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Biology 12

JUNE 2003

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. .
(3)

Question 9:
9. .
(4)

Question 2:
2. .
(3)

Question 10:
10. .
(4)

Question 3:
3. .
(2)

Question 11:
11. .
(4)

Question 4:
4. .
(4)

Question 12:
12. .
(4)

Question 5:
5. .
(3)

Question 13:
13. .
(2)

Question 6:
6. .
(6)

Question 14:
14. .
(3)

Question 7:
7. .
(6)

Question 8:
8. .
(2)

BIOLOGY 12

JUNE 2003

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 marks	45 minutes
PART B: 14 written-response questions	50 marks	75 minutes
	Total: 100 marks	120 minutes

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PART A: MULTIPLE CHOICE

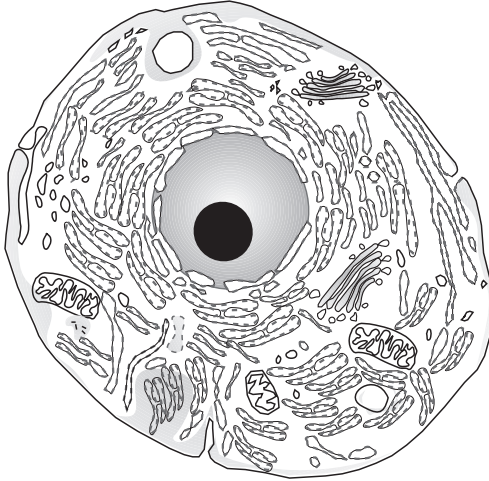
Value: 50 marks

Suggested Time: 45 minutes

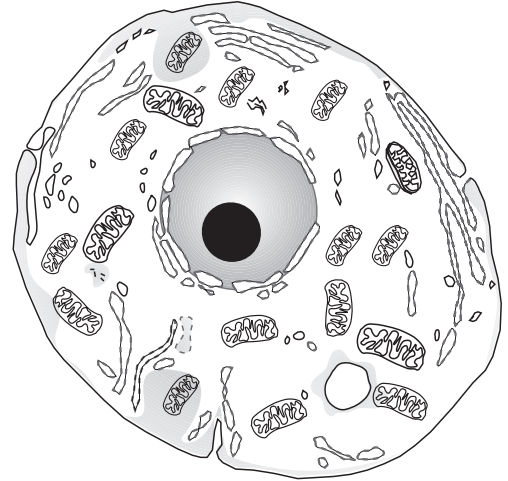
INSTRUCTIONS: For each question select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle on the Response Form that has the letter corresponding to your answer.

1. Which of the following cells could produce the greatest amount of lipase?

A.



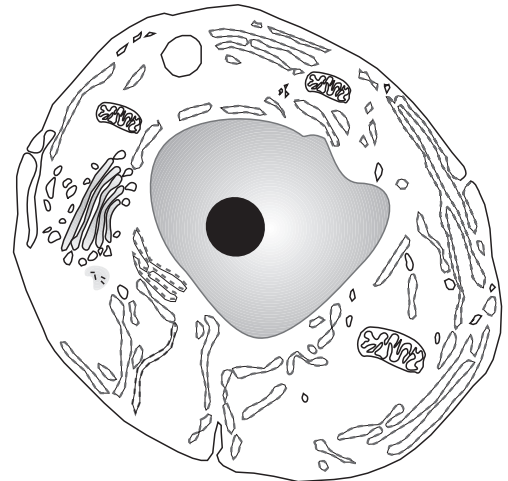
B.



C.

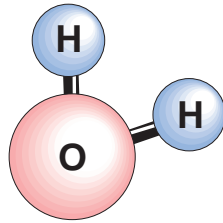


D.



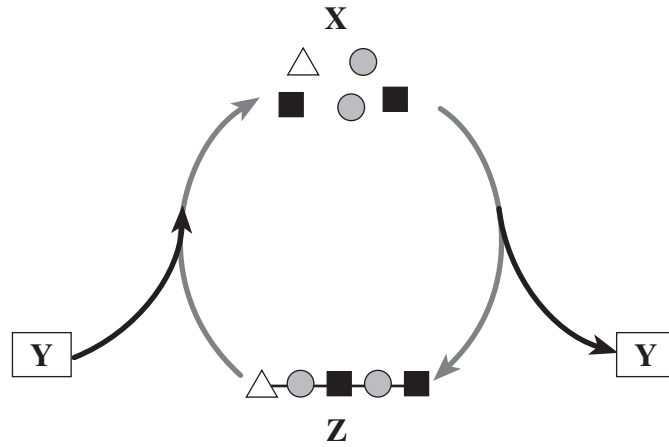
2. Phagocytosis involves the infolding of what structure?
- A. the nucleolus
 - B. the mitochondria
 - C. the cell membrane
 - D. the smooth endoplasmic reticulum

Use the following diagram to answer question 3.



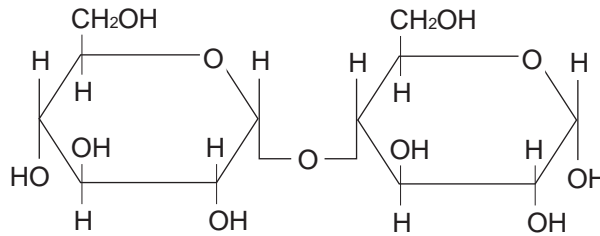
3. The polarity of the molecule above accounts for which of the following characteristics?
- A. an acidic pH
 - B. low density as a liquid
 - C. its ability to act as a solvent
 - D. its ability to buffer reactions

Use the following diagram to answer questions 4 and 5.



