

JANUARY 2000

PROVINCIAL EXAMINATION

MINISTRY OF EDUCATION

BIOLOGY 12

GENERAL INSTRUCTIONS

1. Insert the stickers with your Student I.D. Number (PEN) in the allotted spaces above and on the **back** cover of this booklet. **Under no circumstance is your name or identification, other than your Student I.D. 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. 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.
5. For each of the written-response questions, write your answer in **ink** in the space provided in this booklet.
6. 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 .

7. 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.

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BIOLOGY 12 PROVINCIAL EXAMINATION

	Value	Suggested Time
1. This examination consists of two parts:		
PART A: 50 multiple-choice questions	50	45
PART B: 11 written-response questions	50	75
	Total: 100 marks	120 minutes
2. Electronic devices, including dictionaries and pagers, are not permitted in the examination room.		
3. 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.		
4. This examination is designed to be completed in two hours . <i>Students may, however, take up to 30 minutes of additional time to finish.</i>		

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PART A: MULTIPLE CHOICE

Value: 50 marks

Suggested Time: 45 minutes

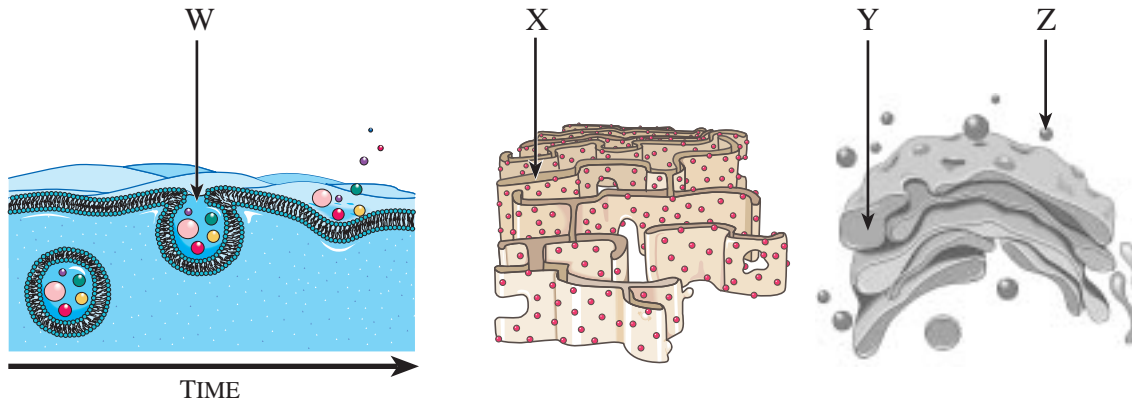
INSTRUCTIONS: For each question, select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle that has the letter corresponding to your answer.

1. Which of the following structures produces vesicles?
 - A. nucleus
 - B. ribosome
 - C. nucleolus
 - D. Golgi body

2. Which of the following produces ribosomal RNA?
 - A. nucleolus
 - B. mitochondrion
 - C. rough endoplasmic reticulum
 - D. smooth endoplasmic reticulum

3. During cell division, genetic material is contained in structures called
 - A. vacuoles.
 - B. lysosomes.
 - C. Golgi bodies.
 - D. chromosomes.

Use the following diagrams to answer question 4.



4. Which of the following describes the sequence in which the above events would occur in the production and secretion of a protein?

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

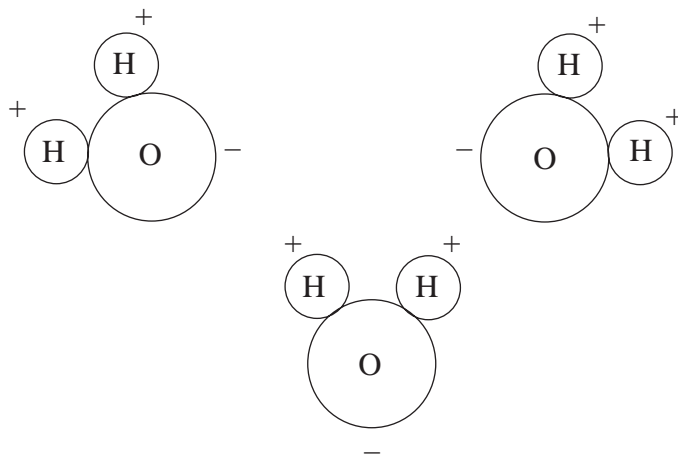
Use the following diagram to answer question 5.



5. Which of the following is a **product** of the structure above?

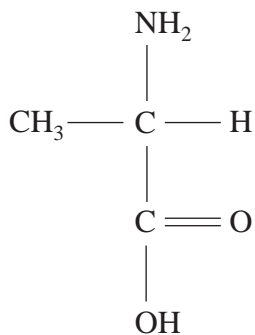
- A. urea
- B. oxygen
- C. glucose
- D. carbon dioxide

Use the following diagram to answer question 6.



6. The indicated charges allow these molecules to
- A. act as a solvent.
 - B. buffer a solution.
 - C. form the cell membrane.
 - D. store energy for cellular use.

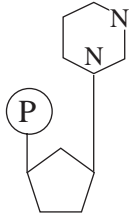
Use the following diagram to answer question 7.



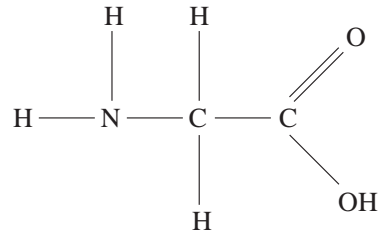
7. This molecule is the result of the hydrolysis of
- A. bile.
 - B. testosterone.
 - C. hemoglobin.
 - D. phospholipid.

8. Which of the following represents a lipid molecule?

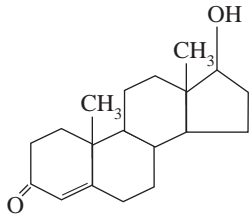
A.



