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**Biology 12**

**JANUARY 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.  .

(4)

Question 9:

9.  .

(7)

Question 2:

2.  .

(4)

Question 10:

10.  .

(6)

Question 3:

3.  .

(6)

Question 4:

4.  .

(6)

Question 5:

5.  .

(6)

Question 6:

6.  .

(4)

Question 7:

7.  .

(5)

Question 8:

8.  .

(2)

**BIOLOGY 12**

**JANUARY 2002**

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## 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 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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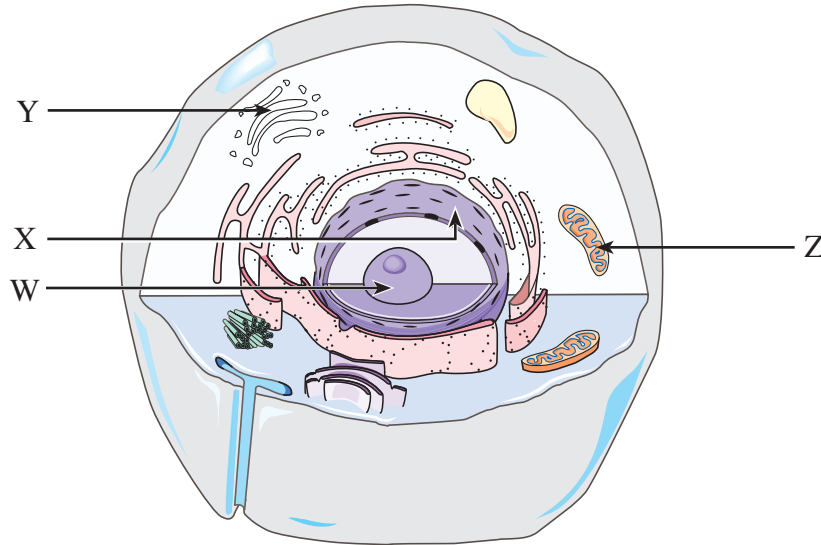
## PART A: MULTIPLE CHOICE

Value: 50 marks

Suggested Time: 45 minutes

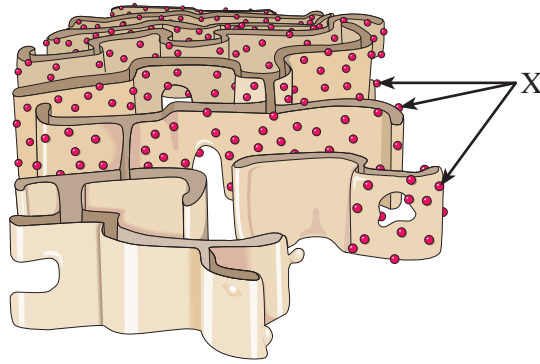
**INSTRUCTIONS:** For each question, select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle that has the letter corresponding to your answer.

Use the following diagram to answer question 1.



1. A protein being packaged and modified for export would be found in
- A. W.
  - B. X.
  - C. Y.
  - D. Z.

Use the following diagram to answer question 2.



2. Structure **X** is composed of molecules produced by the

- A. nucleus.
- B. vesicles.
- C. nucleolus.
- D. lysosomes.

---

3. Consider the functions of the following:

- sperm
- heart muscle cells
- cells lining the proximal convoluted tubules

In order for these metabolically active cells to carry out their functions effectively, they require large numbers of which organelle?

- A. ribosomes
- B. lysosomes
- C. Golgi bodies
- D. mitochondria

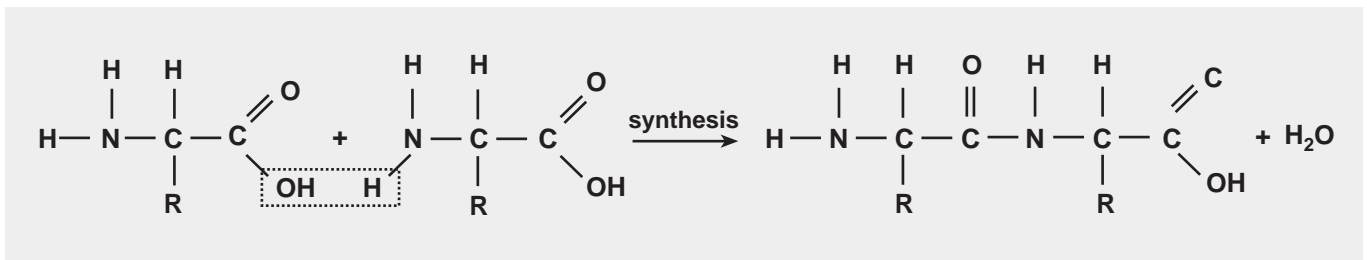


Use the following information to answer question 4.

- solvent
- catalyst
- lubricant
- temperature regulator

4. How many of the above are roles of water in the body?
- A. 1  
B. 2  
C. 3  
D. 4

Use the following diagram to answer question 5.