4. What does the molecule labelled **Y** represent?
- ATP
 - water
 - oxygen
 - carbon dioxide
5. If the molecules at **X** represent amino acids, then what does the molecule at **Z** represent?
- insulin
 - glycerol
 - glycogen
 - messenger RNA

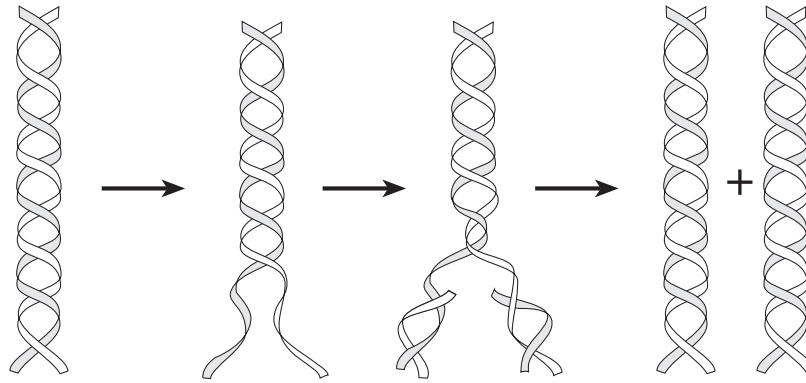
Use the following diagram to answer question 6.



6. What is the molecule illustrated above?
- glycogen
 - a nucleotide
 - an amino acid
 - a disaccharide

OVER

Use the following diagram to answer question 7.



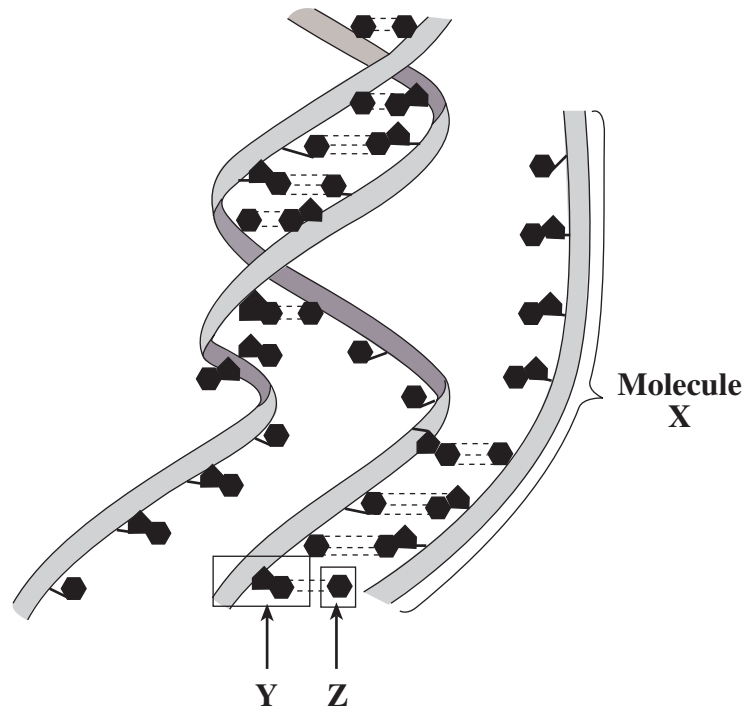
7. Where in the cell does this process take place?

- A. in the nucleus
 - B. in the ribosome
 - C. in the Golgi body
 - D. in the rough endoplasmic reticulum
-

8. Which of the following are characteristics of DNA but **not** of RNA?

A.	single stranded	contains adenine	translates
B.	double stranded	contains guanine	replicates
C.	single stranded	contains thymine	replicates
D.	double stranded	contains uracil	translates

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



9. What process produces molecule **X**?
- A. translation
 - B. replication
 - C. denaturation
 - D. transcription
10. What type of bond joins the structure in box **Y** with the structure in box **Z**?
- A. ionic
 - B. peptide
 - C. covalent
 - D. hydrogen
11. What two components are part of the structure shown in box **Y**?
- A. ribose and guanine
 - B. ribose and cytosine
 - C. deoxyribose and uracil
 - D. deoxyribose and adenine

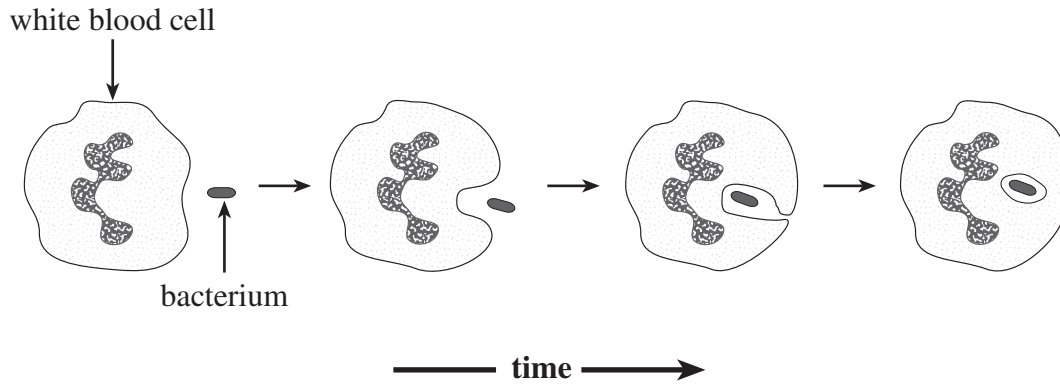
12. What is produced during translation?
- A. messenger RNA
 - B. steroid hormones
 - C. a polypeptide chain
 - D. new DNA molecules
13. What molecules act as carriers of glucose in the cell membrane?
- A. proteins
 - B. nucleic acids
 - C. phospholipids
 - D. carbohydrates
14. Which of the following describes active transport?
- A. Water moves across the cell membrane.
 - B. Small molecules are pushed into the tissue fluid by blood pressure.
 - C. Molecules are moved against the concentration gradient using energy.
 - D. Molecules are moved with the concentration gradient without using energy.

