Biology 12

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

Part B: Written Response

Q	B	C	T	S	CGR
1.	1	H	2	5	V-B-5
2.	2	U	2	6	III-E-1, 2, 4
3.	3	K	2	4	IV-B-1
4.	4	U	3	4	VIII-A-3, 6, 8, 10
5.	5	K	3	4	IX-A-2, B-1
6.	6	H	4	5	XII-B-3, C-1

Core written-response total = 28 marks

Part C: Option Section – Score only 2 out of 6 boxes (options) from box 7 to box 12.

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

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

Multiple Choice = 52 (52 questions)
Written Response = 48 (6 questions and 2 options)
Total = 100 marks

LEGEND:

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

PART B: WRITTEN RESPONSE

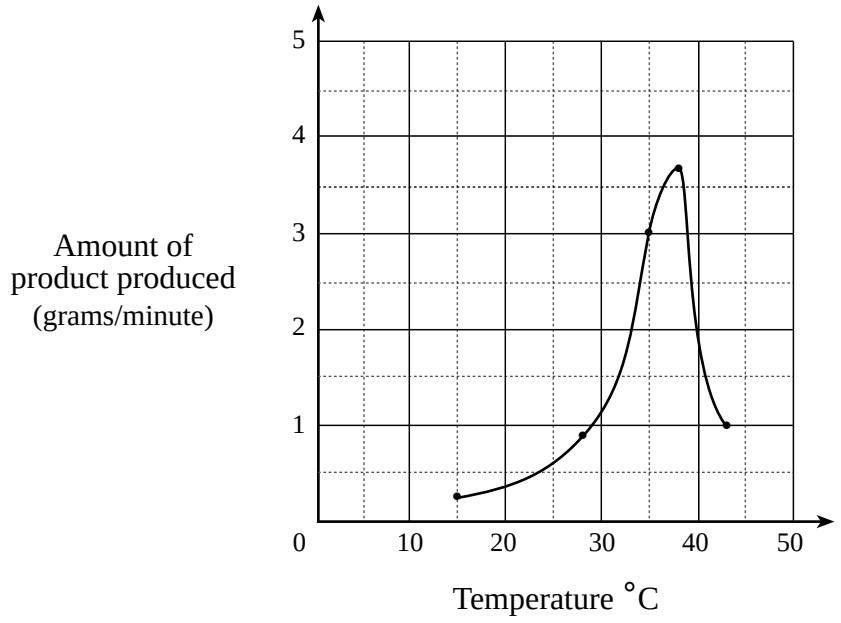
Value: 28 marks **Suggested Time: 50 minutes**

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. The following data show the rate of an enzyme-catalyzed reaction at various temperatures.

Temperature (°C)	Grams of product/minute
15	0.25
28	0.9
35	3.0
38	3.7
43	1.0

a) Graph the data on the grid provided. **(1 mark)**



- **Award 1 mark for a suitable graph.**

b) Use the graphed data to describe the effect of temperature on the rate of enzyme activity. **(4 marks)**

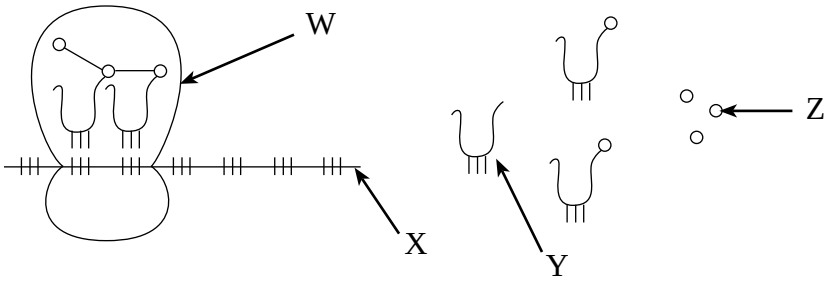
- **As the temperature increases, the rate of enzyme activity increases until at 38°C (optimum temperature).** } **1 mark**

- **As the temperature increases, the kinetic energy of the enzyme and substrate molecules increases up to an optimum temperature after which kinetic energy is too great for the formation of enzyme substrate complexes.** } **1 mark**

- **Above 38°C, the reaction rate slows down.** } **1 mark**

- **After 38°C, the enzyme is denatured; i.e., the active site has changed shape thus preventing the formation of a complex.** } **1 mark**

Use the following diagram to answer question 2.



