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**Biology 12**

**JUNE 2002**

**Course Code = BI**

### Student Instructions

1. Place the stickers with your Personal Education Number (PEN) in the allotted spaces above. **Under no circumstance is your name or identification, other than your Personal Education Number, to appear on this booklet.**
2. Ensure that in addition to this examination booklet, you have an **Examination Response Form**. Follow the directions on the front of the Response Form.
3. **Disqualification** from the examination will result if you bring books, paper, notes or unauthorized electronic devices into the examination room.
4. When instructed to open this booklet, **check the numbering of the pages** to ensure that they are numbered in sequence from page one to the last page, which is identified by **END OF EXAMINATION**.
5. At the end of the examination, place your Response Form inside the front cover of this booklet and return the booklet and your Response Form to the supervisor.

Question 1:

1.  .

(6)

Question 9:

9.  .

(7)

Question 2:

2.  .

(4)

Question 10:

10.  .

(3)

Question 3:

3.  .

(6)

Question 4:

4.  .

(6)

Question 5:

5.  .

(5)

Question 6:

6.  .

(3)

Question 7:

7.  .

(4)

Question 8:

8.  .

(6)

# **BIOLOGY 12**

**JUNE 2002**

COURSE CODE = BI

## GENERAL INSTRUCTIONS

1. Electronic devices, including dictionaries and pagers, are **not** permitted in the examination room.
2. All multiple-choice answers must be entered on the Response Form using an **HB pencil**. Multiple-choice answers entered in this examination booklet will **not** be marked.
3. For each of the written-response questions, write your answer in **ink** unless otherwise instructed in the space provided in this booklet.
4. Ensure that you use language and content appropriate to the purpose and audience of this examination. Failure to comply may result in your paper being awarded a zero.
5. This examination is designed to be completed in **two hours**. *Students may, however, take up to 30 minutes of additional time to finish.*

## BIOLOGY 12 PROVINCIAL EXAMINATION

|   | <b>Value</b>     | <b>Suggested<br/>Time</b> |
|---|------------------|---------------------------|
| 1. This examination consists of <b>two</b> parts: |                  |                           |
| PART A: 50 multiple-choice questions              | 50               | 45                        |
| PART B: 10 written-response questions             | 50               | 75                        |
|   | <b>Total:</b>    |                           |
|   | <b>100 marks</b> | <b>120 minutes</b>        |

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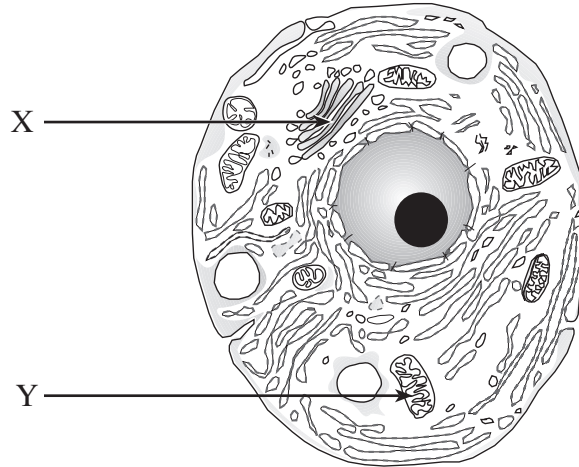
## PART A: MULTIPLE CHOICE

Value: 50 marks

Suggested Time: 45 minutes

**INSTRUCTIONS:** For each question, select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle that has the letter corresponding to your answer.

Use the following diagram to answer questions 1 and 2.

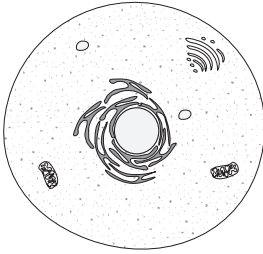


1. The structure labelled **X** is the
  - A. ribosome.
  - B. Golgi body.
  - C. mitochondrion.
  - D. endoplasmic reticulum.
  
2. The function of the structure labelled **Y** is
  - A. phagocytosis.
  - B. steroid synthesis.
  - C. cellular respiration.
  - D. selective re-absorption.

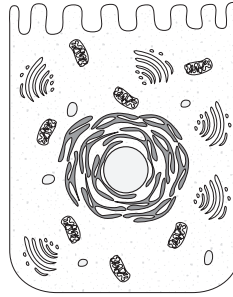
OVER

3. Which of the following cells of equal volume would be the most efficient at absorbing nutrients as well as synthesizing and secreting a product?