Use the following list to answer question 15.

- | |
|--|
| <ul style="list-style-type: none">• temperature• shape of molecule• concentration gradient |
|--|

15. How many of the conditions above would affect the rate of diffusion across a semipermeable membrane?
- A. 0
 - B. 1
 - C. 2
 - D. 3

Use the following diagram to answer question 16.



16. What is the next step in the process shown above?

- A. Water is drawn into the cell.
 - B. Enclosed substances leave the cell.
 - C. A lysosome fuses with the vacuole.
 - D. A vesicle fuses with the cell membrane.
-

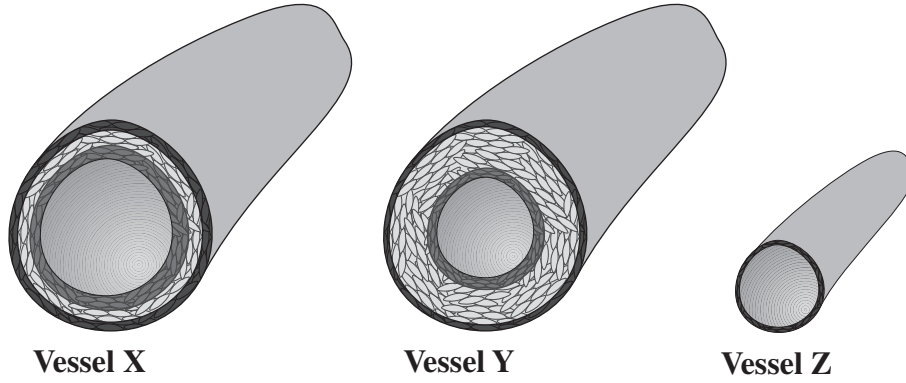
17. The appendix is attached to which of the following structures?

- A. the colon
- B. the stomach
- C. the gall bladder
- D. the small intestine

18. Which of the following compares the blood glucose concentration in the hepatic portal vein to that of the hepatic vein after the digestion of carbohydrate-rich food?

- A. Blood glucose concentration is higher in the hepatic vein due to the actions of insulin.
- B. Blood glucose concentration is higher in the hepatic vein because the liver stores excess glucose.
- C. Blood glucose concentration is similar in each vein because glucose remains in the bloodstream.
- D. Blood glucose concentration is lower in the hepatic vein because glucose is converted to glycogen.

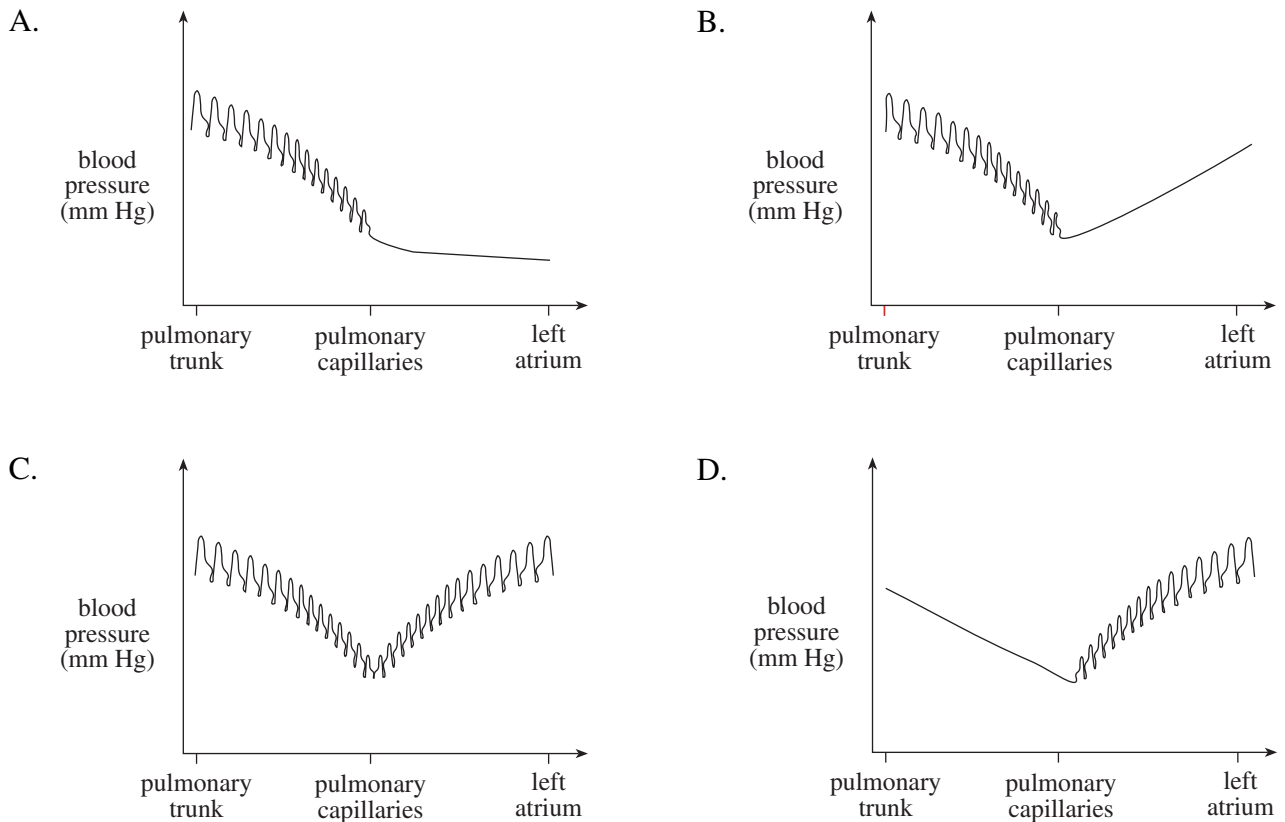
Use the following diagrams to answer question 19.



