JANUARY 1995 BIOLOGY 12 PROVINCIAL EXAMINATION
ANSWER KEY/SCORING GUIDE

TOPICS

CORE:	1.		Methods and Principles
	2.		Cells
	3.		Humans VII, XIII, IX
	4.		Humans X, XI, XII
OPTIONS: (Choose **two** of six)	5.	Section I:	Immunology
	6.	Section II:	Skeletal System and Muscles
	7.	Section III:	Reproduction and Embryology
	8.	Section IV:	Genetic Disorders and Engineering
	9.	Section V:	Cancer
	10.	Section 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 4	27.	H	3	A	1	IX B 2
2.	U	1	D	1	II A 2	28.	H	3	D	1	IX F 4, V D 4
3.	U	2	A	1	III A 1	29.	K	3	C	1	IX A 2
4.	K	2	A	1	III D 1	30.	U	3	C	1	IX F 6
5.	U	2	C	1	III E 1	31.	U	3	B	1	IX B 1
6.	H	2	D	1	III C 8, 9 V A 2	32.	H	3	B	1	IX F 3
7.	U	2	C	1	IV A 1	33.	U	4	A	1	X A 2
8.	H	2	D	1	IV B 1	34.	K	4	B	1	X D 3
9.	K	2	C	1	V A 2	35.	H	4	D	1	X B 1
10.	U	2	D	1	V A 3	36.	U	4	D	1	X B 1
11.	U	2	A	1	V C 2	37.	U	4	A	1	X B 4
12.	H	2	A	1	V D 3	38.	U	4	B	1	X D 2, 3
13.	H	2	C	1	V D 1, 3	39.	K	4	A	1	XI A 1, 2
14.	H	2	B	1	V B 5 VIII A 3	40.	K	4	D	1	XI B 2
15.	U	2	C	1	VI B 1, 2	41.	K	4	B	1	VIII A 7
16.	U	2	D	1	VI D 2, E 1	42.	K	4	D	1	XI G 1
17.	U	2	C	1	VI C 3	43.	H	4	D	1	XI G 2
18.	U	3	C	1	VII 2	44.	H	4	C	1	XI H 1
19.	K	3	D	1	VIII A 1	45.	K	4	D	1	XII A 2
20.	K	3	A	1	VIII A 9	46.	U	4	D	1	XII C 1
21.	U	3	B	1	VIII A 3	47.	U	4	A	1	XII C 1
22.	U	3	C	1	VIII A 4	48.	H	4	D	1	XII C 1
23.	U	3	D	1	IX A 2	49.	H	4	A	1	XII C 1
24.	U	3	B	1	IX C 1	50.	H	4	C	1	XII A 3, C 1
25.	U	3	C	1	IX A 1	51.	U	4	B	1	XII C 1
26.	K	3	B	1	IX F 1	52.	U	4	A	1	XII A 3, C 1

PART B: WRITTEN-RESPONSE

Q	B	C	T	S	CGR
1.	1	H	2	6	IV B 3/V A 2, 5
2.	2	U	2	5	III E 1, 4
3.	3	K	2	3	VI C 2
4.	4	U	3	6	VIII A 2
5.	5	K	4	3	X C 1
6.	6	U	4	5	XI H 1

Core written–response total = 28 marks

PART C: OPTIONS – Score only 2 out of 6 boxes (sections) from box 7 to box 12.

	Q	B	C	T	S	CGR
Section I	1–3	7	U	4	10	Option I
Section II	1–3	8	U	5	10	Option II
Section III	1–3	9	U	6	10	Option III
Section IV	1–3	10	U	7	10	Option IV
Section V	1–3	11	U	8	10	Option V
Section VI	1–3	12	U	9	10	Option VI

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

Multiple–choice = 52 (52 questions)
Written–response = 48 (6 questions and 2 option sections)
Total = 100 marks

LEGEND:

Q = Question
K = Keyed response
B = Score box number
C = Cognitive level
S = Score
T = Topic
CGR = Curriculum Guide Reference

