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Biology 12

JUNE 2001

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. .

(5)

Question 9:

9. .

(7)

Question 2:

2. .

(4)

Question 10:

10. .

(5)

Question 3:

3. .

(4)

Question 4:

4. .

(5)

Question 5:

5. .

(4)

Question 6:

6. .

(4)

Question 7:

7. .

(6)

Question 8:

8. .

(6)

BIOLOGY 12

JUNE 2001

COURSE CODE = BI

GENERAL INSTRUCTIONS

1. Electronic devices, including dictionaries and pagers, are **not** permitted in the examination room.
2. All multiple-choice answers must be entered on the Response Form using an **HB pencil**. Multiple-choice answers entered in this examination booklet will **not** be marked.
3. For each of the written-response questions, write your answer in **ink** unless otherwise instructed in the space provided in this booklet.
4. Ensure that you use language and content appropriate to the purpose and audience of this examination. Failure to comply may result in your paper being awarded a zero.
5. This examination is designed to be completed in **two hours**. *Students may, however, take up to 30 minutes of additional time to finish.*

BIOLOGY 12 PROVINCIAL EXAMINATION

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

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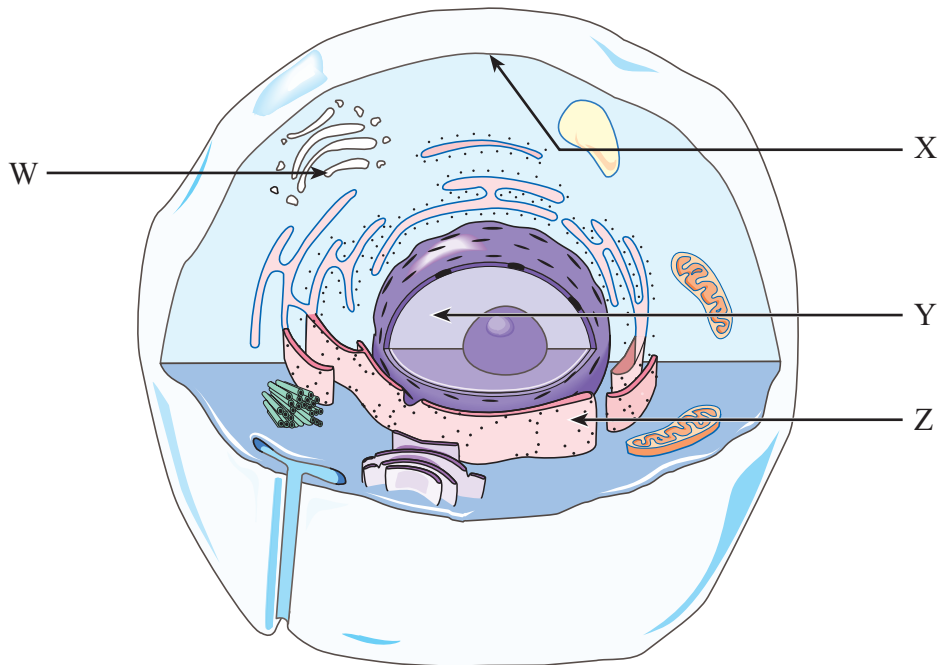
PART A: MULTIPLE CHOICE

Value: 50 marks

Suggested Time: 45 minutes

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

Use the following diagram to answer question 1.



1. Which letter indicates the part of the cell where genetic material is stored?

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

2. If the nucleolus ceases to function, the cellular function first affected would be

- A. DNA replication.
- B. cellular respiration.
- C. ribosome production.
- D. storage of chromosomes.

Use the following information to answer question 3.

1. packaging of lipase at a Golgi body
2. peptide bonding of valine with other amino acids on the rough endoplasmic reticulum
3. hydrolysis of a protein containing valine
4. vesicles fusing with the plasma membrane

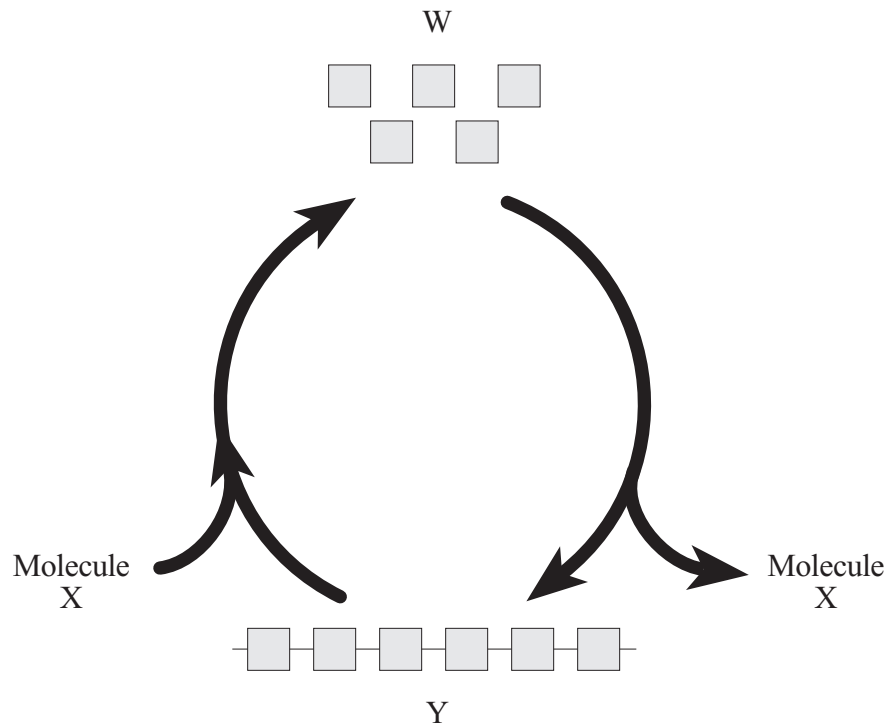
3. The amino acid valine is used in the synthesis of lipase. What would be the correct sequence of events in the production and release of lipase?

- A. 1 → 3 → 2 → 4
 - B. 2 → 3 → 4 → 1
 - C. 3 → 2 → 1 → 4
 - D. 4 → 1 → 2 → 3
-

4. Water molecules are connected to each other by

- A. buffers.
- B. base pairing.
- C. peptide bonds.
- D. hydrogen bonds.

Use the following diagram to answer questions 5 and 6.