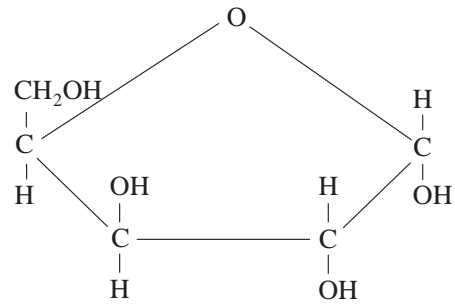
B.



C.



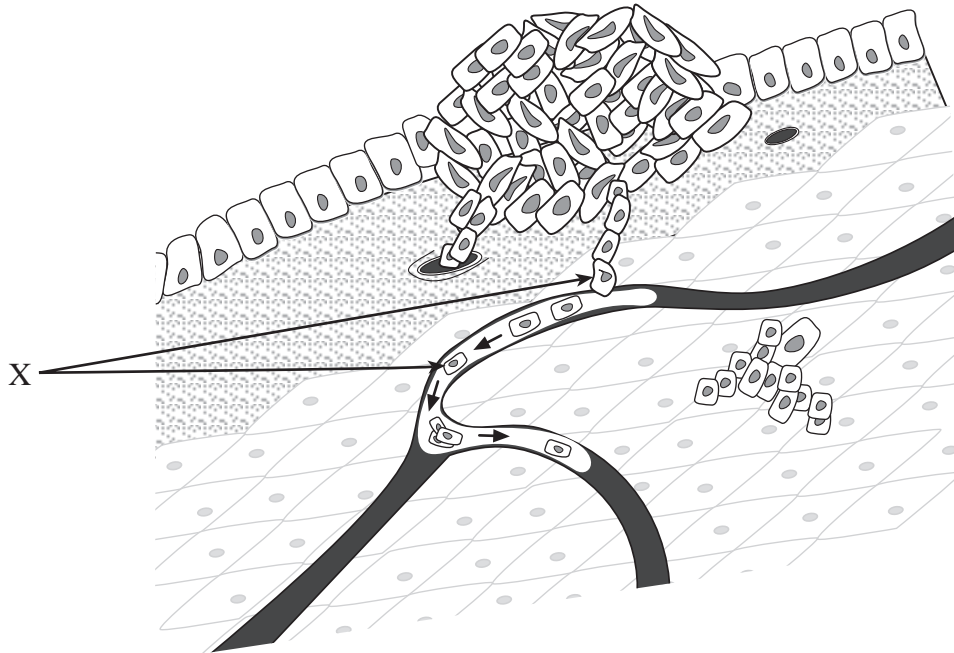
D.



9. A bacterial nucleic acid containing the human insulin gene is an example of

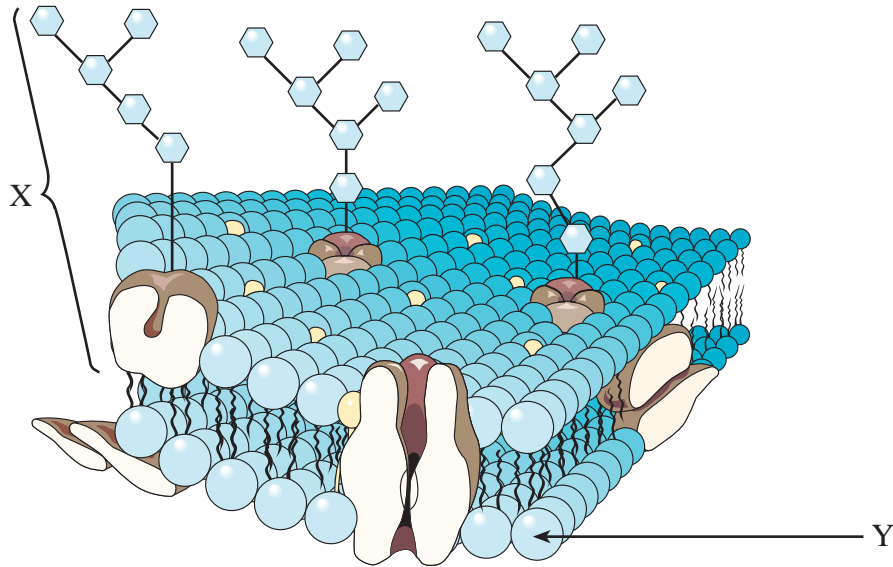
- A. a nucleotide.
- B. an oncogene.
- C. messenger RNA.
- D. recombinant DNA.

Use the following diagram to answer question 10.



10. Which stage in the development of cancer is indicated by the cells at location X?
- A. anaplasia
 - B. metastasis
 - C. vascularization
 - D. loss of contact inhibition
-
11. Which of the following is a recognized danger signal that indicates cancer may be present?
- A. a sore fails to heal
 - B. an infection occurs
 - C. a high fever develops
 - D. the heart beats erratically
12. A carcinogen is a substance that
- A. prevents anaplasia.
 - B. prevents mutations.
 - C. denatures enzymes.
 - D. transforms a proto-oncogene.

Use the following diagram to answer questions 13 and 14.



13. What is the function of the structure labelled X?

- A. move cells
- B. trap nutrient molecules
- C. enable cellular recognition
- D. increase the rate of diffusion

14. The molecule labelled Y contains

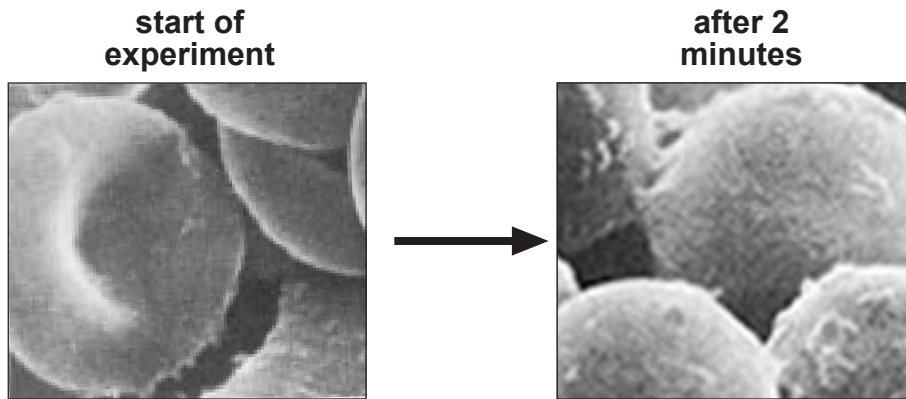
- A. protein.
 - B. steroids.
 - C. glycerol.
 - D. amino acids.
-

15. The cell membrane is selectively permeable because

- A. all particles can pass through it.
- B. particles can quickly pass through it.
- C. only certain particles can pass through it.
- D. only nutrient molecules can pass through it.