19. The diagrams above illustrate cross-sectional views of three different types of blood vessels. Which of the following correctly describes the characteristics of each blood vessel?

	Vessel X	Vessel Y	Vessel Z
A.	carries blood to the heart	contains one-way valves	contraction of skeletal muscle aids blood flow
B.	blood velocity is highest in this type of vessel	carries blood toward the heart	exchanges gases, nutrients and wastes with tissue fluids
C.	smooth muscle allows for contraction	carries blood from the heart	carries blood toward the heart
D.	contraction of skeletal muscle aids blood flow	smooth muscle allows for contraction	blood velocity is lowest in this type of vessel

20. Which of the following graphs illustrates the changes in the blood pressure between the pulmonary trunk and the left atrium?



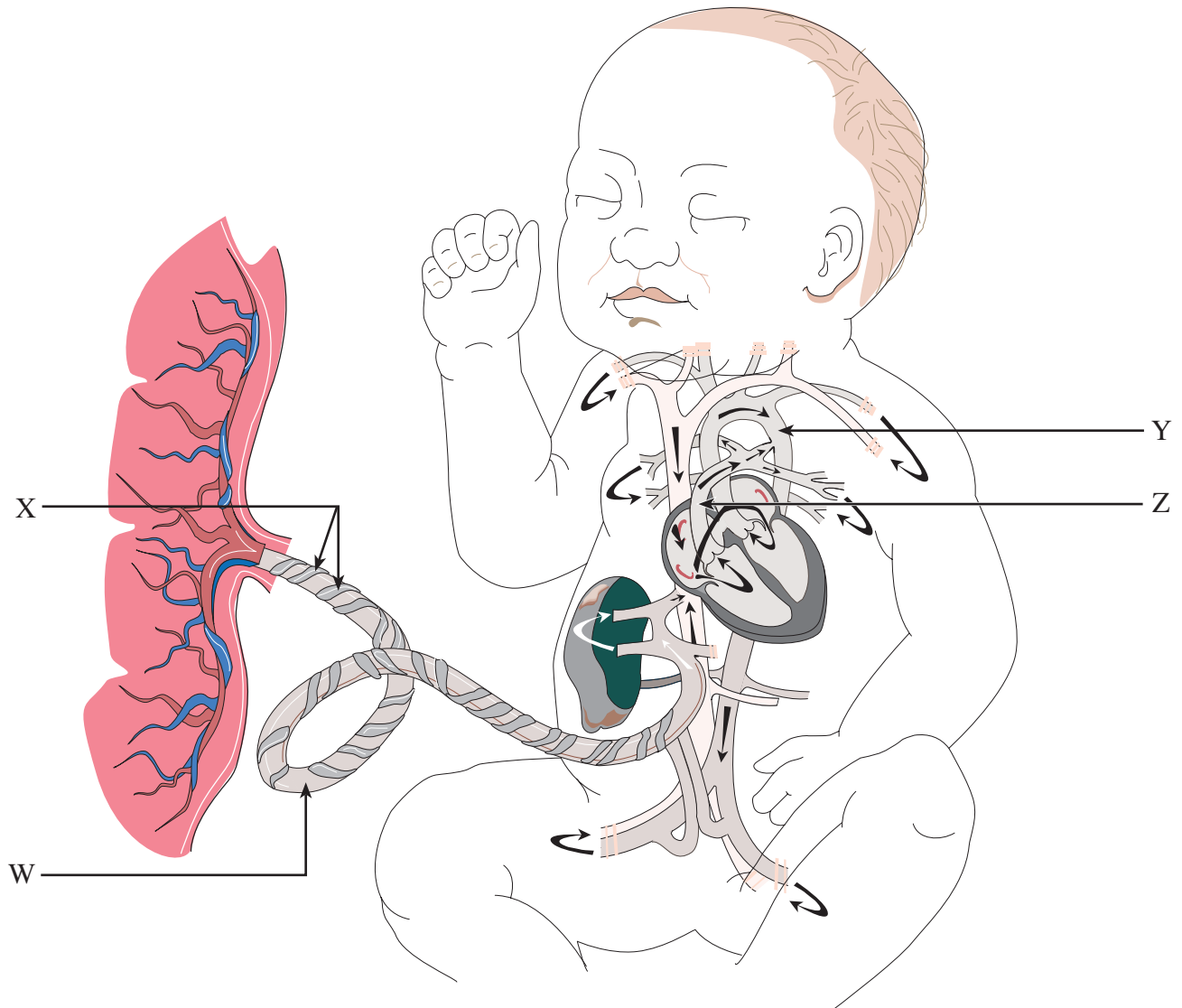
21. Which of the following statements is true?

- A. Arteries have thinner walls than veins.
- B. Veins have greater elasticity than arteries.
- C. Arteries have one-way valves and veins do not.
- D. Veins have a larger internal diameter than arteries.

22. What blood vessel carries oxygen and nutrients to the heart muscle?

- A. the aorta
- B. the carotid artery
- C. the coronary artery
- D. the pulmonary artery

Use the following diagram to answer question 23.