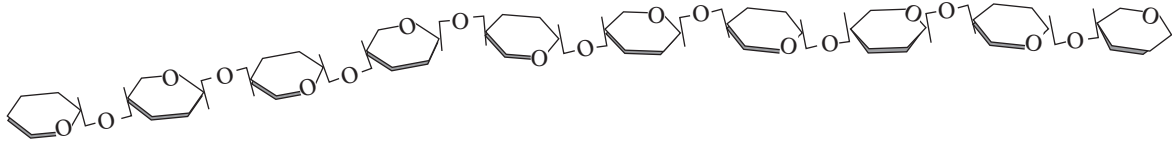


5. At which of the following organelles would the reaction shown take place?
- A. nucleus  
B. ribosome  
C. lysosome  
D. smooth endoplasmic reticulum
- 

6. Which of the following types of molecules does **not** have to be digested before being absorbed?
- A. maltose  
B. peptides  
C. amino acids  
D. nucleic acid

7. Which of the following is the empirical formula for glucose?
- A. CHO
  - B. CH<sub>2</sub>O
  - C. CH<sub>2</sub>O<sub>2</sub>
  - D. C<sub>2</sub>HO<sub>2</sub>

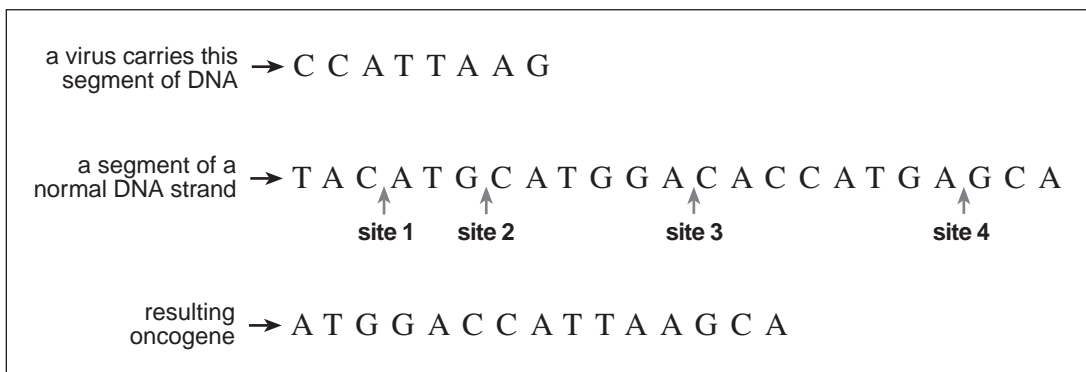
**Use the following diagram to answer question 8.**



8. The molecule above would likely be found in a
- A. vacuole.
  - B. liver cell.
  - C. mitochondria.
  - D. plant cell wall.
- 
9. Hemoglobin and antibodies are all composed of
- A. lipids.
  - B. proteins.
  - C. carbohydrates.
  - D. polysaccharides.
10. Which of the following statements correctly describes DNA?
- A. Guanine bonds to cytosine and adenine bonds to uracil.
  - B. Peptide bonds are found between guanine and cytosine.
  - C. Hydrogen bonds are found between thymine and guanine.
  - D. Nucleotides are composed of a sugar, a phosphate and a base.

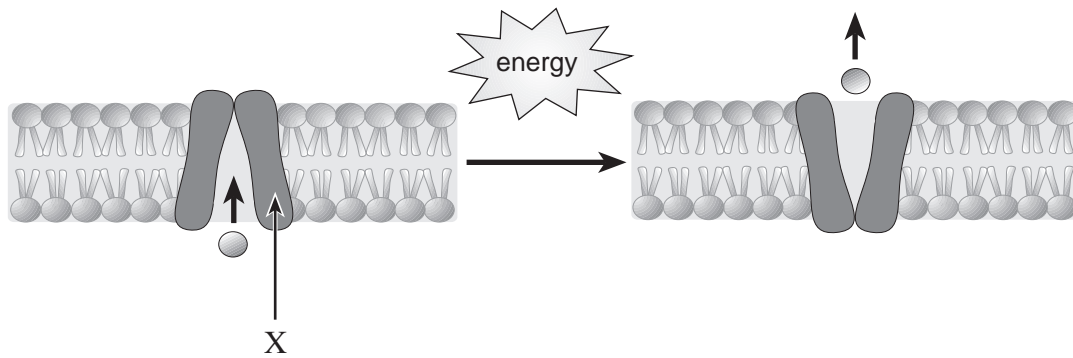
11. DNA replication produces
- two different strands of RNA.
  - two identical molecules of DNA.
  - an mRNA strand that has copied a gene.
  - a parent DNA strand and a daughter tRNA strand.
12. Which term refers to cells which grow and reproduce in a disorganized and uncontrolled manner?
- anaplasia
  - metastasis
  - promotion
  - vascularization
13. A portion of DNA which has been changed by an initiator becomes
- vascularized.
  - an oncogene.
  - undifferentiated.
  - a proto-oncogene.

**Use the following information to answer question 14.**



14. At which site in the normal DNA strand can the viral strand be inserted to initiate carcinogenesis?
- site 1
  - site 2
  - site 3
  - site 4

Use the following diagrams to answer question 15.



