BRITISH COLUMBIA
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Biology 12

Examination Booklet
2008/09 Released Exam
June 2009

Form A

DO NOT OPEN ANY EXAMINATION MATERIALS UNTIL INSTRUCTED TO DO SO.

FOR FURTHER INSTRUCTIONS REFER TO THE RESPONSE BOOKLET.

Contents: 32 pages
67 multiple-choice questions in the Examination Booklet

Examination: 2 hours
Additional Time Permitted: 60 minutes

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 **Answer Sheet** provided. Using an HB pencil, completely fill in the bubble on the **Answer Sheet** that has the letter corresponding to your answer.

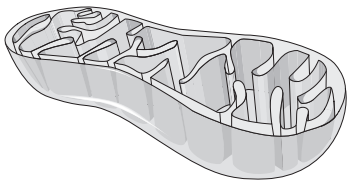
You have **Examination Booklet Form A**. In the box above #1 on your **Answer Sheet**, fill in the bubble as follows.

Exam Booklet Form/ Cahier d'examen	A	B	C	D	E	F	G	H
	●	○	○	○	○	○	○	○

1. What is a function of ribosomes?

   A. to carry lipids to the cell membrane
   B. to break down macromolecules taken into the cell
   C. to produce proteins for use within the cell membrane
   D. to produce nucleic acids at the endoplasmic reticulum

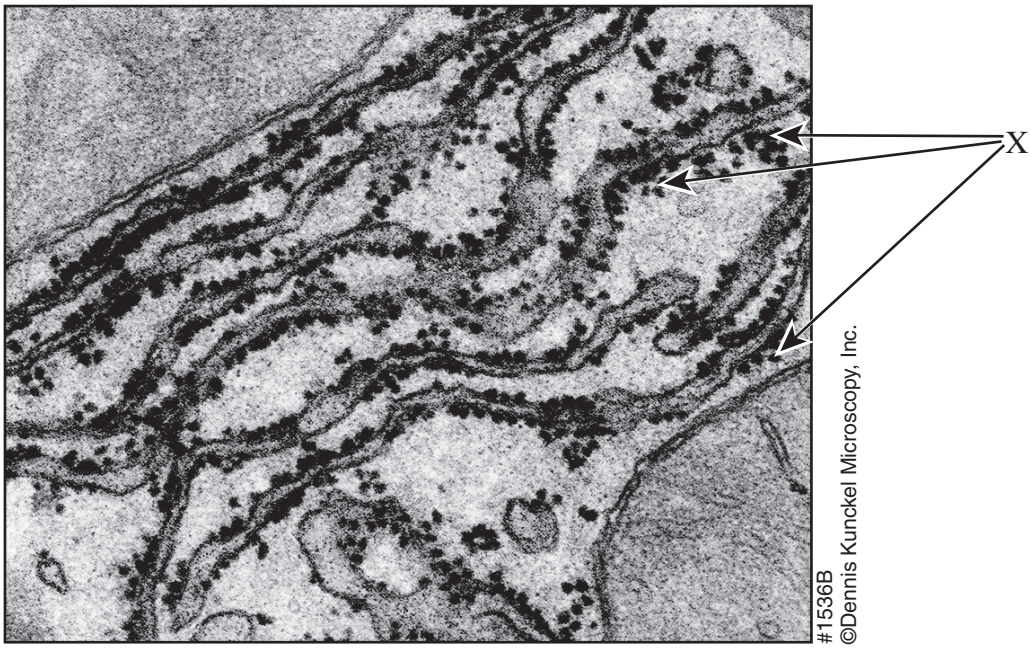
Use the following diagram to answer question 2.



2. Which of the following is produced by this structure?

   A. ATP and oxygen
   B. glucose and ATP
   C. ADP and phosphate
   D. water and carbon dioxide

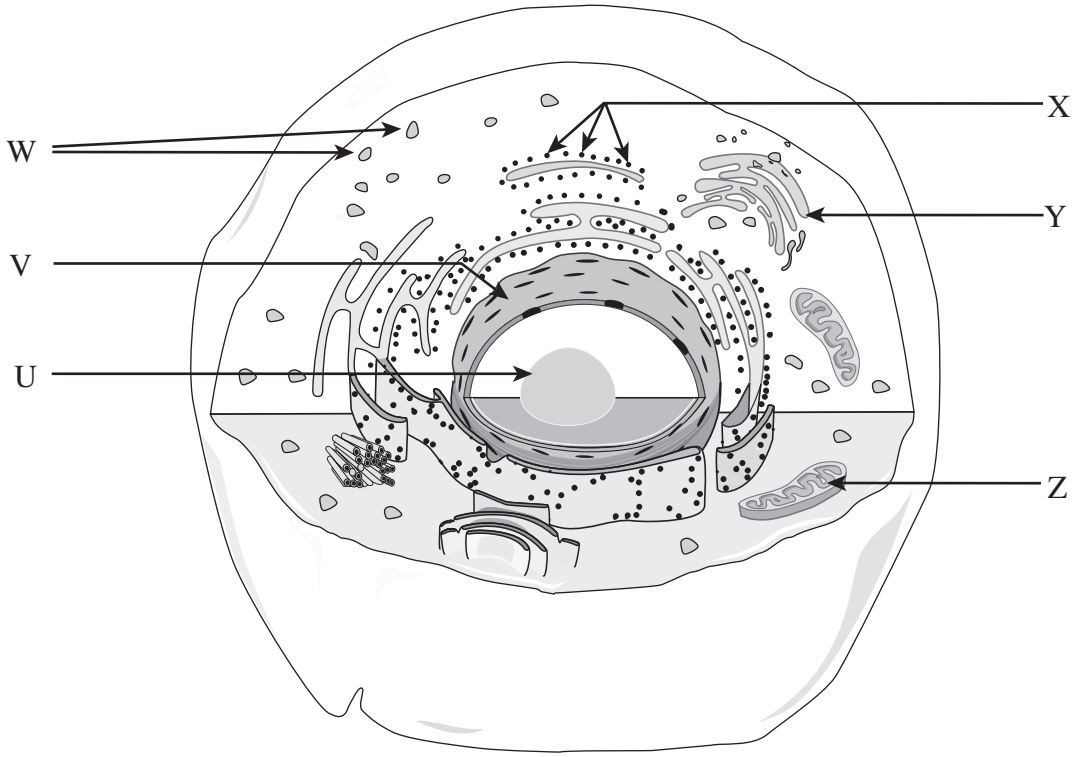
Use the following electron micrograph to answer question 3.



3. Which of the following is a component of the structures indicated by **X**?

   A. lipid
   B. vitamin
   C. nucleic acid
   D. carbohydrate

Use the following diagram of a cell to answer questions 4 and 5.



4. Which of the following produces the structures labelled **W**?

   A. U
   B. V
   C. Y
   D. Z

5. Molecules produced at **U** are a structural component of

   A. V.
   B. X.
   C. Y.
   D. Z.

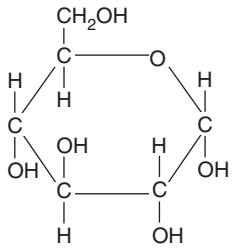
6. Which of the following is a monomer of polysaccharides?

