

XX0

**WRITTEN RESPONSE
SCORING GUIDE**

**BIOLOGY 12
PROVINCIAL EXAMINATION
JUNE 1995**



**Province of
British Columbia**

Ministry of Education

**JUNE 1995 BIOLOGY 12 PROVINCIAL EXAMINATION
KEY AND SCORING GUIDE**

PART B: WRITTEN-RESPONSE (28 marks)

- 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. Living animal cells are added to a solution containing oxygen, carbon dioxide, amino acids and glucose. After four hours, the solution surrounding the cells is sampled and the concentration of each substance is measured.
 - a) Predict the change in the concentrations of carbon dioxide and glucose in the solution surrounding the cells. **(2 marks: 1 mark each)**

Carbon Dioxide • **Increase 1 mark**

Glucose • **Decrease 1 mark**

- b) Using your knowledge of membrane structure, explain the mechanisms that account for these changes in carbon dioxide and glucose concentration. **(4 marks: 2 marks each)**

Carbon Dioxide

- **Diffusion** **1 mark**
- **CO₂ dissolves in water to move through a protein pore** **1 mark**

Glucose

- **Facilitated Transport** **1 mark** or • **Active Transport** **1 mark**
 - **Glucose is carried by a protein carrier through the membrane** **1 mark**
 - **Glucose is moved by a protein carrier using ATP** **1 mark**

2. Complete the following table using your knowledge of biological molecules. (4 marks: $\frac{1}{2}$ mark each box)

| BIOLOGICAL MOLECULE | UNIT MOLECULE (Building Block) | EXAMPLE OF BIOLOGICAL MOLECULE |
|---------------------|--------------------------------|--------------------------------|
| nucleic acid | • nucleotide | • DNA, RNA |
| • protein | • amino acids | enzyme |
| • polysaccharide | • simple sugar | glycogen |
| • neutral fat | fatty acid and glycerol | • butter |

3. Summarize anaerobic respiration with respect to the following: (3 marks: 1 mark each)

a) Net number of ATP produced per glucose.

- 2 ATP 1 mark

b) Name a product in addition to ATP.

- lactic acid
 - CO₂
 - alcohol
- } any one for 1 mark

c) Location of reaction(s) in the cell.

- in the cytoplasm
 - outside of the mitochondria
- } any one for 1 mark

4. Describe white and red blood cells with respect to the following.

(4 marks)

White blood cells

- | | | |
|--|-----------------------------|---------------|
| i) Site of production: | • Bone marrow | 1 mark |
| ii) Brief description of shape: | • Amoeboid/Irregular | 1 mark |

Red blood cells

- | | | |
|---|---|---------------|
| iii) Brief description of shape: | • Biconcave | 1 mark |
| iv) Function: | • Transports oxygen and carbon dioxide | 1 mark |

Use the following diagram to answer question 5.



5. Identify and state **one** function of each part of the brain labelled W, X, Y and Z.
(6 marks: $\frac{1}{2}$ mark each for identification and 1 mark each for function)

- | | | |
|------------------|---|----------------------|
| Part W: | <ul style="list-style-type: none"> • hypothalamus | $\frac{1}{2}$ mark |
| Function: | <ul style="list-style-type: none"> • maintains homeostasis • controls pituitary gland • controls for example, hunger, thirst, body temperature, water balance, and blood pressure • produces ADH • produces oxytocin | } any one for 1 mark |
| Part X: | <ul style="list-style-type: none"> • medulla oblongata | $\frac{1}{2}$ mark |
| Function: | <ul style="list-style-type: none"> • controls heart rate, breathing, vasoconstriction (blood pressure) | 1 mark |
| Part Y: | <ul style="list-style-type: none"> • corpus callosum | $\frac{1}{2}$ mark |
| Function: | <ul style="list-style-type: none"> • allows both cerebral hemispheres to share or exchange information | 1 mark |
| Part Z: | <ul style="list-style-type: none"> • cerebellum | $\frac{1}{2}$ mark |
| Function: | <ul style="list-style-type: none"> • controls muscle coordination • maintains muscle tone (balance) • maintains posture | } any one for 1 mark |

