

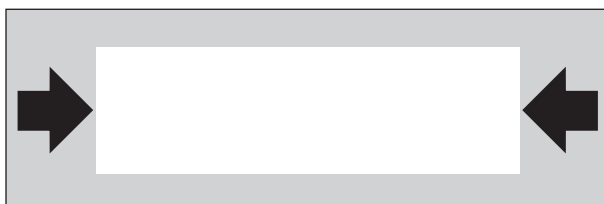
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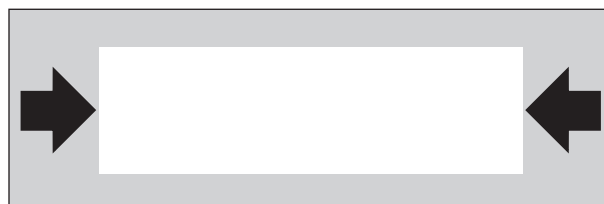
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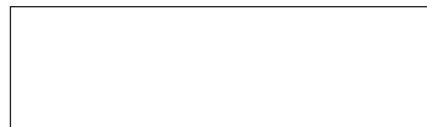
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Biology 12
JANUARY 2004
Course Code = BI

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 2:

2. .

(4)

Question 3:

3. .

(4)

Question 4:

4. .

(4)

Question 5:

5. .

(5)

Question 6:

6. .

(3)

BIOLOGY 12

JANUARY 2004

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: 67 multiple-choice questions	67 marks	80 minutes
PART B: 6 written-response questions	23 marks	40 minutes
Total:	90 marks	120 minutes

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PART A: MULTIPLE CHOICE

Value: 67 marks

Suggested Time: 80 minutes

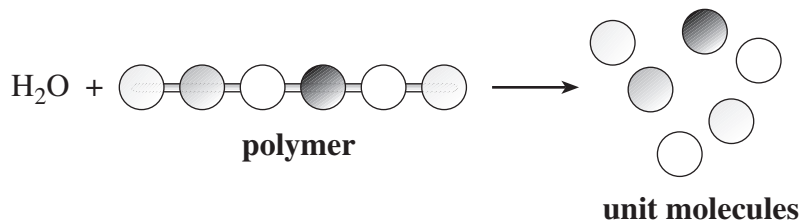
INSTRUCTIONS: For each question select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle on the Response Form that has the letter corresponding to your answer.

1. Which of the following structures is composed of DNA and protein?
 - A. ribosomes
 - B. Golgi bodies
 - C. chromosomes
 - D. smooth endoplasmic reticulum

2. Which of the following structures is attached to the nuclear envelope?
 - A. Golgi body
 - B. mitochondrion
 - C. cell membrane
 - D. endoplasmic reticulum

3. Where are the structures that distinguish rough endoplasmic reticulum from smooth endoplasmic reticulum produced?
 - A. in the nucleolus
 - B. in the Golgi bodies
 - C. in the mitochondria
 - D. in the cell membrane

Use the following diagram to answer question 4.



4. Which cell structure stores substances that could produce the reaction illustrated above?
 - A. nucleus
 - B. vacuoles
 - C. lysosomes
 - D. ribosomes

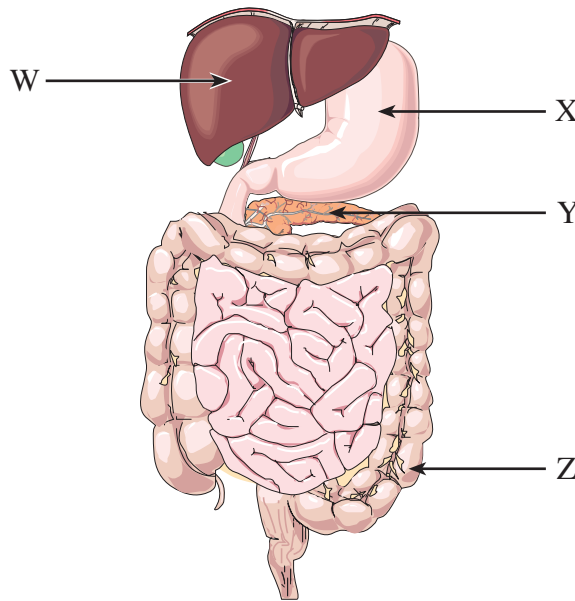
5. What characteristic of a water molecule accounts for its polarity?

- A. its cohesiveness
- B. its ability to act as a solvent
- C. its unequal sharing of electrons
- D. the hydrogen bonding to neighbouring water molecules

6. What is the function of a buffer?

- A. to carry oxygen
- B. to release energy
- C. to catalyze a reaction
- D. to maintain a constant pH

Use the following diagram to answer question 7.



