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Insert **only** pre-printed PEN label here.

STUDENT INSTRUCTIONS

1. Insert 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.

BIOLOGY 12

AUGUST 2000

COURSE CODE = BI

Insert **only** hand-printed PEN here.

Ministry use only.

Question 1:

1. .
(5)

Question 9:

9. .
(6)

Question 2:

2. .
(4)

Question 10:

10. .
(4)

Question 3:

3. .
(5)

Question 4:

4. .
(6)

Question 5:

5. .
(2)

Question 6:

6. .
(8)

Question 7:

7. .
(5)

Question 8:

8. .
(5)

BIOLOGY 12

AUGUST 2000

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

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

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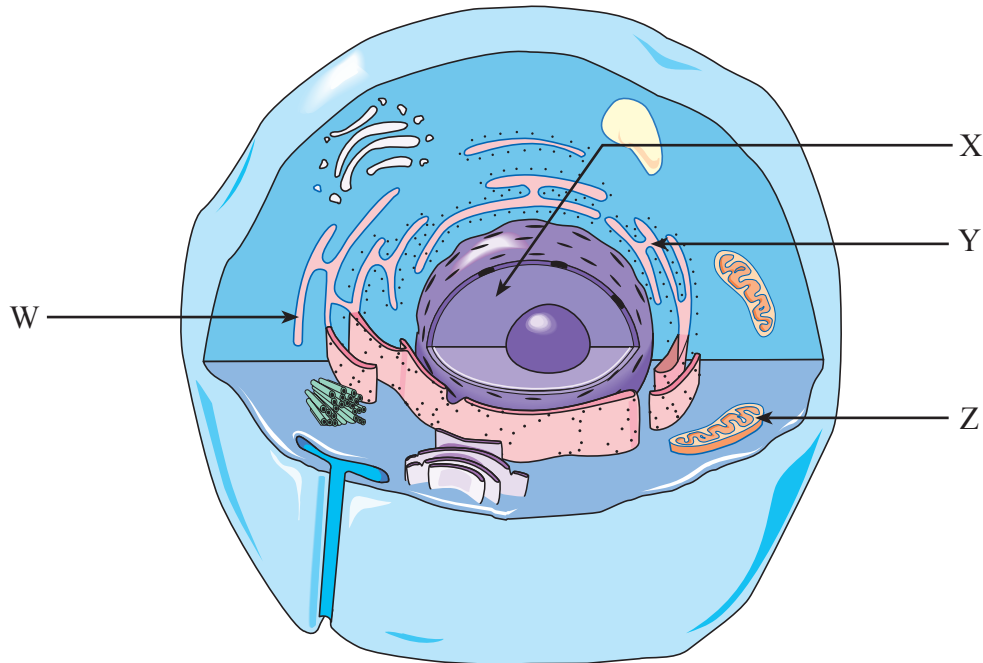
PART A: MULTIPLE CHOICE

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.

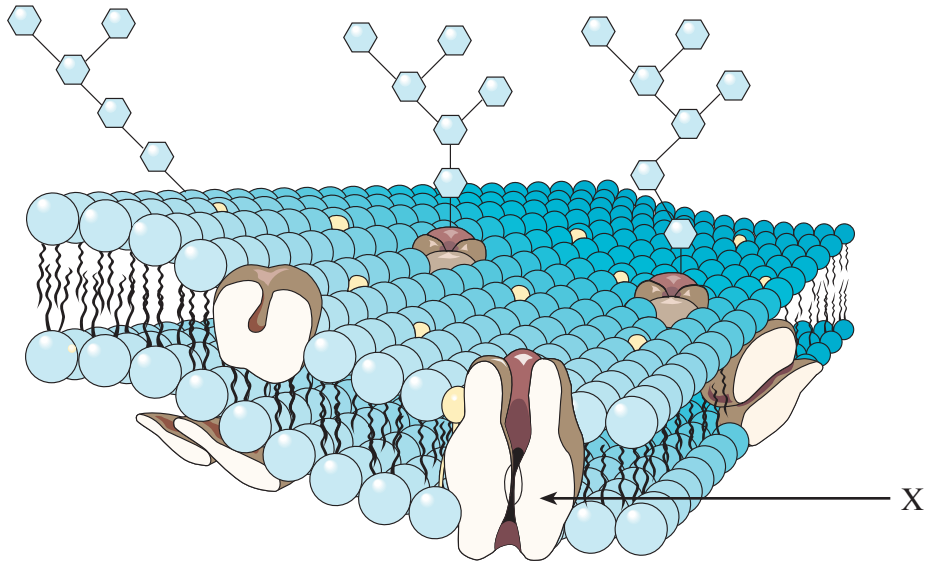
Use the following diagram to answer questions 1, 2 and 3.



1. Which of the following structures is labelled **X**?
 - A. nucleus
 - B. nucleolus
 - C. lysosome
 - D. Golgi apparatus
2. The function of the organelle labelled **Z** is to
 - A. replicate DNA and transcribe mRNA.
 - B. determine what enters and leaves the cell.
 - C. produce ATP to be used in cell processes.
 - D. package and store substances made in the cell.
3. Which of the following is a correct statement regarding structures **W** and **Y**?
 - A. Structure **W** produces ATP and structure **Y** produces lipids.
 - B. Both structures have ribosomes embedded in their membranes.
 - C. Both structures produce substances that are stored in the nucleolus.
 - D. Structure **W** produces steroid hormones and structure **Y** produces proteins.

4. What is the function of an organelle that produces vesicles and is composed of a stack of flattened saccules?
- A. produce ATP
 - B. replicate DNA
 - C. package proteins
 - D. produce vitamins

Use the following diagram to answer question 5.



5. If a substance temporarily interferes with the function of the structure labelled **X**, which of the following would occur?
- A. The breakdown of worn-out cell organelles would stop.
 - B. There would be an increase in the production of mRNA.
 - C. The number of amino acid molecules entering the cell would decrease.
 - D. The active transport of water across the cell membrane would decrease.

6. Which of the following is a function of water in cells?
- A. emulsifying fats
 - B. dissolving chemicals
 - C. copying nucleic acids
 - D. catalyzing chemical reactions

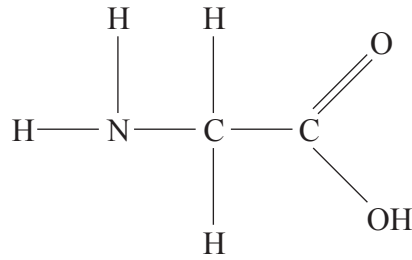
Use the following chart to answer question 7.