16. Facilitated and active transport both
- A. require ATP.
 - B. require protein carrier molecules.
 - C. operate in the sodium-potassium pump.
 - D. move molecules against the concentration gradient.

Use the following micrographs to answer question 17.

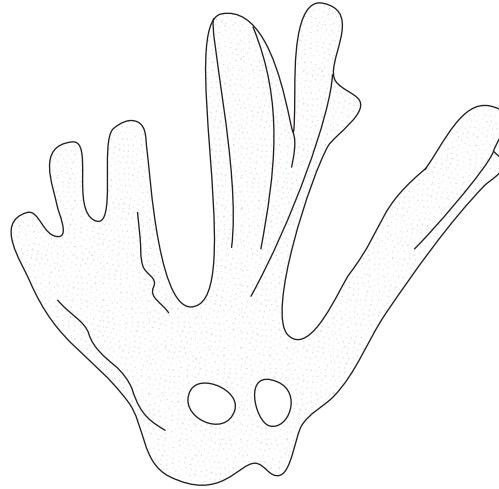
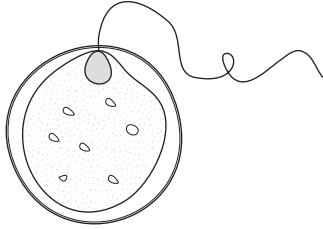


17. Red blood cells were placed in an unknown solution. Micrographs were taken at the start of the experiment and after two minutes. The movement of which component of the solution caused the observed change?
- A. salt
 - B. water
 - C. protein
 - D. glucose

Use the following diagrams to answer question 18.

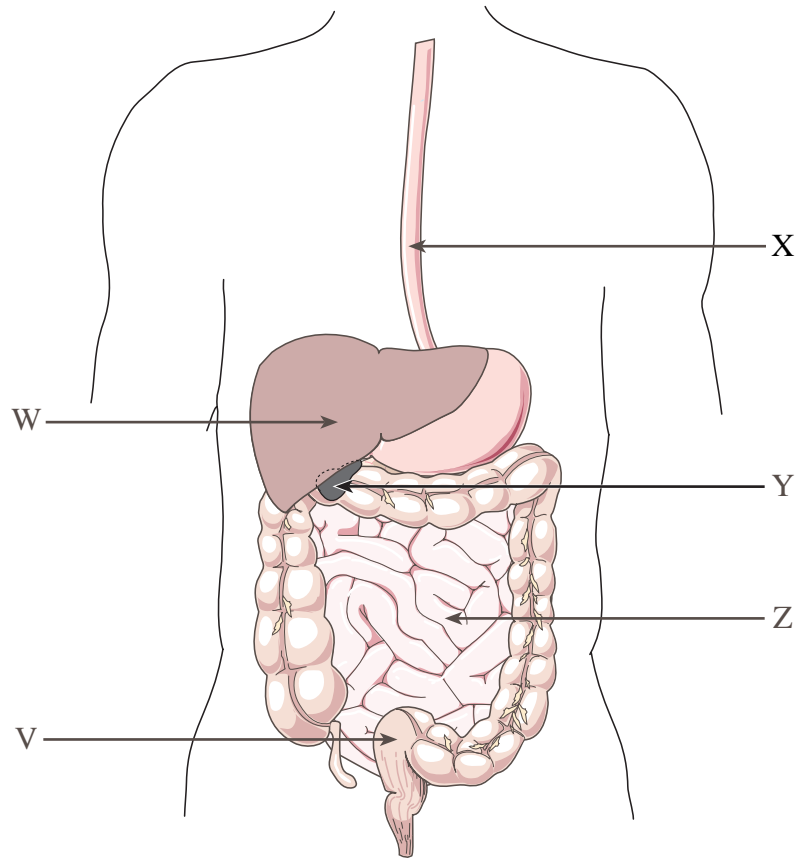
Protozoan A

Protozoan B



18. Spherical protozoans (single-celled organisms), such as **A**, are generally much smaller than irregularly-shaped protozoans, such as **B**, because
- A. irregular protozoans do not divide as often.
 - B. spherical protozoans use greater amounts of energy.
 - C. irregular protozoans have a greater surface area to volume ratio.
 - D. spherical protozoans are able to obtain more food using phagocytosis.

Use the following diagram to answer questions 19 and 20.



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

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

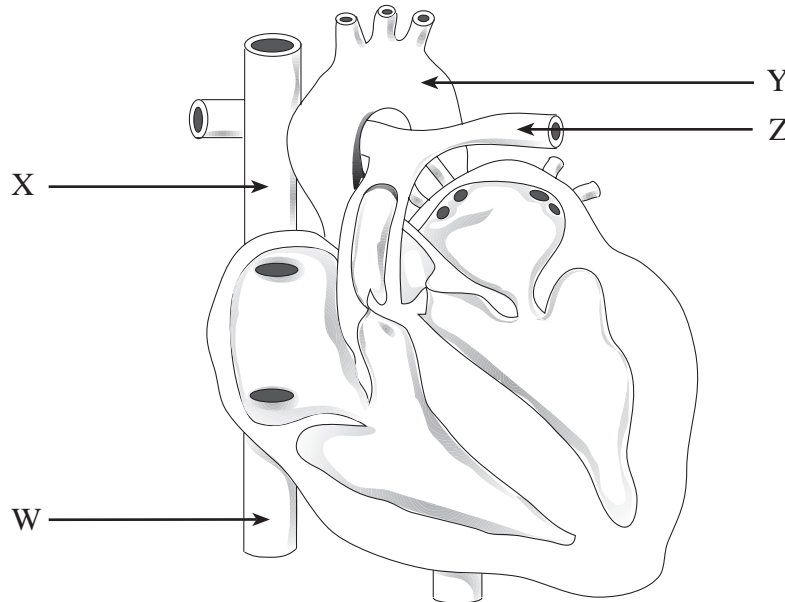
20. Which structure stores bile?