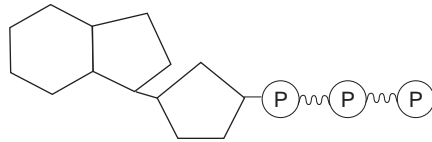
7. What structure produces substances that result in a low pH?

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

8. What substance deactivates antigens?

- A. lipids
- B. proteins
- C. nucleic acids
- D. carbohydrates

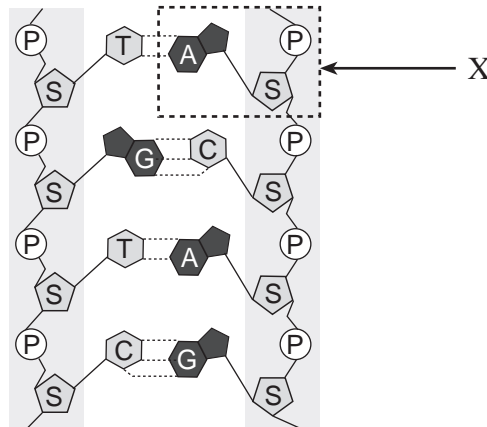
Use the following diagram to answer question 9.



9. What is the function of this molecule?

- A. to carry codons that are complementary to DNA
- B. long term energy storage in the liver and muscles
- C. to form the main component of the phospholipid bilayer
- D. to release energy when the bonds between the phosphate groups are broken

Use the following diagram to answer question 10.



10. Which of the following is indicated by X?

- A. RNA
- B. a codon
- C. a nucleotide
- D. an amino acid

11. Which of the following is a definition of recombinant DNA?
- A. plasmids
 - B. bacterial DNA
 - C. DNA which has been cloned
 - D. DNA from more than one source
12. In an experiment to determine the identity of an unknown substance, it is determined that the sample contains 12% adenine, 12% thymine, 38% cytosine and 38% guanine. What is the unknown substance?
- A. ATP
 - B. DNA
 - C. mRNA
 - D. nuclease
13. Which of the following differentiates DNA from RNA?
- A. DNA is linear and RNA is a double helix.
 - B. DNA has deoxyribose and RNA has ribose.
 - C. DNA is single-stranded and RNA is double-stranded.
 - D. DNA is produced during transcription and RNA is produced during replication.

Use the following chart to answer questions 14 and 15.

Three-letter codons of messenger RNA and the amino acids specified by the codons			
AAU } AAC } Asparagine	CAU } CAC } Histidine	GAU } GAC } Asparatic acid	UAU } UAC } Tyrosine
AAA } AAG } Lysine	CAA } CAG } Glutamine	GAA } GAG } Glutamate	UAA } UAG } Stop
ACU } ACC } ACA } ACG } Threonine	CCU } CCC } CCA } CCG } Proline	GCU } GCC } GCA } GCG } Alanine	UCU } UCC } UCA } UCG } Serine
AGU } AGC } Serine	CGU } CGC } CGA } CGG } Arginine	GGU } GGC } GGA } GGG } Glycine	UGU } UGC } Cysteine
AGA } AGG } Arginine			UGA – Stop UGG – Tryptophan
AUU } AUC } AUA } Isoleucine	CUU } CUC } CUA } CUG } Leucine	GUU } GUC } GUA } GUG } Valine	UUU } UUC } Phenylalanine
AUG – Methionine			UUA } UUG } Leucine

14. The following is a sequence of mRNA bases:

G C U U C U C C U

What sequence of amino acids results after translation occurs?

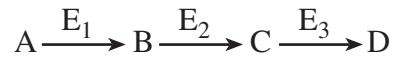
- A. arginine, serine, stop
- B. alanine, arginine, stop
- C. alanine, serine, proline
- D. arginine, arginine, glycine