Reaction I	Reaction II
$\text{HX} \longrightarrow \text{H}^+ + \text{X}^-$	$\text{H}^+ + \text{Z} \longrightarrow \text{HZ}$

7. When substance **Z** is added to the products of Reaction I, Reaction II occurs. Substance **Z** is
- A. an acid.
 - B. a buffer.
 - C. an enzyme.
 - D. a sodium ion.
-

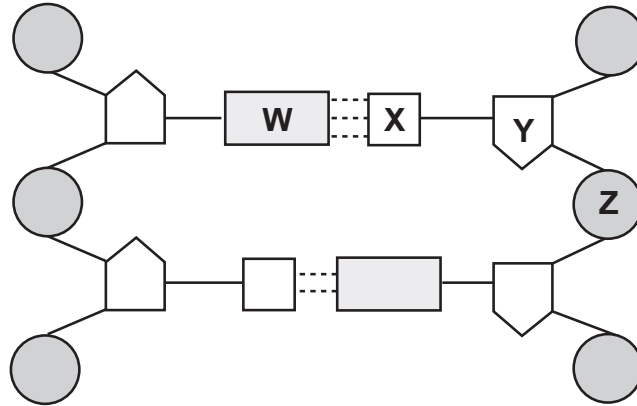
8. How are starch and cellulose similar?
- A. Both are polymers of glucose.
 - B. Both are produced in human cells.
 - C. Both are components of the cell membrane.
 - D. Both can be digested by enzymes produced in the pancreas.

Use the following diagram to answer questions 9, 10 and 11.



9. The molecule above is
- A. a protein.
 - B. a fatty acid.
 - C. a nucleic acid.
 - D. an amino acid.
10. During digestion, the process that produces this molecule is
- A. hydrolysis.
 - B. deamination.
 - C. transcription.
 - D. dehydration synthesis.
11. An example of a substance that could be produced from this molecule is
- A. DNA.
 - B. trypsin.
 - C. sucrose.
 - D. cellulose.
-
12. An unsaturated fat is converted to a saturated fat when
- A. glucose forms covalent bonds with cellulose.
 - B. amino groups are added to fatty acid molecules.
 - C. hydrogen atoms are added to the unsaturated fat.
 - D. the unsaturated fat is broken down into fatty acids and glycerol.

Use the following diagram to answer questions 13 and 14.



13. Which of the following correctly identifies the parts labelled **W**, **X**, **Y** and **Z**?

	W	X	Y	Z
A.	adenine	uracil	deoxyribose	phosphate
B.	adenine	thymine	phosphate	ribose
C.	guanine	cytosine	deoxyribose	phosphate
D.	base	ribose	cytosine	guanine

14. The parts labelled **X**, **Y** and **Z** in the diagram above make up

- A. a fatty acid.
- B. a nucleotide.
- C. an amino acid.
- D. a monosaccharide.

15. One DNA strand is attached to another DNA strand by

- A. hydrogen bonds between the bases.
- B. hydrogen bonds between the sugars.
- C. covalent bonds between the sugars and bases.
- D. covalent bonds between the sugars and the phosphates.

16. A characteristic that identifies metastasizing cells is that they
- A. contain steroid hormones.
 - B. make hydrolytic enzymes that digest fats.
 - C. stop growing when they touch other cells.
 - D. grow in a disorganized, uncontrolled manner.

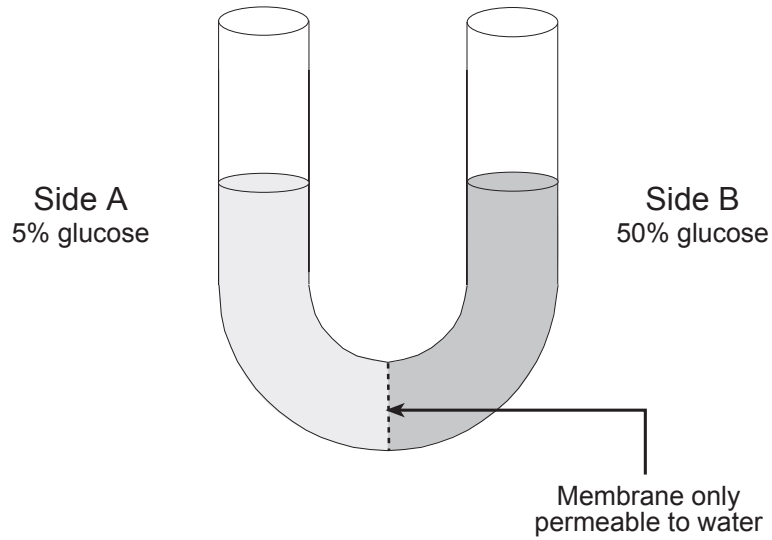
Use the following symptoms to answer question 17.

- a high fever
- a change in bowel or bladder habits
- an obvious change in a wart or mole
- persistent indigestion or difficulty swallowing
- a lump or thickening in the breast or elsewhere

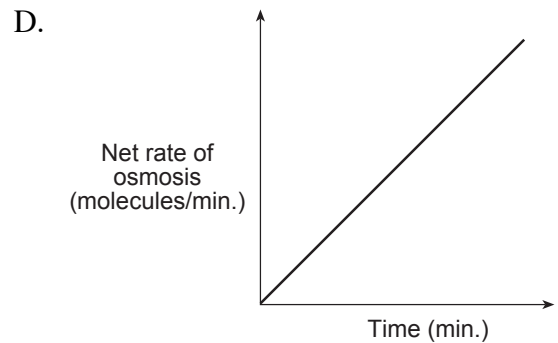
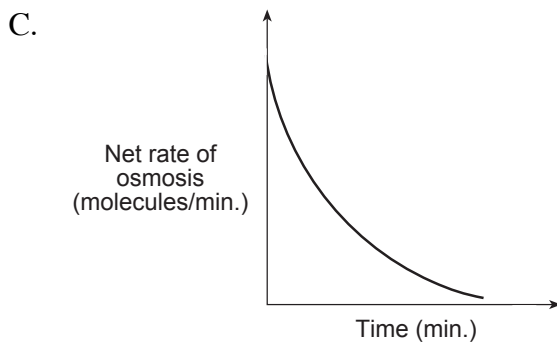
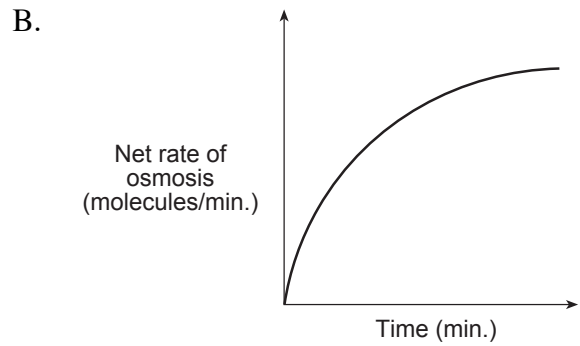
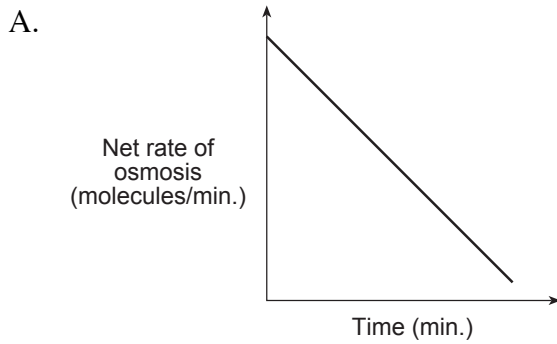
17. How many of the symptoms above are found among the seven commonly recognized cancer danger signals?
- A. two
 - B. three
 - C. four
 - D. five
-

18. An oncogene can be introduced into a cell by
- A. a virus.
 - B. thyroxin.
 - C. a bacterium.
 - D. ultraviolet radiation.

