

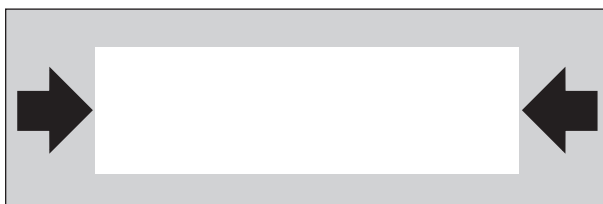
MINISTRY USE ONLY



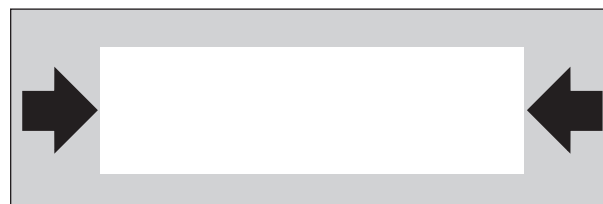
MINISTRY USE ONLY



Place Personal Education Number (PEN) here.



Place Personal Education Number (PEN) here.



BRITISH
COLUMBIA

© 2002 Ministry of Education

MINISTRY USE ONLY



Biology 12

NOVEMBER 2002

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. .

(6)

Question 9:

9. .

(6)

Question 2:

2. .

(3)

Question 10:

10. .

(3)

Question 3:

3. .

(4)

Question 11:

11. .

(4)

Question 4:

4. .

(4)

Question 5:

5. .

(9)

Question 6:

6. .

(5)

Question 7:

7. .

(3)

Question 8:

8. .

(3)

BIOLOGY 12

NOVEMBER 2002

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: 11 written-response questions	50	75
	Total:	
	100 marks	120 minutes

THIS PAGE INTENTIONALLY BLANK

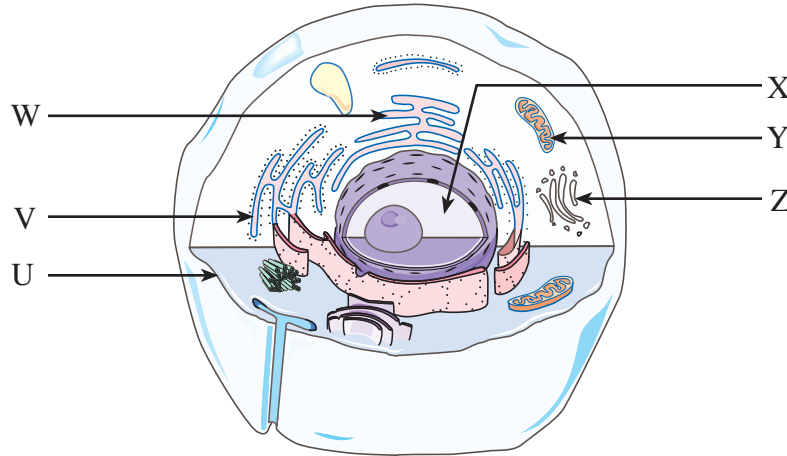
PART A: MULTIPLE CHOICE

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 questions 1, 2 and 3.



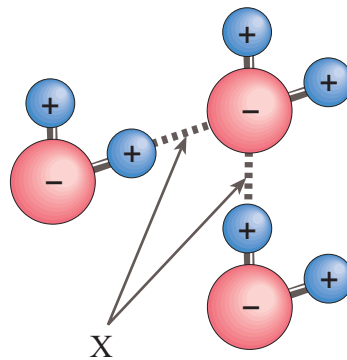
1. What occurs at the site of the structure labelled V?
 - A. translation
 - B. ATP formation
 - C. rRNA synthesis
 - D. DNA replication
2. Drugs are detoxified at which structure?
 - A. W
 - B. X
 - C. Y
 - D. Z
3. Which of the following is the correct sequence of organelles required in the production and export of amylase?
 - A. V → W → X
 - B. V → X → Z
 - C. V → Z → U
 - D. W → V → U

Use the following diagram to answer question 4.



4. The organelle above is abundant in cells involved in
- A. active transport.
 - B. diffusion of oxygen.
 - C. transport of hemoglobin.
 - D. transport of lipid-soluble molecules.

