

**NOVEMBER 1995 BIOLOGY 12 PROVINCIAL EXAMINATION  
ANSWER KEY / SCORING GUIDE**

**TOPICS**

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

**PART B: WRITTEN-RESPONSE**

| <b>Q</b> | <b>B</b> | <b>C</b> | <b>T</b> | <b>S</b> | <b>CGR</b>     |
|----------|----------|----------|----------|----------|----------------|
| 1.       | 1        | H        | 2        | 4        | V B 1, 2, 3, 5 |
| 2.       | 2        | K        | 2        | 3        | III D 1, E 1   |
| 3.       | 3        | U        | 2        | 7        | V C 1          |
| 4.       | 4        | K        | 3        | 4        | VIII A 2       |
| 5.       | 5        | U        | 4        | 3        | IX A 1, 3      |
| 6.       | 6        | U        | 4        | 4        | XI H 1         |
| 7.       | 7        | U        | 4        | 3        | XII B 3, C 1   |

**Core written-response total = 28 marks**

**PART C: OPTIONS —Score only 2 out of 6 boxes (sections) from box 8 to box 13.**

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

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

Multiple-choice = 52 (52 questions)

Written-response = 48 (7 questions and 2 option sections)

**Total = 100 marks**

**LEGEND:**

**Q** = Question

**C** = Cognitive level

**T** = Topic

**K** = Keyed response

**S** = Score

**CGR** = Curriculum Guide Reference

**B** = Score Box Number

## PART B: WRITTEN-RESPONSE

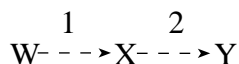
Value: 28 marks

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. An experiment investigating enzyme activity was carried out. A test tube was prepared containing substrate solution **W** and enzyme solutions **1** and **2**.

The reactions that occur in the test tube are summarized below:



The letters represent substrates and products and the numbers represent enzymes.

- a) State **two** ways to increase the rate of production of product **Y**. **(2 marks)**

- **Increase the temperature.**
  - **Add more of enzymes 1 and 2.**
  - **Alter the pH to achieve optimum conditions for reaction.**
- } any two for  
1 mark each

- b) A substance is added to the test tube containing substrate **W**. As a result, no product is formed. Suggest what this substance may be and explain how it achieves these results. **(2 marks)**

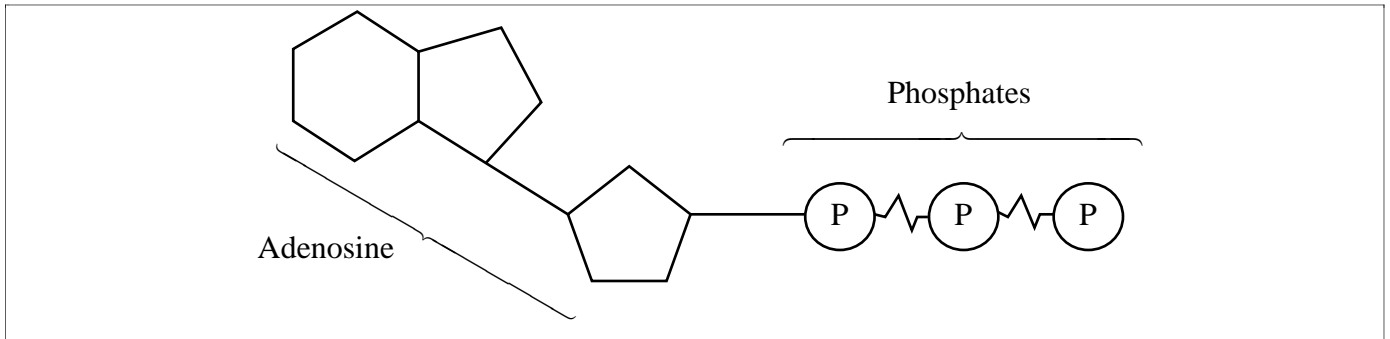
- **A heavy metal – Hg, Pb, etc.** **1 mark**
  - **A heavy metal denatures the enzymes.** **1 mark**
- OR**
- **An acid or a base is added to alter the pH.** **1 mark**
  - **This denaturates the enzymes.** **1 mark**
- OR**
- **An inhibitor.** **1 mark**
  - **It competes with the substrate for the active site on the enzyme.** **1 mark**