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

21. Secretions from the stomach promote the digestion of
- A. fats.
 - B. proteins.
 - C. nucleic acids.
 - D. carbohydrates.

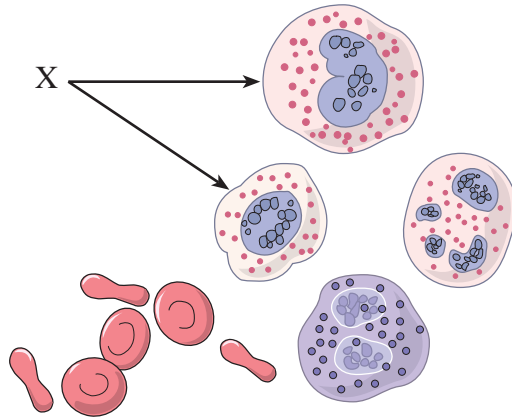
22. Which of the following statements about insulin is correct?
- A. Insulin is produced by the liver.
 - B. Insulin causes a decrease in blood sugar.
 - C. Insulin decreases the hydrogen ion concentration in the blood.
 - D. Insulin is secreted when fats are present in the digestive system.

Use the following diagram to answer question 23.



23. Blood pressure is **greatest** in which of the labelled vessels?
- A. W
 - B. X
 - C. Y
 - D. Z

Use the following diagram to answer question 24.



24. The structures labelled X are

- A. platelets.
 - B. antibodies.
 - C. red blood cells.
 - D. white blood cells.
-

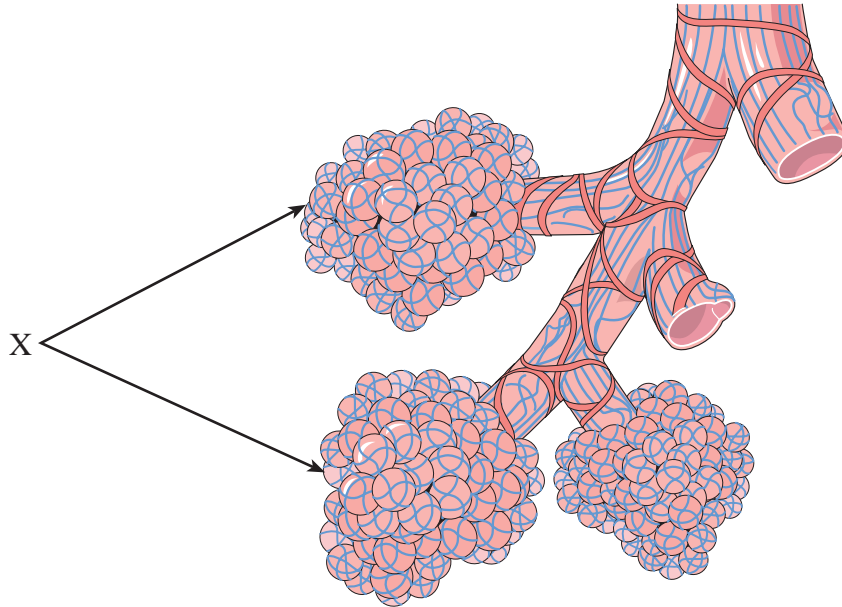
25. A function of the larynx is to

- A. produce sound.
- B. facilitate gas exchange.
- C. prevent the lungs from collapsing.
- D. increase the volume of the thoracic cavity.

26. Cilia are found lining which of the following structures?

- A. larynx
- B. alveoli
- C. trachea
- D. pleural membranes

Use the following diagram to answer question 27.