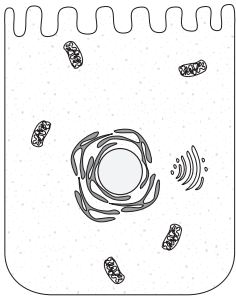
A.



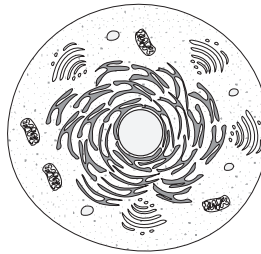
B.



C.



D.



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4. The products of reactions at the rough endoplasmic reticulum are transported in

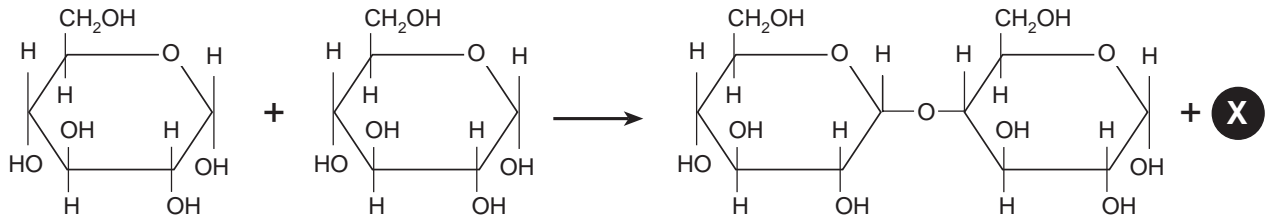
- A. cilia.
- B. vesicles.
- C. nucleoli.
- D. mitochondria.

5. Translation occurs at which of the following organelles?

- A. nucleus
- B. vacuole
- C. ribosome
- D. nucleolus



Use the following diagram to answer question 6.



6. In the reaction above, what is molecule **X**?
- A. water
  - B. an acid
  - C. glucose
  - D. an enzyme
- 
7. Which of the following refers to primary protein structure?
- A. the helical shape of the protein
  - B. the linear sequence of amino acids
  - C. several protein molecules joined together
  - D. the three-dimensional shape of the molecule
8. Which of the following is **not** a component of a nucleotide?
- A. sugar
  - B. phospholipid
  - C. phosphate group
  - D. nitrogenous base
9. Which of the following correctly describes the number of bases in DNA?
- A. Adenine equals cytosine.
  - B. Thymine equals guanine.
  - C. Adenine and thymine equal guanine and cytosine.
  - D. Adenine and cytosine equal thymine and guanine.

OVER

10. DNA from a wheat plant contains a gene that codes for the production of a bacterial enzyme. This is an example of
- A. initiation.
  - B. promotion.
  - C. transfer RNA.
  - D. recombinant DNA.

11. Which of the following correctly contrasts RNA and DNA?

|                     | RNA             | DNA                   |
|---------------------|-----------------|-----------------------|
| A. <b>sugar</b>     | deoxyribose     | ribose                |
| B. <b>structure</b> | single-stranded | double-stranded       |
| C. <b>location</b>  | cytoplasm       | nucleus and cytoplasm |
| D. <b>shape</b>     | helix           | linear                |

12. Which of the following is a characteristic of cancerous cells?

- A. flat shape
- B. undifferentiated
- C. large amount of cytoplasm
- D. increased contact inhibition

13. Which of the following provides more oxygen to cancer cells?

- A. metastasis
- B. promotion
- C. vascularization
- D. abnormal nuclei

14. A virus can cause carcinogenesis in a human cell by
- A. becoming a cancer cell.
  - B. inhibiting transcription.
  - C. introducing an oncogene.
  - D. converting oncogenes into proto-oncogenes.
15. According to the fluid-mosaic membrane model, phospholipids
- A. form a single layer.
  - B. have the consistency of light oil.
  - C. actively transport potassium ions.
  - D. are only found on the outer layer of the membrane.
- 

16. Four tissue samples were placed in four test tubes, each containing a sucrose solution of a different concentration. After a period of time, the final mass of each tissue sample was recorded.