   A. glycine
   B. glucose
   C. adenine
   D. glycogen

7. Which of the following is **not** a function of a protein?

   A. storing genetic information
   B. catalyzing cellular reactions
   C. sending chemical messages
   D. transporting glucose into a cell

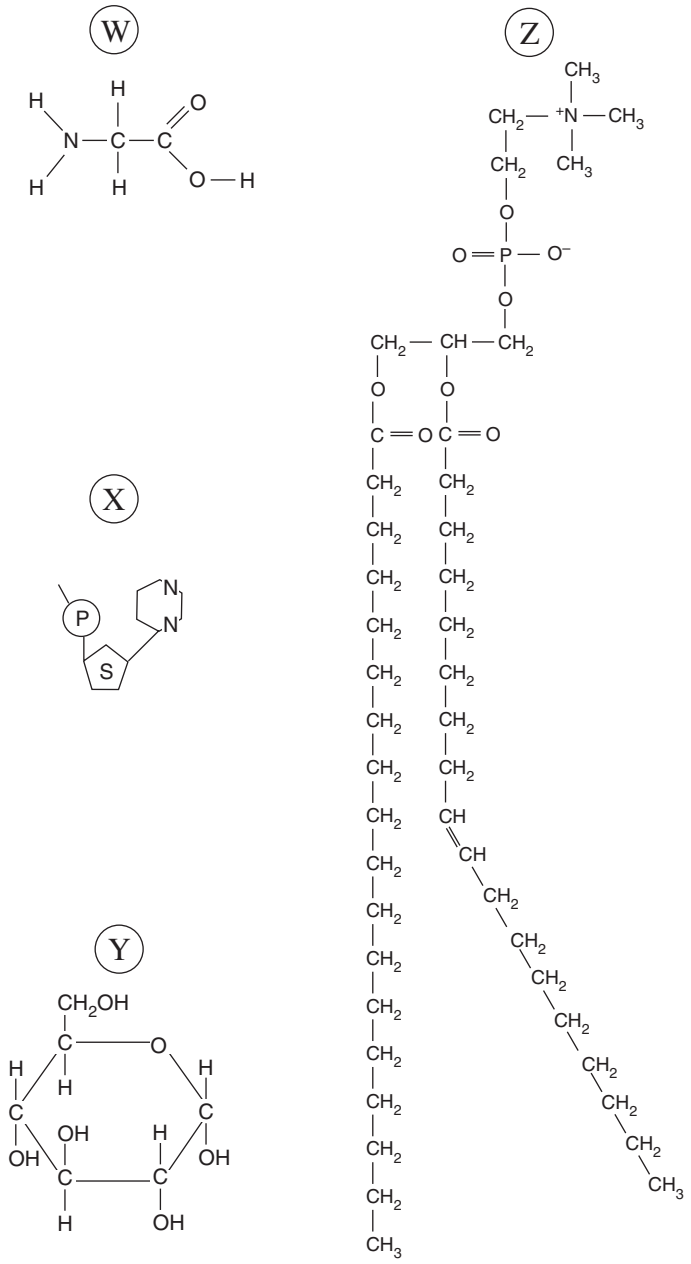
Use the following molecular diagram to answer question 8.



8. A polymer formed from this molecule

   A. stores fat in the body.
   B. acts as a chemical messenger.
   C. provides rigidity to plant cells.
   D. moves ions across the cell membrane.

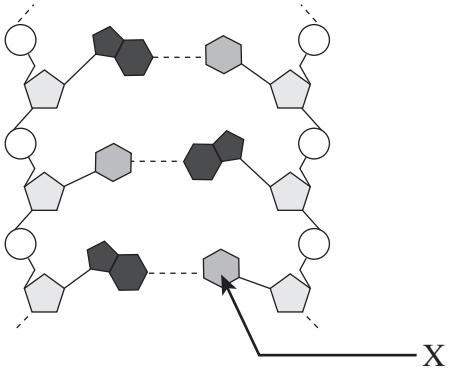
Use the following molecular diagrams to answer question 9.



9. Which molecule is a component of the fluid part of the cell membrane?

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

Use the following diagram to answer question 10.



10. **X** indicates

A. ribose.
B. thymine.
C. phosphate.
D. deoxyribose.

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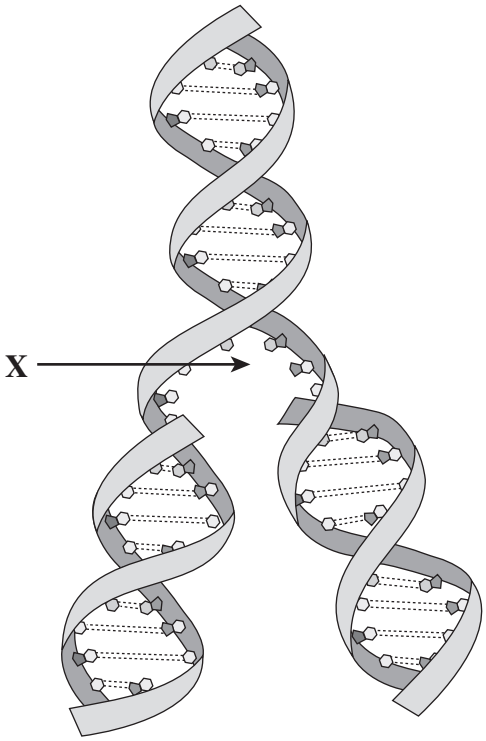
11. If a DNA molecule contains 8% adenine and 42% guanine, it also contains

A. 8% uracil and 42% cytosine.
B. 42% uracil and 8% cytosine.
C. 8% thymine and 42% cytosine.
D. 42% thymine and 8% cytosine.

Use the following diagram of replication to answer questions 12 and 13.



12. Which of the following is occurring at **X**?

    A. bonds between bases are breaking
    B. bases are joining by hydrogen bonding
    C. bonds between the sugar and phosphate are forming
    D. bonds between the ribose and phosphate are breaking

13. Which of the following enzymes catalyzes the process illustrated above?

    A. maltase
    B. helicase
    C. nuclease
    D. peptidase

14. Which of the following occurs during complementary base pairing?

A. Bonds form between uracil and thymine.
B. Bonds form between cytosine and guanine.
C. Bonds break between phosphates and sugars.
D. Bonds break between amino acids and phosphates.