15. What is a function of the structure labelled **X** in the process shown above?

- A. to engulf bacteria by phagocytosis
  - B. to transport lipid-soluble molecules
  - C. to pump sodium ions out of neurons
  - D. to increase the rate of diffusion of carbon dioxide
- 

16. The reactant in an enzyme-catalyzed reaction can also be called

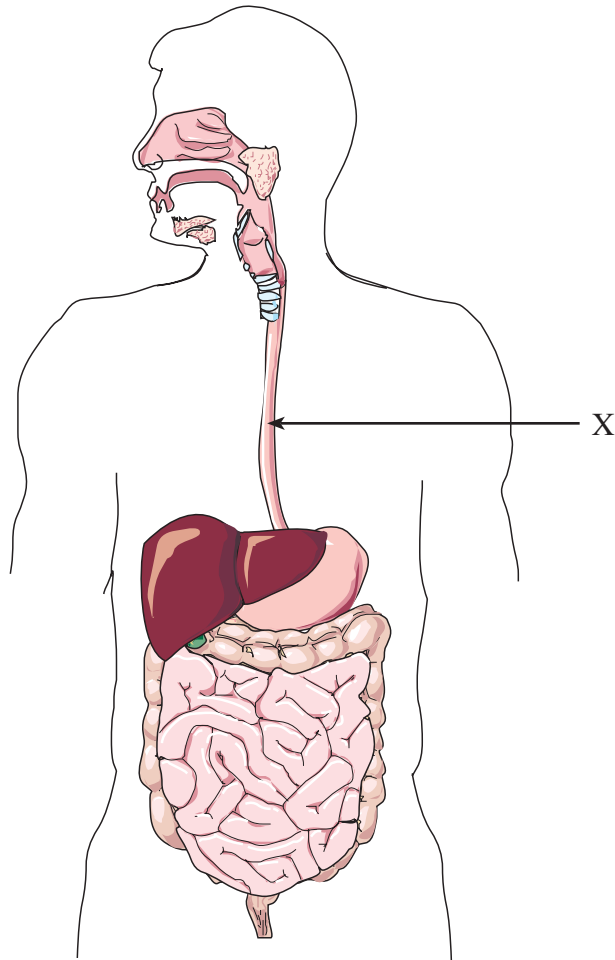
- A. a complex.
- B. a substrate.
- C. an enzyme.
- D. a coenzyme.

17. Overall metabolic rate would increase with increased secretion of

- A. trypsin.
- B. thyroxin.
- C. nuclease.
- D. acetylcholine.

18. Which of the following can be used to determine the rate of enzyme-catalyzed reactions?
- A. increase in activation energy
  - B. increase in product over time
  - C. increase in enzyme over time
  - D. increase in coenzyme over time
19. When the active site of an enzyme is denatured,
- A. substrates cannot be formed.
  - B. a quaternary structure is achieved.
  - C. the activation energy is decreased.
  - D. an enzyme-substrate complex cannot be formed.
20. Vitamins function as
- A. enzymes.
  - B. coenzymes.
  - C. emulsifiers.
  - D. competitive inhibitors.

Use the following diagram to answer question 21.



21. The structure labelled **X** is the

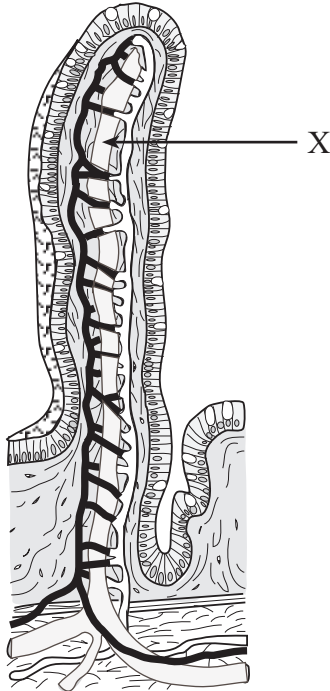
- A. pharynx.
  - B. epiglottis.
  - C. esophagus.
  - D. duodenum.
- 

22. A bacterial infection inhibits the absorption of water in the digestive system leading to dehydration. The infection is located in the

- A. liver.
- B. stomach.
- C. duodenum.
- D. large intestine.

23. Which of the following organs is malfunctioning when the concentration of nitrogenous wastes in the blood increases?
- A. kidney
  - B. stomach
  - C. pancreas
  - D. small intestine
24. Insulin secretion is increased when the level of
- A. sodium in the blood is low.
  - B. sodium in the blood is high.
  - C. glucose in the blood is low.
  - D. glucose in the blood is high.
25. Bile acts as an emulsifier by
- A. increasing the surface area of lipids.
  - B. removing hydrogen atoms from lipids.
  - C. breaking the bonds between fatty acids and glycerol.
  - D. converting unsaturated fatty acids to saturated fatty acids.
26. The liver makes blood plasma hypertonic to the fluid surrounding tissues by
- A. breaking down hemoglobin.
  - B. storing glucose as glycogen.
  - C. making plasma proteins from amino acids.
  - D. detoxifying and removing poisonous substances.

Use the following diagram to answer questions 27 and 28.



27. The structure above is found in the

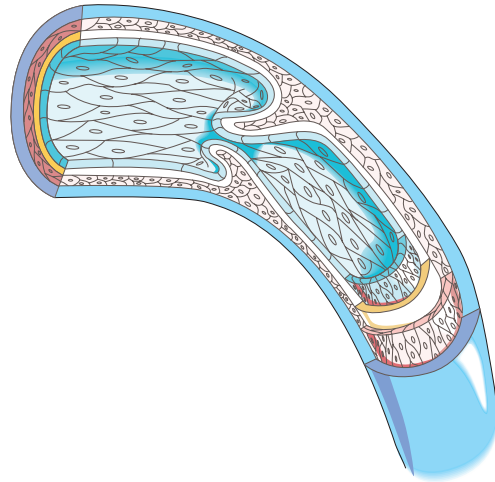
- A. liver.
- B. stomach.
- C. renal medulla.
- D. small intestine.

28. Structure X is specialized to

- A. absorb fats.
- B. repackage glucose.
- C. transport amino acids.
- D. secrete hydrochloric acid.