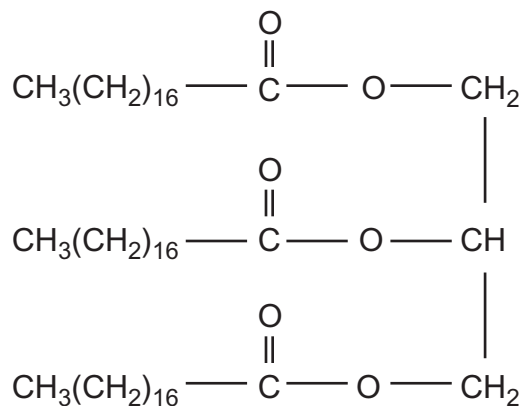
5. Which of the following correctly identifies molecules **W** and **Y**?

	W	Y
A.	proteins	amino acids
B.	glucose	glycogen
C.	nucleic acids	nucleotides
D.	lipids	fatty acids

6. What is molecule **X**?

- A. ATP
- B. DNA
- C. water
- D. peptides

Use the following diagram to answer question 7.



7. The chemical compound above is classified as a
- A. lipid.
 - B. protein.
 - C. nucleic acid.
 - D. carbohydrate.
-
8. An unsaturated fat is characterized by
- A. a helical structure.
 - B. four fused carbon rings.
 - C. double bonds between the carbon atoms.
 - D. phosphate groups substituting for fatty acids.
9. Primary protein structure is dependent on
- A. peptide bonding.
 - B. hydrogen bonding.
 - C. bonding between R-groups.
 - D. bonds between protein molecules.
10. Recombinant DNA can be made by joining together which of the following?
- A. rRNA and DNA
 - B. mRNA and tRNA
 - C. viral tRNA and viral DNA
 - D. bacterial DNA and human DNA

11. One difference between DNA and RNA is that RNA
- A. is helical.
 - B. is single stranded.
 - C. contains deoxyribose.
 - D. contains the bases C, G, A, T.

12. The role of ribosomes in protein synthesis is to
- A. split the two strands of DNA apart.
 - B. check for and replace faulty codons.
 - C. carry amino acids to the site of translation.
 - D. provide a site for mRNA and tRNA to join together.

Use the following table to answer question 13.

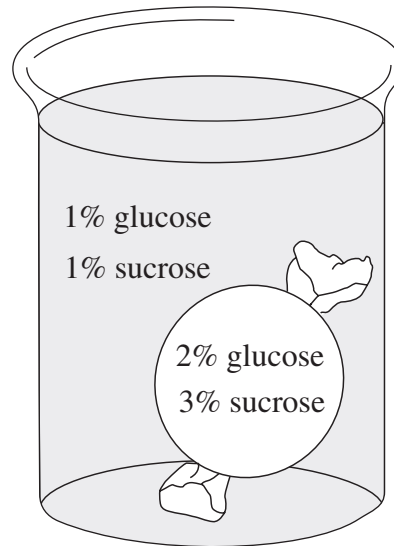
mRNA CODON	AMINO ACID CODED FOR
CCU	proline
CCC	proline
CCA	proline
CCG	proline

13. Which of the following mutations will **not** result in the incorporation of the amino acid proline in a protein?
- A. use of a G G U anticodon during translation
 - B. mutation of the DNA from G A A to G G A
 - C. substitution of the first base in the DNA triplet for proline
 - D. substitution error changing the DNA from G G G to G G T

-
14. The process whereby cancer cells cause new tumours to form away from the primary tumour is called
- A. initiation.
 - B. anaplasia.
 - C. metastasis.
 - D. contact inhibition.

15. Vascularization is the process in the development of a tumour whereby
- A. capillaries are stimulated to grow.
 - B. viruses implant initiators into the cell.
 - C. cells begin to spread throughout the body.
 - D. proto-oncogenes are changed into oncogenes.

Use the following diagram to answer question 16.

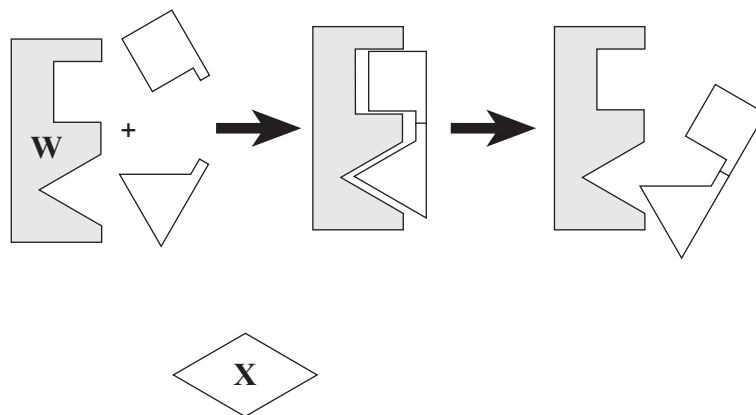


16. A 2% glucose and 3% sucrose solution was added to a bag made from a membrane that is permeable only to water and glucose. The bag was then placed in a beaker of water containing a 1% glucose and 1% sucrose solution.

Which of the following would describe the sugar concentrations inside the bag after one hour?

- A. Both the glucose and sucrose concentrations would increase.
- B. Both the glucose and sucrose concentrations would decrease.
- C. The sucrose concentration would increase and the glucose concentration would decrease.
- D. The sucrose concentration would decrease and the glucose concentration would increase.