15. Which of the following is an anticodon of a molecule of tRNA carrying isoleucine?

- A. A T A
- B. A U U
- C. T A A
- D. U A U

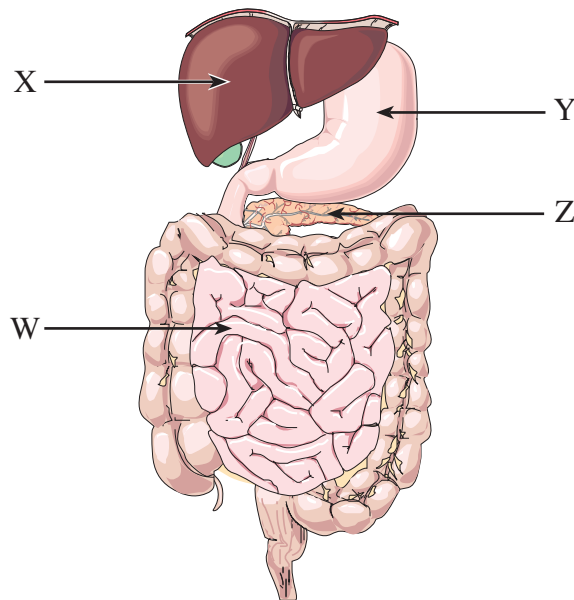
16. How many ribosomes are needed for the production of one polypeptide containing 30 amino acids?
- A. 1
 - B. 3
 - C. 10
 - D. 30
17. Water molecules passing through the cell membrane is an example of which of the following?
- A. osmosis
 - B. exocytosis
 - C. active transport
 - D. facilitated transport
18. Which of the following would decrease the rate of diffusion of molecules across a semi-permeable membrane?
- A. increasing the temperature
 - B. decreasing the size of the molecules
 - C. decreasing the concentration gradient
 - D. increasing the size of the pores in the membrane
19. What is the role of maltase when it acts as a catalyst?
- A. It denatures maltose.
 - B. It breaks down high energy phosphate bonds.
 - C. It increases the energy of activation required in the reaction.
 - D. It speeds up the reaction rate without being used in the reaction.
20. How do vitamins function in cells?
- A. They act as coenzymes.
 - B. They catalyze reactions.
 - C. They provide energy for reactions.
 - D. They act as substrates in hydrolysis.

Use the following information to answer question 21.



21. What would occur if a competitive inhibitor for enzyme E_2 was added to the metabolic pathway above?
- A. Less of D would be produced.
 - B. Enzyme 1 would be denatured.
 - C. There would be a decrease in B.
 - D. There would be an increase in C.

Use the following diagram to answer questions 22 and 23.



22. What is structure **Z**?
- A. the colon
 - B. the stomach
 - C. the pancreas
 - D. the duodenum
23. What structure absorbs the products of protein digestion?
- A. W
 - B. X
 - C. Y
 - D. Z

OVER

24. Which of the following is a cause of the watery feces characteristic of diarrhea?
- A. increased gastric secretions
 - B. decreased activity of the cardiac sphincter
 - C. decreased movement of chyme into the small intestine
 - D. high solute concentration of the fecal material in the colon

Use the following diagrams to answer question 25.

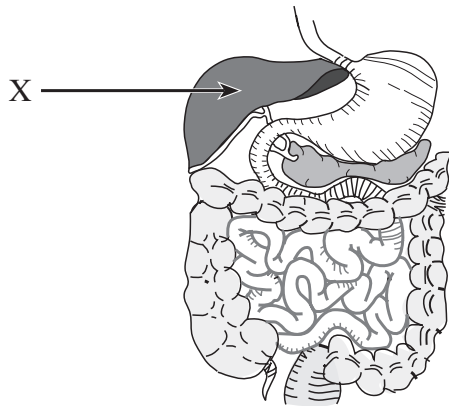


Diagram A

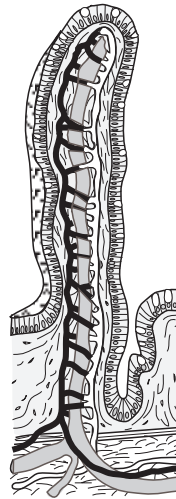


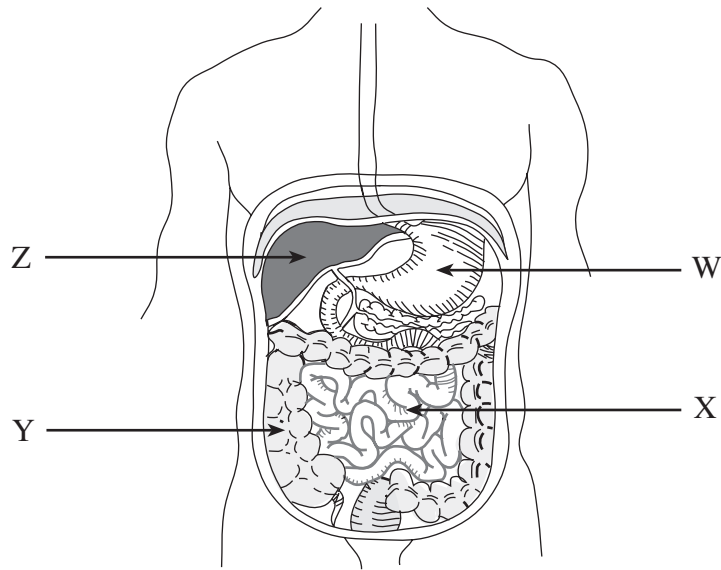
Diagram B

25. If structure **X** in diagram **A** was **not** functioning properly, how would the processes in the structure shown in diagram **B** be affected?
- A. The absorption of fats would decrease.
 - B. The production of lipase would increase.
 - C. The digestion of proteins would decrease.
 - D. The absorption of glucose would increase.