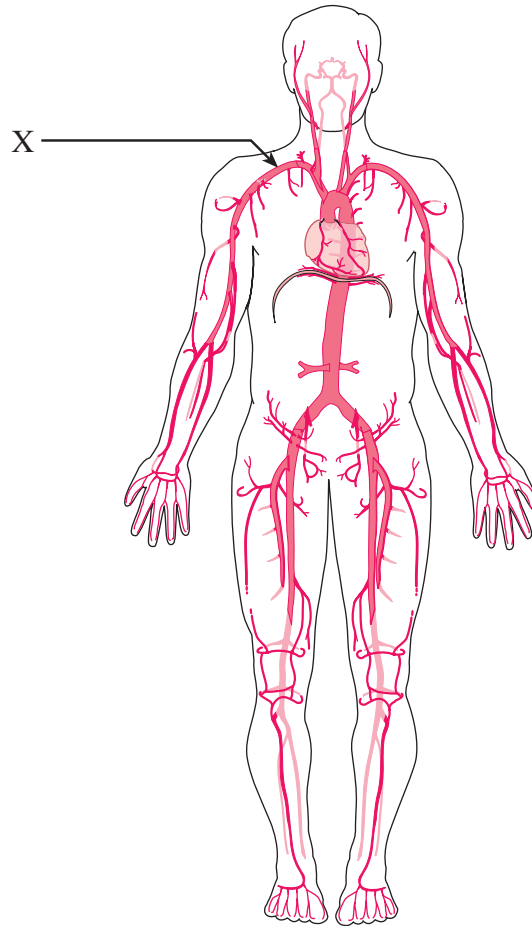


Use the following diagram to answer question 29.



29. The blood vessel shown in the diagram is classified as
- A. a vein.
  - B. an artery.
  - C. a capillary.
  - D. an arteriole.

Use the following diagram to answer question 30.



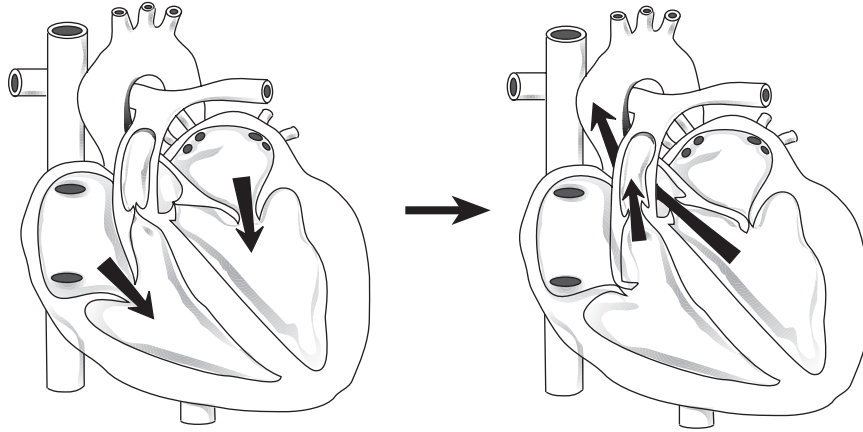
30. The artery labelled X is the

- A. aorta.
  - B. carotid.
  - C. coronary.
  - D. subclavian.
- 

31. A blood clot forms in the hepatic vein but breaks off and lodges in the next capillary bed it encounters. Where would it be found?

- A. liver
- B. brain
- C. lungs
- D. small intestine

Use the following diagrams to answer question 32.

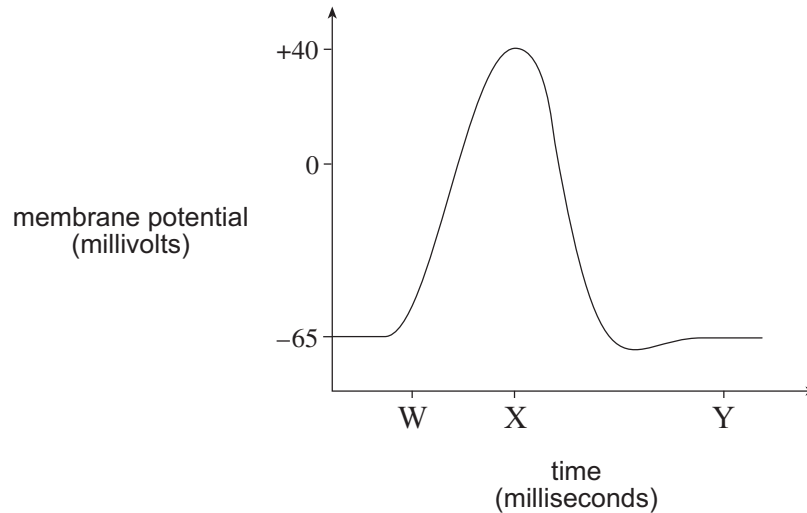


32. The stages in the cardiac cycle shown by the diagrams are
- A. atrial systole followed by ventricular systole.
  - B. atrial systole followed by ventricular diastole.
  - C. atrial diastole followed by ventricular systole.
  - D. atrial diastole followed by ventricular diastole.
- 
33. Which of the following trap particles and move them up the trachea?
- A. villi and mucus
  - B. mucus and cilia
  - C. alveoli and villi
  - D. cilia and alveoli
34. Speech sounds are made when air moves through the
- A. cilia.
  - B. larynx.
  - C. pharynx.
  - D. diaphragm.
35. What occurs when the diaphragm relaxes and becomes dome shaped?
- A. The rib muscles relax, thoracic cavity volume increases and exhalation occurs.
  - B. The rib muscles relax, thoracic cavity volume decreases and exhalation occurs.
  - C. The rib muscles contract, thoracic cavity volume increases and inhalation occurs.
  - D. The rib muscles contract, thoracic cavity volume decreases and inhalation occurs.