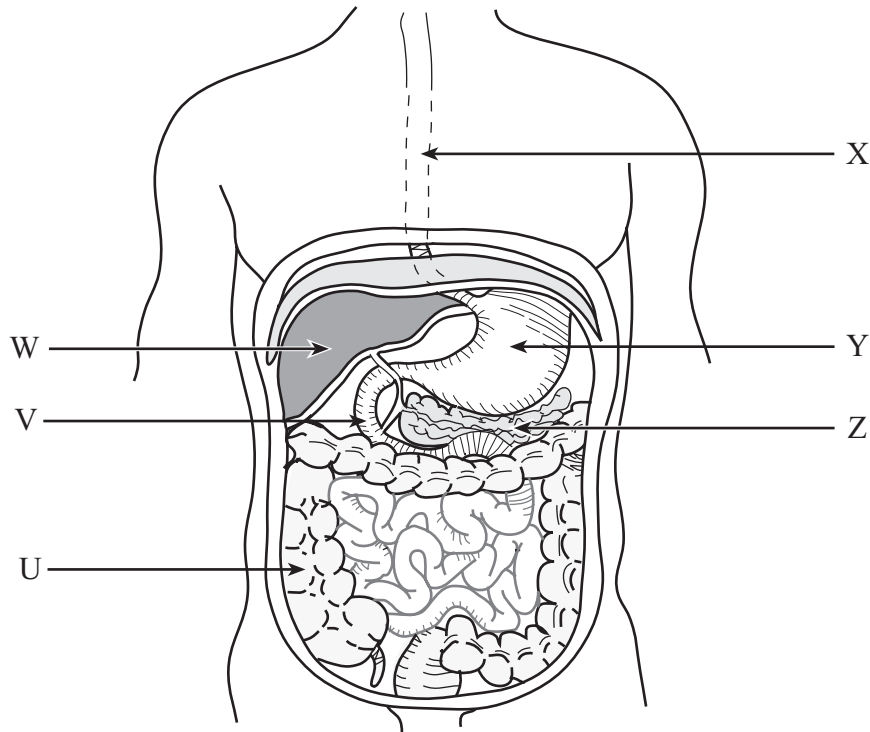
17. The following diagram represents the shapes of reacting molecules in a living system.



When molecule **X** was added to the system, the amount of product decreased.
Molecule **X** must be acting

- A. as a coenzyme.
- B. to denature the reactants.
- C. as a competitive inhibitor.
- D. to synthesize more of molecule W.

Use the following diagram to answer questions 18 and 19.



18. Which two structures do **not** produce enzymes involved in digestion?

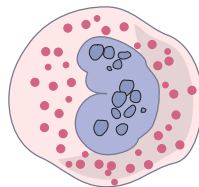
- A. U and W
- B. U and Z
- C. Y and Z
- D. X and Y

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

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

20. The pulmonary artery is classified as an artery because it
- A. has thin walls.
 - B. carries blood away from the heart.
 - C. contains blood that has high levels of oxygen.
 - D. has one-way valves that prevent blood from flowing back to the heart.
21. In which of the following vessels would blood plasma be the **most** hypertonic to distilled water?
- A. renal vein
 - B. carotid artery
 - C. subclavian artery
 - D. hepatic portal vein
22. What would result if a blockage occurred in a lymph vein?
- A. More lymph would enter the subclavian vein.
 - B. The tissue served by this lymph vein would fill with fluid.
 - C. The lymph capillaries attached to this lymph vein would dry up.
 - D. All lymph veins in this part of the body would fill up with blood.

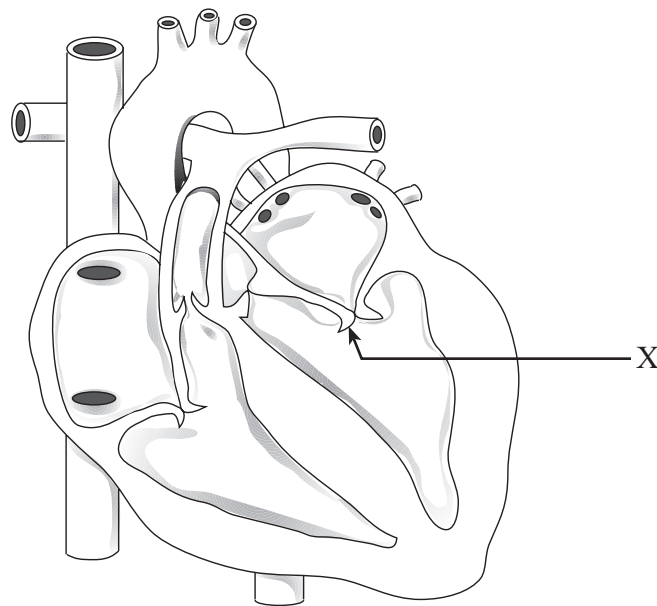
Use the following diagram to answer question 23.



23. Which of the following components of blood is represented by the diagram?
- A. a platelet
 - B. fibrinogen
 - C. a red blood cell
 - D. a white blood cell

24. Which of the following structures prevents viruses from attaching to host cells?
- A. platelets
 - B. antigens
 - C. antibodies
 - D. lymph nodes
25. One factor that can cause edema, an abnormal accumulation of fluid within tissues, is a decrease in
- A. blood pressure.
 - B. the secretion of ADH.
 - C. concentration of plasma proteins.
 - D. water reabsorption by the kidneys.

Use the following diagram to answer question 26.