-
26. What substance is digested by secretions released by both the salivary glands and the pancreas?
- A. fat
 - B. starch
 - C. protein
 - D. maltose

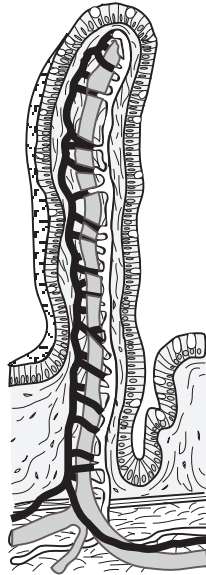
27. What is a result of increased peristalsis in the duodenum?
- A. decreased production of bile
 - B. decreased pH in the small intestine
 - C. decreased absorption of amino acids
 - D. increased hydrochloric acid secretion in the stomach

Use the following diagram to answer question 28.



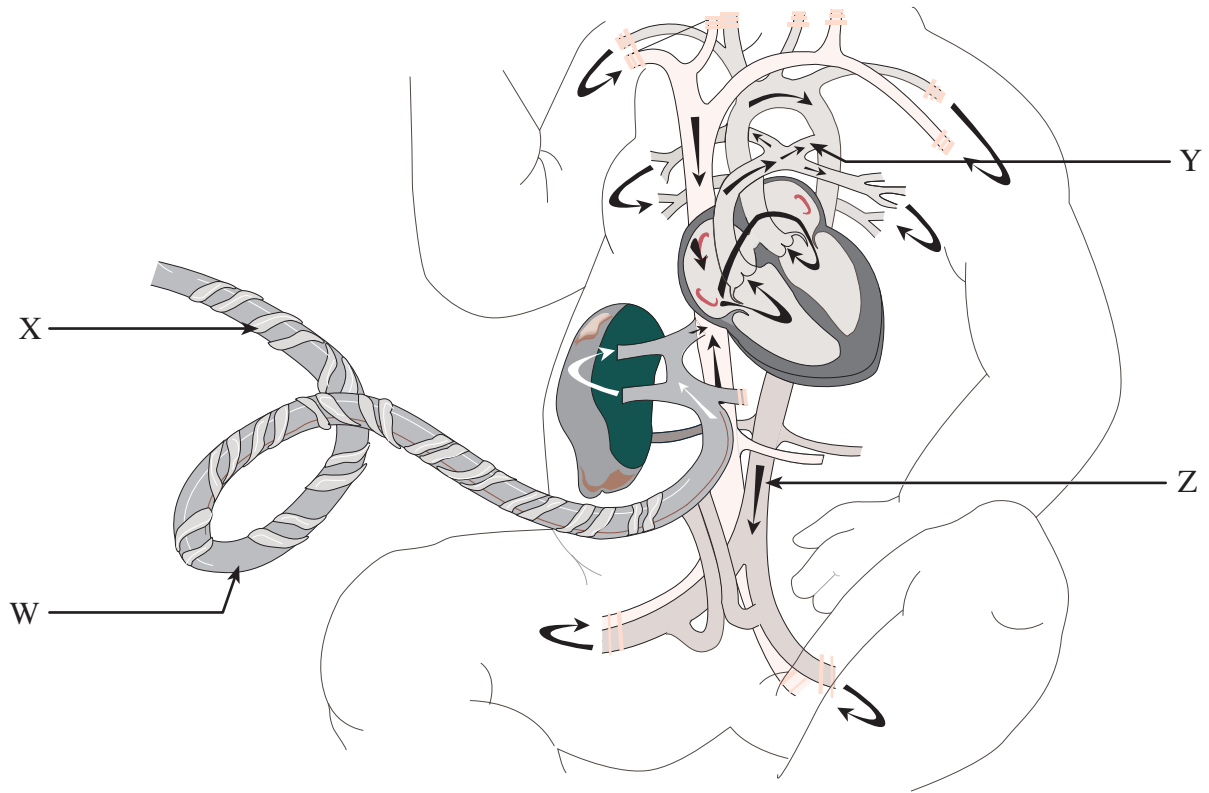
28. Where are the enzymes that break down maltose and peptides produced?
- A. W
 - B. X
 - C. Y
 - D. Z

Use the following diagram to answer question 29.