**OVER**

36. During external respiration, the concentration of which of the following increases in the blood?
- A. ATP
  - B. hemoglobin
  - C. oxyhemoglobin
  - D. reduced hemoglobin
37. Which substance is transported as reduced hemoglobin in the blood?
- A. water
  - B. oxygen
  - C. hydrogen ions
  - D. carbon dioxide
38. Hemoglobin in the umbilical artery carries less of which substance than hemoglobin in the umbilical vein?
- A. oxygen
  - B. hydrogen ions
  - C. carbon dioxide
  - D. bicarbonate ions

Use the following graph to answer questions 39 and 40.

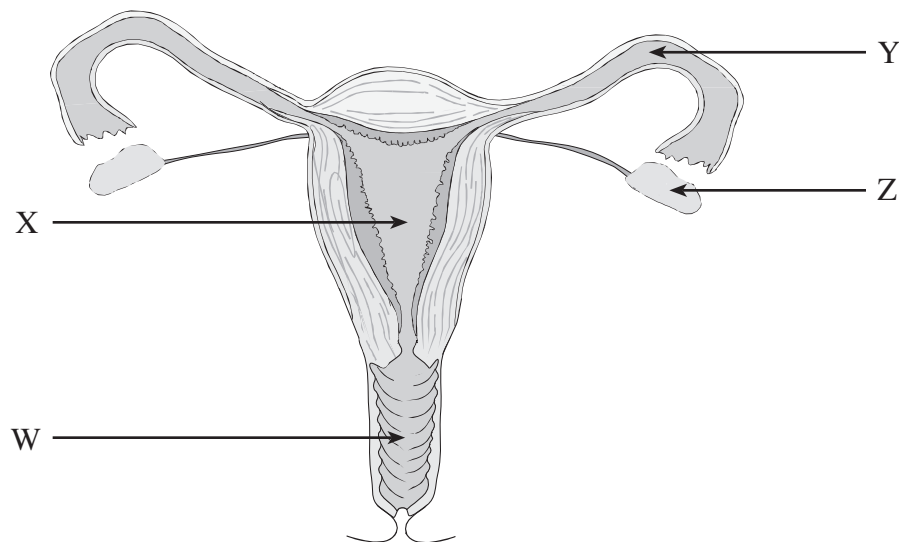


39. The time period between **W** and **X** is called
- A. repolarization.
  - B. depolarization.
  - C. the recovery period.
  - D. the resting potential.
40. ~~Which of the following are characteristics of the neuron at time **Y**?~~ **DELETE D**
- A. ~~positively charged axoplasm and diffusion of sodium ions into the axoplasm~~
  - B. ~~positively charged axoplasm and diffusion of potassium ions into the axoplasm~~
  - C. ~~negatively charged axoplasm and diffusion of sodium ions out of the axoplasm~~
  - D. ~~negatively charged axoplasm and diffusion of potassium ions out of the axoplasm~~
- 
41. If a person's ability to integrate information from both hemispheres of the brain is impaired, the portion of the brain most likely affected is the
- A. pituitary.
  - B. thalamus.
  - C. cerebellum.
  - D. corpus callosum.

42. The collecting ducts are located in which of the following structures?
- A. ureter
  - B. urethra
  - C. renal pelvis
  - D. renal medulla
43. Active transport of glucose into the blood occurs in the
- A. glomerulus.
  - B. collecting duct.
  - C. Bowman's capsule.
  - D. proximal convoluted tubule.
44. Damage to the glomerulus could lead to the presence of
- A. excess glucose in the urine.
  - B. red blood cells in the filtrate.
  - C. an increase of urea in the renal cortex.
  - D. a decrease of nitrogenous waste in the filtrate.
45. Which of the following structures responds to low sodium levels in the blood?
- A. liver
  - B. thyroid
  - C. adrenal
  - D. pancreas
46. Spermatogenesis occurs in the
- A. interstitial cells.
  - B. seminal vesicles.
  - C. seminiferous tubules.
  - D. ductus (vas) deferens.