Use the following diagram to answer question 19.



19. The diagram above represents the initial conditions of an experiment. Which of the following graphs most accurately represents the change in the net rate of osmosis over time?



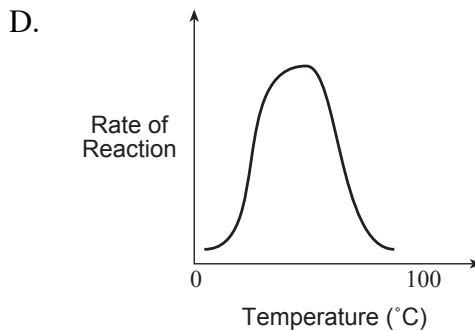
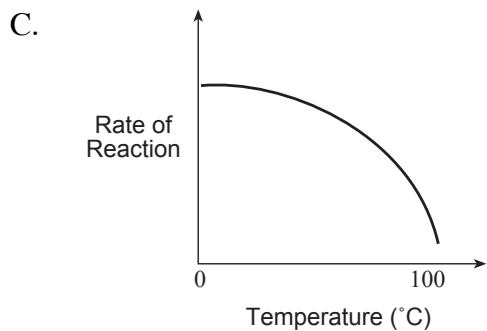
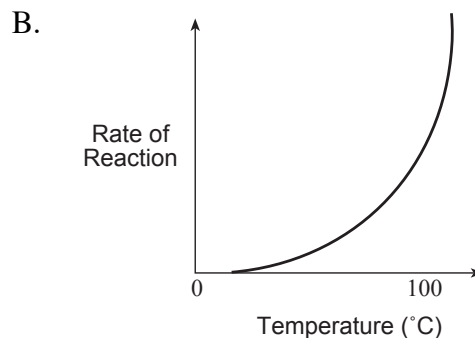
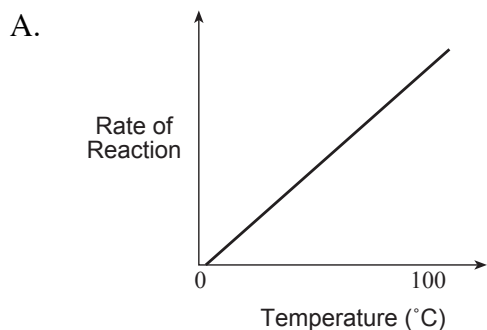
20. What happens when a cell is placed in a hypotonic solution?

- A. The cell swells.
- B. The cell shrinks.
- C. The cell metabolizes faster.
- D. There is no effect on the cell's volume.

21. The location at which the substrate attaches to the enzyme is the

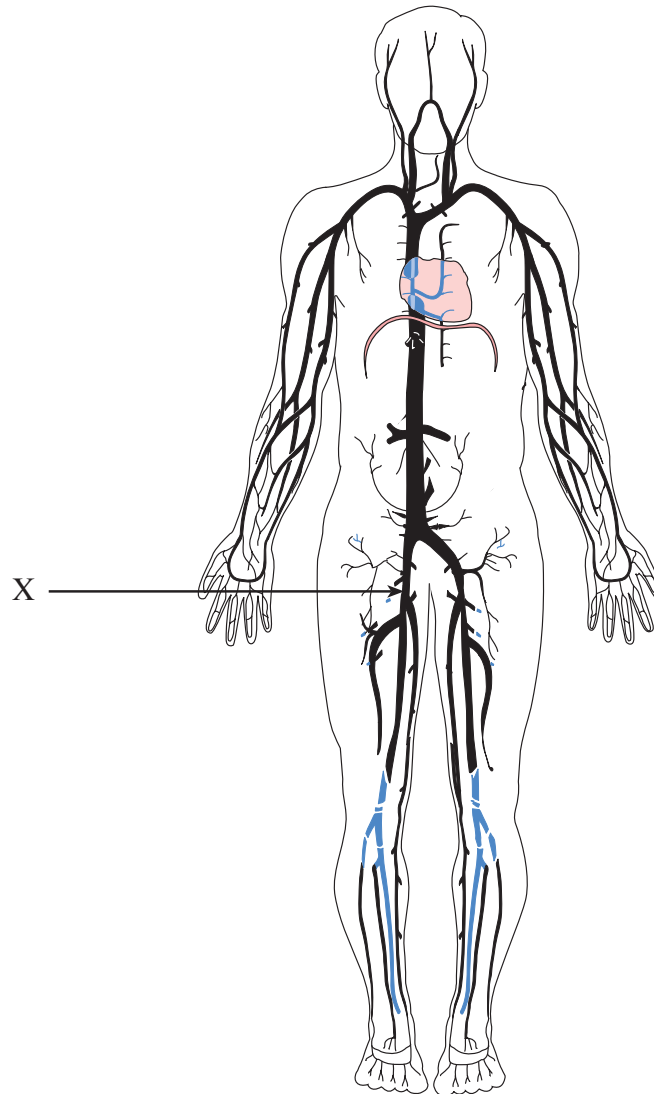
- A. active site.
- B. co-enzyme.
- C. peptide bond.
- D. hydrogen bond.

22. Which of the graphs below represents the relationship between the rate of an enzyme-catalyzed reaction and temperature?



23. Which of the following structures does food enter after it leaves the esophagus?
- A. liver
 - B. pharynx
 - C. stomach
 - D. pancreas
24. Which of the following enzymes is correctly matched with its site of production?
- A. amylase—liver
 - B. pepsin—stomach
 - C. maltase—pancreas
 - D. trypsin—small intestine
25. Enzymes that digest proteins, carbohydrates and lipids are secreted by the
- A. stomach.
 - B. pancreas.
 - C. small intestine.
 - D. salivary glands.
26. Insulin is produced in the
- A. liver.
 - B. pancreas.
 - C. thyroid gland.
 - D. adrenal gland.