27. The structures labelled **X** are

- A. villi.
 - B. alveoli.
 - C. bronchioles.
 - D. lymph nodes.
-

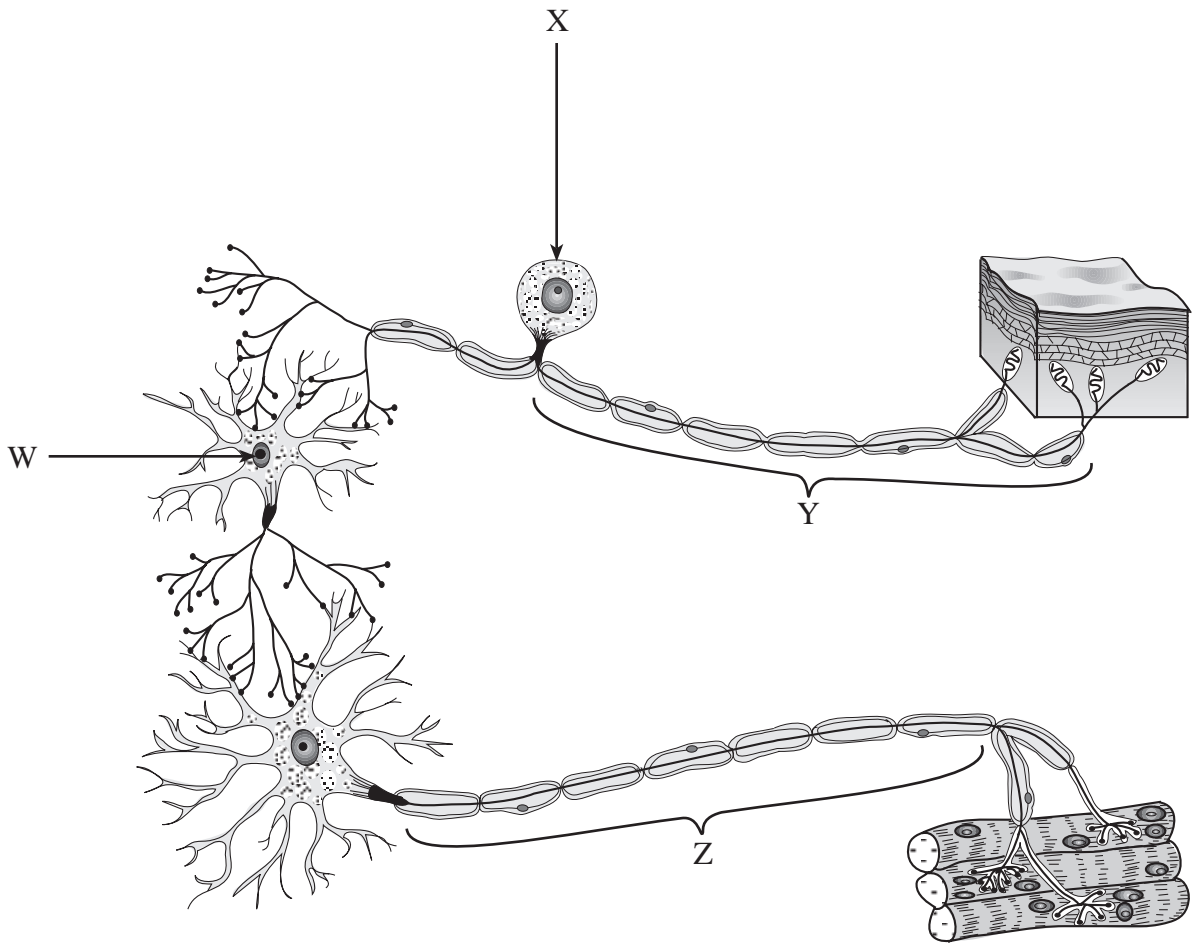
28. Inhalation results from

- A. contraction of the diaphragm.
- B. movement of the pleural membranes.
- C. decreased carbon dioxide in the blood.
- D. relaxation of the rib (intercostal) muscles.

29. The majority of carbon dioxide in the blood travels

- A. as bicarbonate ions.
- B. dissolved in plasma.
- C. as carbonic anhydrase.
- D. as carbaminohemoglobin.

Use the following diagram to answer question 30.



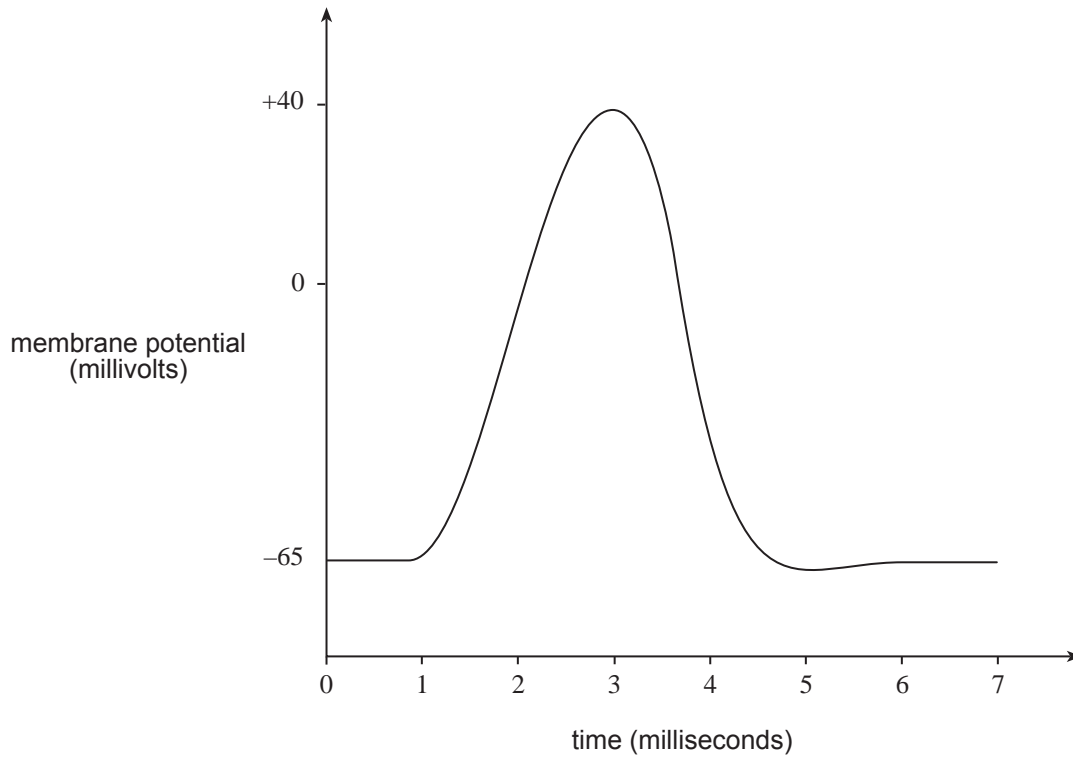
30. Which of the following indicates an axon?

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

31. In which of the following is ATP required?

- A. initiation of the nerve impulse
- B. establishment of the resting potential
- C. repolarization of the neural membrane
- D. depolarization of the neural membrane

Use the following graph to answer question 32.



32. During which of the following times is the membrane's permeability to sodium ions increasing?

- A. 0 to 1 milliseconds
 - B. 1 to 3 milliseconds
 - C. 3 to 4 milliseconds
 - D. 4 to 5 milliseconds
-

33. The space between **two** neurons in a reflex arc is the

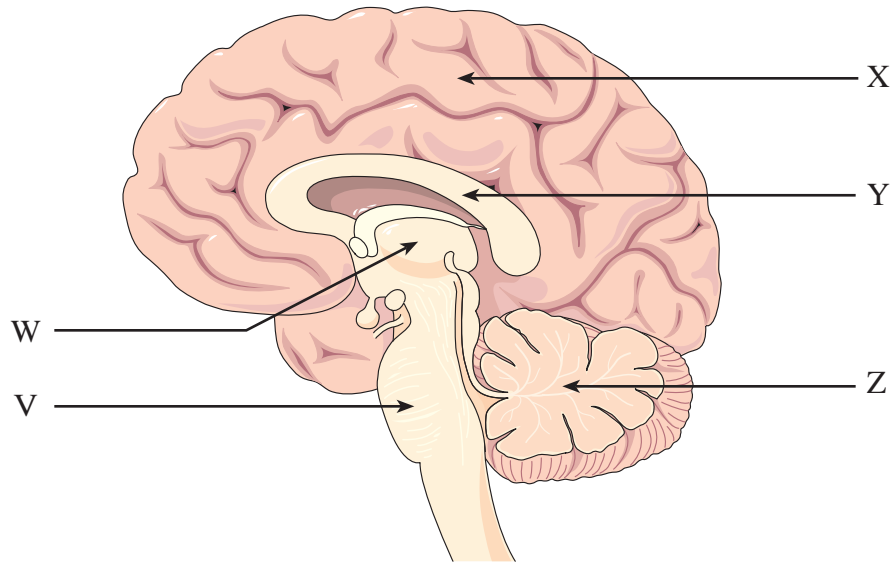
- A. synaptic cleft.
- B. terminal knob.
- C. node of Ranvier.
- D. post-synaptic membrane.