2. Complete the following table using your knowledge of nucleic acids.

**(3 marks: 1 mark each box)**

| Characteristic of Molecule    | Kind of Nucleic Acid        |
|-------------------------------|-----------------------------|
| found in the chromosomes      | <b>DNA</b>                  |
| single-stranded structure     | <b>rRNA or tRNA or mRNA</b> |
| acts as an amino acid carrier | <b>tRNA</b>                 |

Use the following diagram to answer question 3.



3. The diagram above represents a molecule found in all living cells.

a) Name **one** metabolic process in animal cells that produces the above molecule. **(1 mark)**

- **cellular respiration**

b) Name a photosynthetic process whereby this molecule is produced and another photosynthetic process where it is used. **(2 marks)**

- **Produced:** Cyclic and non-cyclic photophosphorylation.
- **Used:** Calvin Cycle or reduction of  $\text{CO}_2$ .

c) What occurs if **one** phosphate is removed? Why? **(2 marks)**

- **Energy is released (1 mark)**  
**because a high energy bond is broken. (1 mark)**

d) Name **two** cellular functions that require the above molecule. **(2 marks)**

- **synthetic reactions**
  - **active transport**
  - **nervous conduction**
  - **muscle contraction**
- } any two for  
1 mark each

4. Give **one** function for each of the following components of the digestive system.  
(4 marks: 1 mark each)

a) Colon:

- **It absorbs vitamins.**
  - **It absorbs water from undigested remains.**
- } any one for  
1 mark

b) Gall bladder:

- **It stores and concentrates bile from the liver.**

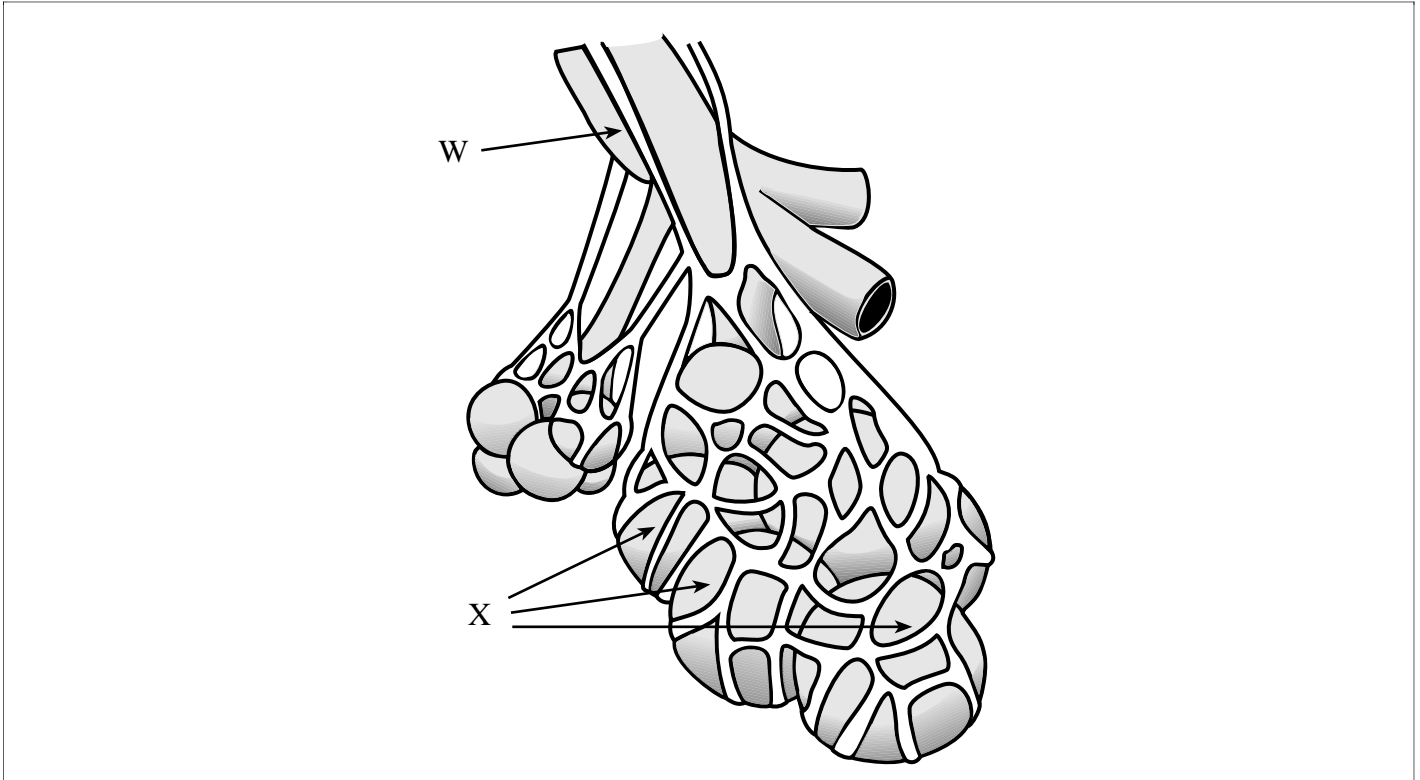
c) Esophagus:

- **It moves food from the mouth to the stomach.**

d) Cardiac sphincter:

- **It prevents food from moving up into the esophagus from the stomach.**

Use the following diagram to answer question 5.



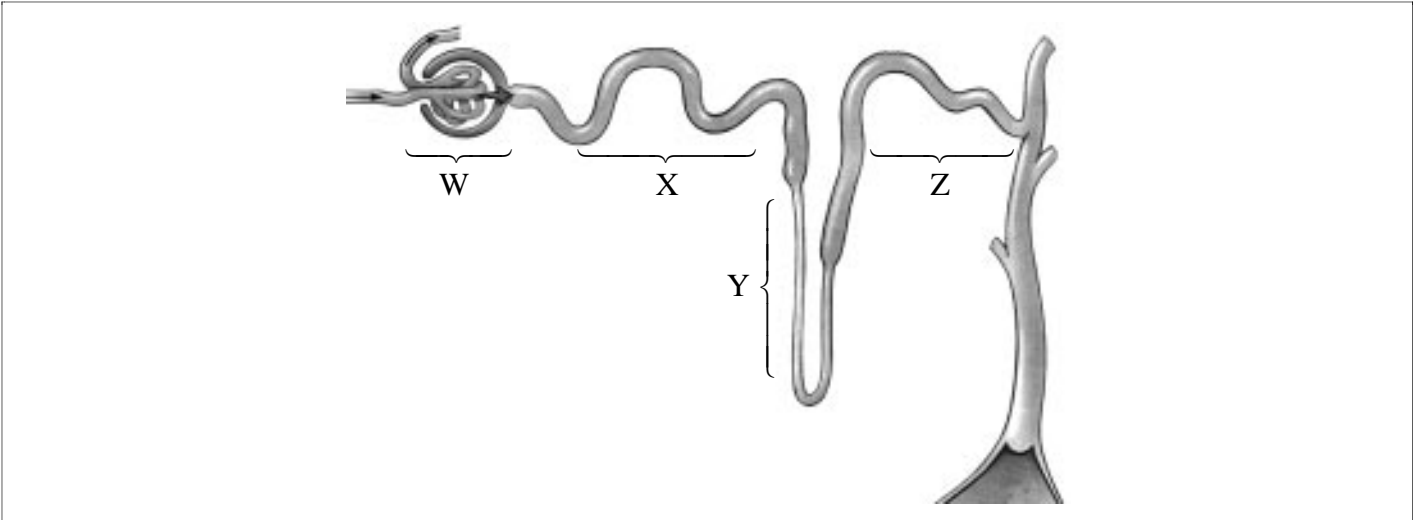
5. a) In the above diagram, structure **W** is a bronchiole. Name structure **X**. **(1 mark)**

- **alveoli**

b) Describe **two** processes that occur at structure **X**. **(2 marks)**

- **Oxygen diffuses into the blood.**
- **Carbon dioxide diffuses out of the blood.**

Use the following diagram to answer question 6.