29. What is a purpose of the structure shown?
- A. to store and compact feces
 - B. to secrete enzymes that break down starch
 - C. to increase surface area of the small intestine
 - D. to secrete substances that physically digest fat
-
30. Which of the following are characteristics of the blood vessel that carries blood from the arterioles to the venules?
- A. thin walls with valves
 - B. thin walls, one cell layer thick
 - C. thick walls to withstand pressure
 - D. a thick middle layer of elastic tissue

Use the following diagram to answer questions 31 and 32.



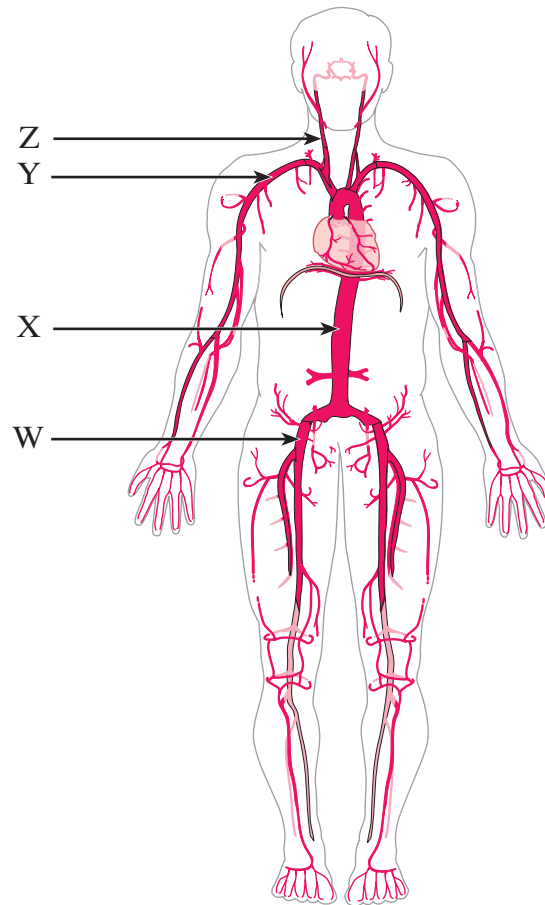
31. Which structure carries oxygenated blood from the mother to the fetus?

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

32. Which structure allows blood to bypass the lungs?

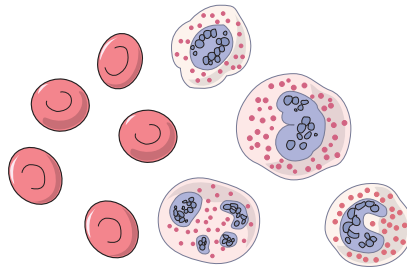
- A. W
- B. X
- C. Y
- D. Z

Use the following diagram to answer questions 33, 34 and 35.



33. What is the blood vessel labelled **W**?
- A. renal vein
 - B. iliac artery
 - C. carotid artery
 - D. hepatic portal vein
34. What is the blood vessel labelled **Z**?
- A. aorta
 - B. carotid artery
 - C. subclavian vein
 - D. posterior vena cava
35. Which blood vessel originates from the left ventricle of the heart?
- A. W
 - B. X
 - C. Y
 - D. Z

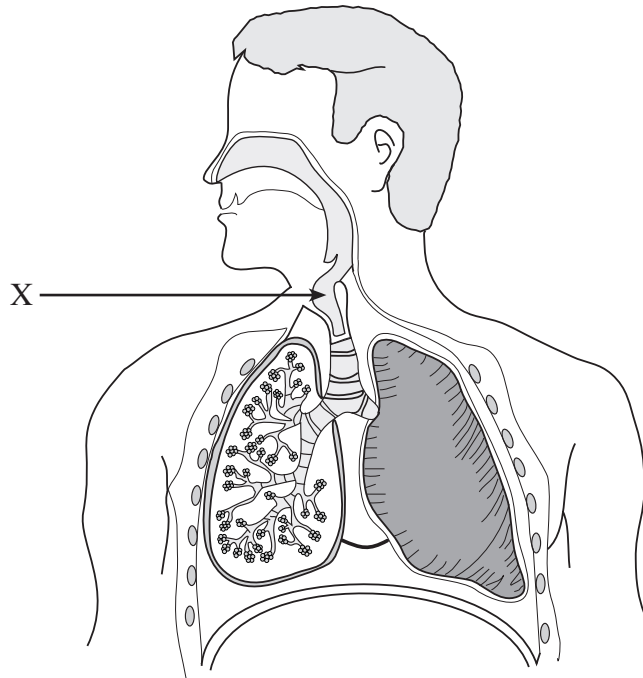
Use the following diagram to answer question 36.