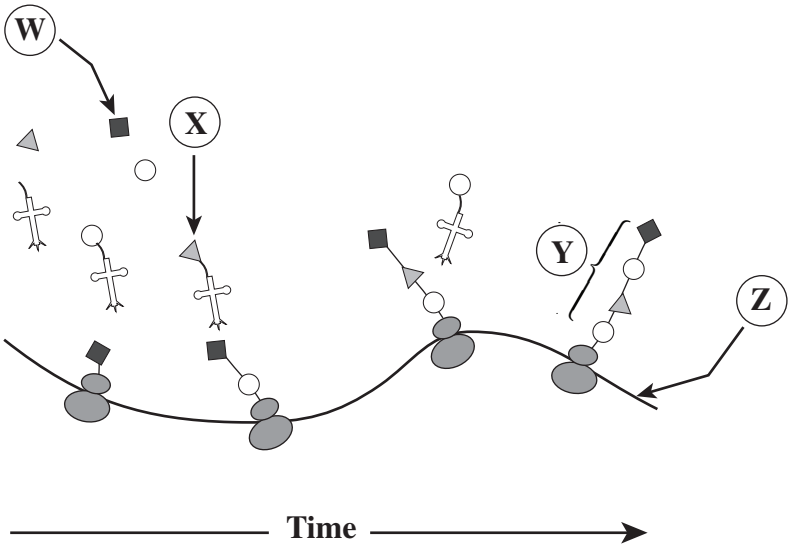
15. The sequence of bases in one strand of a DNA molecule is C C G T A C. Which of the following represents the sequence of bases that attach to this strand during replication?

A. G G C A T G
B. G G C U T G
C. C C G T A C
D. G G C A U G

16. One structural difference between DNA and tRNA is that

A. DNA has uracil and tRNA does not.
B. tRNA contains more bases than DNA.
C. DNA contains deoxyribose and tRNA does not.
D. tRNA contains more hydrogen bonds than DNA.

Use the following diagram to answer question 17.



17. Which of the following represents a molecule that contains peptide bonds?

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

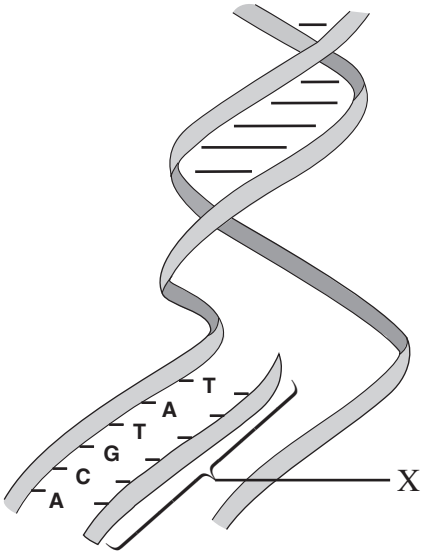
Use the following chart to answer question 18.

Three-letter codons of messenger RNA and the amino acids specified by the codons			
AAU, AAC — Asparagine	CAU, CAC — Histidine	GAU, GAC — Aspartic 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

18. Which of the following occurs if a mutation results in a codon changing from C G A to A G A?

A. The resulting protein would be too short.
B. The resulting protein would function correctly.
C. The mRNA would be repaired before leaving the nucleus.
D. The resulting protein would contain serine in place of alanine.

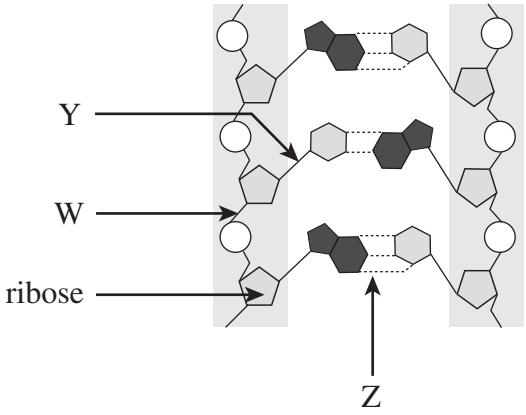
Use the following diagram to answer question 19.



19. Which of the following represents the base sequence of **X** after a single base mutation has occurred?

A. A T A C G T
B. A T T C G T
C. A U A C G U
D. A U U C G U

Use the following diagram of transcription to answer question 20.



20. Which of the following bonds have formed during this process?

    A. W and Y
    B. W and Z
    C. Y only
    D. Z only

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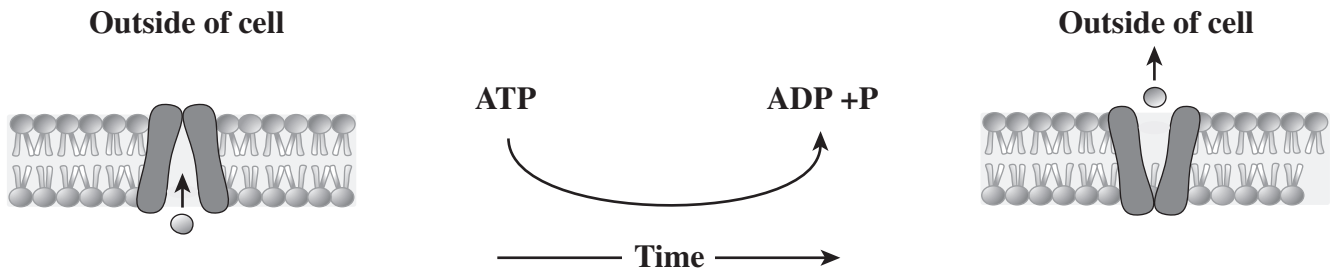
21. When cells are in a hypertonic solution, the concentration of solute in the cells is

    A. the same as that of the solution.
    B. higher than that of the solution.
    C. lower than that of the solution.

Use the following diagram of a cell process to answer question 22.



22. What process is illustrated?

    A. osmosis
    B. phagocytosis
    C. active transport
    D. facilitated transport

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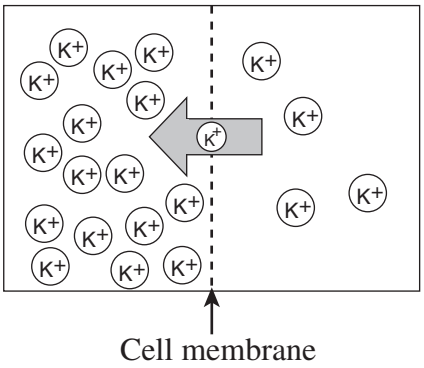
23. Which of the following is a monomer of the mosaic component of the cell membrane?