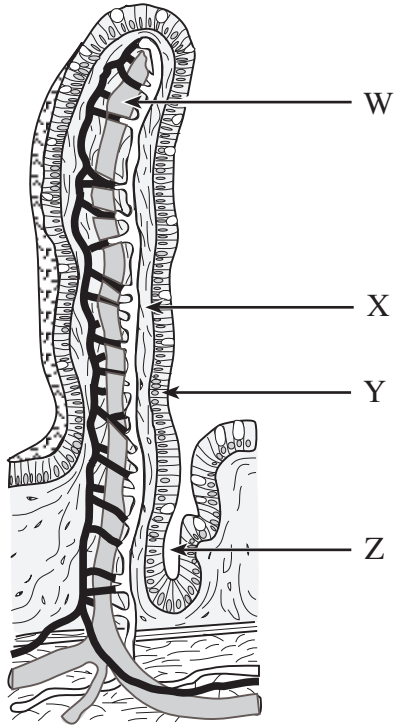
| <b>Test Tube</b> | <b>Initial Mass of Tissue (g)</b> | <b>Final Mass of Tissue (g)</b> |
|------------------|-----------------------------------|---------------------------------|
| 1                | 1.4                               | 1.4                             |
| 2                | 1.9                               | 1.8                             |
| 3                | 1.3                               | 1.8                             |
| 4                | 1.7                               | 1.7                             |

Given the results, which of the test tubes has a solution that is hypotonic to the tissue sample?

- A. 1
- B. 2
- C. 3
- D. 4

17. The function of the gallbladder is to
- A. store bile.
  - B. store lipase.
  - C. produce urea.
  - D. produce trypsin.
18. Starting in the esophagus, how many sphincters will an indigestible fibre molecule pass through on its way to the small intestine?
- A. one
  - B. two
  - C. three
  - D. five
19. Which of the following enzymes produces a product that cannot be absorbed into the body?
- A. lipase
  - B. maltase
  - C. amylase
  - D. nuclease

Use the following diagram to answer question 20.



20. Which letter indicates the area from which the products of lipid digestion are transported throughout the body?

- A. W
- B. X
- C. Y
- D. Z



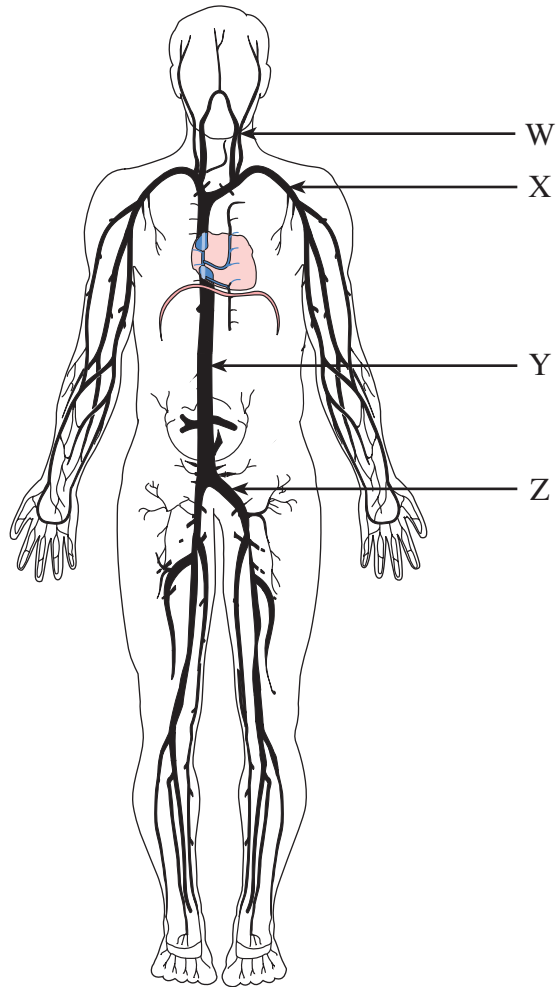
21. Which of the following substances used by the body is produced by *E-coli* living in the digestive system?

- A. minerals
- B. vitamins
- C. fatty acids
- D. polysaccharides

OVER

22. A function of an artery is to carry
- A. blood to the small intestine.
  - B. blood from the head to the heart.
  - C. metabolic wastes away from the liver.
  - D. oxygenated blood from the lungs to the heart.
23. The blood vessels that carry blood to and from the head are the
- A. aorta and pulmonary vein.
  - B. coronary artery and hepatic vein.
  - C. carotid arteries and jugular veins.
  - D. anterior vena cava and pulmonary artery.

Use the following diagram to answer question 24.



24. Which of the following represents the iliac vein?

- A. W
- B. X
- C. Y
- D. Z

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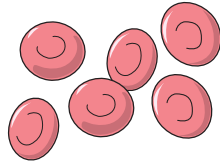
25. Which two structures in the fetal circulatory system allow blood to bypass the lungs?

- A. venous duct and oval opening
- B. oval opening and arterial duct
- C. pulmonary vein and arterial duct
- D. umbilical artery and pulmonary vein

OVER

26. The lymphatic system consists of
- A. vessels and valves.
  - B. AV and semilunar valves.
  - C. the pulmonary artery and the arterial duct.
  - D. the umbilical artery and the pulmonary vein.