36. What structures are shown in the diagram?
- A. platelets and red blood cells
 - B. platelets and white blood cells
 - C. red blood cells and white blood cells
 - D. white blood cells and plasma proteins
-
37. What would result if the SA node received increased stimulation by the sympathetic nervous system?
- A. Heart rate and blood pressure would decrease.
 - B. Mesenteric arteries and arterioles would dilate.
 - C. Blood pressure and blood velocity would increase.
 - D. Production of red blood cells and platelets would increase.
38. Which of the following describes the location and function of valves found in the circulatory system?
- A. found in capillary beds and regulate the diameter of venules
 - B. found in blood vessels that have low blood pressure and prevent backflow of blood in the heart
 - C. found in blood vessels where blood is moving the fastest and control blood entering the capillary beds
 - D. found in blood vessels carrying blood away from the heart and limit high blood pressure in tissues

OVER

Use the following diagram to answer question 39.



39. What is the structure labelled X?

- A. the larynx
 - B. the bronchus
 - C. the epiglottis
 - D. the bronchioles
-

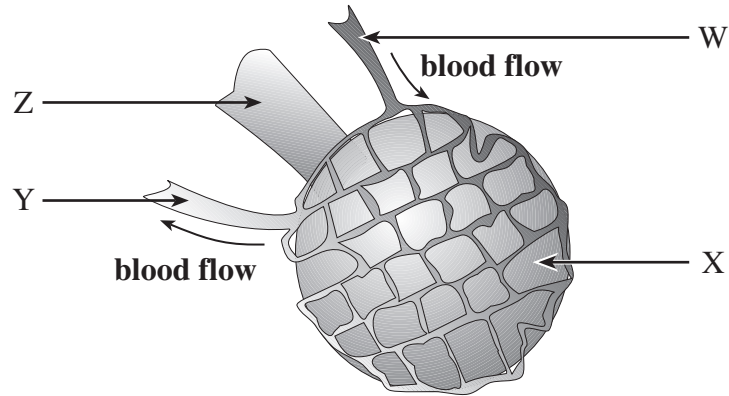
40. What would occur if the cilia in the respiratory tract were damaged?

- A. Mucus would accumulate.
- B. The larynx would stop functioning.
- C. Air would become trapped in the lungs.
- D. The diaphragm would increase thoracic volume.

41. Which of the following occurs during internal respiration?

- A. ATP is produced.
- B. Oxygen enters the bloodstream.
- C. Carbon dioxide leaves the bloodstream.
- D. HCO_3^- (bicarbonate ions) are produced.

Use the following diagram to answer question 42.



capillary network of one alveolus

42. Which labelled structure contains the highest concentrations of HCO_3^- (bicarbonate ions)?

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

43. What is transported in the blood as carbaminohemoglobin?

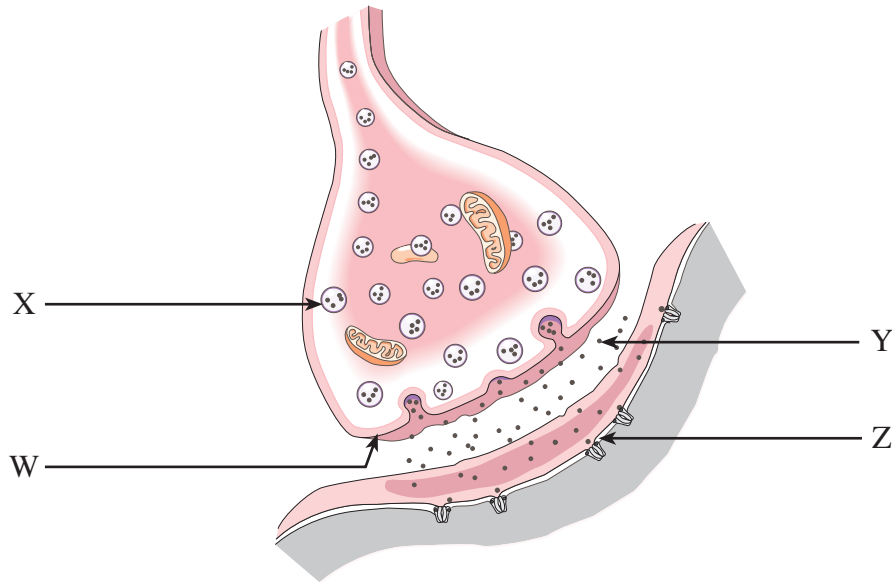
- A. oxygen
- B. amino acids
- C. hydrogen ions
- D. carbon dioxide

44. Which of the following occurs during inhalation?

- A. The rib muscles relax.
- B. The diaphragm contracts.
- C. The diaphragm becomes dome-shaped.
- D. Pressure in the thoracic cavity increases.

