KEY AND SCORING GUIDE

BIOLOGY 12

PROVINCIAL EXAMINATION

JANUARY 1994

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KEY AND SCORING GUIDE

TOPICS			
CORE:	1.		Methods and Principles
	2.		Cells
	3.		Humans
OPTIONS:	4.	Section I:	Immunology
(Choose **TWO** of six)	5.	Section II:	Skeletal System and Muscles
	6.	Section III:	Reproduction and Embryology
	7.	Section IV:	Genetic Disorders and Engineering
	8.	Section V:	Cancer
	9.	Section VI:	Sensory Receptors

MULTIPLE-CHOICE

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

Multiple-choice total = 52

NOTE: Q = Question number; B = Box number; C = Cognitive level; T = Topic; S = Score
CGR = Curriculum Guide Reference, K- Keyed response

WRITTEN-RESPONSE

Q	B	C	T	S	CGR
1	1	U	2	4	IV A 2,B 1
2	2	U	2	4	III D 2, IV B 4,1
3	3	K	2	3	III E 1,2,3,4
4	4	U	2	3	VI C 1,3, D 1
5	5	K	3	2	VIII A 7
6	6	U	3	6	X A 1
7	7	K/U	3	6	XI H 1

Core written–response total = 28

OPTIONS – Score only 2 out of 6 boxes (sections) from box 9 to box 14.

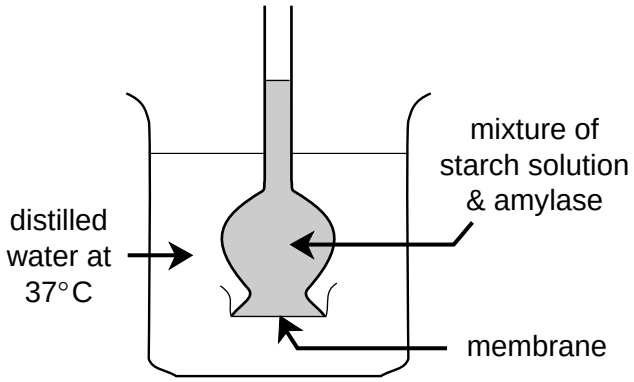
	Q	B	C	T	S	CGR
Section I	1 - 3	8	K/U	4	10	Option I
Section II	1 - 3	9	K/U	5	10	Option II
Section III	1 - 3	10	K/U	6	10	Option III
Section IV	1 - 3	11	K/U	7	10	Option IV
Section V	1 - 3	12	K/U	8	10	Option V
Section VI	1 - 3	13	K/U	9	10	Option VI

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

Multiple–choice total = 52 (52 questions)
Written–response total = 48 (5 questions and 2 option sections)
EXAM TOTAL = 100

PART B: WRITTEN-RESPONSE QUESTIONS (28 marks)

Use the following diagram to answer question 1.



1. A student set up the experiment illustrated above and kept it at 37°C. After five minutes, the distilled water in the beaker was tested and found to contain a sugar but no starch.

   a) What had occurred inside the tube? **(1 mark)**

- amylase has digested starch to a sugar

b) What statement can you make about the permeability of the membrane? **(1 mark)**

- membrane is selectively permeable to sugars but not to starch
- starch molecule is too large to pass through the membrane

} (**any one for 1 mark**)

c) An identical experiment was set up and kept at 5°C. After five minutes, how would the amount of sugar found in the water differ between the two beakers? Explain your answer. **(2 marks)**

- less sugar in beaker kept at 5°C than 37°C **(1 mark)**
- enzymes slow down in low temperatures **(1 mark)**
- arrangement and number of amino acids make different proteins **(2 marks)**

2. Explain any **TWO** of the following three phrases. Only your first two attempts will be marked. **(4 marks: 2 marks each)**

a) Many different proteins can be constructed from just a few different amino acids.

- difference in linear sequence **(1 mark)**
- different amino acids produce different proteins **(1 mark)**
- arrangement and number of amino acids make different proteins **(2 marks)**

} (**any comb. for 2 marks**)

b) Larger organisms are made of more cells, NOT bigger cells.

- as cell size increases, surface area to volume decreases **(2 marks)**

c) Mitochondria are the "power houses" of the cell.