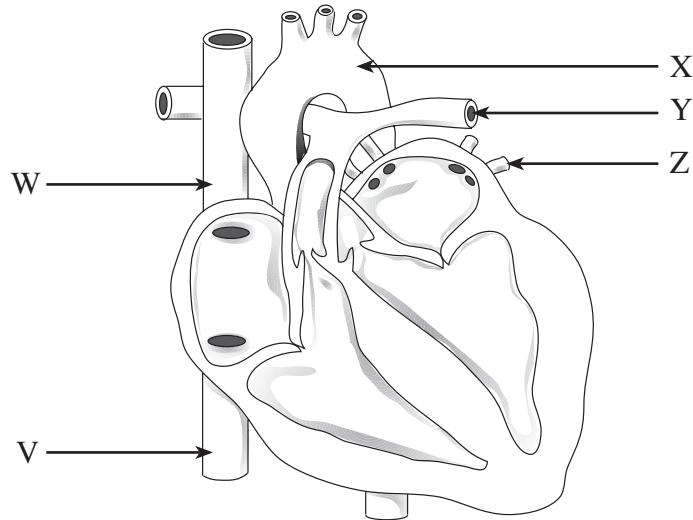
**Use the following diagram to answer question 27.**



27. What is the name of the blood components shown in the diagram?
- A. platelets
  - B. red blood cells
  - C. plasma proteins
  - D. white blood cells



Use the following diagram to answer questions 28 and 29.



28. In which of the labelled structures would the highest blood pressure be measured?

- A. V
- B. W
- C. X
- D. Y

29. Which of the following correctly identifies structure **Z** in the diagram above and the composition of blood it contains?

| Structure Z | Composition of Blood                     |
|-------------|--|
| A. vein     | high concentration of oxyhemoglobin      |
| B. vein     | low concentration of oxyhemoglobin       |
| C. artery   | high concentration of reduced hemoglobin |
| D. artery   | low concentration of reduced hemoglobin  |

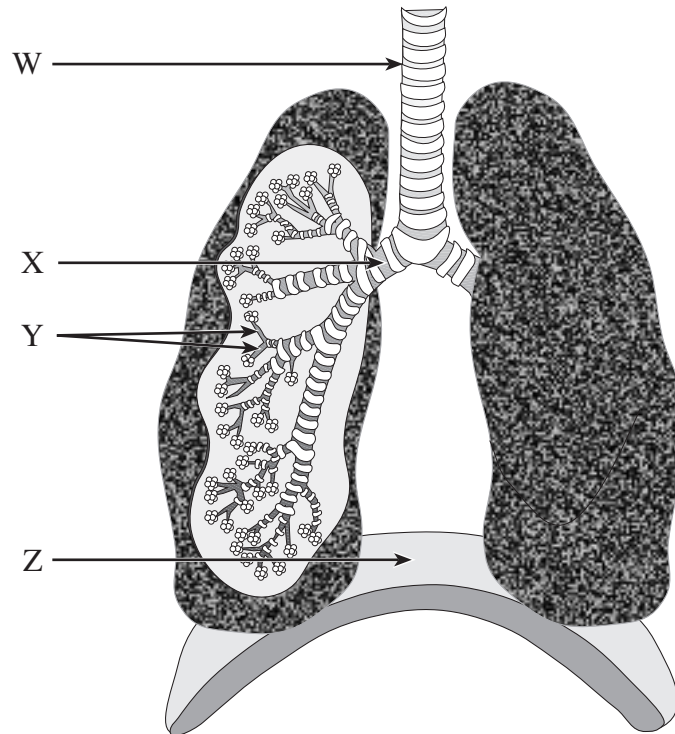
30. As the blood moves through capillary beds from arteriole to venule, the osmotic pressure in the blood **DELETED**

- A. increases.
- B. decreases.
- C. is lost entirely.
- D. stays the same.

**OVER**

31. Which of the following surrounds the lungs and the thoracic cavity and functions to reduce friction during inhalation and exhalation?
- A. cilia
  - B. alveoli
  - C. diaphragm
  - D. pleural membranes

Use the following diagram to answer questions 32 and 33.