45. How does the formation of reduced hemoglobin have a buffering effect in the body?
- A. It absorbs oxygen in the lungs.
 - B. It forms carbaminohemoglobin in the blood.
 - C. It forms carbaminohemoglobin in the tissue fluids.
 - D. It reduces the concentration of hydrogen ions in the blood.
46. Why would a neuron be unable to conduct impulses if, after the passage of an action potential, the sodium-potassium pump no longer functioned?
- A. Sodium ions would remain concentrated inside the axon; the outside of the axon would be positive compared to the inside.
 - B. Potassium ions would remain concentrated inside the axon; the outside of the axon would be negative compared to the inside.
 - C. Sodium ions would remain concentrated outside the axon; the outside of the axon would be positive compared to the inside.
 - D. Potassium ions would remain concentrated outside the axon; the outside of the axon would be negative compared to the inside.
47. How does the presence of the myelin sheath around a neuron increase the speed of impulse conduction?
- A. It prevents ion exchange except at the nodes.
 - B. It transfers ions down the length of the neuron.
 - C. It acts as an enzyme to speed the reactions of the action potential.
 - D. It helps to carry ions across the cell membrane during the action potential.

Use the following diagram to answer question 48.



48. Which of the following describes the role of calcium ions during synaptic transmission?

- A. They cause **Y** to become inactivated.
 - B. They act as carriers to move **Y** toward **Z**.
 - C. They cause **Y** to undergo endocytosis at **W**.
 - D. They initiate the process that results in **X** moving toward **W**.
-

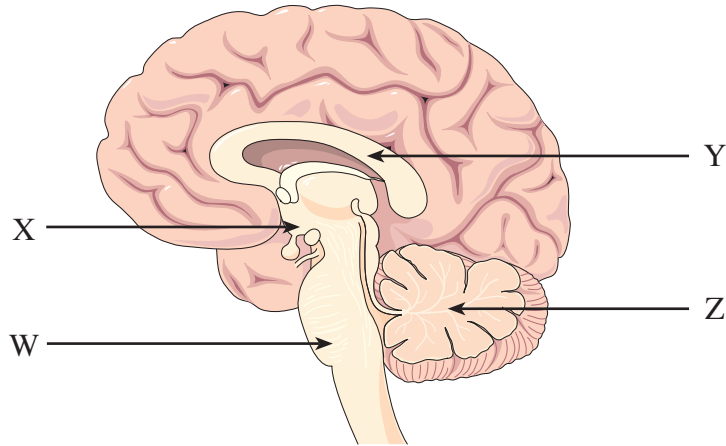
49. Which branch of the nervous system does **not** have nerves which directly connect to the heart?

- A. the central nervous system
- B. the peripheral nervous system
- C. the sympathetic nervous system
- D. the parasympathetic nervous system

50. What part of the brain controls the release of hormones from the pituitary gland?

- A. the thalamus
- B. the cerebellum
- C. the hypothalamus
- D. the medulla oblongata

Use the following diagram to answer question 51.



51. Which part of the brain allows the sharing of sensory information from both sides of the body?
- A. W
 - B. X
 - C. Y
 - D. Z

Use the following chart to answer questions 52 and 53.

Substances in the blood			
Substance	Amount of the substance filtered/day	Re-absorbed by nephron (%)	Amount of the substance in the urine/day
W	170 g	100%	0 g
X	150 L	99%	1.5 L
Y	50 g	40%	30 g
Z	700 g	98%	15 g

52. What is substance W?
- A. salt
 - B. urea
 - C. water
 - D. glucose
53. What is substance Y?
- A. urea
 - B. water
 - C. glucose
 - D. penicillin