    A. glycerol
    B. nucleotide
    C. amino acid
    D. phospholipid

24. A vesicle merges with the cell membrane during the process of

    A. exocytosis.
    B. pinocytosis.
    C. phagocytosis.
    D. facilitated transport.

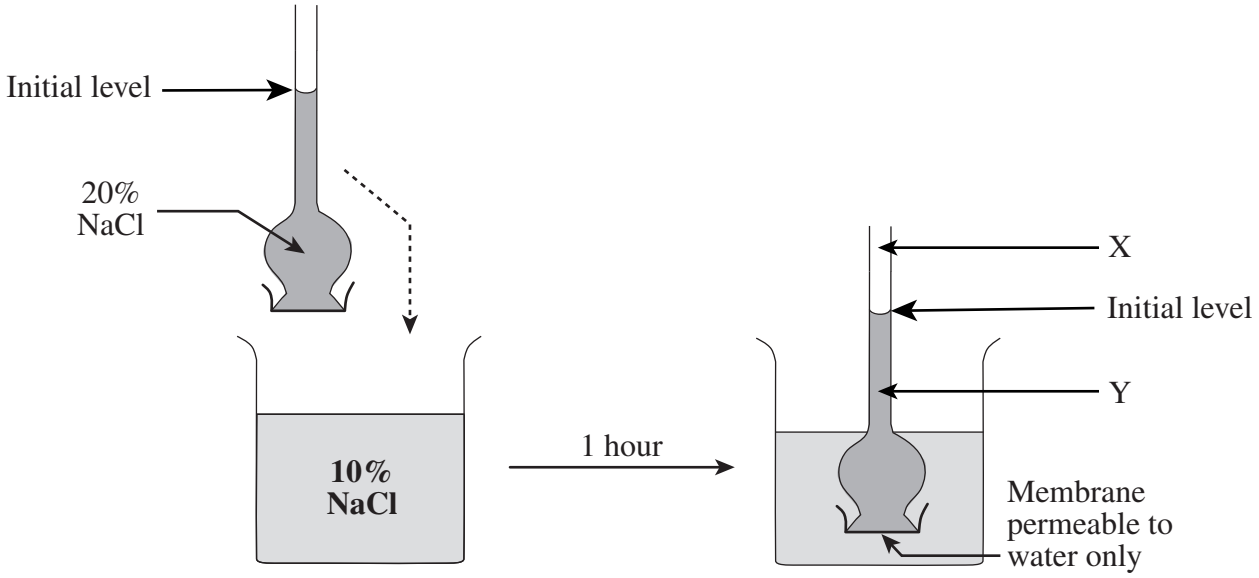
Use the following diagram to answer question 25.



25. The process illustrated in the diagram is

    A. osmosis.
    B. diffusion.
    C. active transport.
    D. facilitated transport.

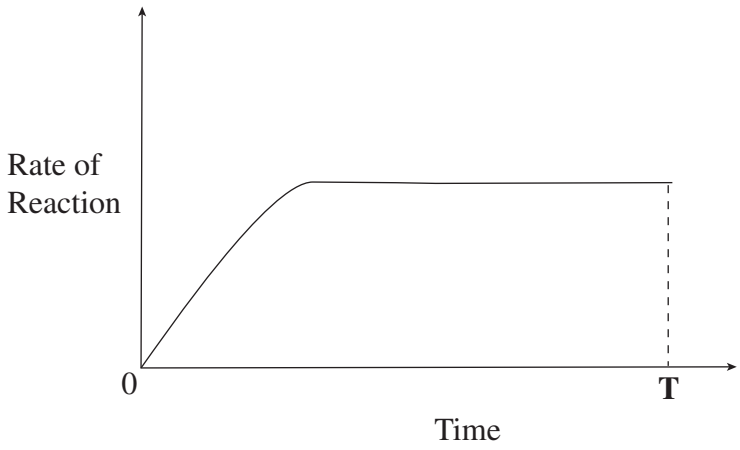
Use the following diagram to answer question 26.



26. A thistle tube containing a 20% NaCl solution is placed in a beaker containing a 10% NaCl solution. After one hour the concentration of NaCl in the tube

    A. increases and the level of solution will be at **Y**.
    B. decreases and the level of solution will be at **Y**.
    C. increases and the level of solution will be at **X**.
    D. decreases and the level of solution will be at **X**.

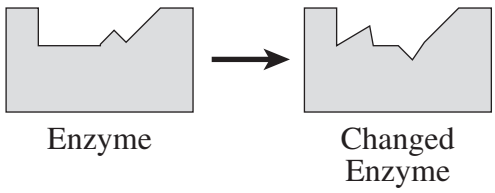
Use the following graph to answer question 27.



27. Which of the following will have no effect on the shape of the graph after Time **T**?

    A. adding extra substrate
    B. adding a competitive inhibitor
    C. decreasing the available energy
    D. changing the pH away from the optimum

Use the following diagram to answer question 28.



28. The changes shown in the diagram cause the rate of an enzyme-catalyzed reaction to decrease because

    A. the enzyme denatures the substrate.
    B. the substrate cannot bind to the active site.
    C. the coenzyme is unable to bind to the substrate.
    D. the enzyme can no longer increase the activation energy.

29. Which of the following describes the function of an enzyme?

A. It speeds up a chemical reaction.
B. It increases the available substrate.
C. It increases the activation energy of a reaction.
D. It contributes atoms to facilitate a chemical reaction.

30. The chemical digestion of starch begins in the

A. mouth.
B. stomach.
C. duodenum.
D. salivary glands.

31. In which structure does peristalsis **not** occur?

A. the liver
B. the stomach
C. the esophagus
D. the duodenum

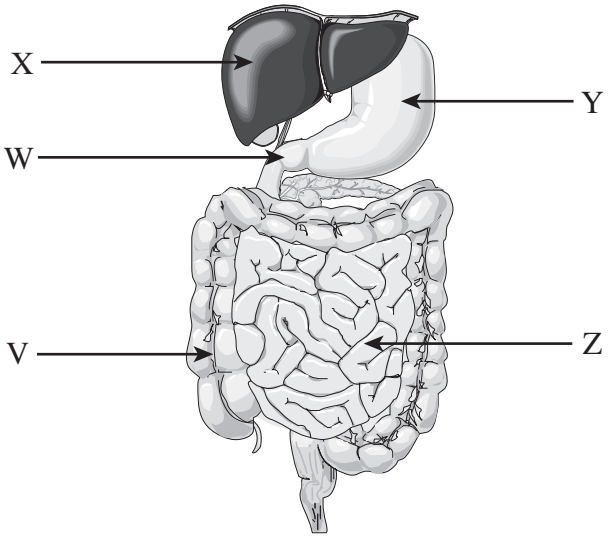
32. Food passing through the digestive tract from the esophagus to the duodenum must pass through the

A. stomach and the colon.
B. pyloric sphincter and the liver.
C. pyloric sphincter and the pancreas.
D. cardiac sphincter and the stomach.

33. Which of the following is a component of gastric juice?

A. bile
B. trypsin
C. pepsinogen
D. bicarbonate ions

Use the following diagram of the digestive system to answer questions 34 and 35.