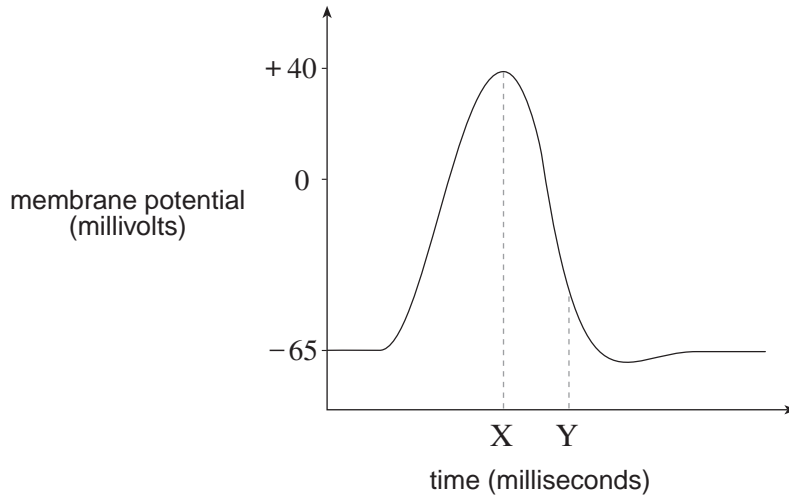
32. The bronchus is labelled
- A. W.
  - B. X.
  - C. Y.
  - D. Z.
33. The structure labelled **Z** functions to
- A. filter dust from the air.
  - B. exchange oxygen and carbon dioxide.
  - C. move blood into the inferior vena cava.
  - D. change the volume of the thoracic cavity.

**Use the following information to answer question 34.**

1. The diaphragm flattens.
2. The rib cage moves down and in.
3. The volume of the thoracic cavity increases.
4. The medulla oblongata signals the rib muscles to contract.

34. Which sequence correctly shows the order of events during breathing?
- A. 1, 2, 4, 3
  - B. 2, 4, 3, 1
  - C. 3, 1, 2, 4
  - D. 4, 1, 3, 2
- 
35. A small amount of carbon dioxide is transported in the pulmonary artery as
- A. bicarbonate ion.
  - B. carbonic anhydrase.
  - C. reduced hemoglobin.
  - D. carbaminohemoglobin.
36. Which of the following carries a nerve impulse toward the spinal cord?
- A. interneuron
  - B. synaptic cleft
  - C. motor neuron
  - D. sensory neuron

Use the following graph to answer question 37.



37. Which of the following events is causing the change within the neuron between time X and time Y?

- A. Sodium ions are moving into the axon.
  - B. Sodium ions are moving out of the axon.
  - C. Potassium ions are moving out of the axon.
  - D. Large, organic, negative ions are moving into the axon.
- 

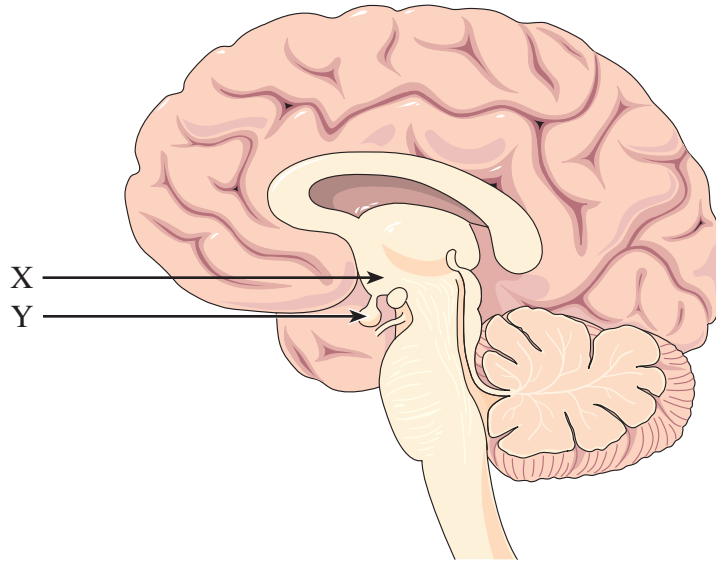
38. Movement of which of the following ions causes depolarization?

- A. sodium
- B. calcium
- C. hydrogen
- D. potassium

39. Which substance causes the microfilaments to contract and pull the synaptic vesicles to the presynaptic membrane?

- A. sodium ions
- B. calcium ions
- C. noradrenalin
- D. acetylcholine

Use the following diagram to answer questions 40 and 41.