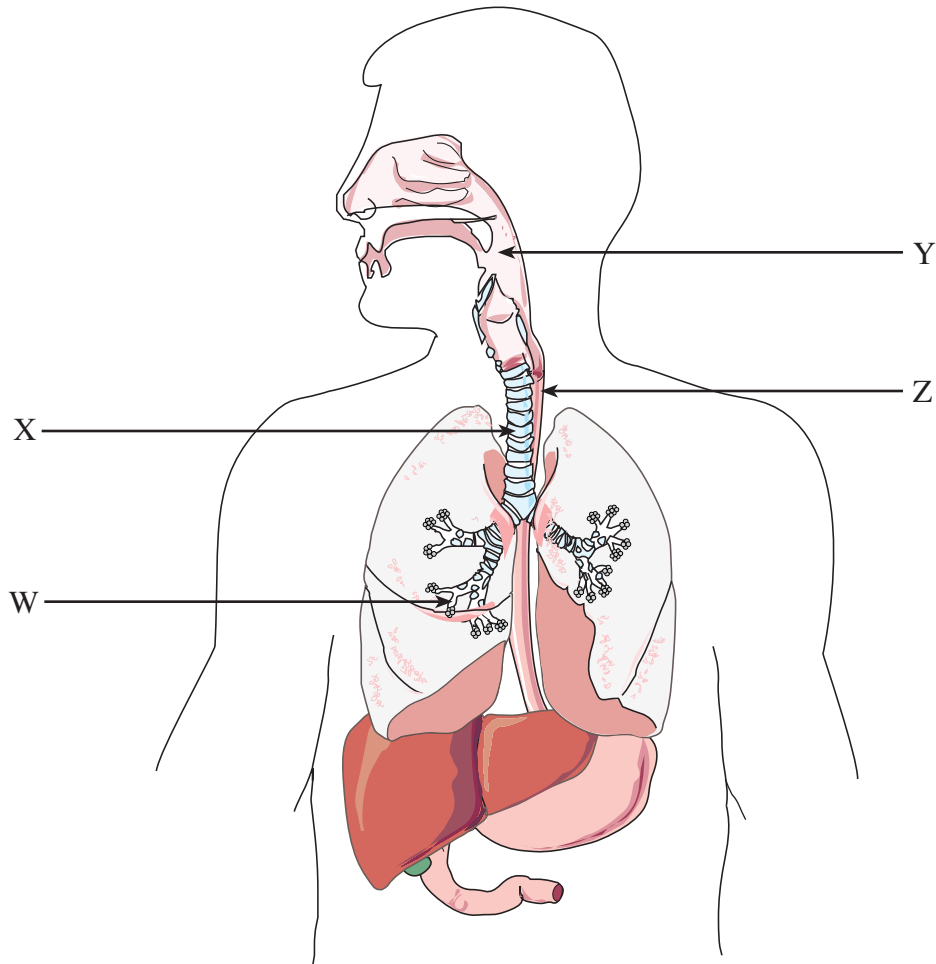


26. The structure labelled **X** will open when which of the following is contracting?
- A. atria
 - B. aorta
 - C. ventricles
 - D. sino-atrial (SA) node

27. The vocal chords are found in which structure?

- A. larynx
- B. bronchi
- C. pharynx
- D. bronchioles

Use the following diagram to answer question 28.

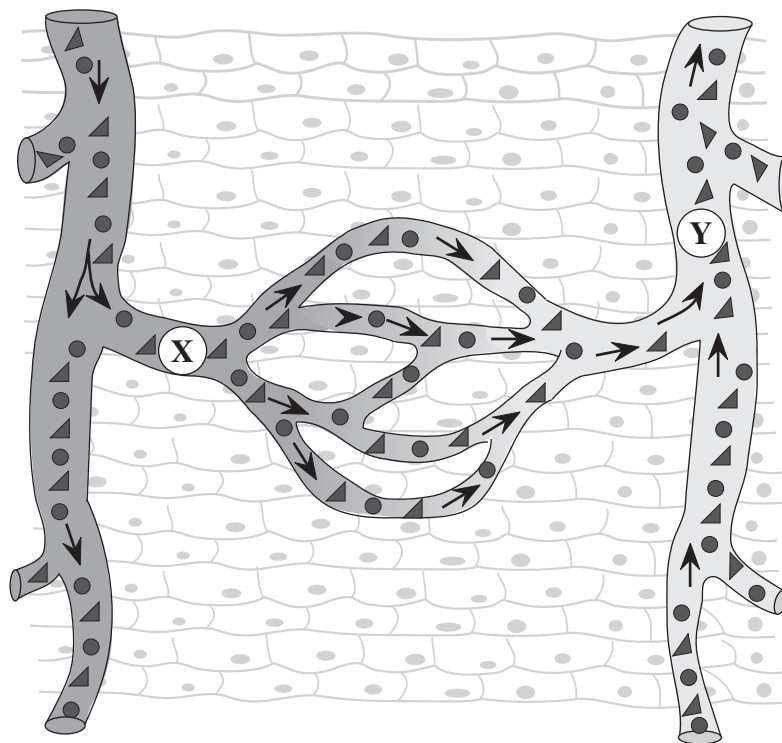


28. Which of the following indicates a cartilaginous tube lined with a ciliated mucous membrane?

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

29. Internal respiration is the
- production of ATP in cells.
 - movement of air into and out of the lungs.
 - exchange of gases between the blood and the air.
 - exchange of gases between the blood and the tissues.

Use the following diagram to answer question 30.

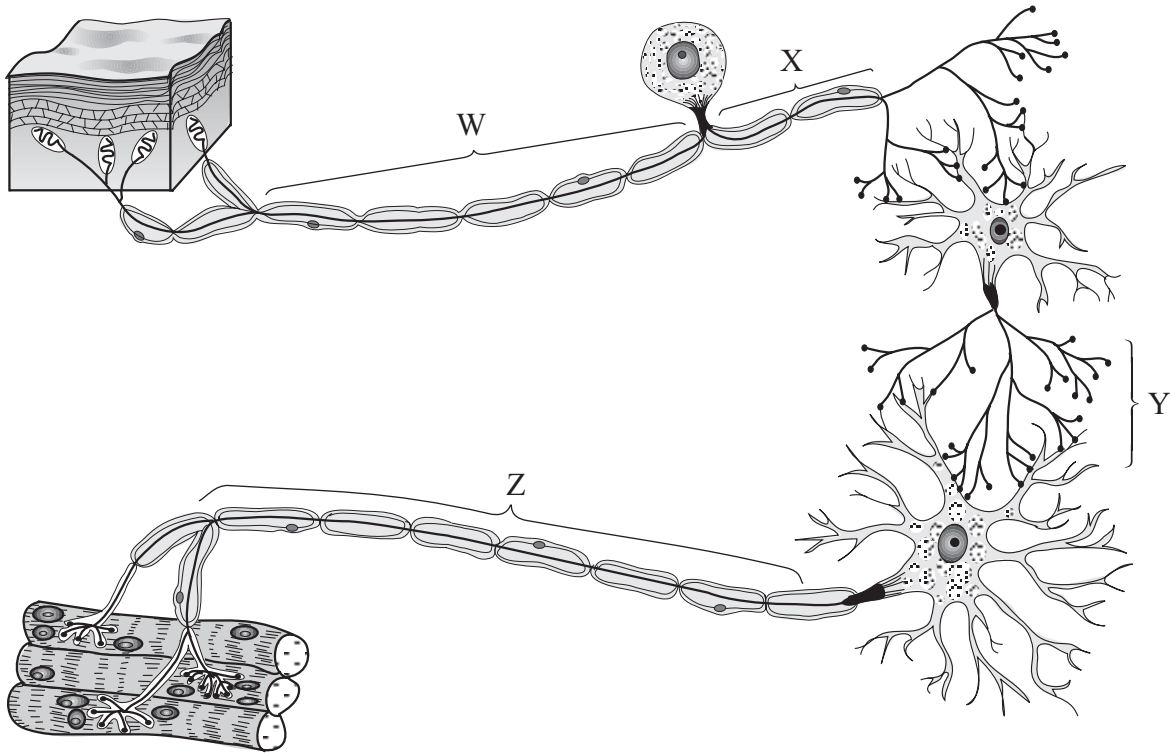


30. Which of the following would be a valid comparison of the blood at location **X** when compared to the blood at location **Y**?