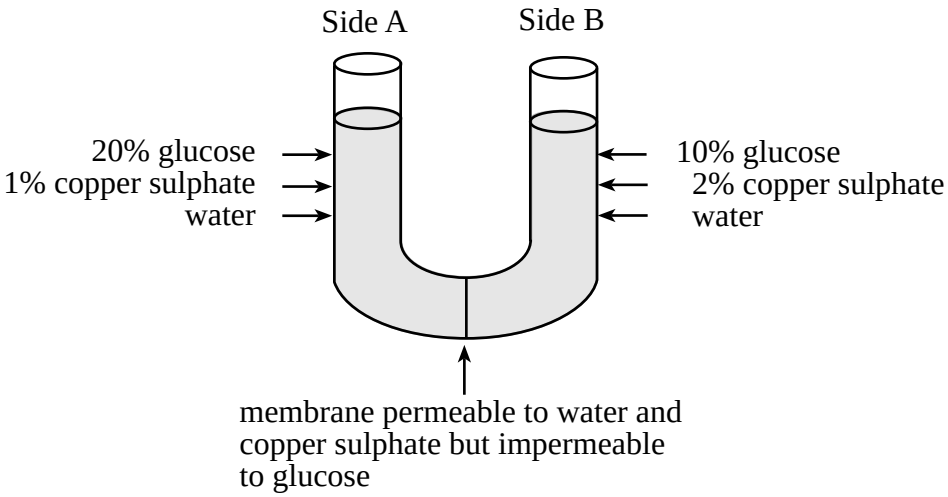
PART B: WRITTEN-RESPONSE QUESTIONS

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.

Use the following diagram to answer question 1.



1. a) Describe what happens to the concentration of the glucose solution on side **A**. Explain your answer. **(2 marks)**

- **Glucose concentration decreases.** **1 mark**
- **Water is moving from side B to A.** **1 mark**

b) Describe what happens to the concentration of the copper sulphate solution on side A. Explain. **(2 marks)**

- **$CuSO_4$ would increase on side A.** **1 mark**
- **Net diffusion from more concentrated side B to less concentrated side A.** **1 mark**

c) Describe **two** ways to increase the rate of diffusion across the membrane. **(2 marks)**

- **Heating the solution.**
- **Increasing the permeability of the membrane.**
- **Increasing the solute concentration on side A.**

any two for 1 mark each

2. State **one** role of each of the following in the synthesis of a protein. **(5 marks: 1 mark each)**

a) DNA

- **DNA contains the information or the blueprint from which the protein will be made.**
- **DNA provides a template for the mRNA molecule to be produced.**

any one for 1 mark

b) mRNA

- **mRNA is a template for translation.**
- **mRNA carries the coded message from the nucleus to the cytoplasm.**
- **mRNA sets the order of amino acids for protein synthesis.**

any one for 1 mark

c) Ribosomes

- **Ribosomes read the mRNA molecule and provide the site for the amino acids to bond.**
- **Site of protein synthesis (or workbench)**

any one for 1 mark

d) tRNA

- **tRNA carries amino acids to the ribosome.** **1 mark**

e) Amino acids

- **They are the sub-units or building blocks of proteins.** **1 mark**

3. Complete the following table contrasting cyclic and non-cyclic photophosphorylation.
(3 marks: 1 mark each)

	Cyclic Photophosphorylation	Non-cyclic Photophosphorylation
Location in chloroplast	thylakoid membrane	**thylakoid membrane**
Photosystem(s) utilized	**photosystem I**	photosystem I and II
Product(s)	ATP	**oxygen, ATP, $NADPH_2$ (any one for 1 mark)**

4. Explain how digestion would be affected if the digestive functions of each of the following organs did **not** occur. **(6 marks)**

a) Salivary glands

- **No amylase is secreted.**
- **No starch digestion.**
- **No moistening of food.**

any one for 1 mark

b) Stomach

- **If peristalsis does not occur, there would be no mechanical/physical digestion.**
- **If pepsin (pepsinogen) is not secreted, protein digestion in the stomach will not occur.**
- **If HCl is not secreted pepsinogen will not be activated and protein will not be broken down. As well, there will be no corrosive action on stomach contents.**
- **Bacteria would not be destroyed by the acidic environment.**

