMICAL COMPOSITION
Peptide	• **C, H, O, N** • **amino acids** **(1 mark)**
steroid **(1 mark)**	• rings of carbon and hydrogen • lipid

c) Explain why some hormones may be ingested while other hormones must be injected into the blood to be effective. **(2 marks)**

- **Peptide hormones would be broken down into amino acids if ingested.**
- **Steroids are not digested, therefore they may be ingested.**
- **Hormones may be denatured by the acidic nature of the stomach.**

} **any two for 1 mark each**

PART C: OPTION SECTION

Value: 20 marks **Suggested Time: 30 minutes**

INSTRUCTIONS:

1. Select **two** options from the six options listed below.
2. Answer **all** of the questions in each option that you select.
3. If you answer questions in more than two options, only the **first two** will be marked.
4. You may not need all of the space provided to answer each question.

OPTION I: IMMUNOLOGY

OPTION II: SKELETAL SYSTEM AND MUSCLES

OPTION III: REPRODUCTION AND EMBRYOLOGY

OPTION IV: GENETIC DISORDERS AND ENGINEERING

OPTION V: CANCER

OPTION VI: SENSORY RECEPTORS

OPTION I: IMMUNOLOGY

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B	
active immunity		
primary response	a) administration of preformed antibodies	**passive immunity**
passive immunity	b) circulating T cells	**cell mediated immunity**
multiple sclerosis	c) circulating memory cells	**active immunity**
cell mediated immunity	d) results of HIV infection	**AIDS**
rheumatoid arthritis	e) inflammation of the joints	**rheumatoid arthritis**
AIDS	f) destruction of the myelin sheath	**multiple sclerosis**
interferon		

2. Name a cell which produces interferon and explain how interferon acts in the immune response. **(2 marks: 1 mark each)**

Cell name:
- **leukocytes.**
- **fibroblasts.**
- **T cells.**
- **virally infected cells.**

} **any one for 1 mark**

Function of interferon:
- **potentiates the ability of T and B cells to fight cancer.**
- **prepares cells for possible viral attack.**
- **early warning system for immune response.**
- **prepares cells to prevent viral infection.**

} **any one for 1 mark**

3. Define *allergy* and explain the role of IgE antibodies in the allergic reaction. **(2 marks: 1 mark each)**

Allergy:
- **a disorder characterized by an overactive immune system.**
- **formation of antibodies to substances which are usually not recognized as foreign.**

} **any one for 1 mark**

Role IgE:
- **causes release of histamines and other substances when in contact with allergens. (1 mark)**
- **promotes allergic response.** **($\frac{1}{2}$ mark)**

OPTION II: SKELETAL SYSTEM AND MUSCLES

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B	
appendicular skeleton		
axial skeleton	a) degeneration of muscle fibres	**muscular dystrophy**
ligament	b) connects muscles to bones	**tendon**
tendon	c) causes lactic acid build-up	**oxygen debt**
oxygen debt	d) skull and vertebral column	**axial skeleton**
creatine phosphate	e) connects bones to bones	**ligament**
muscular dystrophy	f) regenerates ATP	**creatine phosphate**
osteoporosis		

2. Explain how actin filaments function in muscle contraction. **(2 marks)**

- **Provides binding sites for myosin to pull actin. (2 marks)**
- **Actin slides past myosin. (2 marks)**
- **Provides binding sites. (1 mark)**

3. State **two** ways in which bone is different from cartilage. **(2 marks: 1 mark each)**

- **Produces blood cells.**
- **Is vascularized (has Haversian canals).**
- **Hard matrix.**
- **Stores calcium and phosphate.**

} **any two for 1 mark each**

OPTION III: REPRODUCTION AND EMBRYOLOGY

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B	
cleavage		
seminal fluid	a) production of eggs	**oogenesis**
neurula	b) the opening between the vagina and uterus	**cervix**
oogenesis	c) essential to the maturation of sperm	**testosterone**
testosterone	d) the male copulatory organ	**penis**
cervix	e) contains fructose, water and prostaglandins	**seminal fluid**
progesterone	f) cell division without growth	**cleavage**
penis		