(HbO_2 = oxyhemoglobin, HCO_3^- = bicarbonate ions, HHb = reduced hemoglobin)

	LOCATION X		
A.	low HbO_2	high HCO_3^-	high HHb
B.	high HbO_2	high HCO_3^-	high HHb
C.	high HbO_2	low HCO_3^-	low HHb
D.	high HbO_2	low HCO_3^-	high HHb

Use the following diagram to answer question 31.



31. Which of the following represents the axon of the motor neuron in the reflex arc?

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

32. Relative to the outside of a neuron, the cytoplasm inside a resting neuron is

- A. positively charged and the sodium ion concentration is lower inside than outside.
- B. negatively charged and the sodium ion concentration is lower inside than outside.
- C. positively charged and the sodium ion concentration is greater inside than outside.
- D. negatively charged and the sodium ion concentration is greater inside than outside.

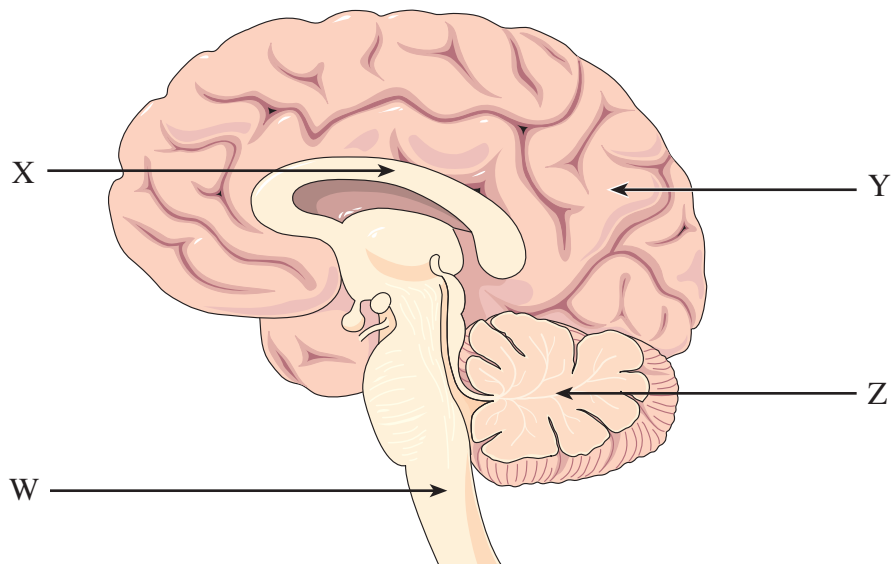
33. Neurotransmitters are released into the

- A. axon.
- B. dendrite.
- C. synaptic cleft.
- D. myelin sheath.

OVER

34. After surgery to remove a brain tumour, a person suffers from poor appetite, alternating chills and fever, and difficulty in maintaining water balance and blood pressure. Memory and muscle control are normal. Which part of the brain is **most** likely affected?
- A. thalamus
 - B. cerebrum
 - C. cerebellum
 - D. hypothalamus

Use the following diagram to answer question 35.



35. Which of the following indicates the part of the brain containing reflex centres for swallowing and vomiting?
- A. W
 - B. X
 - C. Y
 - D. Z

Use the following components of blood plasma to answer question 36.

- urea
- water
- glucose
- proteins
- antibodies
- hydrogen ions

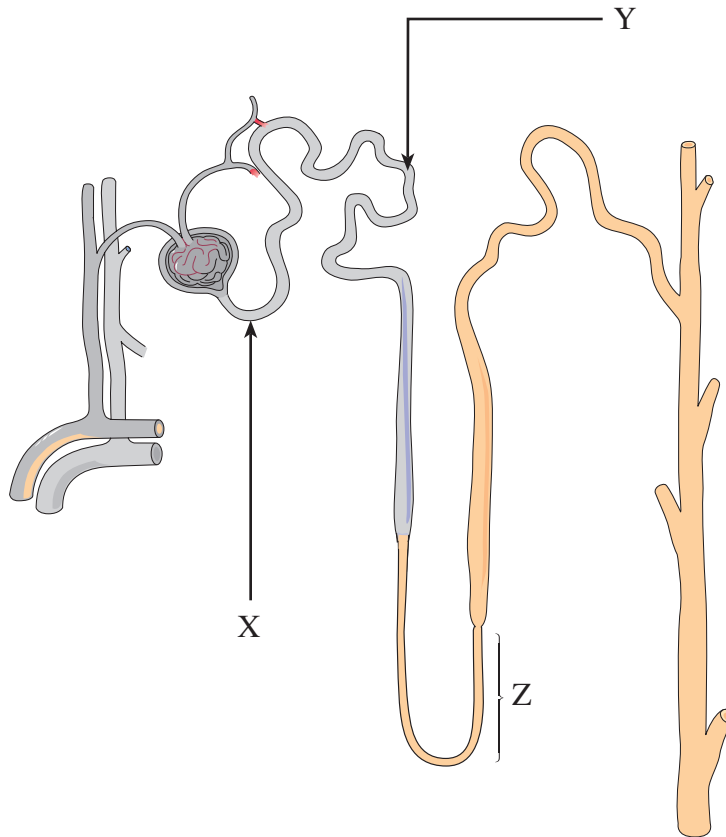
36. How many of these components of blood plasma are excreted or reabsorbed by the kidneys?

- A. two
 - B. three
 - C. four
 - D. five
-

37. The glomerulus is located between the

- A. efferent arteriole and renal vein.
- B. renal artery and afferent arteriole.
- C. afferent arteriole and efferent arteriole.
- D. efferent arteriole and peritubular capillaries.

Use the following diagram to answer questions 38 and 39.