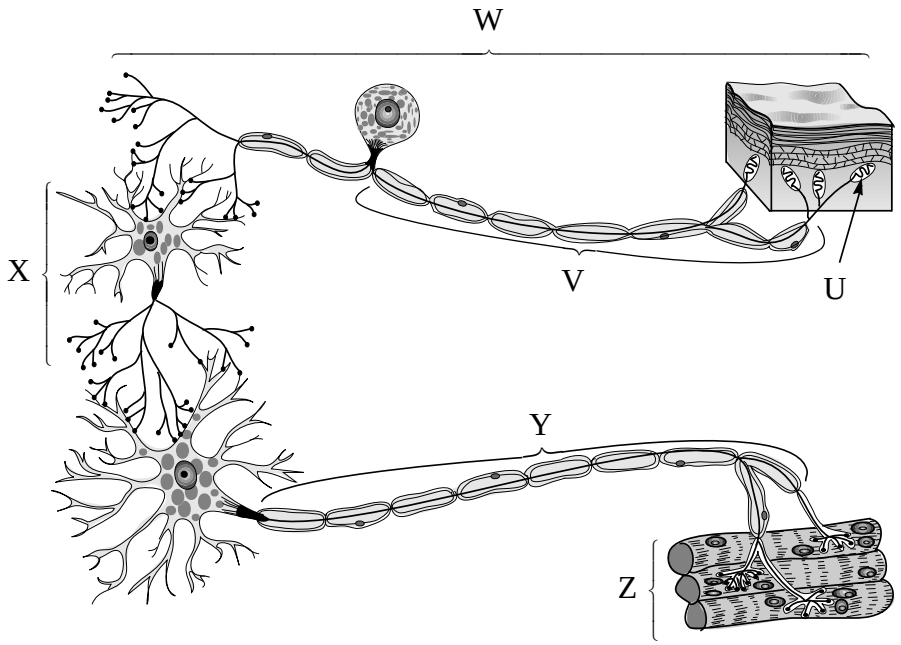
any one for 2 marks

c) Pancreas

- **Trypsin would not be released.**
- **Trypsin would not be available for protein digestion.**
- **Amylase would not be released.**
- **Pancreatic amylase would not be available for starch digestion.**
- **Lipase would not be released.**
- **Lipase would not be available for lipid digestion.**
- **Sodium bicarbonate would not be released.**
- **Sodium bicarbonate would not be available to raise the pH in the small intestine.**

any three for 1 mark each

Use the following diagram to answer question 5.



5. The diagram above represents a simple reflex arc.
   Identify the structures **U** through **Z** in the spaces provided below. **(3 marks: ½ mark each)**

U	**sensory receptor**	**½ mark each**
V	**dendrite**	
W	**sensory neuron**	
X	**interneuron**	
Y	**axon**	
Z	**muscle fibres / effector**	

6. State a function for each of the following during the formation of urine. **(5 marks: 1 mark each)**

a) Bowman's capsule

- **pressure filtration of the blood**
- **collection of filtrate**

any one for 1 mark

b) Proximal convoluted tubule

- **selective reabsorption of nutrients**
- **reabsorbs water**

any one for 1 mark

c) Loop of Henle

- **reabsorption of water**
- **formation of hypertonic urine**
- **counter-current exchange**
- **extrusion of Na^+**

any one for 1 mark

d) Distal convoluted tubule

- **tubular excretion (augmentation) NH_3 , etc**
- **adjustment of pH of the blood**
- **reabsorbs water**

any one for 1 mark

e) Collecting duct

- **reabsorbs water**
- **transports urine to renal pelvis**

any one for 1 mark

PART C: OPTIONAL AREAS

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

INSTRUCTIONS:

1. Choose **two** sections from the optional areas in this part of the examination.
2. Answer **all** of the questions in each section that you choose.
3. If you answer questions in more than two sections, only the **first two** sections 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. **(6marks)**

COLUMN A	COLUMN B	
active immunity		
B cell	a) produces antibodies	**B cell**
antigen	b) foreign substance in the body	**antigen**
lymphokine	c) results from overactive immune system	**allergy**
allergy	d) causes macrophages to become activated	**lymphokine**
passive immunity	e) produced by hybridoma cells	**monoclonal antibodies**
T cell	f) short-term immunity to disease	**passive immunity**
monoclonal antibodies		

2. Give **two** functions of a macrophage in defending the body against disease. **(2 marks: 1 mark each)**

- **Phagocytosis of antigens.**
  <u>or</u>
- **Engulfing of antigens.**

} **any one for 1 mark**

- **Stimulates the production of white blood cells.** **1 mark**

3. How does a vaccine provide immunity against a disease? **(2 marks)**

- **At first, no antibodies can be found for several days after injection. Then, there is a slow rise in antibody concentration which gradually levels off.** **1 mark**
- **Memory cells are formed which provide active immunity.** **1 mark**

OPTION II: SKELETAL SYSTEMS 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	
tendon		
cartilage	a) solid, yet flexible connective tissue	**cartilage**
actin	b) involuntary and non-striated tissue	**smooth muscle**
smooth muscle	c) has calcium-storage sacs	**sarcoplasmic reticulum**
ligament	d) thin, contractile filament	**actin**
scoliosis	e) joins bone to bone	**ligament**
bone	f) characterized by curvature of the spine	**scoliosis**
sarcoplasmic reticulum		

2. Give **two** functions for each of the following. **(2 marks: $\frac{1}{2}$ mark each function)**

   a) Axial skeleton.

- **provides protection**
- **provides support**
- **provides strength**
- **acts as an anchor for appendages**

any one for 1 mark

   b) Appendicular skeleton.