6. Briefly describe the process that occurs in each of the areas indicated on the above diagram of a nephron. **(4 marks: 1 mark each)**

a) Area W:

- **pressure filtration of the blood**

b) Area X:

- **selective reabsorption of nutrients.**

c) Area Y:

- **reabsorption of water**

d) Area Z:

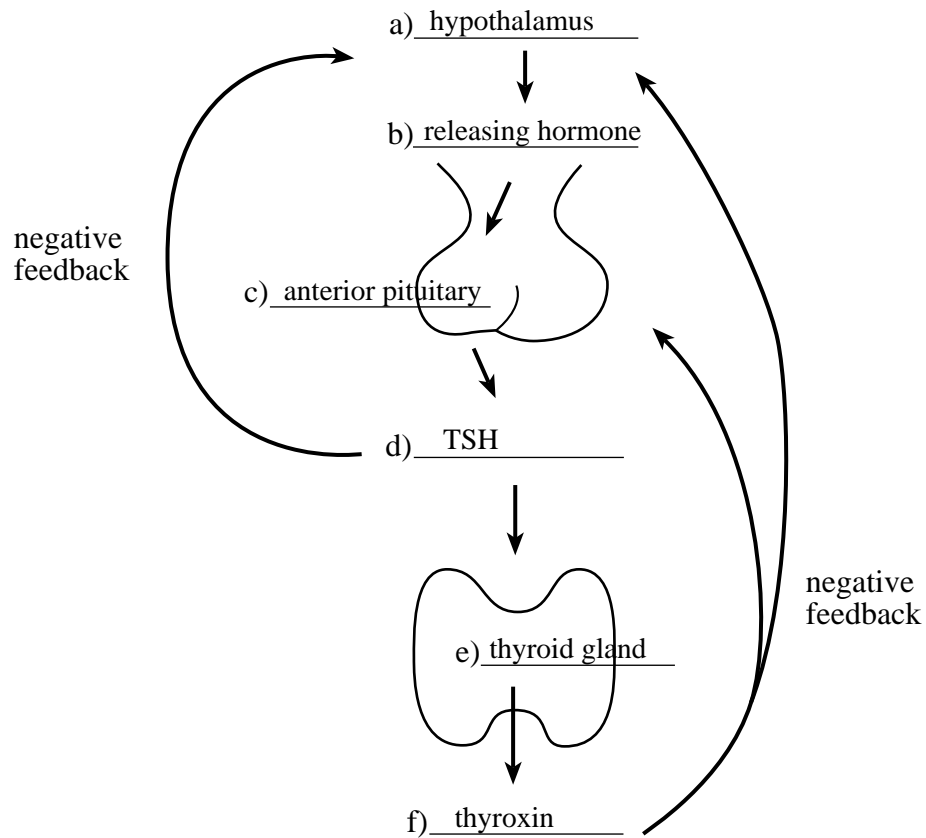
- **tubular excretion**
- **reabsorption of water**



Use the following information to answer question 7.

thyroid gland  
thyroxin  
thyroid-stimulating hormone (TSH)  
hypothalamus  
releasing hormone  
anterior pituitary

7. Label this diagram of a feedback loop by placing the above terms in to the blanks provided.  
Each term may be used **only** once. (3 marks:  $\frac{1}{2}$  mark each)



## PART C: OPTIONAL AREAS

Value: 20 marks

Suggested Time: 30 minutes

- INSTRUCTIONS:**
1. Select **two** sections from the optional areas in this part of the examination.
  2. Answer **all** of the questions in each option area that you choose.
  3. If you answer questions in more than two option areas, only the **first two** areas 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   |
|-----------------|--|
| antigen         |  |
| B cell          | a) second exposure to a vaccine <span style="float: right;"><u>booster shot</u></span>             |
| allergy         | b) cell which produces antibodies <span style="float: right;"><u>B cell</u></span>                 |
| interferon      | c) protein molecule which is foreign to the body <span style="float: right;"><u>antigen</u></span> |
| active immunity | d) sometimes used as a cancer treatment <span style="float: right;"><u>interferon</u></span>       |
| T cell          | e) the result of an over-active immune system <span style="float: right;"><u>allergy</u></span>    |
| antibody        | f) forms complexes with antigens <span style="float: right;"><u>antibody</u></span>                |
| booster shot    |  |