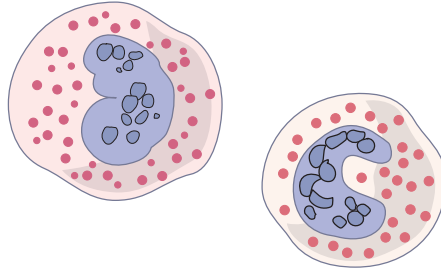
Use the following diagram to answer question 27.



27. The blood vessel labelled **X** is the

- A. aorta.
- B. iliac vein.
- C. subclavian vein.
- D. anterior vena cava.

Use the following diagram to answer question 28.



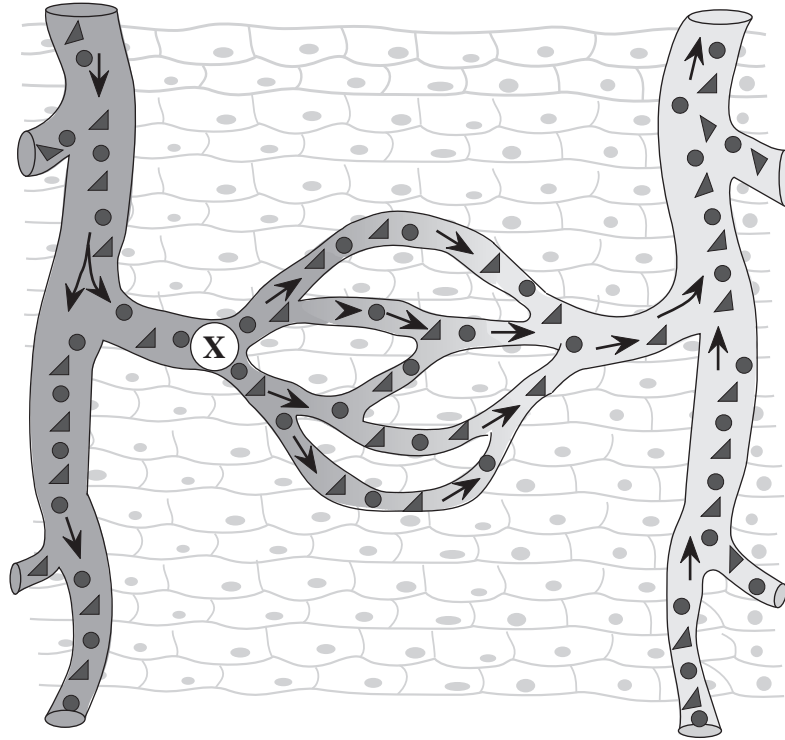
28. The cells above

- A. carry oxygen in the blood.
 - B. exchange gases in the lungs.
 - C. are active in areas of infection.
 - D. begin the process of blood clotting.
-

29. The substance produced by the body in response to a foreign substance is

- A. an antigen.
- B. a hormone.
- C. an enzyme.
- D. an antibody.

Use the following diagram to answer question 30.



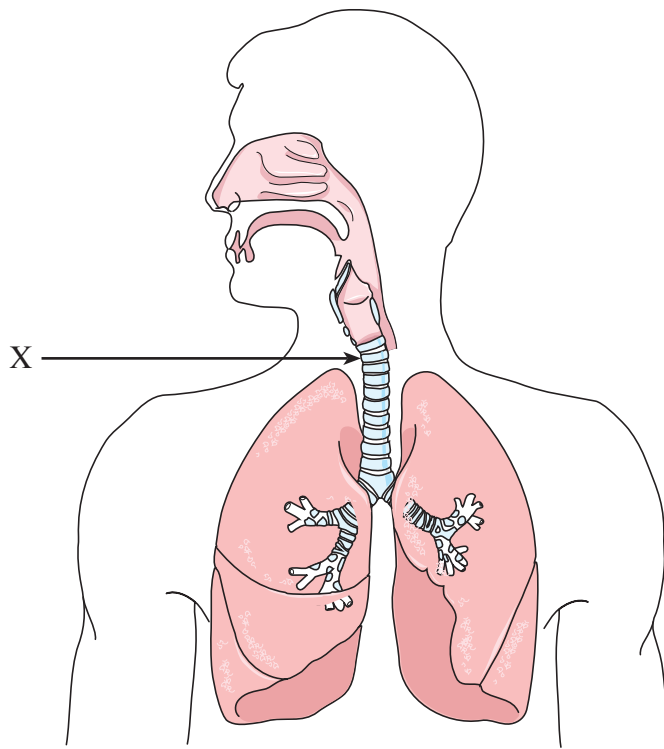
30. If normal blood pressure drops at point X, what will be the result?
- A. Blood velocity will increase.
 - B. The amount of water entering the tissues will increase.
 - C. Active transport of nutrients into the tissues will decrease.
 - D. The rate of diffusion of materials from tissues into the blood will increase.

Use the following information to answer question 31.

1. Sinoatrial (SA) node
2. Purkinje fibers
3. Atrioventricular (AV) node

31. Trace the pathway of electrical activity of the heart beginning with atrial systole and ending with ventricular systole by identifying, in order, the structures above.
- A. 1, 2, 3
 - B. 1, 3, 2
 - C. 3, 1, 2
 - D. 3, 2, 1

Use the following diagram to answer question 32.