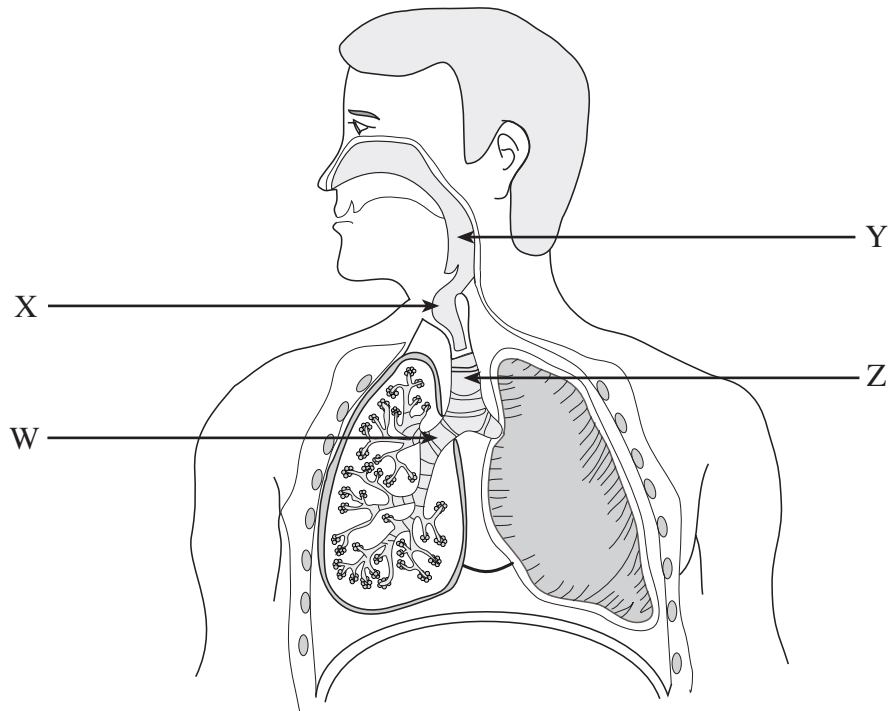


23. Which labelled blood vessel would contain the highest concentrations of oxygen and nutrients?

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

24. What structures are responsible for collecting excess tissue fluids in the body?
- A. the venules
 - B. the lymph nodes
 - C. the blood arterioles
 - D. the lymph capillaries
25. Which of the following is found in greater amounts in the blood of a person with a viral infection?
- A. urea
 - B. platelets
 - C. antibodies
 - D. red blood cells
26. Which of the following describes the net movement of water at the arterial end of a capillary bed?
- A. net movement of water into the tissues because blood pressure is less than the osmotic pressure of the blood
 - B. net movement of water into the tissues because blood pressure is greater than the osmotic pressure of the blood
 - C. net movement of water into the capillaries because blood pressure is less than the osmotic pressure of the blood
 - D. net movement of water into the capillaries because blood pressure is greater than the osmotic pressure of the blood
27. The secretion of which of the following would lead to a decrease in blood pressure?
- A. adrenaline
 - B. aldosterone
 - C. acetylcholine
 - D. antidiuretic hormone

Use the following diagram to answer question 28.



28. Which arrow indicates the location of the vocal cords?

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

29. What structure prevents food from entering the trachea?

- A. the pharynx
- B. the epiglottis
- C. the diaphragm
- D. the bronchioles

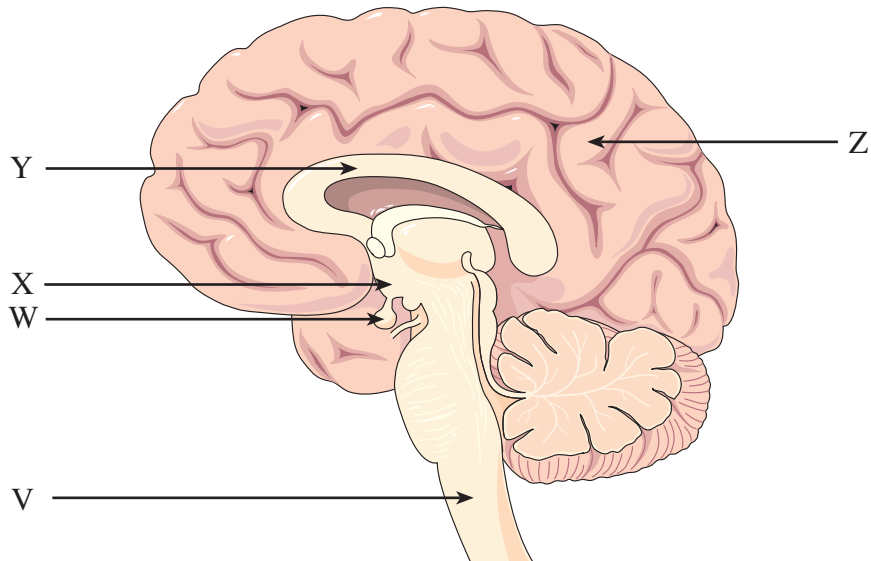
30. Which of the following events occurs during exhalation?

- A. The diaphragm flattens and the rib muscles relax.
- B. The diaphragm flattens and the rib muscles contract.
- C. The diaphragm becomes dome shaped and the rib cage moves up and out.
- D. The diaphragm becomes dome shaped and the rib cage moves down and in.