Use the following diagram to answer question 5.

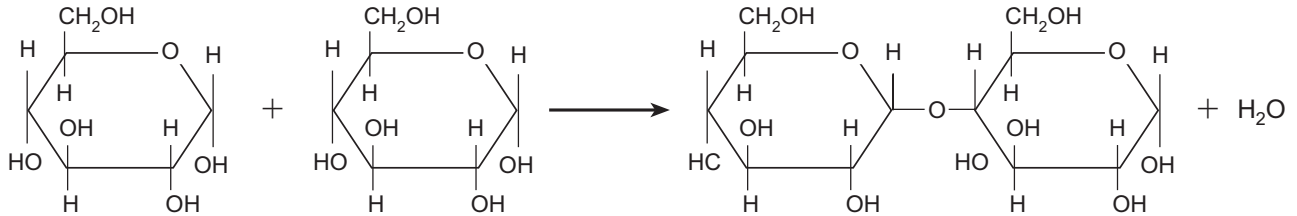


5. The bonding indicated by **X** occurs because
- A. the molecules are polar.
 - B. each molecule has a similar pH.
 - C. the molecules have similar charges.
 - D. the structures are unit molecules of a polymer.

6. Which of the following has the greatest concentration of hydrogen ions?

- A. salt
- B. acid
- C. base
- D. water

Use the following diagram to answer question 7.



7. The diagram illustrates a reaction that would take place during the

- A. digestion of starch.
- B. formation of glycogen.
- C. hydrolysis of a protein.
- D. synthesis of a saturated fat.

8. Which of the following molecules makes up plant cell walls and cannot be digested by human enzymes?

- A. starch
- B. maltose
- C. cellulose
- D. glycogen

Use the following information to answer question 9.

1.	complementary nitrogenous bases join by hydrogen bonding
2.	the sugar of one nucleotide joins to the phosphate of the adjacent nucleotide
3.	hydrogen bonds break to expose both strands of DNA
4.	two identical molecules of DNA are formed

9. Which of the following is the correct sequence to describe DNA replication?

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

10. Which of the following is a characteristic of cancerous tissue?

- A. controlled growth
- B. increased vascularization
- C. increased contact inhibition
- D. specialization of structure and function

11. Which of the following is **not** one of the seven known danger signals associated with the presence of cancer?

- A. a persistent headache
- B. a sore that does not heal
- C. unusual bleeding or discharge
- D. an obvious change in a wart or mole

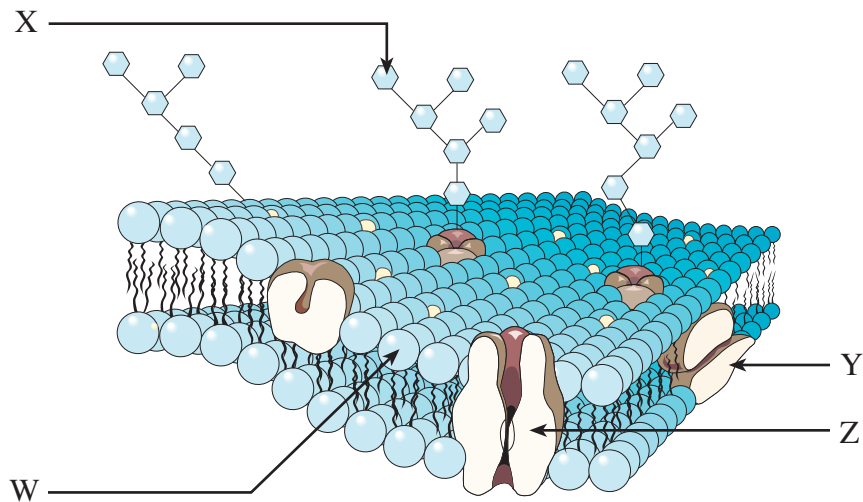
Use the following list to answer question 12.

- viruses
- antibodies
- tobacco smoke
- ultraviolet radiation

12. How many of the factors above may act as initiators?

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

Use the following diagram to answer question 13.