54. Which of the following are located in the renal cortex?
- A. the efferent arteriole and the ureter
 - B. the Bowman's capsule and the glomerulus
 - C. the distal convoluted tubule and the loop of Henle
 - D. the collecting tubule and the proximal convoluted tubule
55. Which of the following is produced by the liver as a result of the metabolism of nitrogenous wastes?
- A. urea
 - B. uric acid
 - C. ammonia
 - D. amino acids
56. What is a function of the collecting ducts?
- A. pressure filtration
 - B. water re-absorption
 - C. tubular excretion of penicillin
 - D. receptors for the hormone insulin
57. Tubular excretion involves the addition of substances into which of the following?
- A. the loop of Henle
 - B. the Bowman's capsule
 - C. the distal convoluted tubule
 - D. the proximal convoluted tubule
58. Which of the following receives blood from the efferent arteriole?
- A. the renal vein
 - B. the glomerulus
 - C. the afferent arteriole
 - D. the peritubular capillaries
59. The cells of which structure contain relatively large numbers of mitochondria?
- A. the glomerulus
 - B. the afferent arteriole
 - C. the Bowman's capsule
 - D. the proximal convoluted tubule

60. Which of the following results from the secretion of ADH?

	Urine volume	Concentration of urine
A.	low	low
B.	low	high
C.	high	high
D.	high	low

61. Which of the following is an effect of an increased secretion of aldosterone on the composition of urine?

- A. Urea decreases.
- B. Sodium ions increase.
- C. Potassium ions increase.
- D. Hydrogen ions decrease.

62. Where does sperm production occur?

- A. in the epididymis
- B. in the vas deferens
- C. in the interstitial cells
- D. in the seminiferous tubules

63. Which of the following would result if fructose was **not** present in seminal fluid?

- A. Sperm would be less motile.
- B. Semen would become acidic.
- C. Less sperm would be produced.
- D. Less testosterone would be secreted.

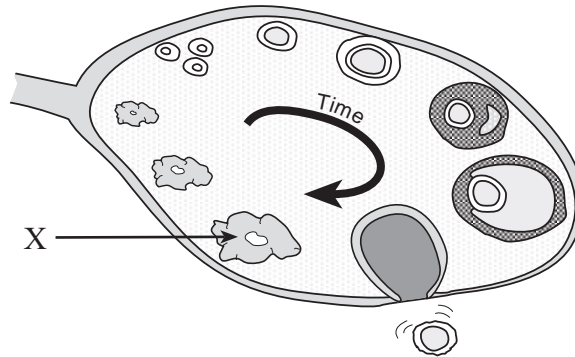
64. Reduced secretions from which structure would result in decreased breast development?

- A. the endometrium
- B. the interstitial cells
- C. the anterior pituitary
- D. the posterior pituitary

65. Which of the following is a function of estrogen?

- A. to initiate menstruation
- B. to stimulate the posterior pituitary gland
- C. to cause maturation of the corpus luteum
- D. to initiate the growth of the endometrium

Use the following diagram to answer question 66.



66. What would occur as a result of structure **X** releasing hormones?

- A. Ovulation would occur.
- B. The follicle would mature.
- C. Estrogen secretion would increase.
- D. The endometrium would become secretory.

67. Taking birth control pills that contain estrogen and progesterone results in which of the following?

- A. the onset of menstruation
- B. an increased production of luteinizing hormone
- C. a decreased production of follicle-stimulating hormone
- D. an increased production of human chorionic gonadotropin

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

PART B: WRITTEN RESPONSE

Value: 23 marks

Suggested Time: 40 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.

Use the following chart to answer question 1.

Three-letter codons of messenger RNA and the amino acids specified by the codons			
AAU } Asparagine AAC }	CAU } Histidine CAC }	GAU } Asparatic acid GAC }	UAU } Tyrosine UAC }
AAA } Lysine AAG }	CAA } Glutamine CAG }	GAA } Glutamate GAG }	UAA } Stop UAG }
ACU } Threonine ACC } ACA } ACG }	CCU } Proline CCC } CCA } CCG }	GCU } Alanine GCC } GCA } GCG }	UCU } Serine UCC } UCA } UCG }
AGU } Serine AGC }	CGU } Arginine CGC } CGA } CGG }	GGU } Glycine GGC } GGA } GGG }	UGU } Cysteine UGC }
AGA } Arginine AGG }			UGA – Stop UGG – Tryptophan
AUU } Isoleucine AUC } AUA }	CUU } Leucine CUC } CUA } CUG }	GUU } Valine GUC } GUA } GUG }	UUU } Phenylalanine UUC }
AUG – Methionine			UUA } Leucine UUG }

1. The following is a DNA base sequence:

GCA CCT ATA GGA ACC

Explain what would occur during the translation of this gene if ATA underwent a mutation and was converted to ATT. **(3 marks)**

6. Describe how positive feedback functions in the female reproductive system. **(3 marks)**

END OF EXAMINATION