2. The diagram above shows a part of the process of protein synthesis.

a) Identify the following labelled structures. **(4 marks)**

W: **Ribosome**
X: **mRNA**
Y: **tRNA**
Z: **Amino acid**

b) Name the part of protein synthesis represented by the diagram above. **(1 mark)**

- **Translation**
- **Elongation.**

} **either one for 1 mark**

c) Where in the cell is **X** synthesized? **(1 mark)**

- **In the nucleus.**

3. State **one** function of each of these parts of a cell.

a) Cell membrane: **(1 mark)**

- **Controls what enters or exits the cell. (Selectively permeable.)**
- **Forms vacuoles/vesicles.**
- **Proteins embedded in membrane allow the immune system to recognize "self".**
- **Contains the cytoplasm.**
- **Protects the cell.**

any one for 1 mark

b) Mitochondrion cristae: **(1 mark)**

- **Site of electron transport chain.**
- **Increases surface area within mitochondria for cellular respiration.**

either one for 1 mark

c) Vacuole: **(1 mark)**

- **Transports substances within the cell.**
- **Storage of wastes, water, or pigments.**
- **Gives shape to plant cell.**

any one for 1 mark

d) Microtubule: **(1 mark)**

- **Locomotion**
  (The microtubules are the functional part of cilia or flagella.)
- **They anchor organelles in the cell.**
- **They form part of cytoskeleton.**
- **They move chromosomes during mitosis/meiosis.**
- **Forms spindle in cell.**
- **Forms centrioles in cell.**

any one for 1 mark

4. Describe the mechanisms involved in the digestion and absorption of fat. **(4 marks)**

- **The presence of fat in the digestive system causes the duodenum to secrete cholecystokinin (CCK) into the bloodstream.**
- **CCK travels to the pancreas and the gall bladder, causing them to release their secretions.**
- **Bile released by the gall bladder emulsifies the fat into droplets.**
- **Pancreatic juice contains lipase which digests the fat droplets, OR**
- **Fat droplets + lipase → fatty acids + glycerol, OR**
- **The fat droplets are digested into fatty acids and glycerol.**

any three for 1 mark each – up to a maximum of 3 marks

- **Transport of fatty acids and glycerol across membrane of the epithelial cells of the villi into the bloodstream.**
- **Fatty acids and glycerols are absorbed into the lacteals of the villi.**

either one for 1 mark

5. State **one** function of each of the following heart structures.

a) SA node: **(1 mark)**

- **Initiates heart beat.**
- **Acts as pacemaker.**
- **Coordinates heart beat.**

} **any one for 1 mark**

b) Coronary arteries: **(1 mark)**

- **Supply the heart muscle with nutrients and O_2.**
- **Supply the heart muscle with oxygen.**
- **Supply the heart muscle with blood.**

} **any one for 1 mark**

c) Atrioventricular valves: **(1 mark)**

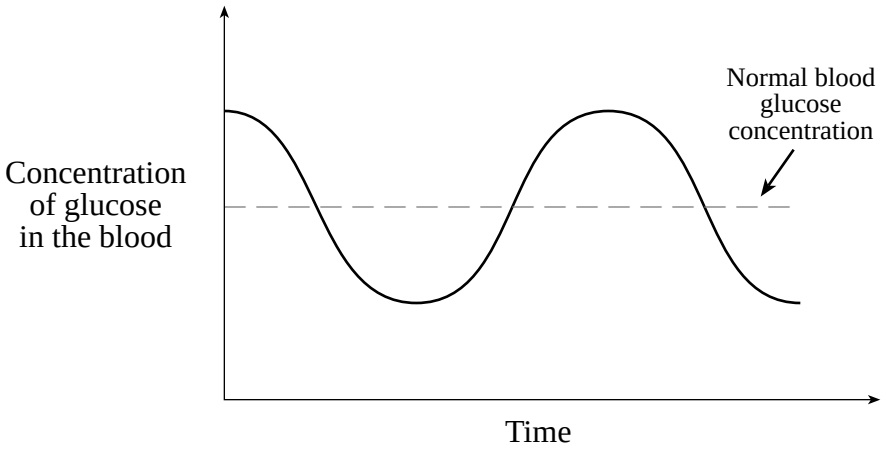
- **Prevent blood from flowing back into the atrium from the ventricle.**

d) Right ventricle: **(1 mark)**

- **Pumps blood to the lungs.**
- **Receives blood from right atrium.**
- **Sends blood to pulmonary trunk or arteries.**