34. Control of skeletal muscle is a function of the

- A. somatic nervous system.
- B. autonomic nervous system.
- C. sympathetic nervous system.
- D. parasympathetic nervous system.

35. When a stimulus reaches the threshold level in a dendrite of a sensory neuron,
- A. the sodium gates open.
 - B. a neurotransmitter is released.
 - C. the neuron becomes repolarized.
 - D. the sodium-potassium pump restores the resting potential.

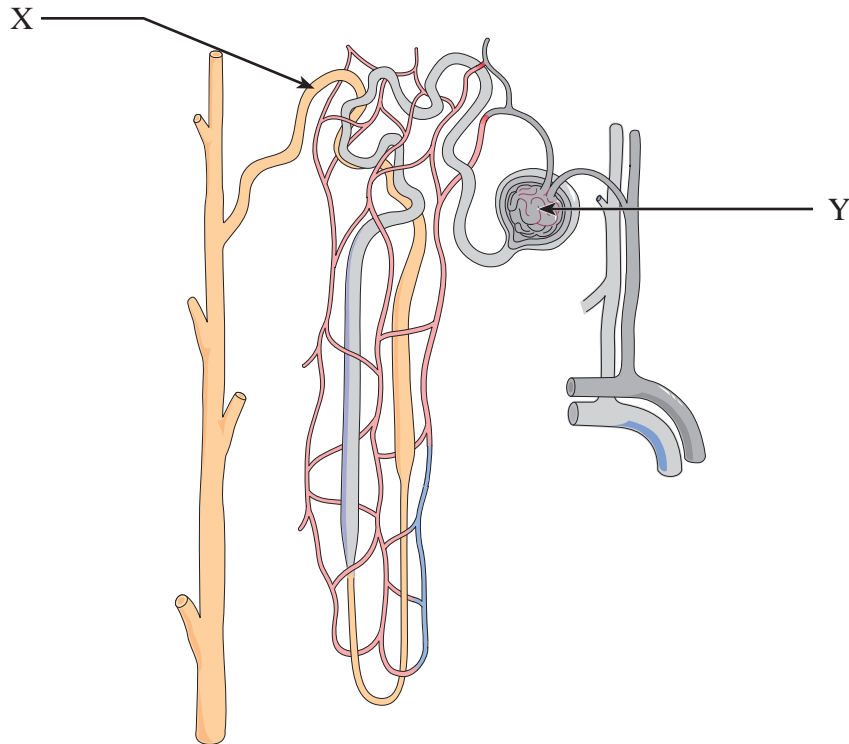
Use the following diagram to answer questions 36 and 37.



36. The structure labelled **Y** is the
- A. thalamus.
 - B. cerebrum.
 - C. hypothalamus.
 - D. corpus callosum.
37. Balance and muscle coordination are functions of which of the following structures?
- A. V
 - B. W
 - C. X
 - D. Z

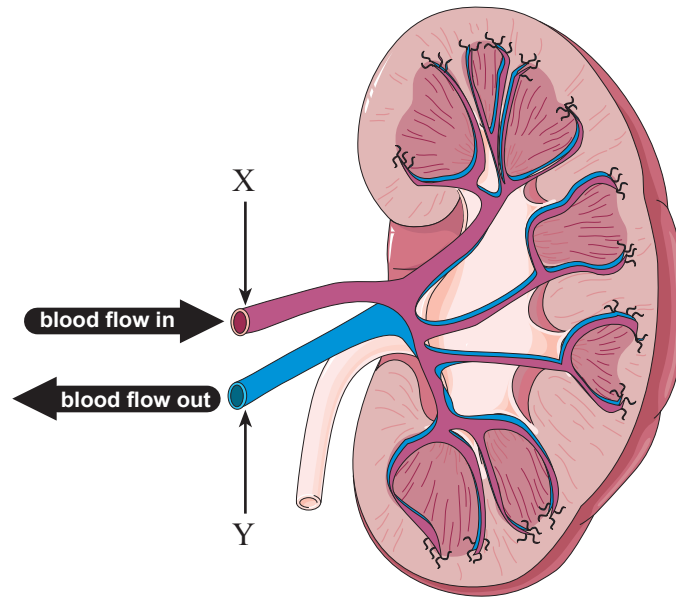
38. The movement of urine from the kidney to the urinary bladder is a function of the
- A. ureter.
 - B. urethra.
 - C. renal pelvis.
 - D. collecting duct.
39. The **greatest** salt concentration in the kidney is found in the
- A. glomerulus.
 - B. renal pelvis.
 - C. renal cortex.
 - D. renal medulla.

Use the following diagram to answer questions 40 and 41.



40. Which process occurs at **X**?
- A. tubular excretion
 - B. pressure filtration
 - C. selective reabsorption
 - D. antidiuretic hormone (ADH) secretion
41. The structure labelled **Y** is the
- A. glomerulus.
 - B. loop of Henle.
 - C. Bowman's capsule.
 - D. proximal convoluted tubule.

Use the following diagram to answer question 42.



