

Biology 12

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

Part B: Written Response

Q	B	C	T	S	CGR
1.	1	H	1	5	IX-F-8, 9
2.	2	U	2	4	VI-B-1, C-2, D-1, E-1
3.	3	U	3	6	IV-B-1; X-A-2, B-3
4.	4	U	4	4	VIII-A-3
5.	5	U	4	6	XI-H-1
6.	6	U	4	3	VIII-A-10; XII-C-1, 2

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

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. Each of four Biology 12 students carries out the following procedures to determine his/her blood type. Each student is provided with a prepared card with four squares:

















Square **W** is prepared with anti-A solution which causes agglutination in blood containing the A antigen.

Square **X** is prepared with anti-B solution which causes agglutination in blood containing the B antigen.


Square **Y** is prepared with anti-Rh solution which causes agglutination in blood containing the Rh antigen. Blood which contains the Rh antigen is said to be Rh⁺, while blood without the Rh antigen is said to be Rh⁻.

Square **Z** is a control (no solutions added).


Each student adds a drop of his/her own blood to each square on his/her card. The results are shown below:

	W anti-A	X anti-B	Y anti-Rh	Z control
Student 1				
Student 2				
Student 3				
Student 4				

LEGEND



non agglutinated



agglutinated

a) What is the blood type of Student 2?

(1 mark)

- The blood type of Student 2 is A^- . (1 mark)

b) Which student(s) may receive a transfusion of A^+ blood (A-type blood that is Rh^+) with no ill effect?

(1 mark)

- Student 4 may receive A^+ blood. (1 mark)

c) Which student has made an error in his/her exercise? Explain how you know an error was made.

(2 marks)

- Student 3 (1 mark), because she has agglutination in her control square (1 mark).

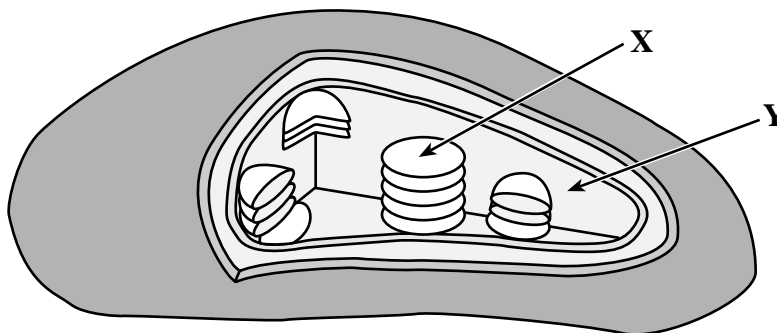
d) If Student 1 is a female, what condition should her doctor alert her to if she becomes pregnant?

(1 mark)

- The doctor should alert her to fetal erythroblastosis.
- The doctor should alert her to complications if the father is Rh^+ .

} either one for
1 mark

Use the following diagram of a chloroplast to answer question 2.



2. a) Name the photosynthetic sub-reactions which occur in areas **X** and **Y** in the diagram above. **(2 marks: 1 mark each)**

X: Light reaction or photophosphorylation. (1 mark)

Y: Calvin Benson cycle or reduction of CO_2 . (1 mark)

- b) Give **one** possible result in each photosynthetic sub-reaction if carbon dioxide is not available to the cell. **(2 marks)**

Sub-reaction X:

- O_2 is not produced.
 - NADP is unavailable for reduction.
 - When CO_2 is not available, light reaction (cyclic photophosphorylation) continues.
- } any one for 1 mark

Sub-reaction Y:

- PGAL is not produced.
 - Calvin Benson cycle stops.
 - There is no production of glucose-phosphate.
- } any one for 1 mark

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

a) Cell membrane:

(1 mark)

- **Controls what enters or exits the cell. (1 mark)**

b) Ribosome:

(1 mark)

- **Site of translation.**
 - **Protein synthesis.**
- } **either one for
1 mark**

c) Nucleolus:

(1 mark)

- **Manufactures ribosomes.**
 - **Manufactures rRNA.**
- } **either one for
1 mark**

d) Smooth endoplasmic reticulum:

(1 mark)

- **Detoxifies the body of drugs and alcohol.**
 - **Produces steroid hormones.**
- } **either one for
1 mark**

e) Motor neuron:

(1 mark)

- **Excites an effector.**
 - **Carries impulse from CNS to effector.**
- } **either one for
1 mark**

f) Myelin sheath:

(1 mark)