31. High blood concentrations of which of the following substances increases the rate and depth of breathing?
- A. acetylcholine
 - B. hydrogen ions
 - C. oxyhemoglobin
 - D. carbonic anhydrase
32. What structure in a neuron contains the nucleus?
- A. the axon
 - B. the vesicle
 - C. the dendrite
 - D. the cell body
33. What event occurs during repolarization?
- A. the sodium gates open
 - B. the potassium gates open
 - C. the net movement of sodium ions into the axon
 - D. the net movement of potassium ions into the axon
34. To which structure does a nerve impulse travel after leaving the axon of an interneuron?
- A. a receptor
 - B. an effector
 - C. an axon of a sensory neuron
 - D. a dendrite of a motor neuron
35. Which of the following is a function of the hormone produced by the adrenal medulla?
- A. to increase the heart rate
 - B. to decrease blood pressure
 - C. to stimulate the actions of the digestive system
 - D. to stimulate the parasympathetic nervous system

36. If damage to the brain leads to difficulties in voluntary muscle response and speech, what area of the brain is most likely affected?
- A. the cerebrum
 - B. the hypothalamus
 - C. the pituitary gland
 - D. the medulla oblongata

Use the following diagram to answer questions 37 and 38.



37. Which of the following are functions of **X**?
- A. to regulate heart rate and breathing rate
 - B. to control temperature and water balance
 - C. to control muscle co-ordination and balance
 - D. to integrate sensory information and act as a relay station
38. Which structures act as the neuro-endocrine control centre?
- A. V and X
 - B. V and Z
 - C. W and X
 - D. W and Y

39. Which of the following correctly compares the relative concentrations of the given substances in urine and blood in the renal vein?

	Urine			Blood in the renal vein		
	Urea	Hydrogen ions	Glucose	Urea	Hydrogen ions	Glucose
A.	high	low	high	high	low	high
B.	high	high	low	low	low	high
C.	low	high	low	low	low	high
D.	low	low	high	high	high	low

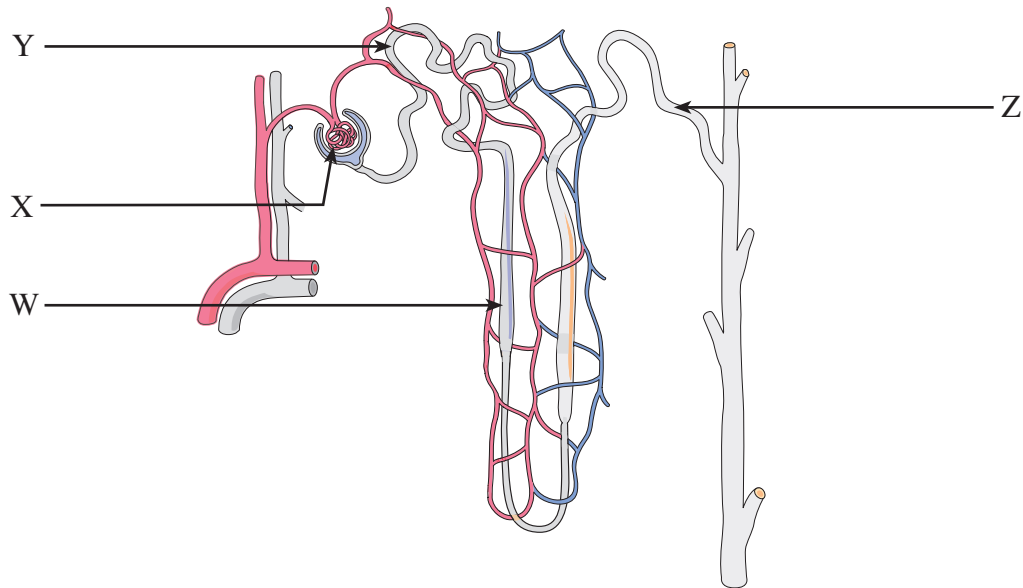
40. How does the composition of blood in the renal vein change if ADH is secreted?

- A. It contains more water.
- B. It contains more glucose.
- C. It contains more aldosterone.
- D. It contains more bicarbonate ions.

41. Which part of the nephron re-absorbs the majority of nutrients?

- A. the glomerulus
- B. the loop of Henle
- C. the distal convoluted tubule
- D. the proximal convoluted tubule

Use the following diagram to answer question 42.



42. The cells of which labelled structure respond to aldosterone?

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

43. What substance is increasingly re-absorbed as blood pH decreases?

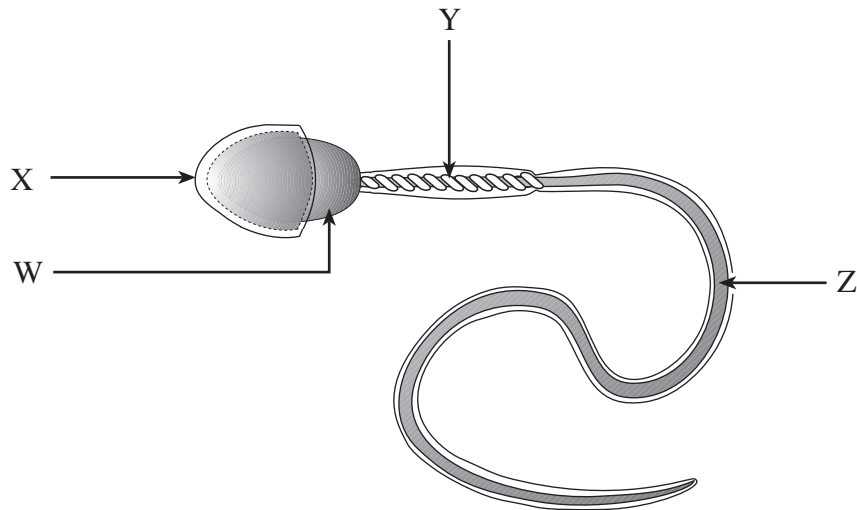
- A. urea
- B. ammonia (NH_3)
- C. bicarbonate ions (HCO_3^-)
- D. antidiuretic hormone (ADH)

44. The secretion of which of the following affects blood volume?

- A. ADH
- B. thyroxin
- C. ammonia
- D. bicarbonate ions

45. Which of the following is **not** a function of seminal fluid?
- A. to cause uterine contractions
 - B. to neutralize acidic pH of the vagina
 - C. to provide fructose for ATP production
 - D. to stimulate the ovaries to release an egg

Use the following diagram to answer question 46.