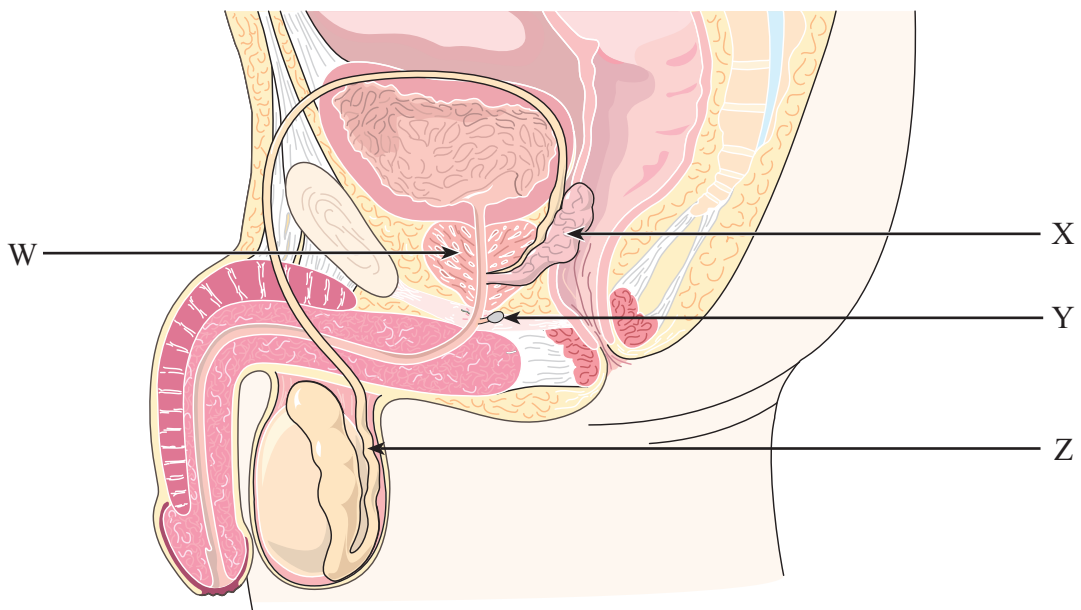
38. When compared to location **X**, the filtrate at location **Y** would be highest in its concentration of
- A. urea.
 - B. water.
 - C. glucose.
 - D. blood proteins.
39. Which of the following describes the tissues surrounding **Z**?
- A. low water content, low salt concentration
 - B. low water content, high salt concentration
 - C. high water content, low salt concentration
 - D. high water content, high salt concentration

40. After penicillin is administered for an infection in the urinary bladder, what pathway would penicillin take out of the body?

renal artery → afferent arteriole →

- A. distal convoluted tubule → loop of Henle → ureter
- B. glomerulus → efferent arteriole → ureter → renal vein
- C. efferent arteriole → distal convoluted tubule → collecting duct → urethra
- D. glomerulus → proximal convoluted tubule → loop of Henle → distal convoluted tubule → collecting duct → urethra

Use the following diagram to answer question 41.



41. Which of the labelled structures represents the prostate gland?

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

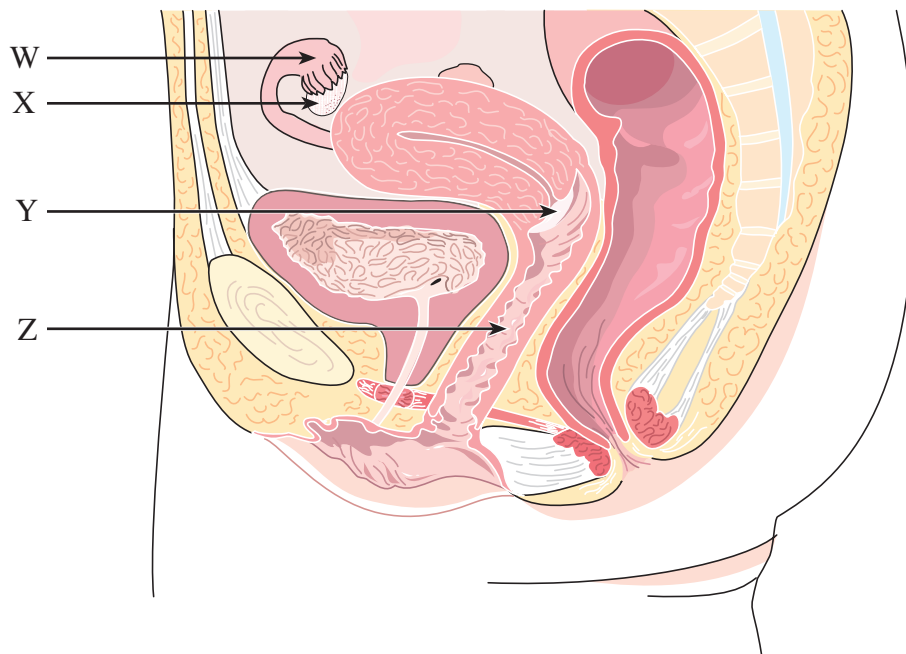
42. If the vas deferens is cut and tied, which component of semen will be missing?

- A. sperm
- B. seminal fluid
- C. prostaglandins
- D. fructose (sugar)

OVER

43. Sperm are produced in the
- interstitial cells of the testes.
 - seminiferous tubules of the testes.
 - interstitial cells of the epididymis.
 - seminiferous tubules of the epididymis.
44. Which hormone is released from the **anterior pituitary** and results in growth of the penis and testes during puberty?
- testosterone
 - progesterone
 - luteinizing hormone (LH)
 - follicle-stimulating hormone (FSH)