2. List the **four** structures which contribute to the formation of semen. **(2 marks: $\frac{1}{2}$ mark each)**

- **Seminiferous tubules or testes.**
- **Cowper's gland or bulbourethral glands.**
- **Seminal vesicle.**
- **Prostate gland.**

} **$\frac{1}{2}$ mark each**

3. Name each birth control method described below.

a) The oviducts are cut and tied, preventing egg and sperm from meeting. **(1 mark)**

- **Tubal ligation.**

b) A latex (rubber) sheath that prevents sperm from entering the vagina. **(1 mark)**

- **Condom (male or female).**

OPTION IV: GENETIC DISORDERS AND ENGINEERING

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B	
ligase		
cell cycle	a) chromosomes line up at the cell's equator	**metaphase**
metaphase	b) a series of events that includes mitosis	**cell cycle**
transformation	c) cuts viral DNA into pieces	**restriction enzyme**
restriction enzyme	d) a plant cell without its cell wall	**protoplast**
protoplast	e) circular DNA that may be found in *E. coli*	**plasmid**
plasmid	f) a change in the DNA of a cell	**transformation**
anaphase		

2. List **two** medical uses of DNA probes. **(2 marks: 1 mark each)**

- **Used in diagnosis of infections.**
- **Used in diagnosis of genetic diseases.**
- **Used to cure genetic diseases through various methods of gene therapy.**

} **any two for 1 mark each**

3. State **two** reasons why phenotypic cures are more frequently used than genotypic cures. **(2 marks: 1 mark each)**

- **They can be done more quickly.**
- **The risk can be estimated fairly accurately.**
- **The final outcome is easier to define.**
- **In some cases, the phenotypic cure is less complicated and less costly.**
- **We know how to do many phenotypic cures, but we don't know much about genotypic cures.**

} **any two for 1 mark each**

OPTION V: CANCER

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B	
contact inhibition		
vascularization	a) characteristic of non-cancerous cells	**contact inhibition**
monoclonal antibody	b) causes cells to make DNA from RNA	**retrovirus**
neoplasia	c) carries drugs to tumor	**monoclonal antibody**
benign	d) a tumor that does not spread	**benign**
retrovirus	e) DNA that causes cancer	**oncogene**
carcinoma	f) new growth of cancer cells	**neoplasia**
oncogene		

2. How is the spread of cancer assisted and hindered by the lymphatic system? **(2 marks: 1 mark each)**

Assisted:

- **Transport of cancer cells to the other parts of the body. (1 mark)**

or

- **Connected to the circulatory system which increases chances of transport. (1 mark)**

Hindered:

- **Lymphocytes destroy viruses that cause cancer. (1 mark)**

3. Describe the role of each of the following cells.

a) Helper T cells: **(1 mark)**

- **Identify foreign invading pathogens.**
- **Activates macrophages.**

} **either one for one mark**

b) Macrophages: **(1 mark)**

- **Engulf bacteria or viruses and enzymatically break them down and display a fragment of the foreign invader on its membrane.**

OPTION VI: SENSORY RECEPTORS

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B	
tympanic membranes		
eustachian tube	a) carries impulse to brain	**auditory nerve**
auditory canals	b) calcium carbonate granules	**otoliths**
otoliths	c) channel sound waves	**auditory canals**
round window	d) equalizes air pressure in middle ear	**eustachian tube**
ossicles	e) organ of hearing	**cochlea**
auditory nerve	f) amplify sound	**ossicles**
cochlea		

2. Complete the following table: **(4 marks)**

STRUCTURE	FUNCTION
sclera	**protection** **(1 mark)**
rods, cones, fovea or retina **(any one for 1 mark)**	converts light to electrical impulses
ciliary body	• **produces aqueous humor** • **changes lens shape for focusing** **(either one for 1 mark)**
lens **(1 mark)**	refracting and focusing light

END OF KEY