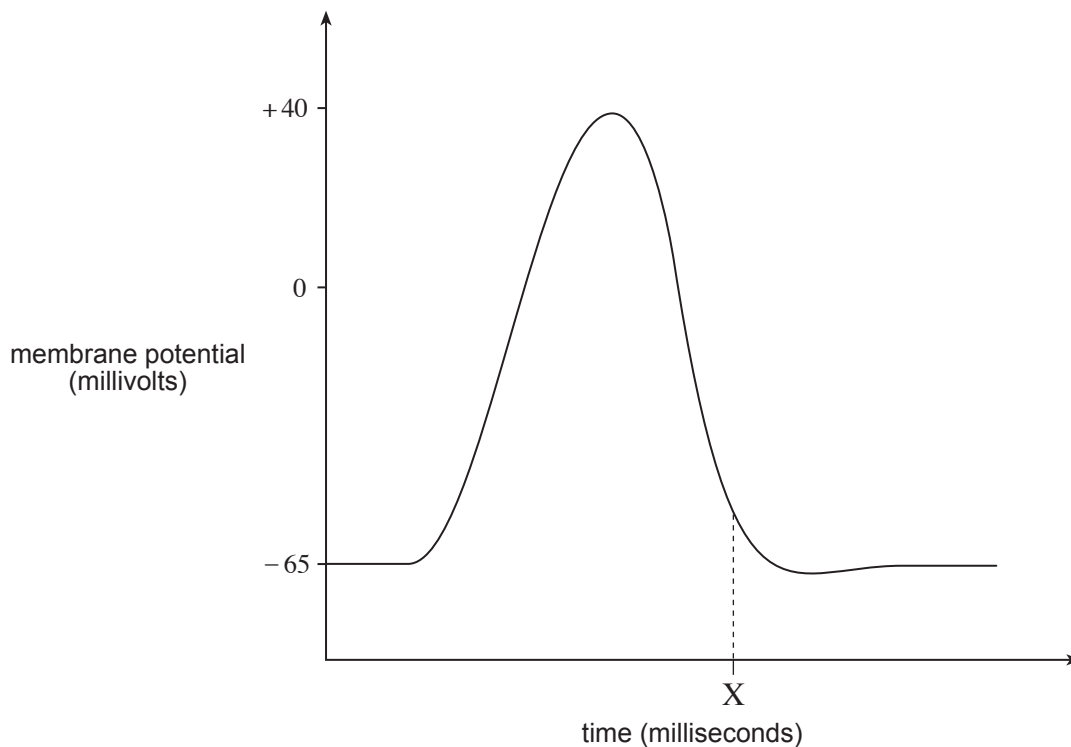


32. Which of the following structures is labelled X?

- A. trachea
- B. bronchi
- C. diaphragm
- D. bronchiole

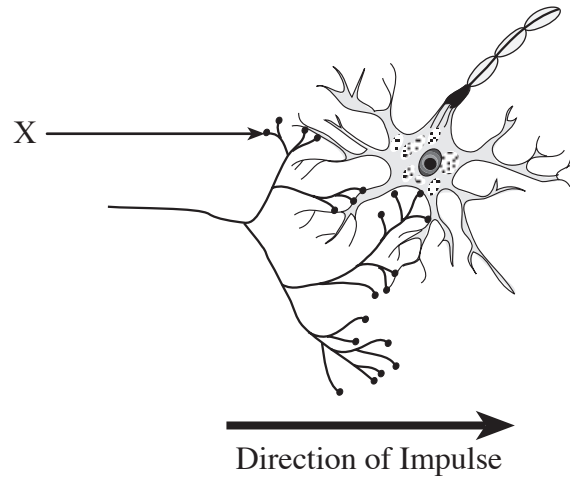
33. If the hydrogen ion concentration in the blood increases, the breathing control centre in the brain will
- decrease thoracic cavity volume.
 - decrease rib muscle contractions.
 - increase contractions of the diaphragm.
 - increase pressure in the thoracic cavity.
34. In a neuron, the correct order of structures that a nerve impulse passes through is
- axon → cell body → dendrite.
 - dendrite → axon → cell body.
 - cell body → dendrite → axon.
 - dendrite → cell body → axon.

Use the following graph to answer question 35.



35. Which of the following is a characteristic of the neuron at time **X**?
- Sodium ions are transported into the axon.
 - The axon membrane is impermeable to potassium ions.
 - There is a lower concentration of potassium ions inside than outside of the axon.
 - There is a net positive charge on the inside of the axon and a net negative charge on the outside.

Use the following diagram to answer question 36.



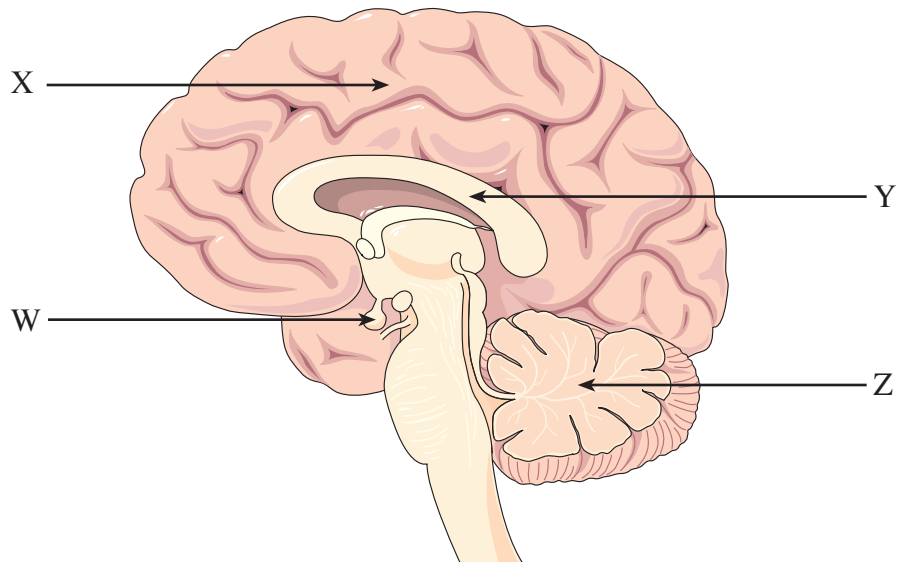
36. Considering the direction of the nerve impulse, what is structure **X**?

- A. cell body
 - B. myelin sheath
 - C. synaptic ending
 - D. post-synaptic membrane
-

37. Two areas of the brain that regulate the responses of the autonomic nervous system are the

- A. cerebrum and cerebellum.
- B. corpus callosum and thalamus.
- C. hypothalamus and medulla oblongata.
- D. anterior pituitary and posterior pituitary.

Use the following diagram to answer question 38.



38. Which letter indicates the cerebellum?

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

39. The portion of the brain involved in speech, vision, learning and memory is the

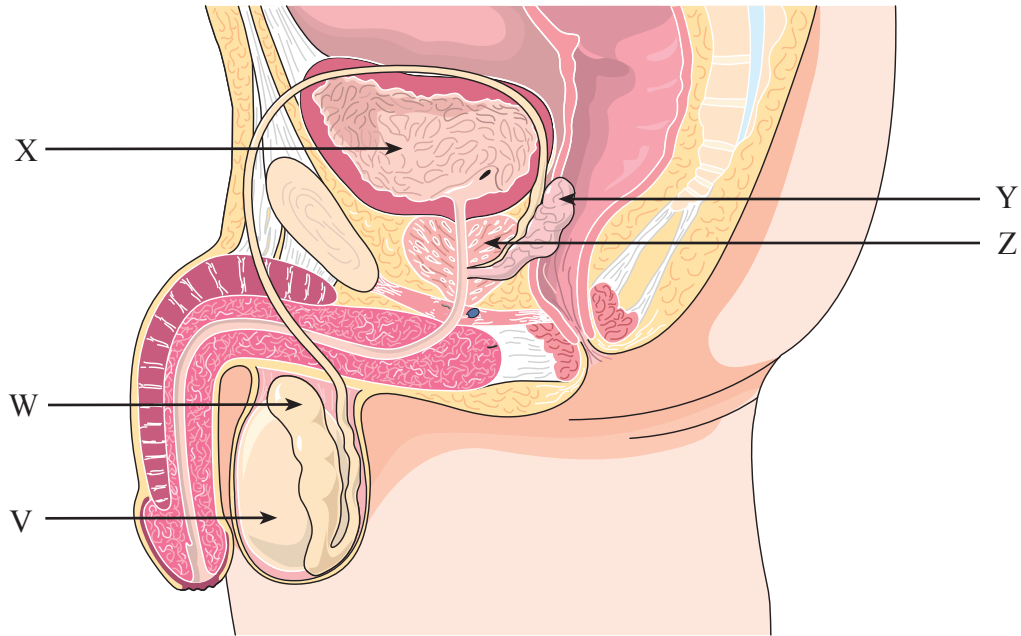
- A. cerebrum.
- B. cerebellum.
- C. hypothalamus.
- D. medulla oblongata.