- **provides strength**
- **provides flexibility**
- **calcium storage**

any one for 1 mark

3. Arrange these terms in order of **increasing** size. **(2 marks: $\frac{1}{2}$ mark each)**

sarcomere **myosin** **muscle fibre** **myofibril**

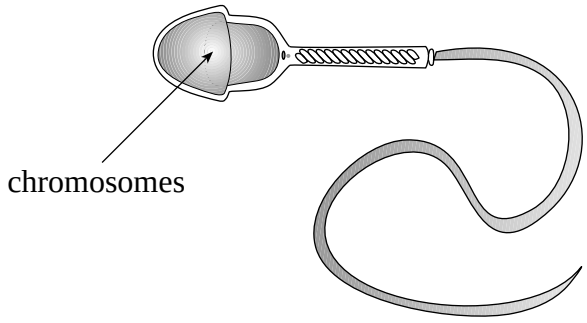
smallest **myosin**
sarcomere
myofibril
largest **muscle fibre**

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	
syphilis		
urethra	a) promotes spermatogenesis	**FSH**
LH	b) conducts sperm	**urethra**
FSH	c) produces sex hormones	**ovary**
in vitro fertilization	d) promotes development of corpus luteum	**LH**
chlamydia	e) symptoms include vaginal or urethral discharge	**chlamydia**
implantation	f) zygote embeds into endometrial lining	**implantation**
ovary		

2. Draw a mature sperm and identify the location of the chromosomes it carries.
(2 marks: one mark for drawing and one mark for location of chromosome)



3. Give **two** physiological changes that cause the erection of the penis. **(2 marks)**

- **The parasympathetic nerve messages induce erection.**
- **Veins in the erectile tissue become compressed.**
- **Arteriole dilation.**

any two for 1 mark each

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	
interphase		
cytokinesis	a) a viral transfer of bacterial DNA between cells	**transduction**
Turner's syndrome	b) a way to check for fetal genetic defects	**amniocentesis**
restriction enzyme	c) period between cell divisions	**interphase**
amniocentesis	d) cell fission	**cytokinesis**
Down's syndrome	e) results from an extra 21st chromosome	**Down's syndrome**
metaphase	f) used to "cut up" viral DNA	**restriction enzymes**
transduction		

2. Describe the function of the following in mitosis. **(2 marks: 1 mark each)**

   a) Spindle fibres

- **They are the point of attachment of chromosomes during mitosis.**
- **They pull the chromosomes toward the poles.**

} **any one for 1 mark**

   b) Centromere

- **They connect chromatids together**
- **They connect chromatids to spindle fibers**

} **any one for 1 mark**

3. Distinguish between *conjugation* and *transformation*. **(2 marks)**

- **In conjugation, the donor bacterium passes DNA to another bacterium.**
- **In transformation, bacteria take up DNA from dead bacteria.**

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	
helper T cell		
chemotherapy	a) spreading of cancer cells	**metastasis**
sarcoma	b) cancer of connective tissues	**sarcomas**
metastasis	c) a surgical treatment for cervical cancer	**hysterectomy**
enhancer	d) skin cancers are an example of this	**carcinoma**
carcinoma	e) a gene which regulates the activity of an oncogene	**enhancer**
hysterectomy	f) use of drugs to treat cancer	**chemotherapy**
interferon		

2. List **two** ways in which a proto-oncogene can be transformed into an oncogene. **(2 marks: 1 mark each)**

- **radiation**
- **chemicals**
- **viruses**
- **adding an enhancer**

} **any two for 1 mark each**

3. Distinguish between an *initiator* and a *promotor* in cancer development. **(2 marks)**

- **Initiators are generally mutagens which change the genetic makeup of the cell.**
- **Promotors speed up the expression of these changes.**

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. **(6marks)**

COLUMN A	COLUMN B	
ossicles		
ciliary muscle	a) controls the shape of the lens	**ciliary muscle**
iris	b) stimulated by dim light	**rods or iris**
chemoreceptor	c) amplify sound vibrations	**ossicles**
semi-circular canals	d) opening in the centre of the eye	**pupil**
rods	e) determine dynamic equilibrium	**semi-circular canals**
organ of Corti	f) has hair cells that determine pitch	**organ of Corti**
pupil		

2. Describe the changes that would occur in the eye as the focus is changed from something close to something far away. **(2 marks)**

- **The ciliary muscle relaxes.**
- **The lens is flattened.**
- **The ligaments are under tension.**

} **any two for 1 mark**

3. State **one** characteristic of and **one** possible corrective measure for conduction deafness. **(2 marks: 1 mark each)**

Characteristic: **ossicles are fused together**

Corrective measure: **the use of a hearing aid**

END OF KEY