40. The structure labelled **X** is the
- A. pituitary.
  - B. cerebellum.
  - C. hypothalamus.
  - D. medulla oblongata.
41. Increased activity in structures **X** and **Y** is associated with which of the following?
- A. rebuilding of the endometrium
  - B. decreased coordination of skeletal muscle
  - C. contraction of smooth muscle in the intestines
  - D. reabsorption of neurotransmitters in the synaptic cleft
- 
42. What is the pathway for urine leaving the body?
- A. collecting duct → renal pelvis → bladder → ureter
  - B. collecting duct → renal pelvis → ureter → bladder
  - C. renal pelvis → collecting duct → ureter → bladder
  - D. renal pelvis → bladder → ureter → collecting duct

**OVER**

43. Which of the following is less concentrated in blood plasma than it is in urine?
- A. urea
  - B. insulin
  - C. glucose
  - D. carbon dioxide

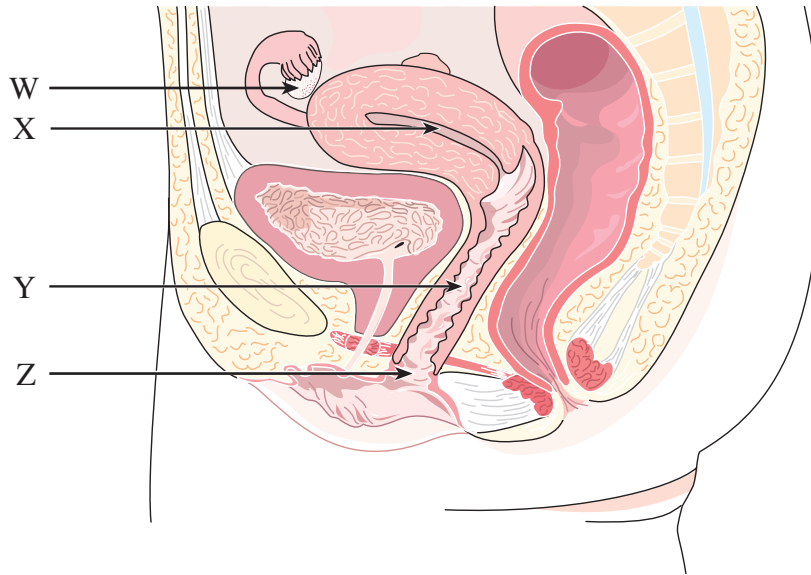
Use the following information to answer question 44.

| Water lost from the body (mL per day)<br>on two different days |       |       |
|--|-------|-------|
| From   | Day 1 | Day 2 |
| Evaporation  | 900   | 1 200 |
| Urine  | 1 500 | 1 200 |
| Feces  | 100   | 100   |

44. Homeostasis is maintained on **day 2** by a hormone that is produced in the
- A. hypothalamus and acts on the collecting duct.
  - B. adrenal cortex and acts on the collecting duct.
  - C. posterior pituitary and acts on the loop of Henle.
  - D. anterior pituitary and acts on the distal convoluted tubule.
- 

45. What is the function of the mid-piece of the sperm?
- A. to propel the sperm
  - B. to protect the sperm
  - C. to produce ATP energy
  - D. to carry genetic material

Use the following diagram to answer questions 46 and 47.



46. Structure **W** contains the

- A. cervix.
- B. oviduct.
- C. endometrium.
- D. corpus luteum.

47. At which of the labelled structures is human chorionic gonadotropin (HCG) released?

- A. W
- B. X
- C. Y
- D. Z

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48. Which hormone is released by the anterior pituitary that triggers the production of egg or sperm cells?

- A. estrogen
- B. progesterone
- C. luteinizing hormone (LH)
- D. follicle-stimulating hormone (FSH)

**OVER**

49. On which day of a typical 28-day menstrual cycle will luteinizing hormone (LH) be the highest?
- A. day 2
  - B. day 7
  - C. day 13
  - D. day 28
50. Which of the following substances stimulates uterine contractions?
- A. estrogen and calcium
  - B. oxytocin and prostaglandins
  - C. progesterone and human chorionic gonadotropin (HCG)
  - D. acrosomal enzymes and follicle-stimulating hormone (FSH)

**This is the end of the multiple-choice section.  
Answer the remaining questions directly in this examination booklet.**



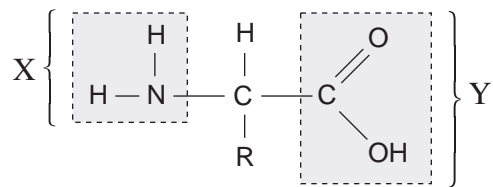
**PART B: WRITTEN RESPONSE**

**Value: 50 marks**

**Suggested Time: 75 minutes**

- INSTRUCTIONS:**
1. Use a **pen** for this part of the examination unless otherwise instructed.
  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) Identify each of the following parts of the molecule. **(2 marks: 1 mark each)**

Part X:

---

Part Y:

---

- b) State **two** different polymers that are synthesized from the molecule and give a function of each. **(4 marks: 1 mark each for polymer; 1 mark each for function)**

| Polymer | Function |
|---------|----------|
|         |          |
|         |          |