42. Which of the following statements comparing blood in **X** to blood in **Y** is true?

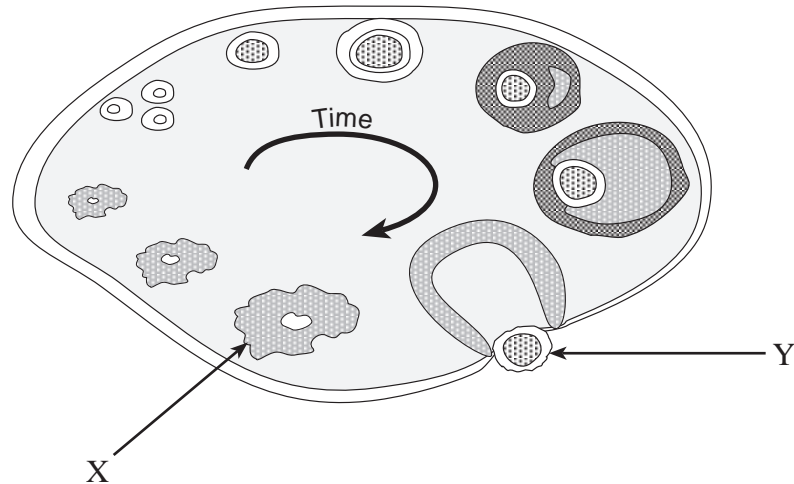
- A. The concentration of urea is higher in **X**.
 - B. The concentration of oxygen is lower in **X**.
 - C. The concentration of glucose is higher in **Y**.
 - D. The concentration of carbon dioxide is lower in **Y**.
-

43. Consuming alcohol inhibits the release of a hormone, resulting in the production of dilute urine. This occurs because the alcohol is affecting the

- A. thyroid gland.
- B. adrenal cortex.
- C. adrenal medulla.
- D. posterior pituitary.

44. High salt concentration in the blood is detected by the
- A. glomerulus.
 - B. hypothalamus.
 - C. medulla oblongata.
 - D. distal convoluted tubule.
45. Which of the following would cause increased water reabsorption by the kidneys?
- A. increased blood volume
 - B. increased cardiac output
 - C. decreased blood pressure
 - D. decreased ADH secretion
46. Testosterone is produced in the
- A. urethra.
 - B. epididymis.
 - C. interstitial cells.
 - D. seminiferous tubules.
47. Which of the following is **not** a function of seminal fluid?
- A. to provide energy for sperm
 - B. to cause the growth of sperm
 - C. to provide a medium for movement of sperm cells
 - D. to transport prostaglandins that promote uterine contraction

Use the following diagram to answer questions 48 and 49.



48. Which of the following structures within the ovary is labelled **X**?
- A. egg
 - B. follicle
 - C. oviduct
 - D. corpus luteum
49. After leaving the ovary, the next structure that **Y** will enter is the
- A. uterus.
 - B. cervix.
 - C. oviduct.
 - D. endometrium.
-
50. In order to prevent the degeneration of the corpus luteum, the concentration of which of the following hormones increases during implantation?
- A. estrogen
 - B. luteinizing hormone (LH)
 - C. follicle-stimulating hormone (FSH)
 - D. human chorionic gonadotropin (HCG)

**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.
 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. State **two** biological functions of glucose in living organisms. **(2 marks)**

i) _____

ii) _____

2. Using the chart below, contrast DNA and mRNA.

(3 marks: 1 mark for each contrasting pair)

	DNA	mRNA
TYPE OF SUGAR		
NUMBER OF STRANDS		
BASES		

3. Describe **one** way in which each of the following pairs of molecules are functionally related in the process of protein synthesis. **(4 marks: 1 mark each)**

DNA and mRNA:

mRNA and tRNA:

tRNA and amino acids:

protein and rRNA:

4. An experiment was conducted to measure the effects of the presence of thyroxin and temperature on oxygen use in human tissue cells. Two tissue samples were prepared as shown below.

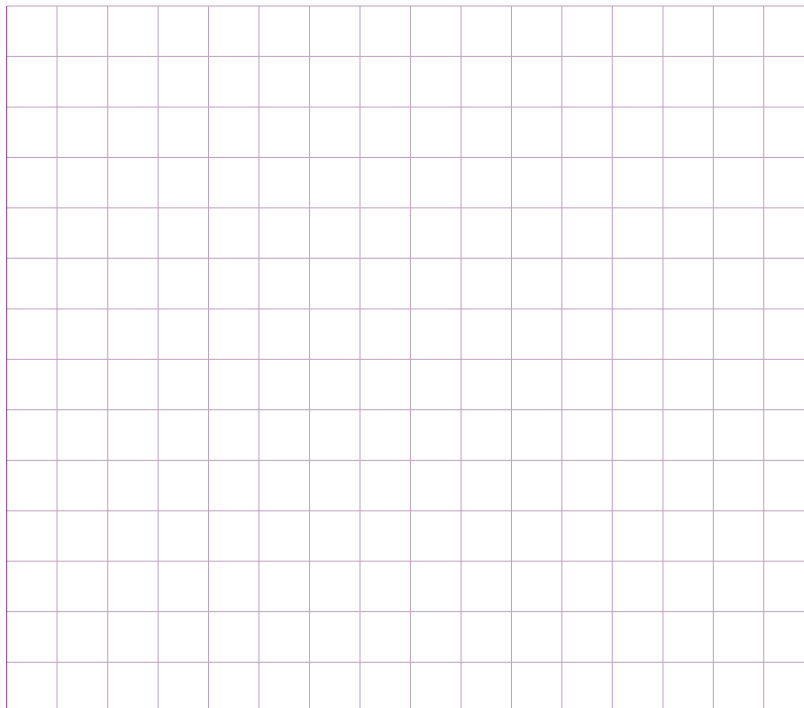
Sample A: 50 grams of muscle tissue was added to a nutrient solution.

Sample B: 50 grams of muscle tissue was added to a thyroxin and nutrient solution.

Oxygen consumption was measured at various temperatures. The results are shown below.