6. Complete the following table for hormones secreted by the anterior pituitary.
(5 marks: 1 mark each)

| HORMONE SECRETED | TARGET ORGAN | PRIMARY ACTION |
|--|------------------|---|
| • TSH | thyroid | • stimulates thyroid to release thyroxin |
| • FSH (folicle stimulating hormone) | ovaries | • stimulates follicle development |
| ACTH (adrenocorticotrophic hormone) | • adrenal cortex | stimulates target organ to produce cortisol |

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. **(6 marks)**

| COLUMN A | COLUMN B |
|------------------|---|
| interferon | |
| booster shot | a) obtaining antibodies from breast milk • passive immunity |
| lymphocyte | b) antibodies which react against own tissue • autoimmune |
| autoimmune | c) B or T cell • lymphocytes |
| neutrophil | d) monocyte that has swollen to 5 or 10 times its normal size • macrophages |
| macrophage | e) long lasting immunity to disease • active immunity |
| active immunity | f) second of two vaccine injections which raises antibody titer to high levels • booster shot |
| passive immunity | |

2. Describe **one** cause of organ rejection and **one** way that it can be controlled. **(2 marks)**

- **An organ may be rejected due to MHC incompatibility.** **1 mark**
 - **By carefully selecting the transplanted organ; that is to say, it should have the same kind of MHC proteins.** **1 mark**
- or**
- **The organ may also be rejected by active immunity against transplanted organ.** **1 mark**
 - **By using an immunosuppressive drug such as cyclosporine which suppresses cell-mediated immunity.** **1 mark**

3. Describe where in the body interferon is produced and how it is used in immune therapy. **(2 marks)**

- **It is produced in leukocytes, fibroblasts, and most cells.** **1 mark**
- **It is injected which results in viral replication being interfered with.** **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 |
|-----------------------|--|
| osteoporosis | |
| tendon | a) contains blood-producing tissue <u>• spongy bone</u> |
| spongy bone | b) bacterial infection of bone <u>• osteomyelitis</u> |
| sarcolemma | c) suture of the skull <u>• immovable joint</u> |
| appendicular skeleton | d) membrane surrounding the muscle fibre <u>• sarcolemma</u> |
| osteomyelitis | e) joins bone to muscle <u>• tendon</u> |
| immovable joint | f) cylindrical contractile portion of a muscle fibre <u>• myofibril</u> |
| myofibril | |

2. For each of the following, give **one** way the vertebral column is designed to provide

a) flexibility. **(1 mark)**

- **It is made up of multiple bones.**

b) resistance to shock. **(1 mark)**

- **There are discs between the vertebrae.**
- **S-curve of the spine**

3. Complete this chart comparing types of muscle. **(2 marks: $\frac{1}{2}$ mark each)**

| | | | |
|-----------------|-------------------|----------------------|-----------------------|
| Smooth muscle | internal organs | involuntary | • non-striated |
| Cardiac muscle | • heart | • involuntary | striated |
| Skeletal muscle | attached to bones | voluntary | • striated |

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 glands |
| acrosome | c) secreted by the follicle • estrogen |
| spermatogenesis | d) developmental stage with three cell layers • gastrula |
| Cowper's gland | e) contains enzymes for penetration of the egg • acrosome |
| gastrula | f) site of egg production • ovary |
| ovary | |

2. List **two** effects of testosterone on the body. **(2 marks: 1 mark each)**

- | | | |
|--|---|------------------------------------|
| <ul style="list-style-type: none"> • deeper voice • increased height • facial hair • wider shoulders • increased body hair • increased oil gland activity • testes growth • penis growth | } | <p>any two for 1 mark each</p> |
|--|---|------------------------------------|