2. Describe **one** function of (2 marks: 1 mark each)

- Suggest 1 mark for any valid difference regarding the structure, origin or function of B and T cells. For example:

|                 | B Cells   | T Cells  |
|-----------------|---|--|
| <b>Function</b> | <ul style="list-style-type: none"> <li>• become plasma cells and produce/release antibodies</li> <li>• become memory cells for active immunity</li> </ul> | <ul style="list-style-type: none"> <li>• cytotoxic T cells destroy foreign or infected cells by lysing them</li> <li>• helper T cells activate cytotoxic T cells and B cells</li> <li>• suppressor T cells shut down response</li> </ul> |

3. Define the following terms and give **one** way in which each may be acquired. (2 marks)

a) Active immunity:

- Active immunity means long-term immunity due to the presence of antibodies and memory cells in the blood.  $\frac{1}{2}$  mark
- It may be acquired through infection by disease-causing organisms.
- It may be acquired by vaccination. } any one for  $\frac{1}{2}$  mark

b) Passive immunity:

- Passive immunity results when antibodies are given to the individual.  $\frac{1}{2}$  mark
- It may be acquired through a serum injection.
- It may be acquired through breast feeding. } any one for  $\frac{1}{2}$  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  |
|-----------------------|---|
| cardiac muscle        |   |
| osteomyelitis         | a) thick contractile filament <u>myosin</u>                                   |
| sarcomere             | b) striated and involuntary tissue <u>cardiac muscle</u>                      |
| actin                 | c) connective tissue with poor blood supply <u>cartilage</u>                  |
| myosin                | d) weak and thin bones <u>osteoporosis</u>                                    |
| cartilage             | e) provides mobility and strength <u>appendicular skeleton</u>                |
| osteoporosis          | f) myofibril contractile unit composed of two major proteins <u>sarcomere</u> |
| appendicular skeleton |   |

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

a) Compact bone:

- **strength**
- **storage of calcium**
- **storage of phosphate**

} **any one for 1 mark**

b) Haversian canals:

- **passageway for nerves**
- **passageway for blood vessels**

} **any one for 1 mark**

3. Explain how myosin cross-bridges act to bring about muscle contraction. **(2 marks)**

- **The myosin cross-bridges attach to actin filaments, pulling them along. (1 mark)**
- **The myosin acts as an ATPase causing detachment and reattachment further along actin. (1 mark)**

**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  |
|----------------|---|
| testis         |   |
| diaphragm      | a) hollow ball of cells <span style="float: right;"><u>blastula</u></span>                                  |
| blastula       | b) oviducts are cut and tied <span style="float: right;"><u>tubal ligation</u></span>                       |
| gastrula       | c) produces sex hormones <span style="float: right;"><u>testis</u></span>                                   |
| vasectomy      | d) a plastic or rubber cup inserted to cover the cervix <span style="float: right;"><u>diaphragm</u></span> |
| estrogen       | e) an embryo with three germ layers <span style="float: right;"><u>gastrula</u></span>                      |
| progesterone   | f) responsible for proliferation of endometrium <span style="float: right;"><u>progesterone</u></span>      |
| tubal ligation |   |

2. a) Define spermatogenesis. **(1 mark)**

- **It is the production of sperm.**

- b) Where in the testis does spermatogenesis occur? **(1 mark)**

- **It occurs in the seminiferous tubules.**

3. Give **one** function for each of the following hormones. **(2 marks: 1 mark each)**

**FSH (follicle stimulating hormone):**

- **matures follicles in female ovary.**
- **promotes spermatogenesis.**

**LH (lutenizing hormone):**

- **Promotes testosterone release in males.**
- **Promotes ovulation in females.**
- **Promotes the development of corpus luteum in ovaries.**