} **any one for 1 mark**

6. The concentration of glucose in the blood was recorded over a set period of time and the following pattern was observed.



a) Does the above graph represent positive or negative feedback? **(1 mark)**

- **The above graph represents negative feedback.**

b) Explain the hormonal response when the

i) blood glucose concentration is high. **(2 marks)**

- **High levels of glucose in the blood stimulate the pancreas to release insulin.**
- **The liver and muscles store glucose as glycogen.**
- **Increase of cell membrane permeability to glucose uptake.**

any two for 1 mark each

ii) blood glucose concentration is low. **(2 marks)**

- **Low levels of glucose in the blood stimulate the:**
  - **– pancreas to release glucagon.**
  - **– adrenal cortex to release cortisol.**
- **Glucagon causes the breakdown of glycogen to glucose in the liver.**
- **Gluconeogenesis of muscle tissue will occur.**

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	
cyclosporin		
antibody	a) promotes dilation of blood vessels	**histamine**
allergen	b) inhibits viral replication and release	**interferon**
histamine	c) promotes release of IgE antibodies	**allergen**
MHC protein	d) results in active immunity	**vaccine**
vaccine	e) inhibits immune system activity	**cyclosporin**
interferon	f) promotes production and activity of monocytes	**lymphokine**
lymphokine		

2. Define *passive immunity* and give **one** example. **(2 marks)**

Definition:

- **Immunity gained by the injection of a serum containing antibodies which were produced by another organism.** } **1 mark**

Example:

- **Injection of an antiserum, e.g., anti-venom serum.**
- **Antibodies via breastfeeding.**
- **Rh antibodies via placenta.**

} **any one for 1 mark**

3. State **one** role for each of the following.

a) T cell: **(1 mark)**

- **Lymphokines.**
- **Memory T cells.**
- **Cell mediated immunity.**

} **any one for 1 mark**

b) B cell: **(1 mark)**

- **Plasma cells.**
- **Antibodies.**
- **Memory B cells.**
- **Antibody mediated immunity.**

} **any one for 1 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	
sarcomere		
smooth muscle	a) site of blood cell production	**spongy bone**
skeletal muscle	b) filament that moves during muscle contraction	**actin**
cardiac muscle	c) an involuntary striated tissue	**cardiac muscle**
lactic acid	d) found in the wall of the small intestine	**smooth muscle**
actin	e) functional unit of a muscle fibre	**sarcomere**
spongy bone	f) product of anaerobic respiration	**lactic acid**
myosin		

2. List **two** causes of osteoporosis. **(2 marks)**

1 mark max.

- **Increased PTH production.**
- **Lack of exercise.**
- **Lack of Ca^{2+} in diet.**
- **Decreased estrogen production.**
  or
  Decreased progesterone production.
  or
  Menopause.

any two for 1 mark each

3. State **one** role for each of the following.

a) Sarcoplasmic reticulum: **(1 mark)**

- **Stores calcium ions $\left(Ca^{2+}\right)$ in muscle fibres.**
- **Passageway for action potential.**

either one for 1 mark

b) Haversian canal: **(1 mark)**

- **Acts as a conduit for nerves and blood vessels into bone.**

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	
seminiferous tubule		
blastula	a) process that produces male sex cells	**spermatogenesis**
estrogen	b) produces components of seminal fluid	**Cowper's gland**
acrosome	c) secreted by the follicle	**estrogen**
spermatogenesis	d) an embryo with three germ layers	**gastrula**
Cowper's gland	e) contains enzymes necessary for fertilization	**acrosome**
gastrula	f) site of egg production	**ovary**
ovary		