46. Which structure contains high numbers of mitochondria?

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

47. Which of the following secrete female reproductive hormones?

- A. the vagina and the cervix
- B. the uterus and the clitoris
- C. the follicle and the corpus luteum
- D. the fallopian tubes and the urethra

48. Which of the following is an effect of estrogen?

- A. maturation of the corpus luteum
- B. decreased levels of LH secretions
- C. increased levels of FSH secretions
- D. increased thickness of the uterine lining

49. Which of the following describes the hormonal levels on day 13 of a 28-day uterine cycle?

	Follicle-stimulating hormone	Luteinizing hormone
A.	low	high
B.	high	high
C.	low	low
D.	high	low

50. What structure secretes luteinizing hormone?

- A. the ovary
- B. the placenta
- C. the corpus luteum
- D. the anterior pituitary

**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. You may not need all of the space provided to answer each question.

1. Describe how the function of the cell membrane, vacuoles and lysosomes are related.

(3 marks)

2. Describe **three** ways that water is important to living organisms.

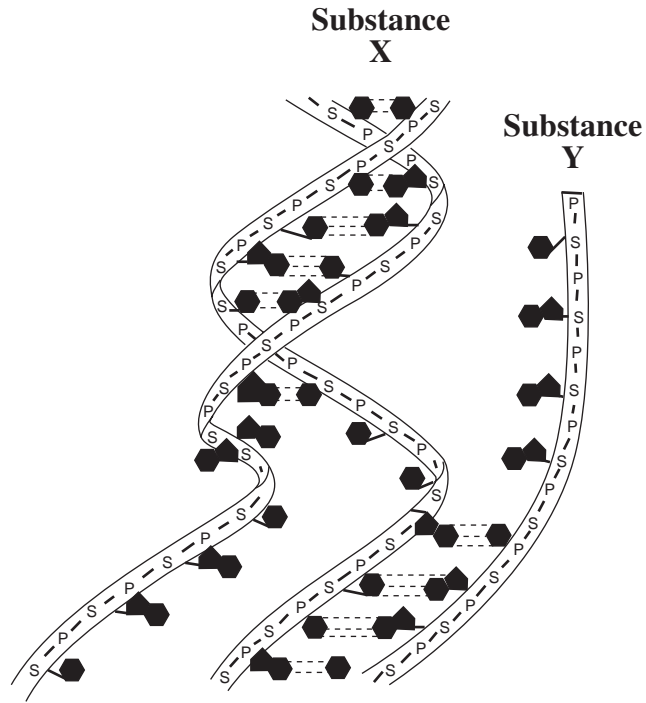
(3 marks)

i) _____

ii) _____

iii) _____

Use the following diagram to answer question 3.

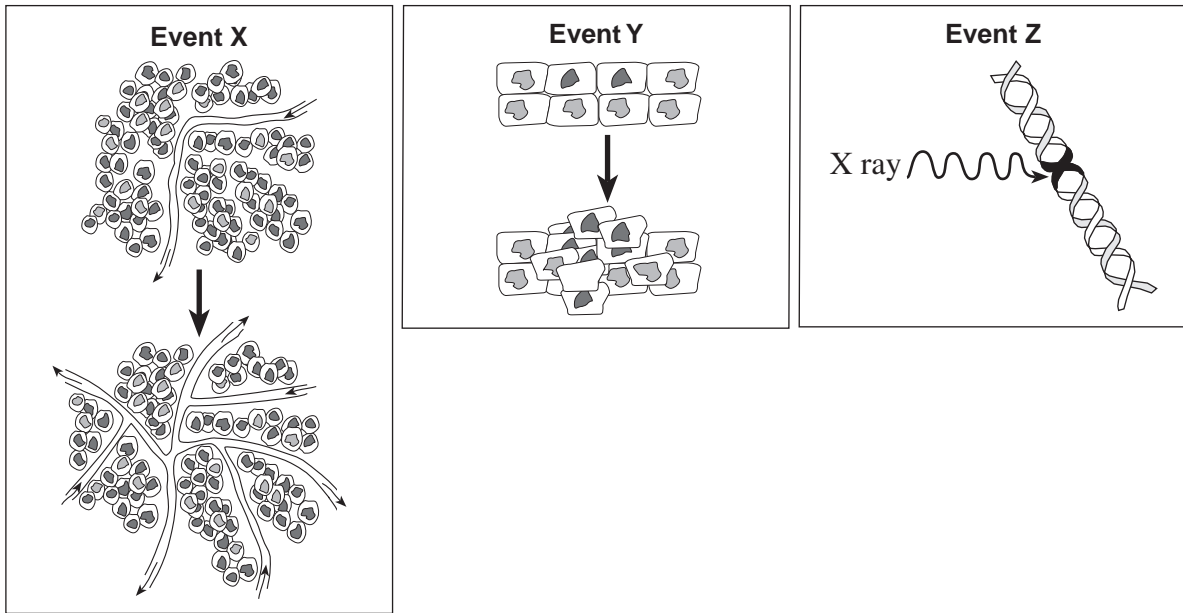


3. A radioactive molecule is added to a cell culture where the process shown in the diagram is taking place. Upon analysis, it is found that substance **Y** is radioactive but substance **X** is not. Give a possible identity for the radioactive molecule which was added and explain why it is only in substance **Y**. **(2 marks: 1 mark for molecule; 1 mark for explanation)**

molecule: _____

explanation: _____

4. Each of the following diagrams illustrates an event in the growth and development of cancer in the body.



a) Place the events in the correct order from the start of carcinogenesis. (1 mark)

b) Explain what is occurring in each of the events. (3 marks: 1 mark each)

event **X**: _____

event **Y**: _____

event **Z**: _____

5. Compare the process of facilitated transport with that of active transport.

(3 marks)