- **Speeds impulse transmission. (1 mark)**

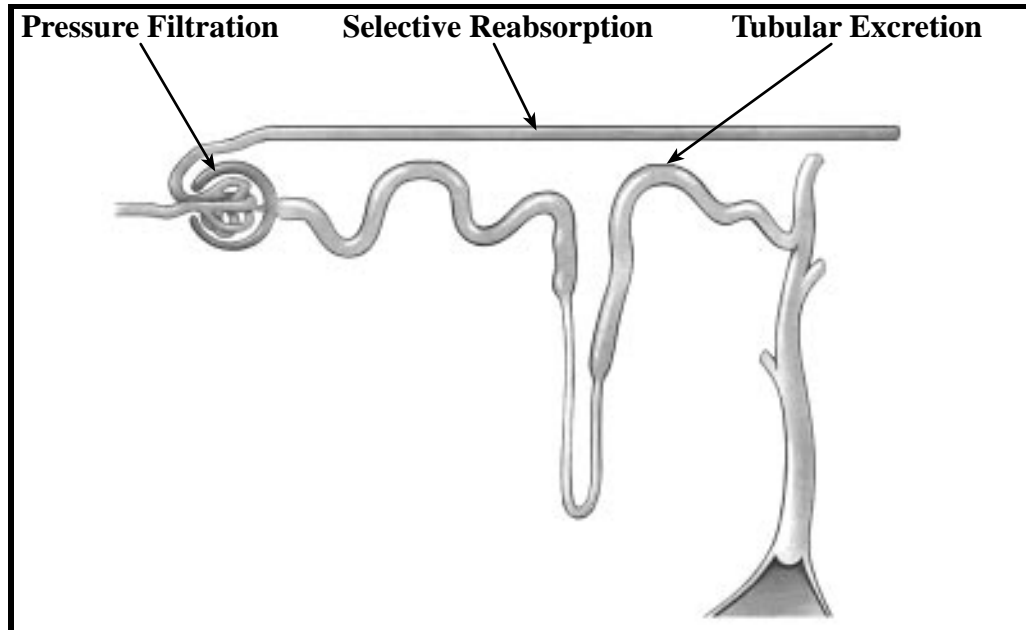
4. Complete the following table summarizing digestive enzyme activity. (4 marks: $\frac{1}{2}$ mark each)

ENZYME	SUBSTRATE	SITE OF ACTIVITY
pepsin	protein	stomach
lipase	fat droplets	small intestine
peptidase	peptides	small intestine
amylase	starch	mouth or small intestine

5. a) On the diagram below, indicate and label the appropriate location for each of the following terms associated with urine formation.

(3 marks)

- Selective Reabsorption
- Pressure Filtration
- Tubular Excretion (Augmentation)



b) State what happens during each of the following processes.

(3 marks: 1 mark each)

Selective Reabsorption: • **Nutrients are selectively reabsorbed from filtrate back to blood.**
 • **Salts are actively transported into blood.**

} either one for 1 mark

Pressure Filtration: • **Small particles are filtered from the glomerulus (blood) into the Bowman's capsule using blood pressure.**

} 1 mark

Tubular Excretion: • **Materials from blood can be added to the urine at this point in the nephron. Typically ammonia, drugs, hormones and/or H^+ are added.**

} 1 mark

6. State **one** function of each of the following hormones.

a) Insulin:

(1 mark)

- **Causes a decrease in blood glucose concentration.**
- **Alters cell membrane permeability to allow glucose to enter the cell.**

} either one for
1 mark

b) Secretin:

(1 mark)

- **Causes pancreas to release pancreatic juice. (1 mark)**

c) Prostaglandins:

(1 mark)

- **Causes contractions of the vagina and uterus to propel sperm upward.**
- **Alters blood pressure.**

} either one for
1 mark

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
neutrophil	
allergy	a) released by T lymphocytes <u>lymphokine</u>
active immunity	b) produces antibodies in the blood <u>B lymphocyte</u>
B lymphocyte	c) marks the antigen for destruction by other agents <u>immune complex</u>
immune complex	d) provokes an allergic reaction <u>allergen</u>
lymphokine	e) releases histamine when stimulated <u>mast cell</u>
mast cell	f) phagocytizes bacteria <u>neutrophil</u>
allergen	

2. Define *auto-immune disease* and give **one** example.

(2 marks)

Auto-immune disease:

- **Production of antibodies that attack an individual's own tissue. (1 mark)**

Examples:

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> • Multiple sclerosis. • Lupus. • Rheumatoid arthritis. • Diabetes. | } | <p>any one for
one mark</p> |
|---|---|--|

3. Define *primary* and *secondary immune response*.

(2 marks: 1 mark each)

Primary immune response:

- **Initial immune response to a foreign antigen - typically as a vaccination. (1 mark)**

Secondary immune response:

- **Immune response following a second exposure to antigen - typically as a booster shot. (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
spongy bone	
myosin	a) network of channels and tubules <u> sarcoplasmic reticulum </u>
compact bone	b) joins bones to bones <u> ligament </u>
immovable joint	c) holds bones of the skull together <u> immovable joint </u>
creatine phosphate	d) regenerates ATP <u> creatine phosphate </u>
ligament	e) capable of breaking down ATP <u> myosin </u>
tendon	f) found in the shaft of long bones <u> compact bone </u>
sarcoplasmic reticulum	

2. What is the role of calcium in muscle contraction?

(2 marks)

- **Attaches to thin filament.**
- **Causes cross-bridges to form.**

3. State **two** differences between cartilage and bone.

(2 marks)