34. In which structure is maltose converted to glucose?

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

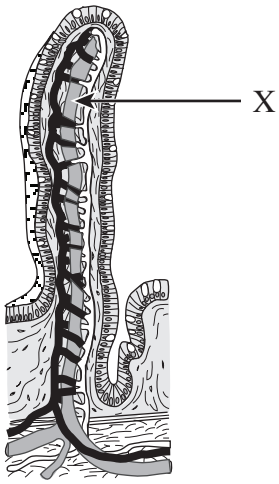
35. A function of structure **X** is to

A. absorb lipids.
B. produce insulin.
C. chemically digest fats.
D. remove toxins from the blood.

36. An increase in the concentration of glucose in the blood results in increased secretion of a hormone from the

A. liver.
B. stomach.
C. pancreas.
D. duodenum.

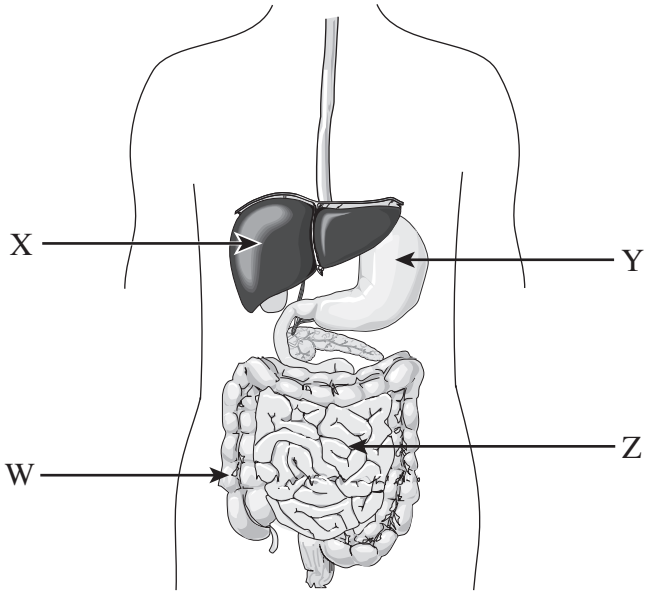
Use the following diagram to answer question 37.



37. After the digestion of a meal, which of the following increases in concentration in structure **X**?

A. lipids
B. glucose
C. maltose
D. amino acids

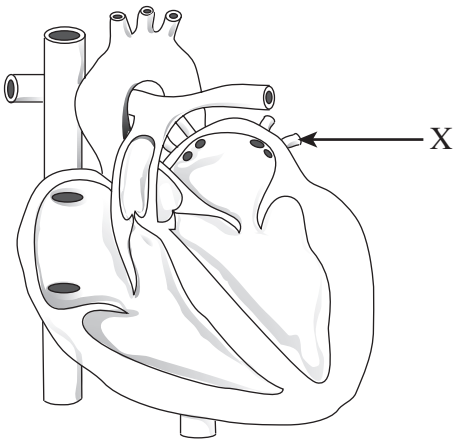
Use the following diagram of the digestive system to answer question 38.



38. The contents of which structure contains the greatest concentration of hydrogen ions?

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

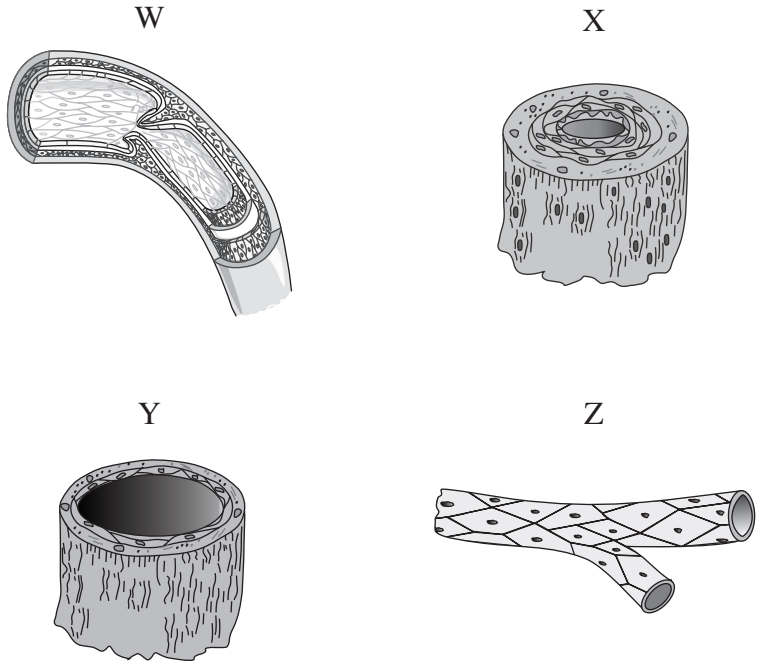
Use the following cross-sectional diagram of the heart to answer question 39.



39. Structure **X** indicates

A. a pulmonary vein.
B. the pulmonary trunk.
C. the chordae tendineae.
D. the anterior vena cava.

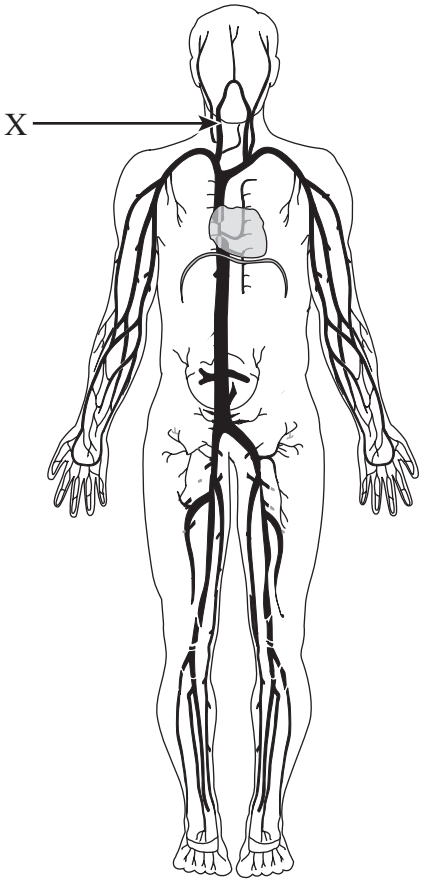
Use the following diagrams of blood vessels to answer question 40.



40. Which of these vessels is involved in the process of internal respiration?

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

Use the following diagram of the circulatory system to answer question 41.



41. Which structure is indicated by **X**?

    A. the jugular vein
    B. the coronary vein
    C. the subclavian vein
    D. the anterior vena cava

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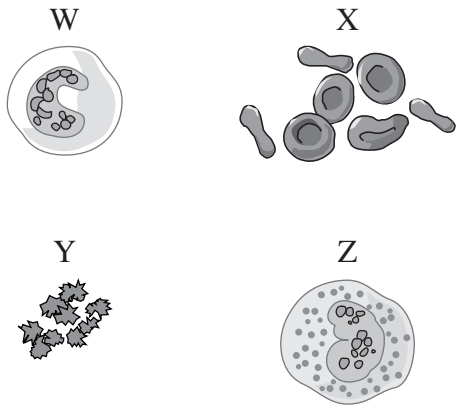
42. Which of the following is required to initiate blood clotting?

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

43. A red blood cell leaves the right ventricle, moves through the circulatory system and arrives in the anterior vena cava. The sequence of organs through which this cell moved is

A. lungs → brain → heart.
B. lungs → heart → brain.
C. heart → brain → lungs.
D. heart → lungs → kidney.

Use the following diagram of the formed elements of the blood to answer question 44.



44. Which of these are a part of the immune system?

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

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45. Which of the following characteristics is **not** true of both the posterior vena cava and a lymph vein?