2. Describe how the following are related in terms of their function in protein synthesis.

DNA and mRNA:

**(2 marks)**

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tRNA and ribosomes:

**(2 marks)**

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3. The cells of the thyroid gland are able to take in iodine atoms and may contain iodine concentrations up to 25 times that of the surrounding tissue fluid. In an experiment designed to study factors affecting the rate of iodine intake, thyroid cells were cultured and placed in a medium containing normal blood concentrations of iodine. Temperature and glucose concentrations were varied and the effects recorded. The results of the study are shown in the table below.

| <b>Sample</b>     | <b>Glucose Concentration (%)</b> | <b>Temperature (°C)</b> | <b>Increase in Iodine Concentration (X)</b> |
|-------------------|----------------------------------|-------------------------|---|
| normal conditions | 0.20                             | 38                      | 22  |
| A                 | 0.01                             | 38                      | 12  |
| B                 | 0.20                             | 60                      | 8   |

- a) Explain the observed results for sample **A**. **(2 marks)**

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- b) Explain the observed results for sample **B**. **(2 marks)**

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- c) Explain how the movement of amino acids into the cells would be affected by the conditions in sample **B**. **(2 marks)**

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4. Describe the pH in each of the following regions along the digestive tract. Identify the secretion which determines the pH of the region and give the source of the secretion.

stomach: **(3 marks)**

pH: \_\_\_\_\_

secretion: \_\_\_\_\_

source of secretion: \_\_\_\_\_

small intestine: **(3 marks)**

pH: \_\_\_\_\_

secretion: \_\_\_\_\_

source of secretion: \_\_\_\_\_

5. For each of the following processes, describe how the small intestine functions to digest food and absorb nutrients.

digestion:

**(3 marks)**

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absorption:

**(2 marks)**

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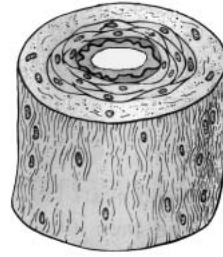
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Use the following diagram to answer question 6.



6. a) Identify the type of blood vessel shown in the diagram. (1 mark)

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b) State **two** functions of the blood vessel in the diagram. (2 marks)