3. Describe the location and function of the cervix. **(2 marks: 1 mark each)**

Location: • At the opening to the uterus at the top of the vagina. **1 mark**

Function: • It provides a passage-way for sperm moving towards the egg.
 • It holds the fetus and amniotic sac in the uterus.
 • It provides an opening through which menses are shed. } 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 |
|-----------------|---|
| transformation | |
| plasmid | a) allows physicians to diagnose genetic diseases |
| <i>E. coli</i> | b) plant cell lacking cell wall |
| vector | c) causes DNA fragments to bind together |
| protoplast | d) the result of joining DNA fragments |
| DNA probe | e) ring of DNA removed from a bacterium |
| recombinant DNA | f) changes the genetic makeup of the cell |
| ligase | |

2. Describe the process and purpose of amniocentesis. **(2 marks)**

- **A long needle is passed through the abdominal wall and amniotic fluid is removed.** **1 mark**
- **Extracted fetal cells are cultured and checked for genetic defects.** **1 mark**

3. List **two** physical characteristics of individuals with:

a) Turner's syndrome. **(1 mark: $\frac{1}{2}$ mark for each characteristic)**

- **short and broad chested**
 - **heart defects**
 - **non-functional ovaries**
 - **no menstruation**
 - **little breast development**
- } **any two for $\frac{1}{2}$ mark each**

b) Down's syndrome.

(1 mark: $\frac{1}{2}$ mark for each characteristic)

- **short stature**
- **fold in eyelids**
- **stubby fingers**
- **large tongue**
- **mental retardation**

} any two for
 $\frac{1}{2}$ 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 |
|------------|---|
| oncogene | |
| macrophage | a) a compound which changes DNA <u>• initiator</u> |
| initiator | b) new growth of non-differentiating cells <u>• neoplasia</u> |
| neoplasia | c) describes a tumour which does not spread <u>• benign</u> |
| anaplasia | d) epithelial cancer <u>• carcinoma</u> |
| metastasis | e) spreading of cancer cells throughout the body <u>• metastasis</u> |
| benign | f) a body defence against cancer cells <u>• macrophage</u> |
| carcinoma | |

2. Describe how the lymphatic system

a) helps the spread of cancer. **(1 mark)**

- **It travels slowly to all areas of the body.**
 - **Metastasis can occur within the lymph vessels.**
- } any one for
1 mark

b) hinders the spread of cancer. **(1 mark)**

- **Lymphocytes are one of the body's defences against cancer cells.**
 - **Lymph nodes act as filter.**
- } any one for
1 mark

3. List **two** common treatments for cancer. **(2 marks: 1 mark each)**

- **chemotherapy**
 - **radiation therapy**
 - **surgery**
- } 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 |
|----------------|--|
| vestibule | |
| chemoreceptor | a) responds to tastes or smells <u>• chemoreceptor</u> |
| ciliary body | b) area responsible for detailed vision <u>• fovea</u> |
| organ of Corti | c) location of receptors for static equilibrium <u>• vestibule</u> |
| radioreceptor | d) controls shape of the lens <u>• ciliary body</u> |
| fovea | e) carries impulses from the ear to the brain <u>• auditory nerve</u> |
| auditory nerve | f) has hair cells that determine pitch <u>• organ of Corti</u> |
| retina | |

2. Describe the role of the semicircular canals in maintaining balance. **(2 marks)**

• When the body is moving, fluid in the canals moves back and forth causing bending of the cilia attached to the hair cells within the ampullae. They then initiate nerve impulses that are sent to the brain. **2 marks**

3. Describe **one** role of each of the following in vision. **(2 marks: 1 mark each)**

a) Rods:

- black and white vision
 - vision in dim light
- } any one for 1 mark

b) Cones:

- colour vision
 - sharp images
- } any one for 1 mark

END OF KEY