40. The loop of Henle is found in the

- A. ureter.
- B. urethra.
- C. renal pelvis.
- D. renal medulla.

41. Identify the correct order of structures through which urine passes on its way out of the body.
- A. renal pelvis → collecting duct → ureter → bladder → urethra
 - B. collecting duct → renal pelvis → ureter → bladder → urethra
 - C. bladder → collecting duct → urethra → renal pelvis → ureter
 - D. urethra → ureter → bladder → renal pelvis → collecting duct
42. Which of the following will cause the kidneys to reabsorb more sodium ions?
- A. a decrease in blood pressure
 - B. an increase in the volume of blood
 - C. constriction of the afferent arterioles
 - D. a decrease in the amount of ADH secreted
43. If a drop in the pH of the blood occurs, the kidneys will
- A. increase the absorption of urea.
 - B. decrease the absorption of sodium ions.
 - C. decrease the secretion of hydrogen ions.
 - D. increase the reabsorption of bicarbonate ions.
44. Sperm cells travel through which of the following structures?
- A. ureter
 - B. prostate gland
 - C. seminal vesicles
 - D. ductus (vas) deferens

Use the following diagram to answer questions 45, 46 and 47.



45. Which **two** structures contribute fluids that make up semen?

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

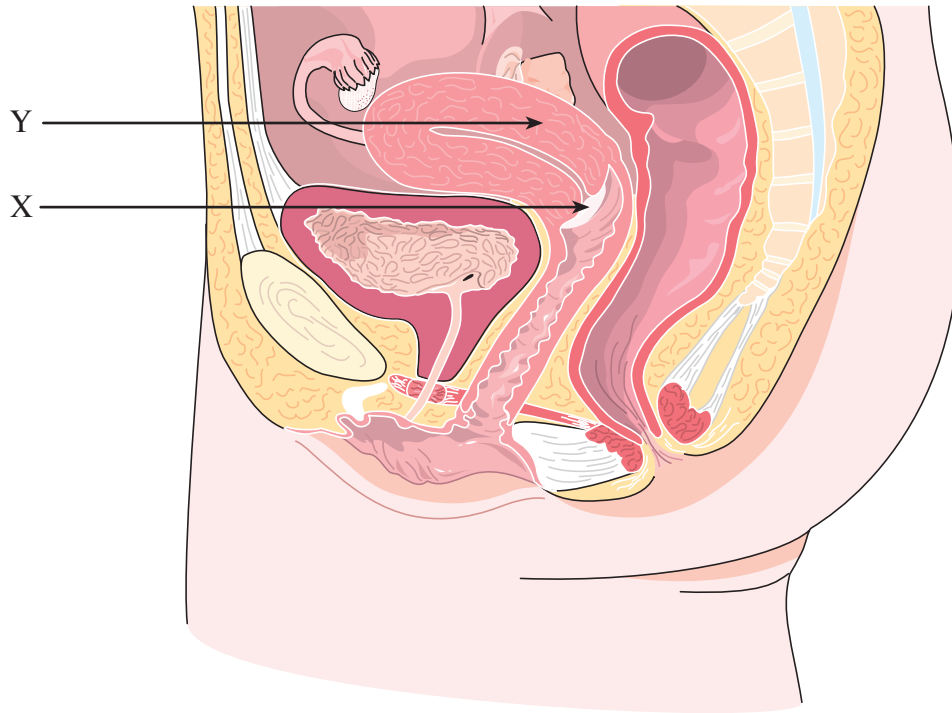
46. The structure labelled **W** is the

- A. prostate.
- B. epididymis.
- C. Cowper's gland.
- D. seminiferous tubule.

47. Secretions from structure **V** cause

- A. follicle maturation.
- B. increased secretion of luteinizing hormone (LH).
- C. beard growth and growth of the genitals at puberty.
- D. rhythmic contractions of the female reproductive system.

Use the following diagram to answer questions 48 and 49.



48. Structure **X** is the

- A. ovary.
- B. cervix.
- C. vagina.
- D. oviduct.

49. What will occur in structure **Y** if there is a reduction in hormones secreted from the ovary?

- A. the release of an egg
- B. increased vascularization
- C. the maturation of a follicle
- D. the breakdown of the endometrium

50. What hormone is primarily responsible for egg maturation and the distribution of fat in females?
- A. estrogen
 - B. progesterone
 - C. luteinizing hormone (LH)
 - D. human chorionic gonadotropic (HCG) hormone

**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) In an experiment conducted to study protein synthesis, radioactive thymine and radioactive uracil were added to a culture of human cells. A few hours later, the culture was analyzed and radioactive mRNA was found.

i) Explain how an mRNA molecule is produced. **(2 marks)**

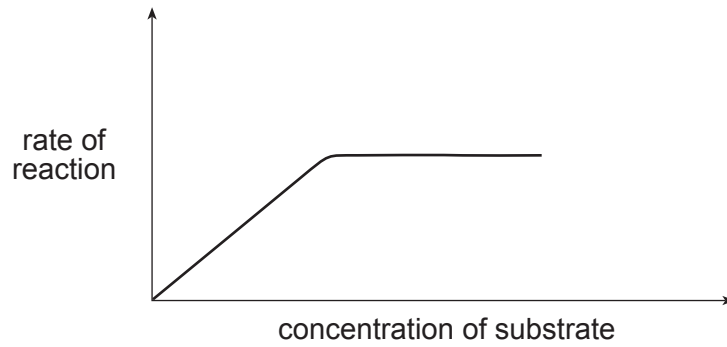
ii) Explain why the mRNA produced is radioactive. **(1 mark)**

b) In a different experiment, radioactive uracil was added to a culture of human cells undergoing DNA replication. What will be the characteristic of the resulting DNA in terms of radioactivity? Explain. **(2 marks)**

2. Materials move across the cell membrane either actively or passively. Complete the following table to compare and contrast these two ways of moving materials. **(4 marks)**