i) \_\_\_\_\_

\_\_\_\_\_

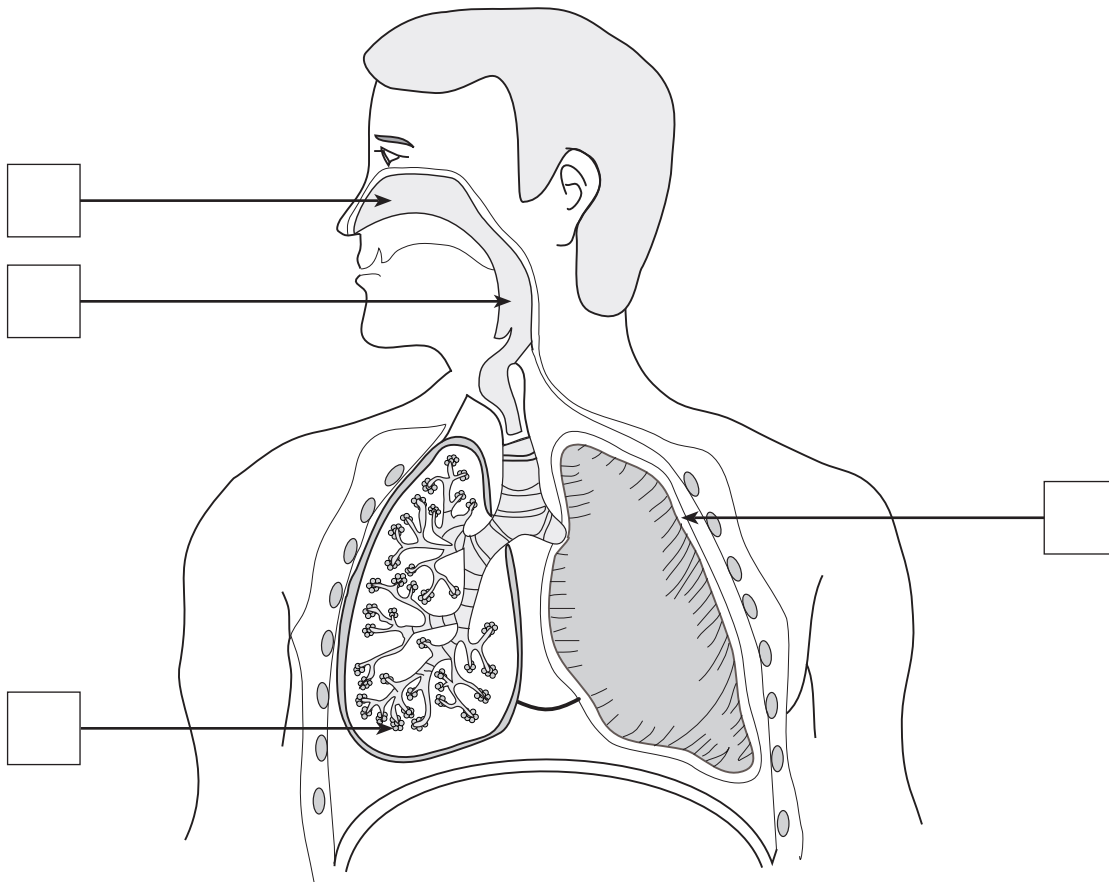
ii) \_\_\_\_\_

\_\_\_\_\_

7. Place the correct number for each of the following characteristics in the appropriate box at the locations in the diagram. (Only put one number per box. Not all of the characteristics will be used.)

**(4 marks)**

1. has stretch receptors
2. prevents collapse of the lungs
3. filters, warms and moistens air
4. stops food from entering the lungs
5. allows food and air to pass through
6. has cilia, cartilaginous rings and mucous membranes





8. a) In what type of situation does the sympathetic nervous system respond? **(1 mark)**

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b) What division is the sympathetic system part of? **(1 mark)**

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c) State **four** effects on the body when the sympathetic nervous system is active. **(4 marks)**

i) \_\_\_\_\_

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ii) \_\_\_\_\_

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iii) \_\_\_\_\_

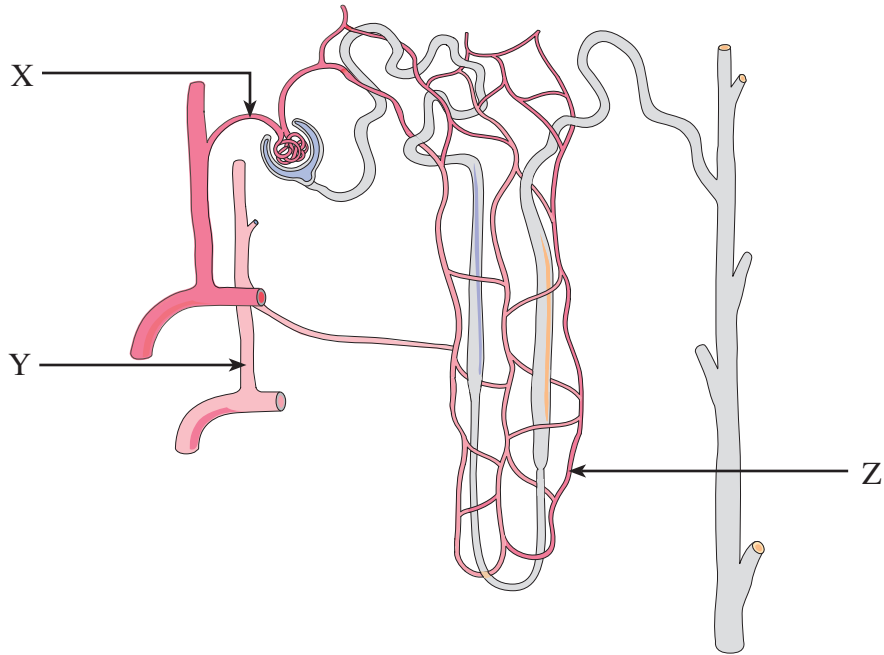
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iv) \_\_\_\_\_

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**OVER**

Use the following diagram to answer question 9 a) and b).



9. a) Identify the following structures. (2 marks: 1 mark each)

Structure **X**:

---

Structure **Z**:

---

b) In an experiment, fluids were removed at point **X** and at point **Y** and the composition of each sample was analyzed. Describe **three** ways in which the fluid obtained at point **X** is different from the fluid obtained at point **Y**. (3 marks)

i) \_\_\_\_\_

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ii) \_\_\_\_\_

---

iii) \_\_\_\_\_

---

- c) Explain how an increase in blood pressure from 120/80 to 160/100 would increase the volume of urine produced. **(2 marks)**

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10. Give **one** function for each of the following substances found in seminal fluid.  
(3 marks: 1 mark each)

| Substance              | Function |
|------------------------|----------|
| fructose               |          |
| prostaglandins         |          |
| alkaline (basic) fluid |          |

**END OF EXAMINATION**