- **Bone has greater vascularization than cartilage.**
- **Cartilage is more flexible than bone.**
- **Bone has Haversian canals.**
- **Bone stores calcium and phosphate salts.**
- **Bone has a hard matrix.**

} 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	
ejaculation		
gastrula	a) usual site of fertilization	<u>oviduct</u>
uterus	b) recognizably human stage of development	<u>fetus</u>
testis	c) may transport semen or urine	<u>urethra</u>
blastula	d) produces testosterone	<u>testis</u>
urethra	e) propulsion of semen from penis	<u>ejaculation</u>
fetus	f) a hollow ball of cells	<u>blastula</u>
oviduct		

2. Name **two** parts of a mature sperm and state **one** function of each.

(2 marks: $\frac{1}{2}$ mark each for names and $\frac{1}{2}$ mark each for functions)

(Any two parts and functions: $\frac{1}{2}$ mark each for names and $\frac{1}{2}$ mark each for functions)

Name: • **Acrosome.**

Function: • **Contains enzymes necessary for fertilization.**

Name: • **Mid-piece.**

Function: • **Produces ATP energy necessary for motility.**

Name: • **Head.**

Function: • **Contains genetic material.**

Name: • **Tail.**

Function: • **Propels sperm.**

3. Describe how each of the following prevents pregnancy.

a) An IUD (intrauterine device):

(1 mark)

• **It irritates the endometrium, thus preventing implantation. (1 mark)**

b) A vasectomy:

(1 mark)

- **It prevents sperm from leaving a man's body. (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
protoplast	
DNA probe	a) stage of mitosis when chromatids move to poles <u>anaphase</u>
replication	b) method by which DNA is copied <u>replication</u>
ligase	c) a plant cell without a cell wall <u>protoplast</u>
telophase	d) sticks DNA bases to complementary bases <u>ligase</u>
anaphase	e) contains genetic material from two organisms <u>recombinant DNA</u>
recombinant DNA	f) used to diagnose certain diseases <u>DNA probe</u>
conjugation	

2. a) Describe the surgical procedure of amniocentesis.

(2 marks)

- **A long needle is passed through the abdominal wall into the uterus.**
- **Amniotic fluid is withdrawn.**

} one mark each

b) List **one** benefit and **one** drawback of using amniocentesis.

(2 marks: 1 mark each)

Benefit:

- **Medical specialists can be apprised of any problem and so can be present at the birth.**
- **Family can prepare for genetic problems.**
- **Life-saving surgery for fetus can be performed *in utero* or arranged for soon after birth.**

} any one for
1 mark

Drawback:

- **Results are not available for a long time.**
- **Spontaneous abortion may occur as a result of the procedure.**
- **Procedure cannot be done early in pregnancy.**

} any one for
1 mark

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
anaplasia	a) regulates the activity of an oncogene <u>enhancer</u>
metastasis	b) disorganized cell growth <u>anaplasia</u>
interferon	c) causes secondary tumors <u>metastasis</u>
enhancer	d) cancer of the blood <u>leukemia</u>
leukemia	e) can change a proto-oncogene into an oncogene <u>radiation</u>
sarcoma	f) a tumor that does not metastasize <u>benign</u>
radiation	
benign	

2. Give the function of the following cells in fighting cancer.

a) Cytotoxic (killer) T cells:

(1 mark)

- **They puncture the cell membrane of infected cells. (1 mark)**

b) B cells:

(1 mark)

- **They produce antibodies. (1 mark)**

3. State **two** effects of oncogenes on a cell.

(2 marks)

They:

- **promote cell growth.**
- **promote cell division.**
- **produce surface receptors.**
- **produce cell growth factors.**
- **require few or no growth factors.**

**any two for
1 mark each**

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
chemoreceptor	
fovea	a) fibrous, protective layer of the eye <u> sclera </u>
middle ear	b) hair cell for hearing <u> mechanoreceptor </u>
vitreous humor	c) found behind lens for refracting light <u> vitreous humor </u>
mechanoreceptor	d) secreted by the ciliary body <u> aqueous humor </u>
aqueous humor	e) area of cone concentration <u> fovea </u>
semicircular canal	f) amplifies sound <u> middle ear </u>
sclera	

2. State where in the inner ear otoliths are located, and explain how they function.

(2 marks: 1 mark each)

- Location: • **Utricle.**
 • **Saccul.**
 • **Vestibule.**

} any one for
1 mark

- Function: • **As the otoliths shift, stimulation of the hair cell occurs. This permits awareness of head position in one plane (horizontal or vertical).**

} 1 mark

3. State **one** characteristic of and **one** possible cause for cataracts.

(2 marks: 1 mark each)

- Characteristic: • **Lens appears opaque.**
 • **Decreased vision.**

} either one for
1 mark

- Possible cause: • **Aging.**
 • **Excessive exposure to UV light.**
 • **Oxidation of crystalline protein.**
 • **Genetic pre-disposition.**

} any one for
1 mark

END OF KEY