A. Both have internal valves.
B. Both carry fluids low in oxygen.
C. Both remove fluids from the tissues.
D. Both carry fluids directly to the right atrium.

46. In fetal circulation, which of the following vessels carries blood with the highest concentration of oxyhemoglobin?

A. the aorta
B. the umbilical vein
C. the umbilical artery
D. the anterior vena cava

47. Which of the following occurs at the venous end of a capillary bed in a muscle?

A. Plasma proteins leave the bloodstream.
B. Carbon dioxide and glucose enter the bloodstream.
C. Blood pressure forces water to move into the tissues.
D. Osmotic pressure causes water to move into the blood.

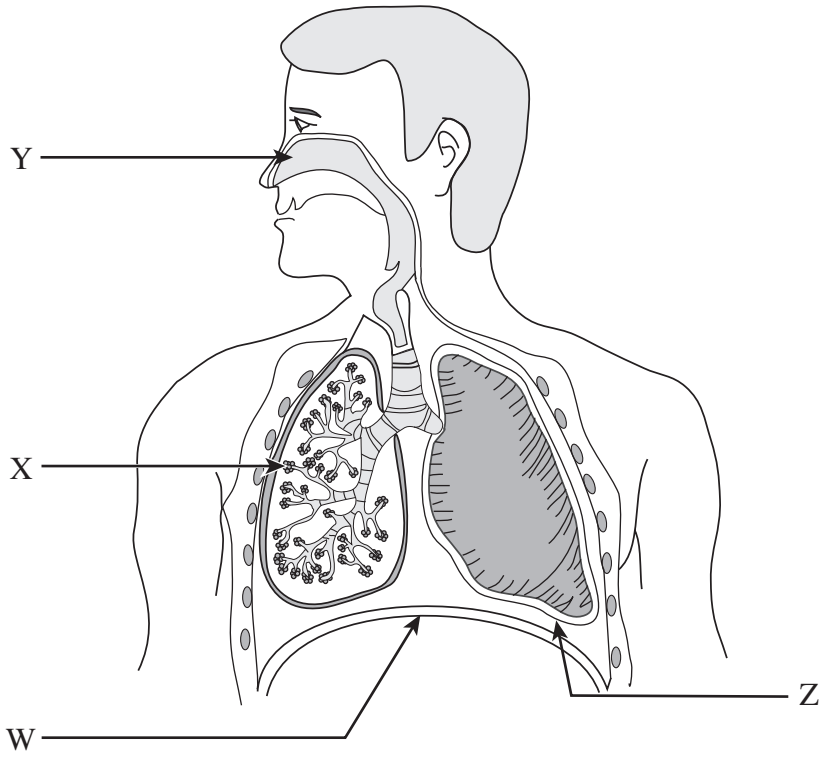
48. During inhalation, air moves from the bronchioles into the

A. larynx.
B. alveoli.
C. trachea.
D. bronchi.

49. Voice sounds are produced in the

A. larynx.
B. trachea.
C. bronchi.
D. pharynx.

Use the following diagram of the respiratory system to answer question 50.



50. Which structure responds to nerve impulses from the medulla oblongata?

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

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51. Consider the following reaction:

$$CO_2 + H_2O \rightarrow H^+ + HCO_3^-$$

Which of the following occurs as a result of an increase in the rate of this reaction?

A. decreased activity in the aortic bodies
B. decreased stimulation of the diaphragm
C. increased rate of contraction of the rib muscles
D. increased concentration of carbonic anhydrase in the blood

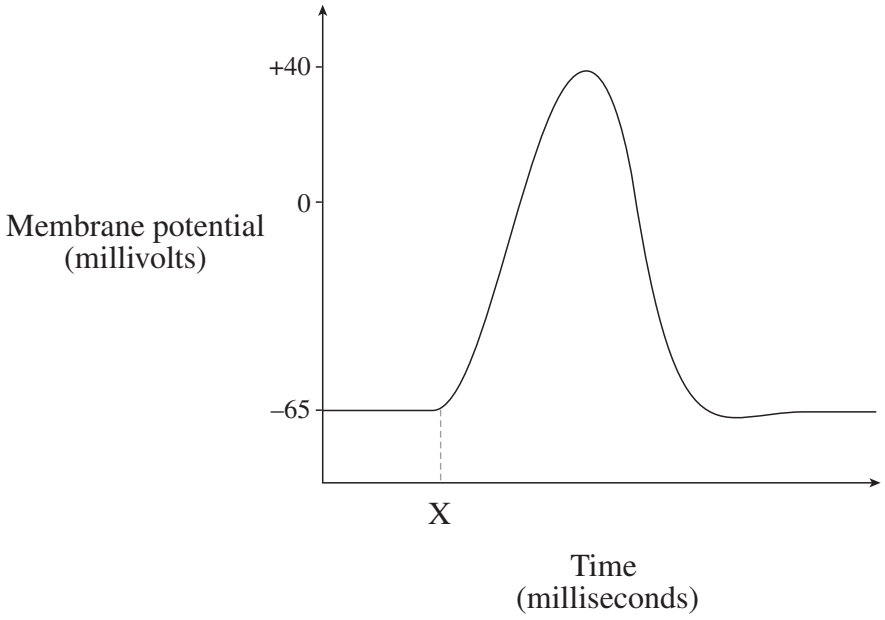
52. What part of a neuron carries impulses toward the cell body?

A. an axon
B. a dendrite
C. the synaptic cleft
D. the myelin sheath

53. What structure stores neurotransmitters?

A. a receptor site
B. the synaptic cleft
C. a synaptic vesicle
D. the postsynaptic membrane

Use the following graph of an action potential to answer question 54.



54. What would result if the sodium gates did **not** open at time **X**?

A. Active transport would stop.
B. The potassium gates would open.
C. The membrane potential would change from $-65\ \text{mV}$ to $+40\ \text{mV}$.
D. The outside of the membrane would remain positive compared to the axoplasm.

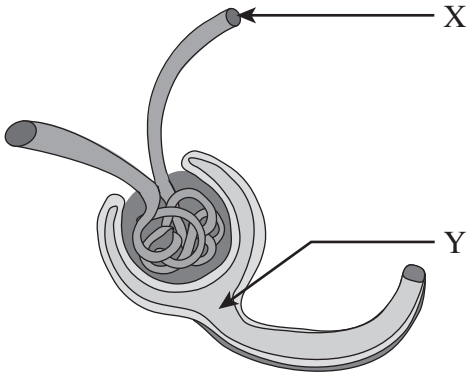
55. Which of the following results if the synaptic ending is treated with a substance that prevents the absorption of calcium ions?

A. The neurotransmitter is denatured.
B. The postsynaptic membrane remains polarized.
C. The synaptic vesicles release neurotransmitters.
D. Contractile proteins pull synaptic vesicles to the membrane.