Temperature (°C)	Consumption of oxygen (mL/hour)	
	Sample A muscle tissue	Sample B muscle tissue + thyroxin
15°C	6	12
25°C	8	16
35°C	12	24
45°C	7	14
55°C	2	4

- a) Use the grid provided to graph the data in the table above. Label the x -axis as temperature. (2 marks: 1 mark for correct scale and labels; 1 mark for plotting and lines)



Use the following lines to plot your data:
 Sample A - - - -
 Sample B —————

- b) Based on your graph of the data for sample **B**, predict the amount of oxygen consumed per hour at 20°C. **(1 mark)**

Amount of oxygen consumed: _____

- c) Explain the difference observed in the results of samples **A** and **B**. **(1 mark)**

- d) Explain the results for sample **B** at each of the following temperatures. **(3 marks: 1 mark each)**

15°C:

35°C:

55°C:

5. Explain how the liver is involved in each of the following processes.

digestion of fat:

(2 marks)

maintenance of blood glucose levels:

(2 marks)

maintenance of healthy blood:

(2 marks)

6. How does the circulatory system respond to each of the following?

an antigen enters the blood:

(2 marks)

increased stimulation by the sympathetic nervous system:

(2 marks)

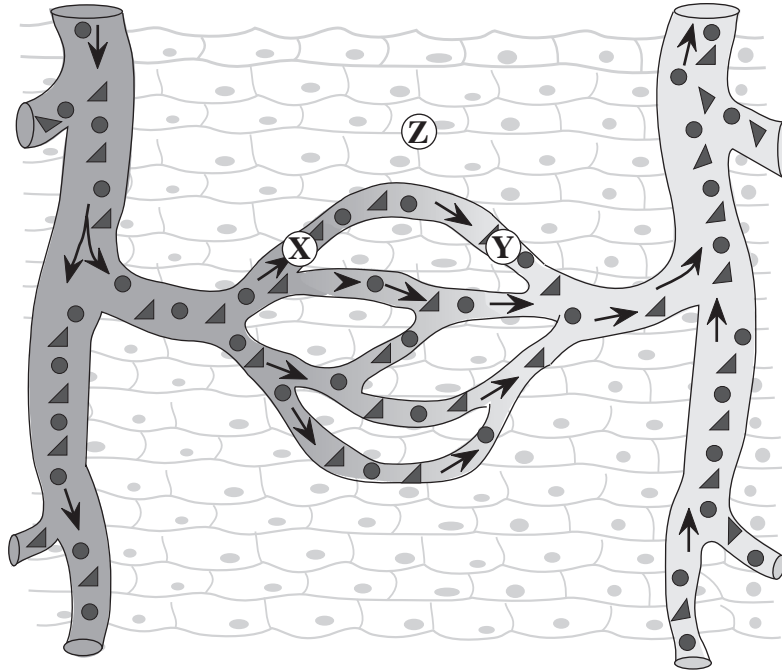
hardening of the arteries (inability of arteries to expand and recoil):

(1 mark)

a cut on your finger:

(1 mark)

Use the following diagram to answer question 7.



7. a) Describe the capillary-tissue fluid exchange

at **X**.

(2 marks)

at **Y**.

(2 marks)

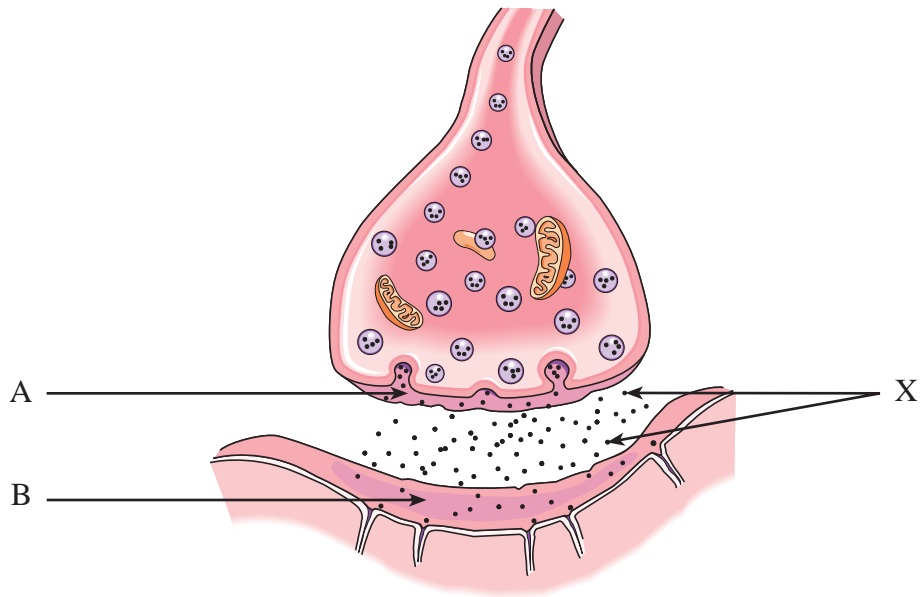
b) Describe what is occurring at **Z** between the tissue fluid and the cells.

(2 marks)

8. a) How does an increase in the concentration of carbon dioxide in the blood affect the breathing rate? **(1 mark)**

- b) Where is an increase in the concentration of carbon dioxide in the blood detected? Explain how the body responds to return carbon dioxide concentration to normal levels. **(2 marks)**

Use the following diagram to answer question 9.



9. a) Identify the process by which the molecules labelled **X** leave the cell. **(1 mark)**

b) How do the molecules travel from membrane **A** to membrane **B**? **(1 mark)**

c) Describe the effect of these molecules on membrane **B**. **(1 mark)**

10. Describe the process which occurs at each of the following structures.

(4 marks: 1 mark each)

Bowman's capsule:

proximal convoluted tubule:

collecting duct:

loop of Henle:

11. Give **one** function of each of the following hormones.

(6 marks: 1 mark each)

testosterone:

follicle-stimulating hormone:

luteinizing hormone:

estrogen:

progesterone:

oxytocin:

END OF EXAMINATION

Question 1:

1. .
(2)

Question 7:

7. .
(6)

Question 2:

2. .
(3)

Question 8:

8. .
(3)

Question 3:

3. .
(4)

Question 9:

9. .
(3)

Question 4:

4. .
(7)

Question 10:

10. .
(4)

Question 5:

5. .
(6)

Question 11:

11. .
(6)

Question 6:

6. .
(6)

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BIOLOGY 12
January 2000

Course Code = BI

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