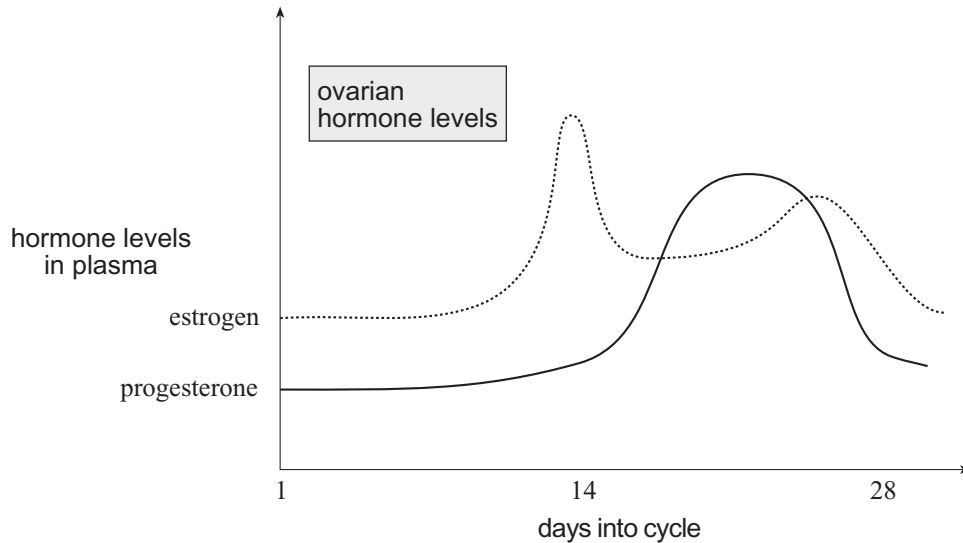
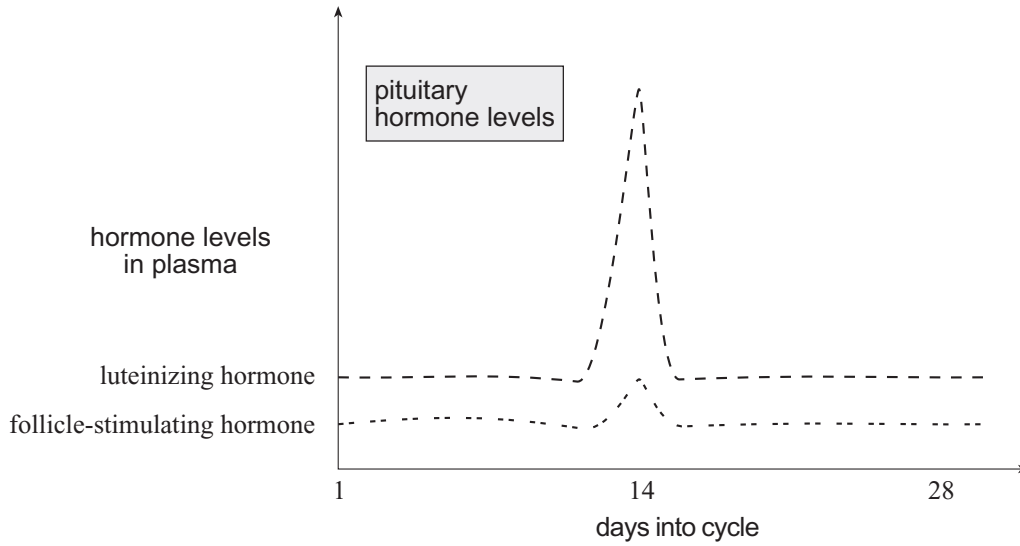
Use the following diagram to answer question 45.



45. Which of the following indicates the cervix?
- W
 - X
 - Y
 - Z

46. Which of the following hormones is involved in a negative feedback loop in the male reproductive system?
- A. oxytocin
 - B. adrenalin
 - C. aldosterone
 - D. testosterone
47. Which of the following organs is lined with cilia?
- A. ovary
 - B. uterus
 - C. vagina
 - D. oviduct
48. During puberty, increased estrogen production causes
- A. milk production.
 - B. breast development.
 - C. development of the corpus luteum.
 - D. release of human chorionic gonadotropin (HCG).
49. Which of the following correctly describes days 15 to 28 of a 28-day menstrual cycle?
- A. increased estrogen is associated with the secretory phase in the uterus
 - B. increased estrogen is associated with the proliferative phase in the uterus
 - C. increased progesterone is associated with the secretory phase in the uterus
 - D. increased progesterone is associated with the proliferative phase in the uterus

Use the following graphs to answer question 50.



50. The graphs show the levels of four different hormones in the blood plasma during the ovarian and uterine cycles. Which **two** hormones would have reduced levels if the corpus luteum fails to develop?
- A. progesterone and estrogen
 - B. progesterone and luteinizing hormone
 - C. estrogen and follicle-stimulating hormone
 - D. luteinizing hormone and follicle-stimulating hormone

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

PART B: WRITTEN RESPONSE

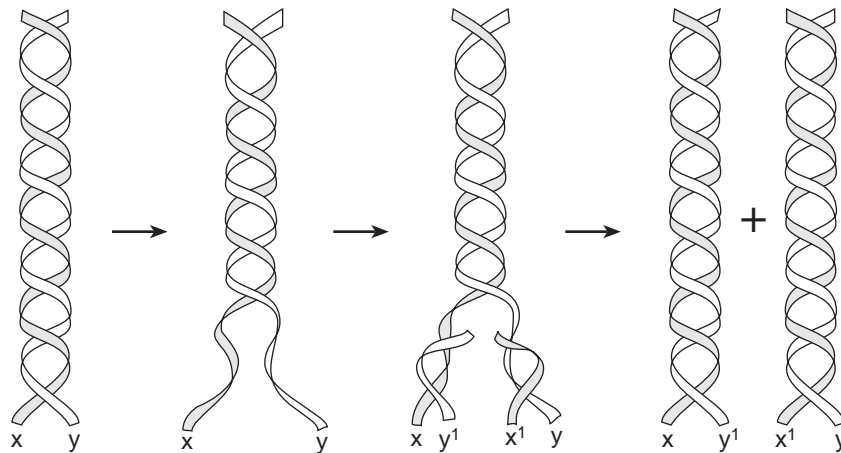
Value: 50 marks

Suggested Time: 75 minutes

- INSTRUCTIONS:**
1. Use a **pen** for this part of the examination unless otherwise instructed.
 2. Write your answers in the space below the questions.
 3. Organization and planning space has been incorporated into the space allowed for answering each question.
 4. You may not need all of the space provided to answer each question.

1. a) Name and describe the process shown below.

(4 marks: 1 mark for name; 3 marks for description)



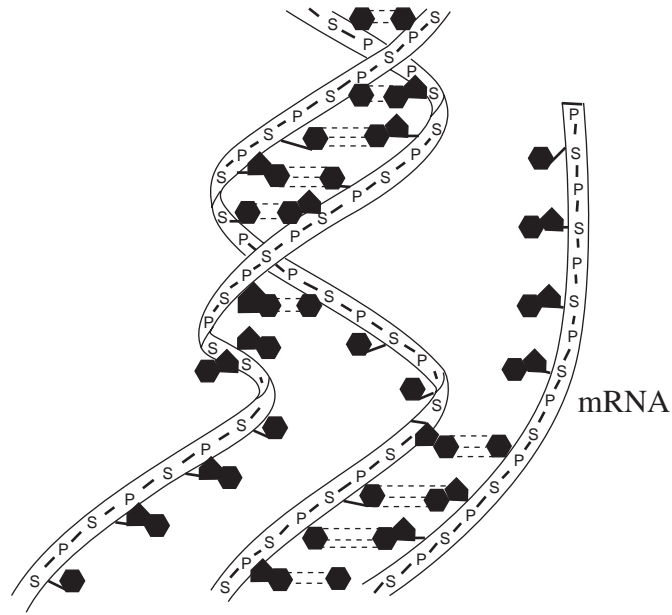
Name: _____

Description: _____

b) How could a virus affect the molecule shown in the diagram above?