- site of aerobic cellular respiration **(1 mark)**
- makes ATP **(1 mark)**

3. Give **ONE** role of each of the following RNA molecules in protein synthesis: **(3 marks: 1 mark each)**

a) mRNA:

- carries DNA code to site of protein synthesis

b) tRNA:

- carries amino acids to the site of protein synthesis

c) Ribosomes (rRNA):

- where amino acids are assembled into a new protein

4. State **ONE** role of each of the following in photosynthesis. **(3 marks: 1 mark each)**

a) Chlorophyll:

- absorbs light energy
- electron source/donates electrons/liberates excited electrons
- may receive lower energy electrons from photosystem II
- receives electrons from the photolysis of water

} **(any one for 1 mark)**

b) Water:

- electron source/donates electrons
- provides 2 H^+'s that will be used to reduce CO_2 to CH_2O

} **(any one for 1 mark)**

c) Stroma:

- site of enzymes for the dark reaction/Calvin Cycle/Calvin-Benson Cycle
- reduction of CO_2
- production of carbohydrate/ CH_2O/PGAL

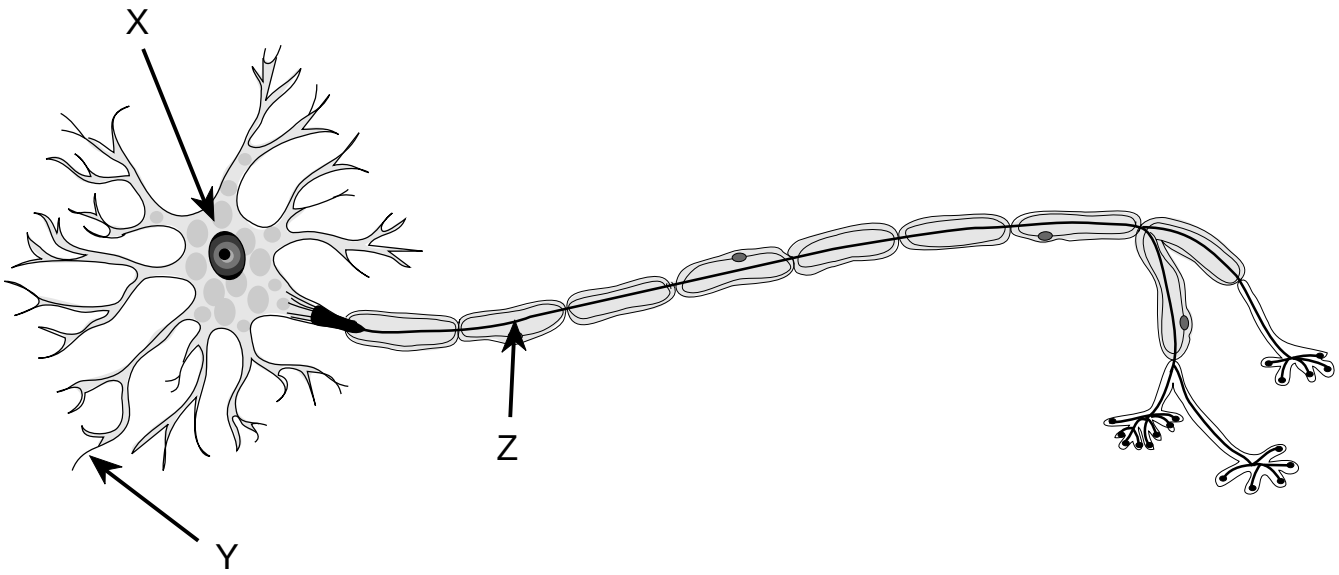
} **(any one for 1 mark)**

5. State **TWO** functions of the liver. **(2 marks: 1 mark each)**

- production of urea
- storage of glycogen
- production of blood proteins
- storage of vitamin B12
- destruction of old red blood cells
- detoxification of the blood
- production of bile

} **(any two for 1 mark each)**

Use the following diagram to answer question 6.



6. The above diagram is of a neuron. Name the parts labelled X, Y and Z and give **ONE** function of each.
(6 marks: 1 mark for name, 1 mark for function)

a) Part X:

Cell Body **(1 mark)**
- controls protein synthesis
- carry out cell metabolism
- continues impulse between dendrite and axons

} (**any one for 1 mark**)

b) Part Y:

Dendrite **(1 mark)**
- to receive nerve impulses
- to start new nerve impulses
- to transmit nerve impulses towards the cell body
- receptor sites for neurotransmitters

} (**any one for 1 mark**)

c) Part Z:

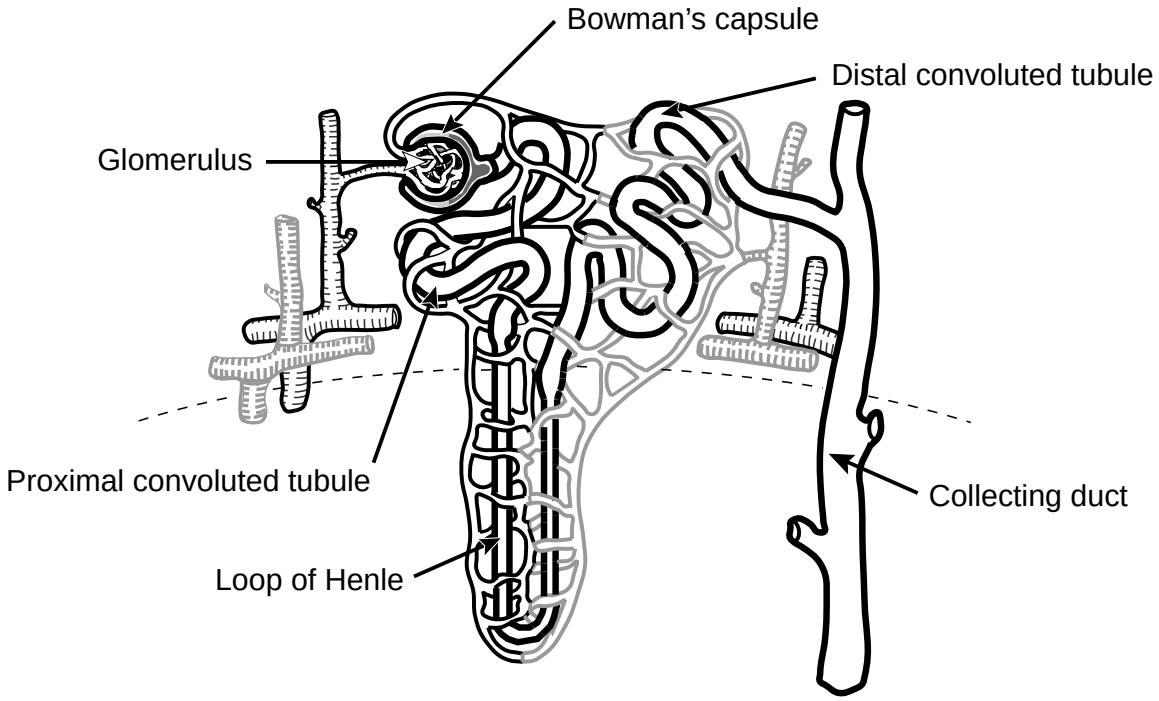
Axon **(1 mark)**
- conducts impulses away from cell body
- transmits impulses to next neuron or effector

} (**any one for 1 mark**)

Use the following list to answer question 7.

Proximal tubule
Loop of Henle
Distal tubule
Bowman's capsule
Collecting duct
Glomerulus

7. a) Label the structures indicated on the following diagram using the terms given above.
(3 marks: $\frac{1}{2}$ mark each)



b) Give **ONE** role of each of the following in the production of urine. **(3 marks: 1 mark each)**

i) Glomerulus:

- pressure filtration of plasma contents (except for proteins) into nephron

ii) Proximal tubule:

- selective reabsorption
- reabsorption of water
- active transport of sugars

} (**any one for 1 mark**)

iii) Distal tubule:

- pH regulation
- secretion of histamines, penicillin, ammonia, H^+, bicarbonate
- reabsorption of water
- tubular excretion (augmentation)

} (**any one for 1 mark**)

PART C: OPTIONAL AREAS (20 marks)

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
B cells	a) foreign substances in the body _____
killer (cytotoxic) T cells	b) results from an overactive immune system _____
passive immunity	c) blow up cells infected with virus _____
active immunity	d) engulf foreign substances _____
allergy	e) memory cells are responsible for _____
macrophages	f) plasma cells that release antibodies _____
antibodies	
antigens	

a) antigens
b) allergy
c) killer T cell
d) macrophages
e) active immunity
f) B cells

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

- vaccine introduces antigen which stimulates production of specific antibodies **(1 mark)**
- memory cells produced which release antibody during secondary immune response **(1 mark)**

3. a) Which virus causes AIDS? **(1 mark)**

- HIV

b) How does this virus destroy the body's immune system? **(1 mark)**

- attacks Helper T cells that regulate other cells in the immune system

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	
appendicular skeleton	a) supports and protects the organs of the head, neck and trunk	_____
cardiac muscle	b) has a matrix composed of calcium salts	_____
sarcolemma	c) the membrane of a muscle cell	_____
axial skeleton	d) provides increased flexibility between vertebrae	_____
bone	e) composed of striated, branched cells	_____
scoliosis	f) abnormal curvature of the spine	_____
slightly-movable joint		
sarcomere		

a) axial skeleton
b) bone
c) sarcolemma
d) slightly-movable joint
e) cardiac muscle
f) scoliosis