**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   |
|-------------------|--|
| prophase          |  |
| protoplast        | a) used to introduce recombinant DNA into a host cell <u>vector</u>  |
| vector            | b) exchange of DNA between living bacteria <u>conjugation</u>        |
| ligase            | c) plant cell prepared to take up plasmids <u>protoplast</u>         |
| Turner's syndrome | d) result of having only one sex chromosome <u>Turner's syndrome</u> |
| clone             | e) genetically identical to parent <u>clone</u>                      |
| conjugation       | f) joins DNA fragments together <u>ligase</u>                        |
| transformation    |  |

2. List **two** ways in which recombinant DNA technology might be used in human medical treatment. **(2 marks: 1 mark each)**

**Could be many. Suggest 1 mark each.**

- **It is useful in DNA probes.**
- **It is useful in making vaccines.**
- **It is useful in making hormones.**
- **It is useful in the treatment of genetic disorders.**

} **any two for  
1 mark each**

3. Explain the process of amniocentesis.

**(2 marks)**

- **Needle inserted through abdominal wall into uterus.**
- **Fluid withdrawn and cells are analyzed for abnormalities.**

**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   |
|-----------------|--|
| leukemia        |  |
| mammograph      | a) a portion of DNA which may cause cancer <u>          <b>oncogene</b>          </u>        |
| oncogene        | b) used to detect cervical cancer <u>          <b>pap smear</b>          </u>                |
| vascularization | c) describes a tumor which spreads <u>          <b>malignant</b>          </u>               |
| malignant       | d) cancer of blood tissue <u>          <b>leukemia</b>          </u>                         |
| benign          | e) controls the expression of mutated genes <u>          <b>promoter</b>          </u>       |
| pap smear       | f) branching of blood vessels into a tumor <u>          <b>vascularization</b>          </u> |
| promoter        |  |

2. List **four** danger signals that may indicate the presence of cancer. **(2 marks:  $\frac{1}{2}$  mark each)**

- **unusual bleeding or discharge**
- **a lump or thickening in the breast or elsewhere**
- **a sore that does not heal**
- **change in bowel or bladder habits**
- **persistent cough**
- **persistent indigestion**
- **change in wart or mole**

} **any four for  
 $\frac{1}{2}$  mark each**

3. Distinguish between the terms *neoplasia* and *anaplasia*. **(2 marks)**

- **New cell growth that has lost the ability to respond to normal controls is called neoplasia.**
- **Anaplasia is a type of disorganized growth involving undifferentiated cells.**

**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  |
|----------------|---|
| proprioceptor  |   |
| cone           | a) responds to heat flow <span style="float:right"><u>thermoreceptor</u></span>                   |
| optic nerve    | b) cell for colour vision <span style="float:right"><u>cone</u></span>                            |
| olfactory cell | c) responsible for sense of smell <span style="float:right"><u>olfactory cell</u></span>          |
| vestibule      | d) controls shape of the lens <span style="float:right"><u>ciliary body</u></span>                |
| rod            | e) carries impulses from the eye to the brain <span style="float:right"><u>optic nerve</u></span> |
| ciliary body   | f) sense position and movement of limbs <span style="float:right"><u>proprioceptor</u></span>     |
| thermoreceptor |   |

2. State **one** characteristic and **one** possible corrective measure for glaucoma. **(2 marks)**

**Characteristic:**      • **Drainage ducts for the fluid that make up the aqueous humor are blocked, pressure then builds up and compresses the nerve and eventually causes blindness.** **1 mark**

**Corrective measure:**      • **surgery to relieve pressure**  
**OR**                              • **eye drops to decrease aqueous humor production** } **any one for 1 mark**  
    • **see Merck Manual p. 2008-9** **1 mark**

3. Give **two** functions of the organ of Corti. **(2 marks: 1 mark each)**

**Could be many. Suggest 1 mark each.**

• **determines the pitch of a sound**  
 • **determines the volume of a sound** } **any one for 1 mark each**

**END OF KEY**