(1 mark)

Use the following diagram to answer question 2.



2. Name the process shown above and explain how the molecule that is produced is used to determine the sequence of amino acids in a protein.

(4 marks: 1 mark for name; 3 marks for explanation)

Name: _____

Explanation: _____

3. List **four** factors that would affect the rate of diffusion of molecules crossing a cell membrane. **(4 marks)**

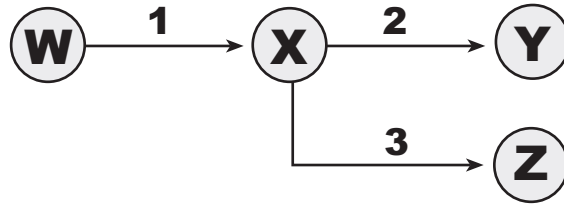
i) _____

ii) _____

iii) _____

iv) _____

4. An experiment investigating enzyme activity is carried out. A test tube is prepared containing substrate solution **W** and enzyme solutions **1**, **2** and **3**. The reactions that occur in the test tube are summarized below.



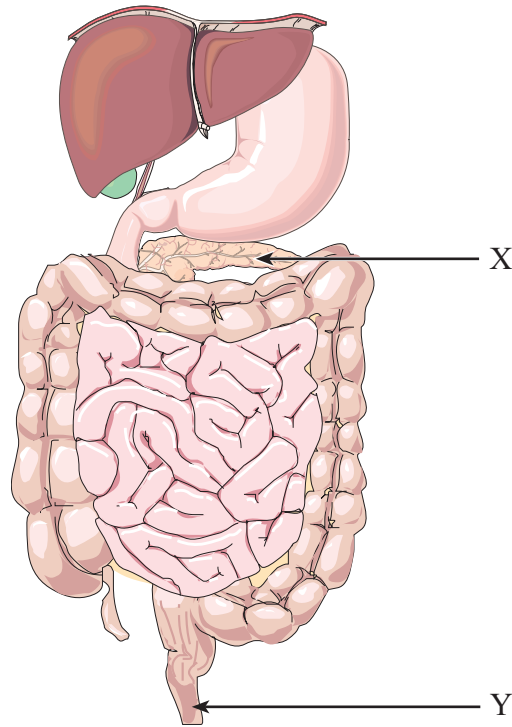
- a) Describe **two** ways in which the rate of production of product **Y** can be increased. (2 marks)

i) _____

ii) _____

- b) A substance is added to the test tube. As a result, no product **Y** is formed, but product **Z** is still formed. Explain why. (3 marks)

Use the following diagram to answer question 5.



5. a) Describe **three** different ways that **X** aids in digestion. **(3 marks)**

i) _____

ii) _____

iii) _____

b) What is the role of **Y** in the digestive system? **(1 mark)**

6. Describe the mechanisms involved in the digestion and absorption of fat.

(4 marks)

7. a) Mountaineers attempting to scale Mt. Everest encounter an environment that contains one-third the oxygen present at sea level. Describe how each of the following will change during the climb and how the change will compensate for the lower than normal oxygen levels.

rate of cell division in the bone marrow: **(2 marks)**

breathing rate: **(2 marks)**

- b) During the climb, the blood pH decreases. Explain how the body compensates for this change. **(2 marks)**

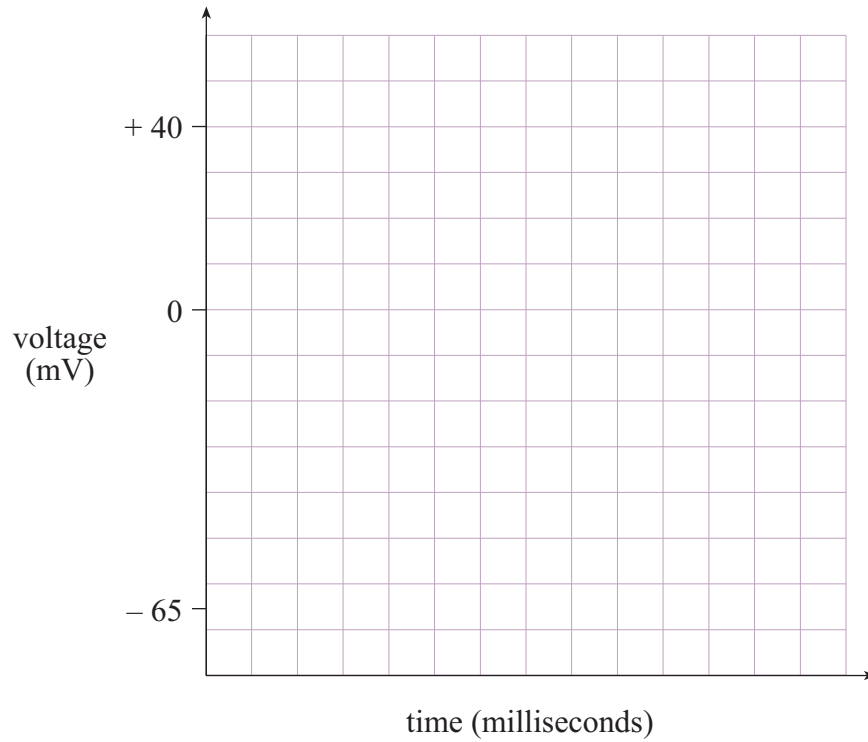
8. Complete the following chart that describes the composition of blood.

(6 marks: 1 mark each)

PART OF THE BLOOD	COMPONENT NAME	SOURCE	FUNCTION
plasma	water		maintaining blood volume
plasma		liver	<ul style="list-style-type: none"> • maintaining blood volume, pressure and pH • clotting
formed elements	platelets	bone marrow	
formed elements			fighting infection
plasma	glucose	absorbed by intestinal villi	

9. a) On the following grid, draw a curve to represent an action potential.

(2 marks)



b) Label the “depolarization” and the “recovery period” of your graph.

(1 mark: $\frac{1}{2}$ mark each)

c) Describe what happens to the axon during repolarization.

(3 marks)

d) Describe what happens to the axon during the recovery period.

(1 mark)

OVER

10. State **one** function of each of the following.

(5 marks: 1 mark each)

ureter: _____

collecting duct: _____

antidiuretic hormone (ADH): _____

renal pelvis: _____

glomerulus: _____

END OF EXAMINATION