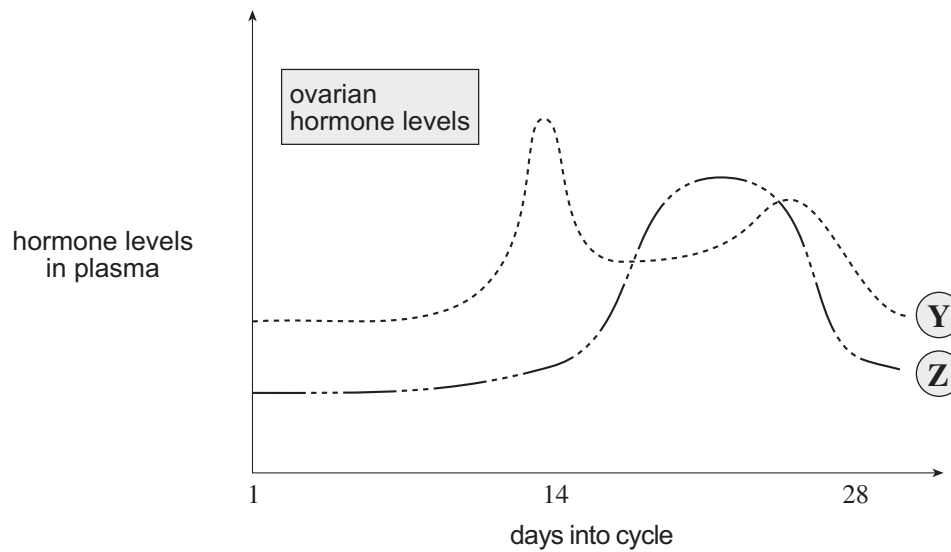
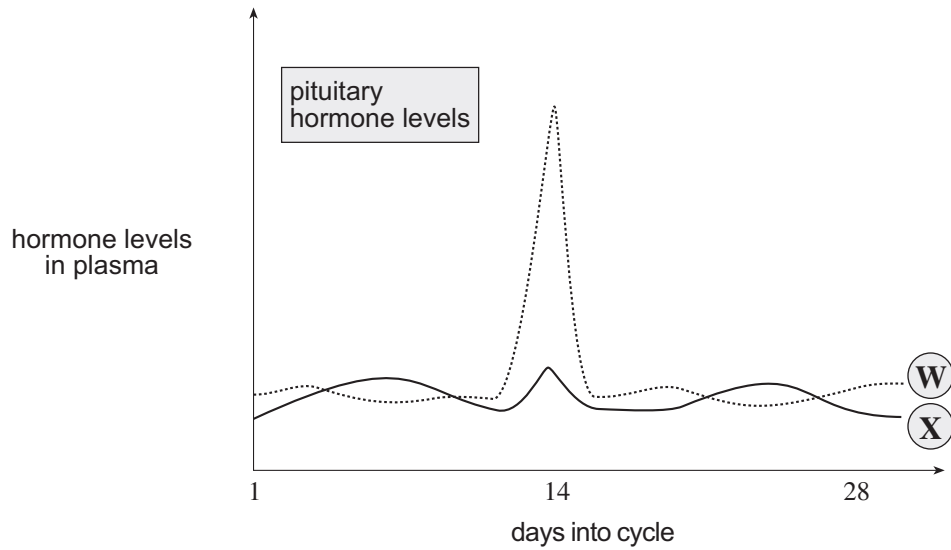
47. Which part of a sperm cell contains the enzymes that aid the penetration of an ovum?
- A. tail
  - B. head
  - C. acrosome
  - D. mid-piece
48. Which hormone is responsible for increased musculature and body hair?
- A. estrogen
  - B. testosterone
  - C. follicle-stimulating hormone (FSH)
  - D. human chorionic gonadotropin (HCG)

Use the following diagram to answer question 49.



49. Which letter indicates the uterus?
- A. W
  - B. X
  - C. Y
  - D. Z

Use the following graphs to answer question 50.



50. Which letter represents levels of follicle-stimulating hormone during the ovarian and uterine cycles?

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

**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.

1. a) Define recombinant DNA. **(1 mark)**

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b) Give **two** uses of recombinant DNA. **(2 marks)**

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

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

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c) In which organelle of a human cell would recombinant DNA be found? **(1 mark)**

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2. Give a role of each of the following nucleic acids in the production of an enzyme.  
(4 marks: 1 mark each)

DNA:

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mRNA:

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rRNA:

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tRNA:

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3. In an experiment, 10 cubes of potato each weighing 10 grams and cut from the same potato were placed in 10 different numbered beakers. Each beaker contained a different concentration of sucrose solution as shown in the table below. After 24 hours, the potato cubes were removed, blotted dry and their weights entered into the data table.

Beaker	Concentration of Sucrose (%)	Weight of Potato Cube After 24 Hours (grams)	Percent Change in Mass (%)
1	0.0	13.4	34
2	0.5	12.5	25
3	1.0	11.2	12
4	1.5	10.3	3
5	2.0	9.2	-8
6	2.5	8.5	-15
7	3.0	8.0	-20
8	3.5	7.7	-23
9	4.0	7.5	-25
10	4.5	7.4	-26