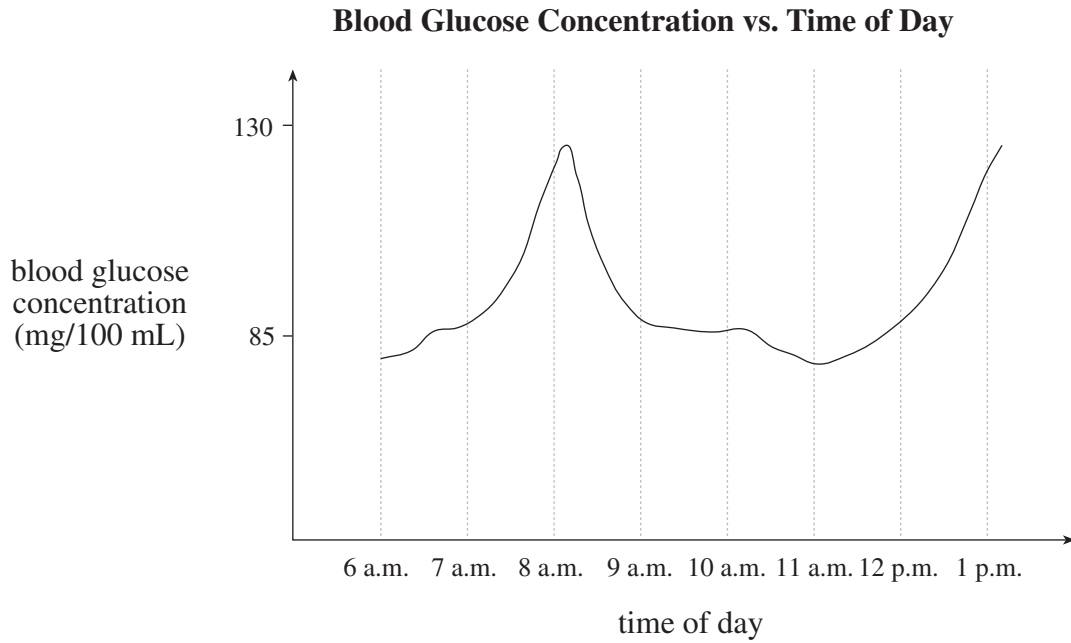
6. Explain how each of the following affects the rate of an enzyme-catalyzed reaction that occurs in the mouth. **(6 marks: 2 marks each)**

adding more enzyme:

changing the pH from 7.2 to 12:

lowering the temperature from 37°C to 10°C:

Use the following graph to answer question 7.



7. A person eats a well-balanced meal at 7 a.m. and again at 12 p.m. Explain the changes that occur in blood glucose concentration at each of the times indicated below.

(6 marks: 2 marks each)

between 7 a.m. and 8 a.m.

between 8 a.m. and 9 a.m.

between 11 a.m. and 12 p.m.

8. a) Name the substance which emulsifies fat in the digestive system. **(1 mark)**

b) Explain how emulsification assists in the chemical digestion of fat. **(1 mark)**

9. a) What is the name of the pacemaker of the heart and where in the heart is it located? **(2 marks)**

name: _____

location: _____

b) Explain how the Purkinje fibres function to control heartbeat. **(2 marks)**

10. a) State **three** functions of hemoglobin.

(3 marks)

i) _____

ii) _____

iii) _____

b) How does the hemoglobin found in the pulmonary artery differ from the hemoglobin found in the pulmonary vein?

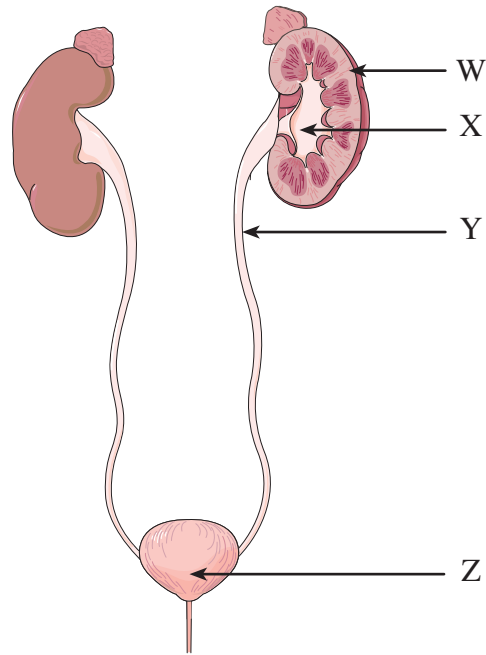
(1 mark)

11. Compare the structural similarities and differences of motor and sensory neurons.
(4 marks: 2 marks for similarities; 2 marks for differences)

similarities:

differences:

Use the following diagram to answer question 12.



12. Identify each of the labelled regions or structures.

(4 marks)

region **W**: _____

region **X**: _____

structure **Y**: _____

structure **Z**: _____

13. Identify the source of follicle-stimulating hormone (FSH) in males and describe its effect on the testes. **(2 marks)**

source: _____

effect: _____

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

testosterone:

progesterone:

oxytocin:

END OF EXAMINATION