2. Give **two** effects that the secretion of testosterone has on the male body. **(2 marks)**

- **Deeper voice.**
- **Increased height.**
- **Facial hair.**
- **Wider shoulders.**
- **Increased body hair.**
- **Increased oil gland activity.**
- **Sperm maturation.**

any two for 1 mark each

3. Give **one** function of each of the following.

a) Oviducts (Fallopian tubes): **(1 mark)**

- **Conducts eggs to the uterus.**
- **Site of fertilization.**
- **Passageway for egg or sperm.**

any one for 1 mark

b) Uterus: **(1 mark)**

- **Site of development of the embryo.**
- **Site of implantation.**

any one for 1 mark

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	
telophase		
ligase	a) plant cell lacking its cell wall	**protoplast**
protoplast	b) stage in mitosis when chromosomes are located at each pole	**telophase**
prophase	c) genetic material containing genes from two organisms	**recombinant DNA**
restriction enzyme	d) caused by an extra 21st chromosome	**Down's syndrome**
recombinant DNA	e) joins DNA fragments together	**ligase**
Down's syndrome	f) the transfer of DNA from one cell to another by viruses	**transduction**
transduction		

2. a) Distinguish phenotypic from genotypic cures. **(1 mark)**

- **Phenotypic cures change physical characteristics of the body. Genotypic cures change the genetic make-up of the body.** } **1 mark**

b) Why are phenotypic cures used more frequently? **(1 mark)**

- **Phenotypic cures have proven to be successful and are well-understood.**
- **Genotypic cures are not yet practical because of the technical difficulty of carrying out the cure.**

} **any one for 1 mark**

3. Define *transformation*. **(2 marks)**

- **A change in genotype of a bacterial cell due to the introduction of foreign genes into the genome**
- **The uptake of bacterial DNA from dead bacteria.**

} **either one for 2 marks**

One mark for *what* it is; 1 mark for *how* it is done.

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	
macrophage		
B cell	a) triggers uncontrolled cell growth	**promoter**
promoter	b) a tumor that metastasizes	**malignant**
malignant	c) a protein released by cells infected with a virus	**interferon**
anaplasia	d) ingests cancerous cells	**macrophage**
interferon	e) produces antibodies	**B cell**
initiator	f) changes proto-oncogene to oncogene	**initiator**
killer T cell		

2. List **three** danger signals that may indicate the presence of cancer. **(3 marks)**

- **A lump.**
- **A sore that does not heal.**
- **Unusual bleeding or discharge.**
- **Changes in bowel or bladder habits.**
- **Persistent cough.**
- **Persistent indigestion.**
- **Change in the shape or size of a wart or mole.**

any three for 1 mark each

3. Why can interleukin be an effective treatment for some forms of cancer? **(1 mark)**

For example:

- **It is used to maintain killer activity of the lymphocytes.**
- **It promotes formation and action of T cells.**
- **It promotes interferon release.**

any one for 1 mark

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	
fovea		
vitreous humor	a) allow for vision in low light	**rods**
accommodation	b) area of acute vision	**fovea**
sclera	c) regulates light entrance	**iris**
lens	d) refracts and focuses light	**lens**
iris	e) changing shape of the lens	**accommodation**
rods	f) tough outer coating	**sclera**
cones		

2. List the **four** types of taste and state the location on the tongue where each type of tastebud is concentrated. **(2 marks: $\frac{1}{2}$ mark for each pair)**

	TASTE	LOCATION ON TONGUE
a)	**sweet**	**tip / front**
b)	**sour**	**sides**
c)	**salt**	**tip/middle**
d)	**bitter**	**back**

3. State **one** possible cause for conduction deafness and **one** possible cause for nerve deafness. **(2 marks)**

Conduction deafness:

- **Congenital defect (mother contracting measles).**
- **Infection.**
- **Punctured eardrum.**
- **Fused ossicles**

} **any one for 1 mark**

Nerve deafness:

- **Aging (loss of hair cells).**
- **Exposure to loud noise over prolonged periods.**
- **Damage to auditory nerve.**

any one for 1 mark

END OF KEY