2. Give the function of the following. **(2 marks: 1 mark each)**

a) Tendons:

- join muscle to bone
- holds joints together

} **(any one for 1 mark)**

b) Ligaments:

- join bone to bone
- allows muscle to move bone

} **(any one for 1 mark)**

3. Explain the relationship between ATP and myosin. **(2 marks)**

- myosin acts as an ATPase
  this breaks actomyosin cross-bridges
  and allows reattachment further along

} **(any two for 1 mark each)**

OPTION III: REPRODUCTION & 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
prostate gland	a) produce sperm and testosterone _____
oviduct	b) provides energy for movement _____
vasectomy	c) usual site of fertilization _____
testes	d) cutting and tying of the ductus deferens on each side _____
morphogenesis	e) a hollow ball of cells _____
fertilization	f) movement of cells and tissues to establish an organism's shape _____
mid-piece of sperm	
blastula	

a) testes
b) mid-piece of sperm
c) oviducts
d) vasectomy
e) blastula
f) morphogenesis

2. Name the source and target of luteinizing hormone (LH) in the female. **(2 marks: 1 mark each)**

Source: anterior pituitary **(1 mark)**

Target: ovary
corpus luteum
follicle
} (**any one for 1 mark**)

Target: ovary **(1 mark)**

3. a) List **TWO** characteristics of the endometrium of the uterus during the second half of the menstrual cycle. **(1 mark: $\frac{1}{2}$ mark each)**

- doubles in thickness
- secretory
- vascularization
} (**any two for $\frac{1}{2}$ mark each**)

b) Name the hormone responsible for these characteristics. **(1 mark)**

- progesterone

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 vector plasmid protoplast conjugation transduction ligase clone	a) introduces recombinant DNA into a human host cell _____ b) attaches foreign DNA to host DNA _____ c) transfer of DNA by viruses _____ d) product of plant cell wall removal _____ e) when division of cytoplasm occurs _____ f) genetically identical to parent cell _____

a) vector
b) ligase
c) transduction
d) protoplast
e) telophase
f) clone

2. Give **ONE** function of each of the following in biotechnology. **(2 marks: 1 mark each)**

a) Plasmid:

- used as vectors
- used to carry DNA fragments to host cell
- act as a recipient for foreign DNA

} **(any one for 1 mark)**

b) Restriction enzymes:

- cut the DNA into specific pieces
- cleave DNA at a specific site

} **(any one for 1 mark)**

3. State **TWO** uses of recombinant DNA. **(2 marks)**

- DNA probes
- vaccines
- pollution clean-up
- improving crops
- mineral processing
- gene therapy

} **(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
anaplasia initiator promoter metastasis sarcoma carcinoma interleukin vascularization	a) increased blood supply to tumour site _____ b) converts proto-oncogene into oncogene _____ c) spreading cancer cells to different organs _____ d) boosts the immune system's activity _____ e) disorganized growth of cells _____ f) cancers of epithelial tissues _____

a) vascularization
b) initiator
c) metastasis
d) interleukin
e) anaplasia
f) carcinoma

2. Give the role of the following cells in fighting cancer. **(2 marks: 1 mark each)**

a) Macrophage:

- key engulfs cancerous cells **(1 mark)**

b) B cells:

- release antibodies that attach to cancer cells **(1 mark)**

3. Give **ONE** symptom or danger sign for each of the following cancers. **(2 marks: $\frac{1}{2}$ mark each)**

a) Breast:

- lump in breast **($\frac{1}{2}$ mark)**

b) Lung:

- persistent cough **($\frac{1}{2}$ mark)**

c) Colon:

- blood in stool **($\frac{1}{2}$ mark)**

d) Skin:

- change in mole **($\frac{1}{2}$ 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	
radioreceptors mechanoreceptors rods cones iris ampulla saccules ciliary body	a) base of a semicircular canal	_____
	b) secretes aqueous humour	_____
	c) active in bright light	_____
	d) regulates diameter of pupil	_____
	e) respond to displacement of tissue	_____
	f) contain rhodopsin	_____

a) ampulla
b) ciliary body
c) cones
d) iris
e) mechanoreceptors
f) rods

2. State **ONE** characteristic of and **ONE** possible corrective measure for cataracts. **(2 marks: 1 mark each)**

Characteristic: lens becomes cloudy and opaque and unable to transmit light rays **(1 mark)**
Corrective measure: removal of lens and implantation of intraocular lens attached to iris **(1 mark)**

3. Give **TWO** functions of the ossicles in the ear.. **(2 marks: 1 mark each)**

- to transmit sound waves from the outer ear to the inner ear **(1 mark)**
- to magnify the sound waves **(1 mark)**