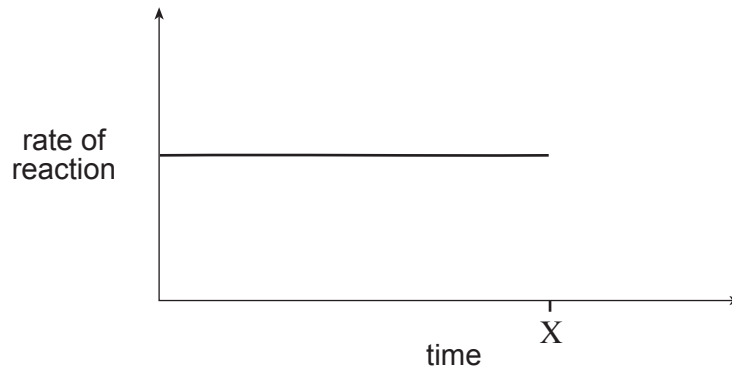
ACTIVE TRANSPORT	PASSIVE TRANSPORT

Use the following graph to answer question 3 a).



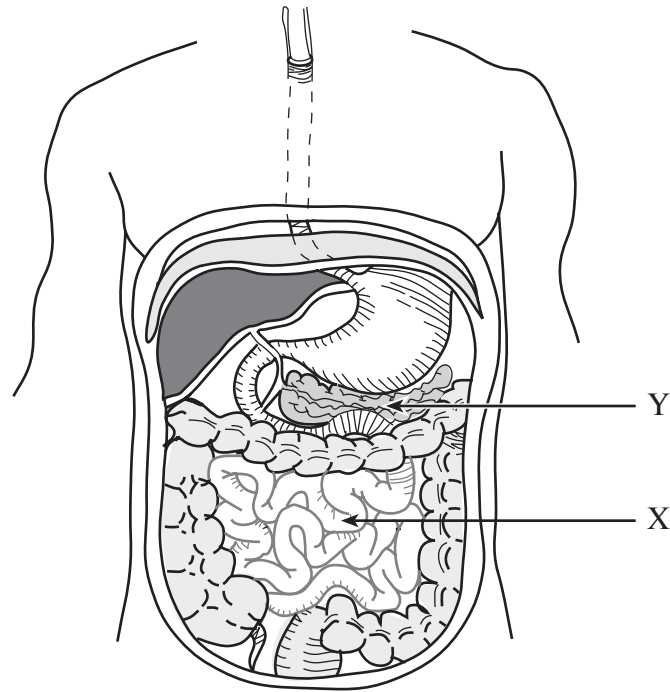
3. a) The graph represents data collected from an enzyme-catalyzed reaction in the small intestine. Explain the results. **(2 marks)**

- b) How would the shape of the graph below change if a large amount of concentrated acid were added to the enzyme-catalyzed reaction at time **X**? **Draw** the change on the graph and explain your answer. **(3 marks)**



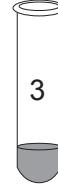


Explanation:

Use the following diagram to answer question 4.



4. Secretions from glands in the walls of structure **X** and secretions from structure **Y** are collected and added to test tubes containing three substrates as shown below. The test tubes are allowed to stand for one hour. Blue litmus paper, which turns red in the presence of an acid, is used as an indicator.

	 1	 2	 3
Substrate	starch	fats	protein
Secretions from	X and Y	X and Y	X and Y

- a) The test tubes were sampled during a one hour period. Identify any new substances produced in the following test tubes and account for their presence.

Test tube 1:

(2 marks)

Test tube 2:

(2 marks)

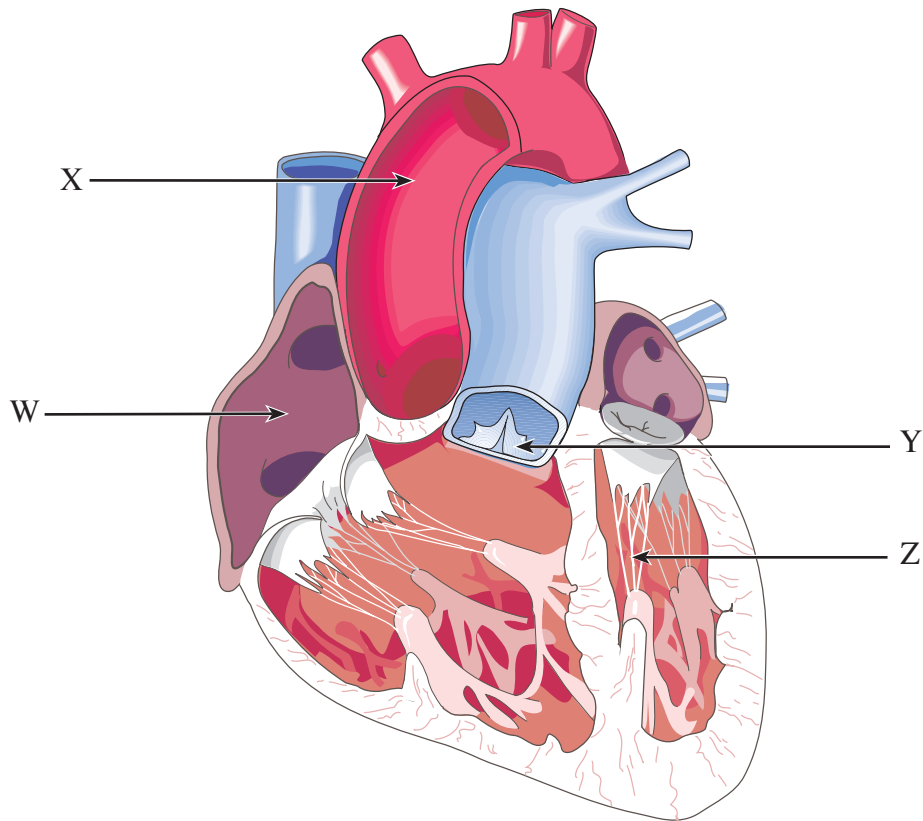
- b) Each test tube was tested with litmus paper at the beginning of the experiment and after one hour. In test tube 3, the litmus paper changed from blue at the beginning of the experiment to red after one hour. Explain what occurred in the test tube to cause the litmus paper to turn red. **(2 marks)**

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5. Explain how the structure of arteries is related to their function.

(2 marks)

Use the following diagram to answer question 6.