56. What structure can carry both urine or semen?

A. the ureter
B. the urethra
C. the vas deferens
D. the collecting duct

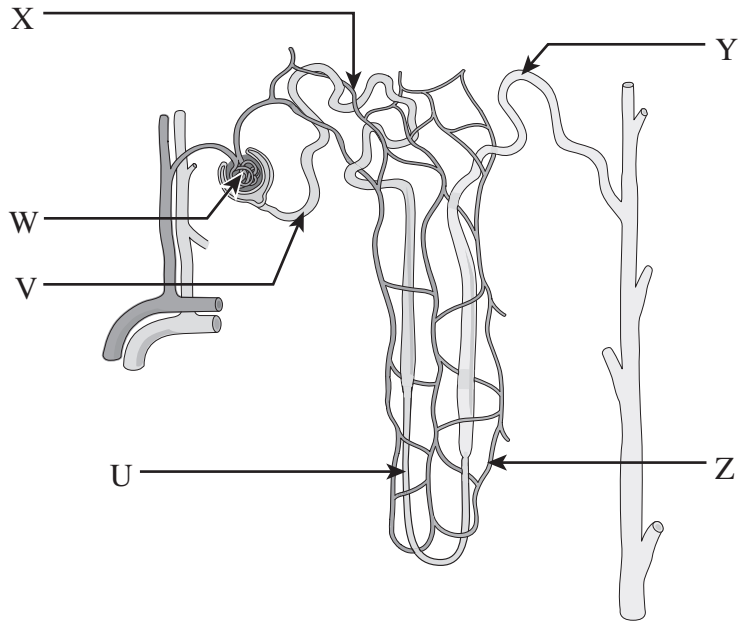
Use the following diagram of the glomerulus to answer question 57.



57. Which of these substances is found in **X** but not in **Y**?

A. urea
B. water
C. glucose
D. fibrinogen

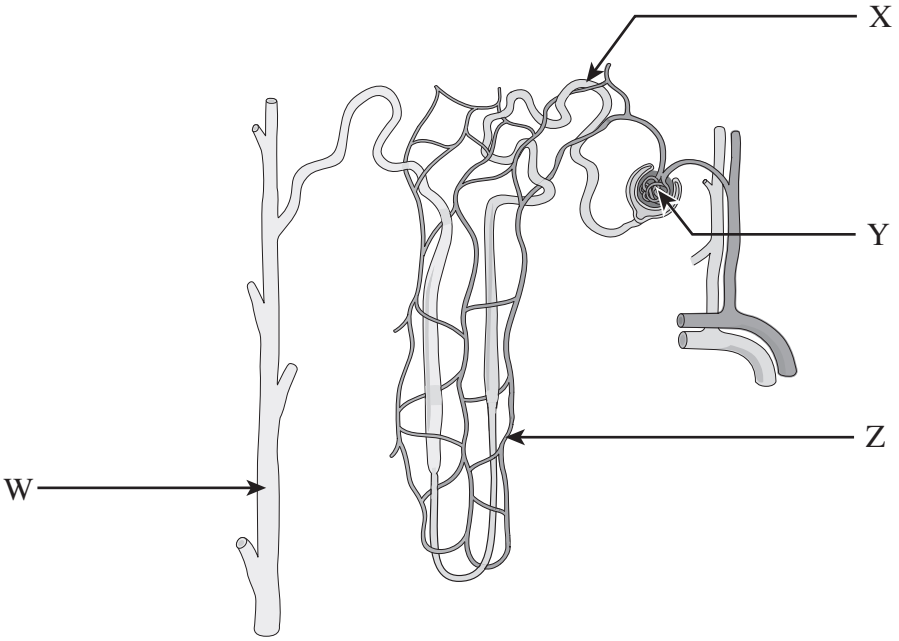
Use the following diagram of a nephron to answer question 58.



58. What happens to most of the water that passes into the glomerular filtrate?

A. It is reabsorbed from structure **U** into structure **Z**.
B. It is reabsorbed from structure **V** into structure **X**.
C. Tubular excretion carries it from structure **Z** to structure **Y**.
D. Pressure filtration pushes it from structure **W** to structure **X**.

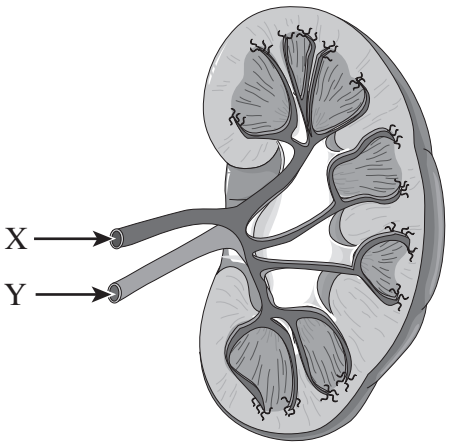
Use the following diagram of a nephron to answer question 59.



59. The contents of which of the following have the greatest concentration of urea?

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

Use the following diagram of a kidney to answer question 60.



60. What happens to the concentration of glucose and urea as blood flows from **X** to **Y**?

    A. Both increase in concentration.
    B. Both decrease in concentration.
    C. Glucose increases, while urea decreases.
    D. Glucose decreases, while urea increases.

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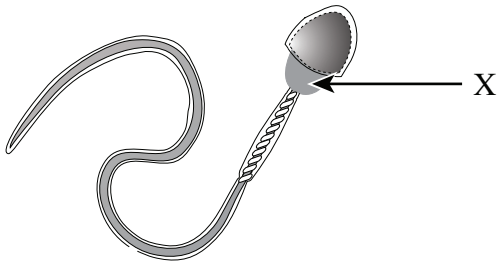
61. Which of the following structures responds to aldosterone?

    A. the glomerulus
    B. the Bowman's capsule
    C. the distal convoluted tubule
    D. the proximal convoluted tubule

Use the following diagram of a sperm cell to answer question 62.



62. What is the primary function of the structure labelled **X**?

    A. to produce ATP
    B. to store chromatin
    C. to propel the sperm
    D. to release hydrolytic enzymes

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63. Which part of a sperm cell stores hydrolytic enzymes?

    A. the head
    B. the flagellum
    C. the acrosome
    D. the mid-piece

64. Which of the following describes the path of sperm during ejaculation?

    A. epididymis → vas deferens → urethra
    B. seminiferous tubule → ureter → urethra
    C. seminiferous tubule → urethra → vas deferens
    D. epididymis → seminiferous tubule → vas deferens

65. What is the function of the interstitial cells in the testes?

A. to produce sperm cells
B. to produce testosterone
C. to produce seminal fluid
D. to provide a site for sperm maturation

66. Which structure produces a hormone that results in the secretion of estrogen?

A. the ovaries
B. the adrenal cortex
C. the hypothalamus
D. the posterior pituitary

67. Which of the following is affected by oxytocin?

A. ovary
B. uterus
C. thalamus
D. anterior pituitary

You have **Examination Booklet Form A**. In the box above #1 on your **Answer Sheet**, ensure you filled in the bubble as follows.