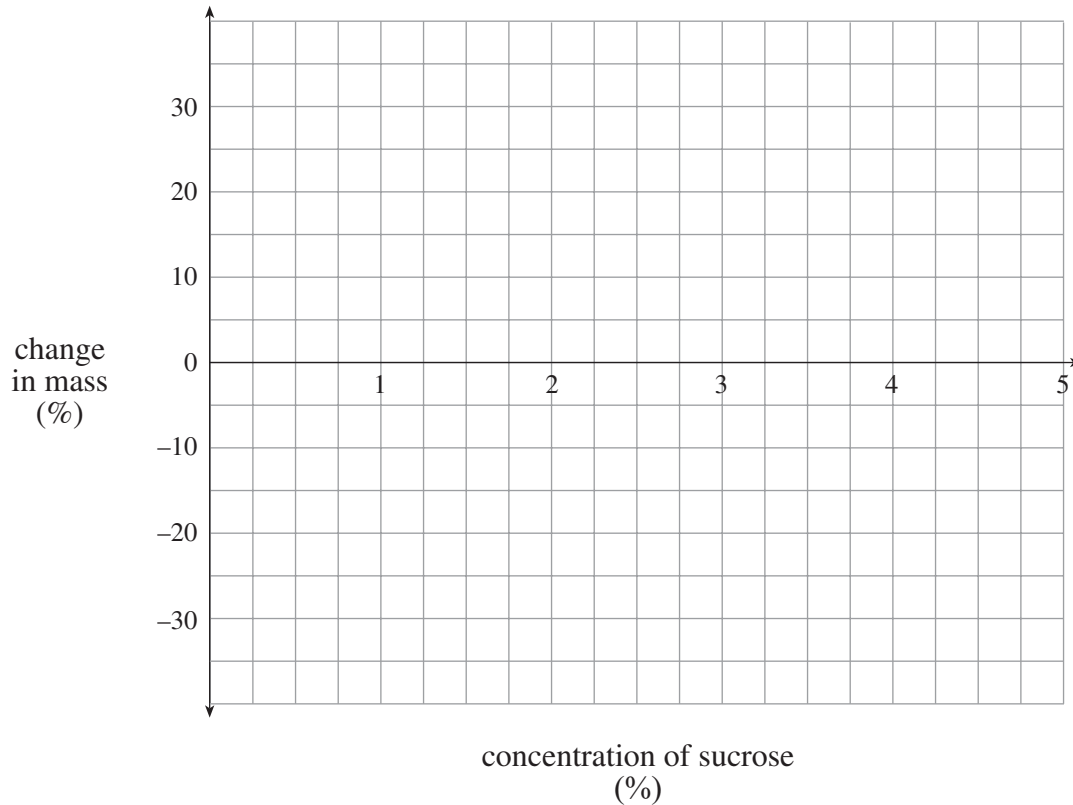
a) Why were all the pieces cut from the same potato?

**(1 mark)**

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- b) Graph the data that compares the concentration of sucrose to the percent change in mass.  
(2 marks: 1 mark for plotting points; 1 mark for drawing line)



- c) Use your graph to estimate at what point the concentration of sucrose in the potato is equal to the sucrose concentration in the beaker. (1 mark)

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- d) Explain why some of the potato cubes gained mass. (2 marks)

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4. For each of the following, indicate whether the optimum pH is acidic, basic or neutral and explain why that pH is needed for normal functions.

**(6 marks: 1 mark each for optimum pH; 1 mark each for explanation)**

stomach:

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

Explanation: \_\_\_\_\_

\_\_\_\_\_

small intestine:

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

Explanation: \_\_\_\_\_

\_\_\_\_\_

seminal fluid:

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

Explanation: \_\_\_\_\_

\_\_\_\_\_

5. Complete the following table describing components of the blood. **(6 marks: 1 mark each)**

	Red Blood Cells	Platelets
Structural Description		
Function		
Site of Production		

6. When people are involved in an exercise program, changes in the circulatory system occur.

a) Explain why the number of capillaries in the skeletal muscle tissue increases. **(2 marks)**

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b) Explain why the maximum heart rate is lower for the same amount of exercise. **(2 marks)**

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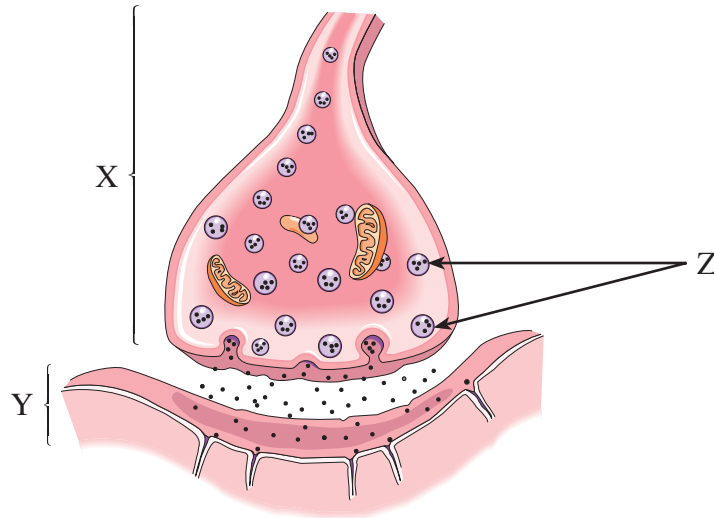
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Use the following diagram to answer question 7.



7. a) Identify each of the following structures. **(2 marks: 1 mark each)**

Structure X:

\_\_\_\_\_

Structure Y:

\_\_\_\_\_

b) Identify the substance stored and released by structure Z and describe its function. **(2 marks: 1 mark for substance; 1 mark for function)**

Substance: \_\_\_\_\_

Function: \_\_\_\_\_

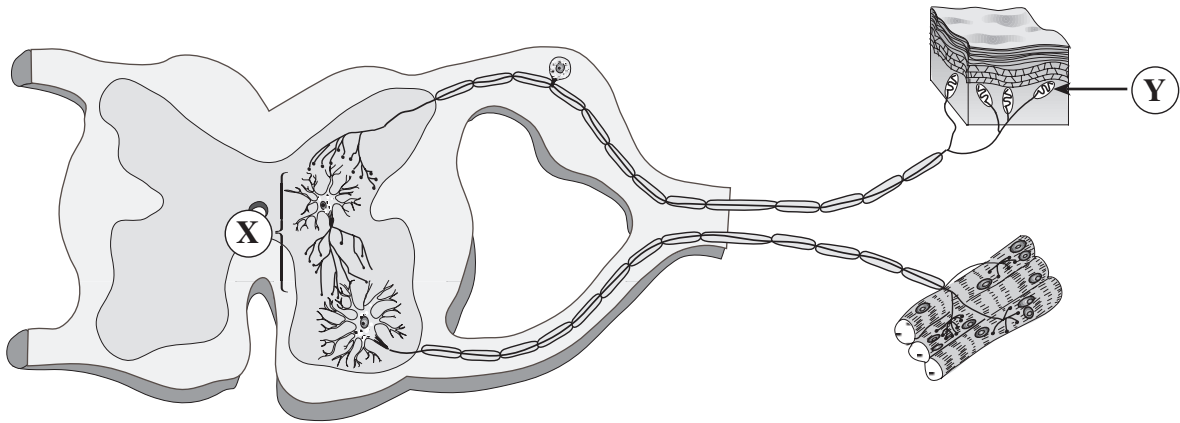
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