6. Identify and give **one** function of each of the following structures.
(8 marks: 1 mark each for name; 1 mark each for function)

Structure **W**:

Name: _____

Function: _____

Structure **X**:

Name: _____

Function: _____

Structure **Y**:

Name: _____

Function: _____

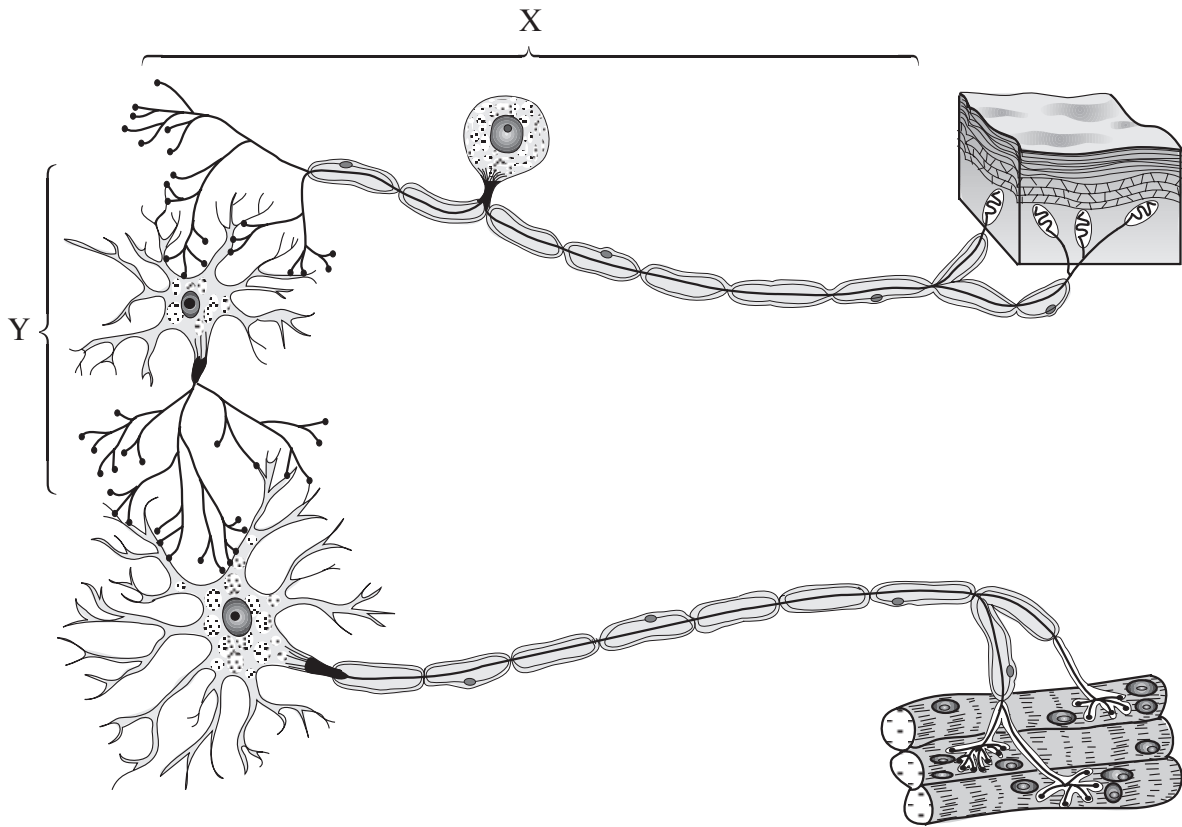
Structure **Z**:

Name: _____

Function: _____

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Use the following diagram to answer question 8.



8. a) Identify each of the following structures and give **one** function of each.
(4 marks: 1 mark each for name; 1 mark each for function)

Structure **X**:

Name: _____

Function: _____

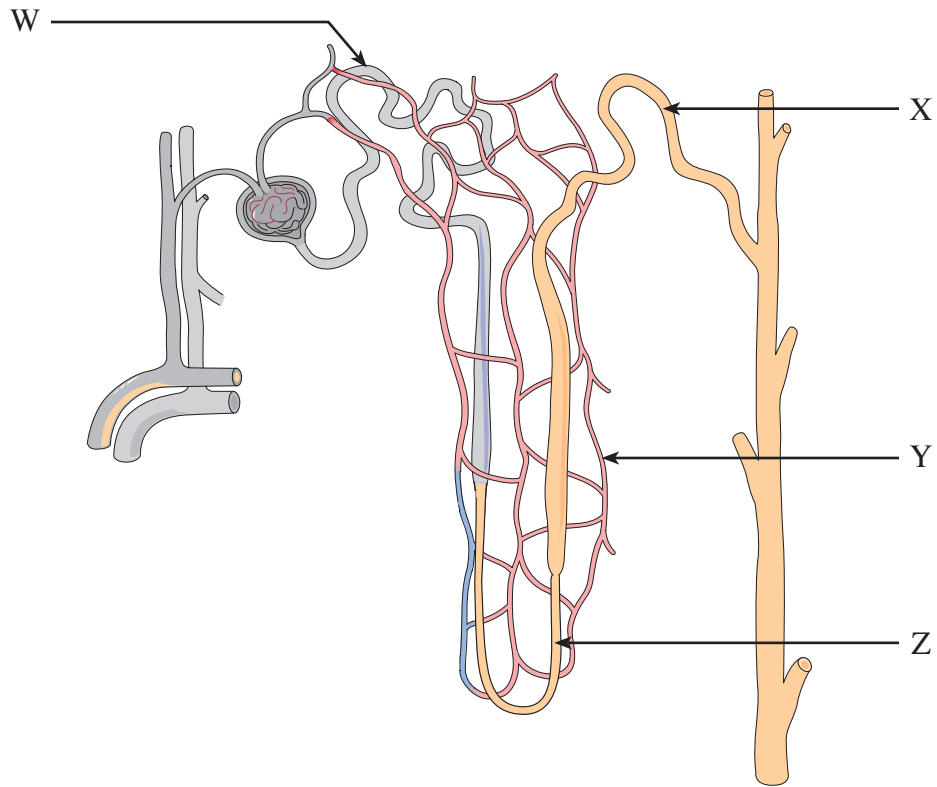
Structure **Y**:

Name: _____

Function: _____

- b) A substance disrupts communication between structures **X** and **Y**. Give an explanation of how a substance could do this. **(1 mark)**

Use the following diagram to answer question 9 a).



9. a) Give **one** different function of each of the following structures. (4 marks: 1 mark each)

Structure **W**: _____

Structure **X**: _____

Structure **Y**: _____

Structure **Z**: _____

Use the following table to answer question 9 b).

Filtrate	Urine
95% water	50% water

- b) Provide an explanation that accounts for the difference in the water content as shown in the table above. **(2 marks)**

10. a) Describe any **two** events that occur during days 15 to 28 of the ovarian or uterine cycles. **(2 marks)**

i) _____

ii) _____

b) During days 1 to 13 of the ovarian cycle, what would occur if follicle-stimulating hormone (FSH) was **not** secreted? **(2 marks)**

END OF EXAMINATION