Exam Booklet Form/ Cahier d'examen	A	B	C	D	E	F	G	H
	●	○	○	○	○	○	○	○

This is the end of the multiple-choice section.
Answer the written-response questions in the Response Booklet.

MINISTRY USE ONLY

Place Personal Education Number (PEN) here.

Course Code = BI 12

2008/09 Released Exam

June 2009

Exam Booklet Form/ Cahier d'examen A B C D E F G H

Student Instructions

1. Place your Personal Education Number (PEN) label at the top of this Booklet **AND** fill in the bubble (Form A, B, C, D, E, F, G or H) that corresponds to the letter on your Examination Booklet.
2. Use a pencil to fill in bubbles when answering questions on your Answer Sheet.
3. Use a blue- or black-ink pen when answering written-response questions in this Booklet.
4. Read the Examination Rules on the back of this Booklet.

MINISTRY USE ONLY

Question 1	0	1	2	3			NR
Question 2	0	1	2	3	4		NR
Question 3	0	1	2	3			NR
Question 4	0	1	2	3	4	5	6	NR
Question 5	0	1	2	3			NR
Question 6	0	1	2	3	4		NR

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Place Personal Education Number (PEN) here.

Course Code = BI 12

Biology 12

2008/09 Released Exam

June 2009

Response Booklet

BRITISH COLUMBIA
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PART B: WRITTEN RESPONSE

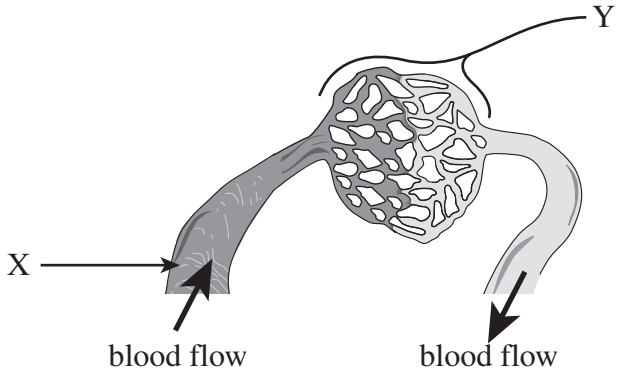
Value: 23 marks

Suggested Time: 40 minutes

INSTRUCTIONS:
1. Answer the following questions in the space provided in this **Response Booklet**.
2. Use a pen for this part of the examination unless otherwise instructed.
3. You may not need all of the space provided to answer each question.

1. In an experiment, a reaction catalyzed by a human enzyme is subjected to an increase in temperature from $37°C$ to $80°C$. Describe what happens to the rate of this reaction, and explain why this has occurred. **(3 marks)**

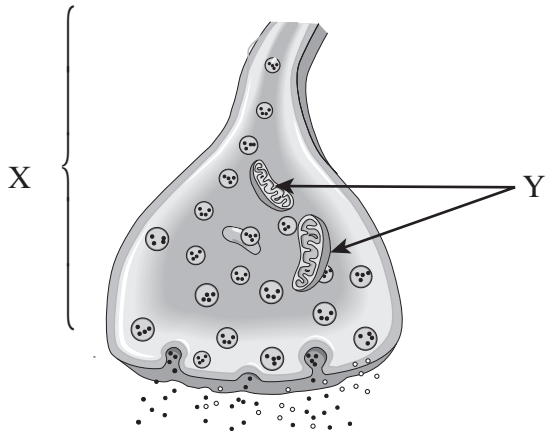
Use the following diagram to answer question 2.



2. Explain how the structure of blood vessels **X** and **Y** are well-suited to their function. **(4 marks: 2 marks each)**

3. Describe how the diaphragm and rib cage function to change the pressure in the thoracic cavity during inhalation. **(3 marks)**

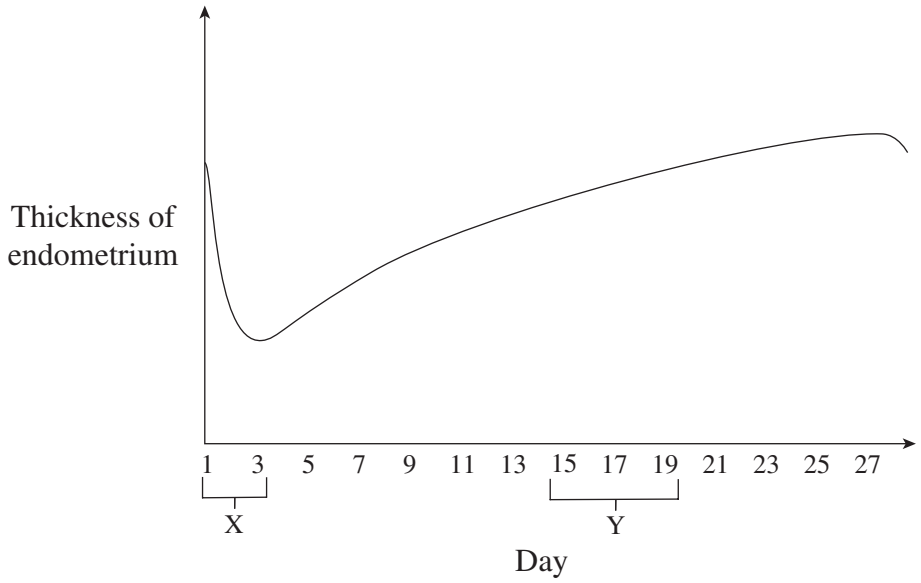
Use the following diagram to answer question 4.



4. By listing reactants and products, describe the chemical process that occurs in structures **Y**. Explain 3 ways in which one of these products is used by structure **X**. **(6 marks)**

5. Explain how the nephron regulates blood pH. **(3 marks)**

Use the following graph to answer question 6.



6. Explain how changes in the secretions of the pituitary gland and the ovaries cause changes in the thickness of the endometrium shown at **X** and **Y**. **(4 marks)**

Examination Rules

1. The time allotted for this examination is two hours.
   You may, however, take up to 60 minutes of additional time to finish.
2. Answers entered in the Examination Booklet will not be marked.
3. Cheating on an examination will result in a mark of zero. The Ministry of Education considers cheating to have occurred if students break any of the following rules:

   - Students must not be in possession of or have used any secure examination materials prior to the examination session.
   - Students must not communicate with other students during the examination.
   - Students must not give or receive assistance of any kind in answering an examination question during an examination, including allowing one's paper to be viewed by others or copying answers from another student's paper.
   - Students must not possess any book, paper or item that might assist in writing an examination, including a dictionary or piece of electronic equipment, that is not specifically authorized for the examination by ministry policy.
   - Students must not copy, plagiarize or present as one's own, work done by any other person.
   - Students must immediately follow the invigilator's order to stop writing at the end of the examination time and must not alter an Examination Booklet, Response Booklet or Answer Sheet after the invigilator has asked students to hand in examination papers.
   - Students must not remove any piece of the examination materials from the examination room, including work pages.

4. The use of inappropriate language or content may result in a mark of zero being awarded.
5. Upon completion of the examination, return all examination materials to the supervising invigilator.