c) Draw an arrow on the diagram above to indicate the direction of the nerve impulse. **(1 mark)**

**OVER**

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Use the following diagram to answer question 8.



8. a) Identify structure **X**. (1 mark)

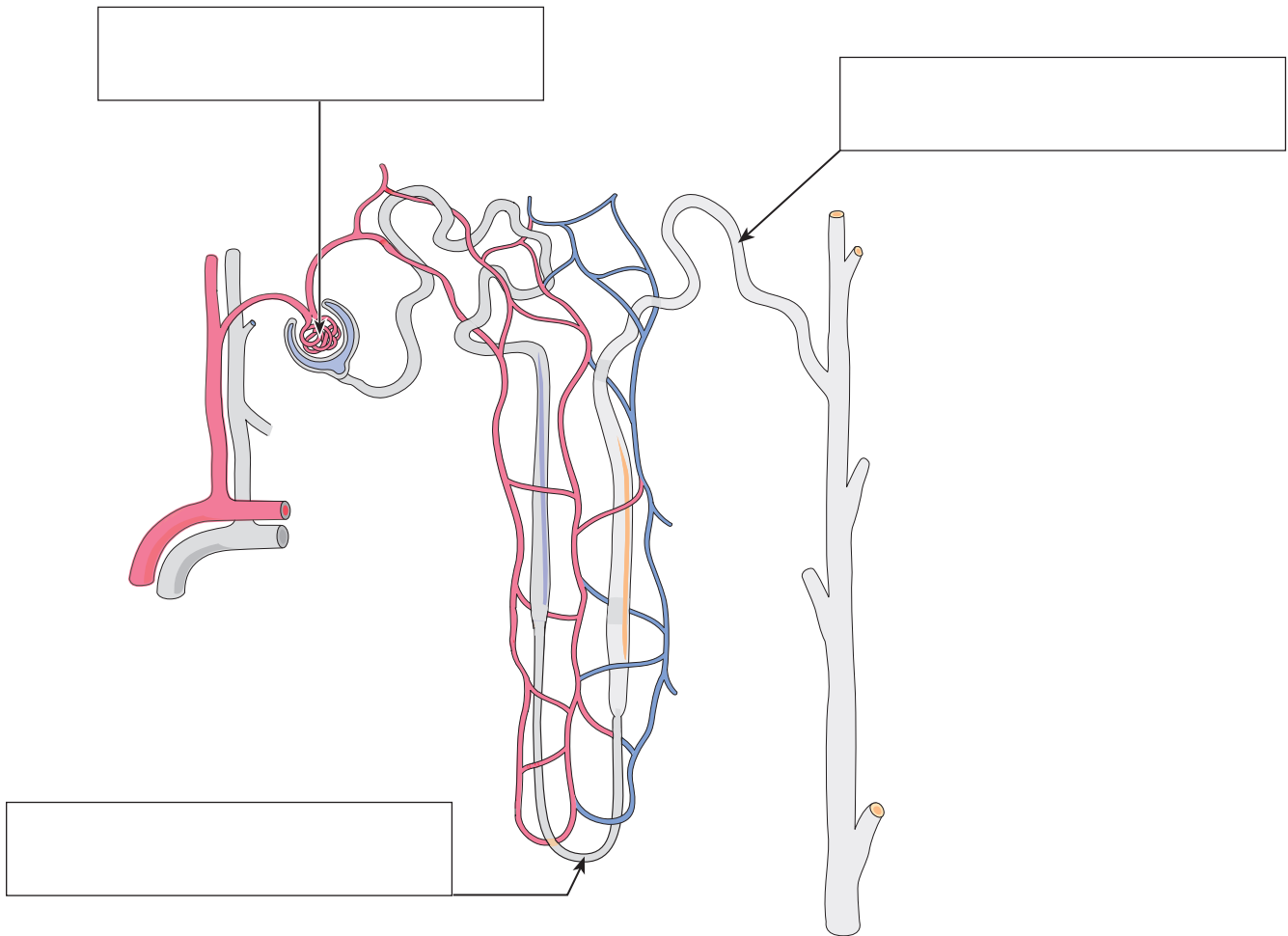
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b) What is the function of structure **Y**? (1 mark)

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9. a) Write the names of the structures indicated by each of the arrows in the boxes provided. **(3 marks)**



b) Give a function of each of the following in the excretory system.

**(4 marks: 1 mark each)**

carrier proteins:

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peritubular capillary network:

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sodium bicarbonate:

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aldosterone:

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10. Identify **three** components of seminal fluid and give **one** function of each component.  
(6 marks: 1 mark each for name; 1 mark each for function)

Component	Function

**END OF EXAMINATION**