13. The fluid nature of the cell membrane is dependent on which labelled molecule?

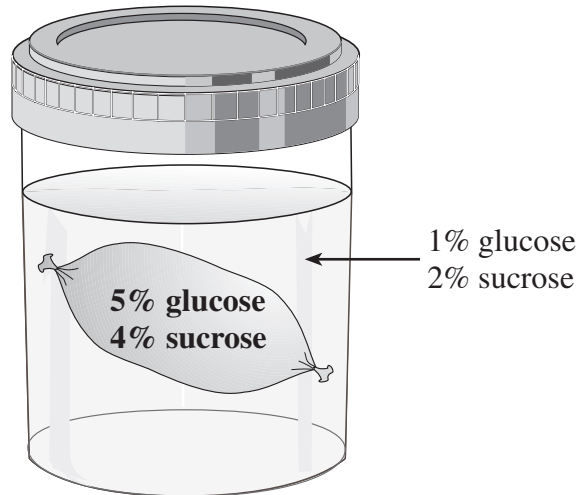
- A. W
- B. X
- C. Y
- D. Z

14. Which type of molecules move sodium ions through the cell membrane?

- A. proteins
- B. cholesterol
- C. phospholipids
- D. carbohydrates

OVER

Use the following diagram to answer questions 15, 16 and 17.



15. The bag in the beaker above is only permeable to water. What will happen to the concentration of glucose and sucrose in the solution in the beaker after 24 hours?

	Glucose	Sucrose
A.	decrease	increase
B.	increase	increase
C.	increase	decrease
D.	decrease	decrease

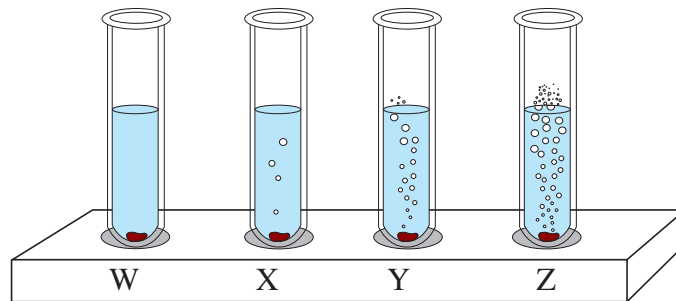
16. Which of the following processes occurs during the 24 hours?

- A. osmosis
- B. pinocytosis
- C. active transport
- D. facilitated transport

17. Initially, the solution **in the bag** will be

- A. hypertonic to the solution in the beaker, and becomes isotonic after 24 hours.
- B. hypertonic to the solution in the beaker, and becomes hypotonic after 24 hours.
- C. hypotonic to the solution in the beaker, and becomes isotonic after 24 hours.
- D. hypotonic to the solution in the beaker, and becomes hypertonic after 24 hours.

18. What conditions would decrease the ability of lipase to form an enzyme-substrate complex?
- a pH of 8.5
 - the addition of lipids
 - the addition of lead ions
 - an increase in the amount of bile available
19. An experiment was set up to measure the effect of temperature on catalase, an enzyme found in the liver that breaks down hydrogen peroxide into water and oxygen gas. Four labelled test tubes, each containing similar amounts of catalase and 2 mL of hydrogen peroxide, were incubated at different temperatures.

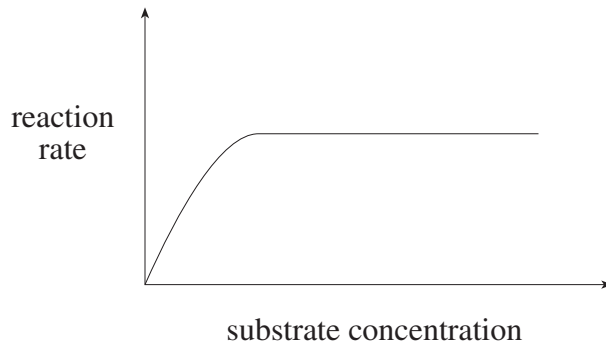


Which of the following matches the test tube with its correct temperature?

	W	X	Y	Z
A.	70°C	37°C	20°C	5°C
B.	5°C	20°C	37°C	70°C
C.	70°C	5°C	20°C	37°C
D.	5°C	70°C	37°C	20°C

Use the following graph to answer question 20.

**Reaction rate versus
substrate concentration
in an enzyme-catalyzed reaction**



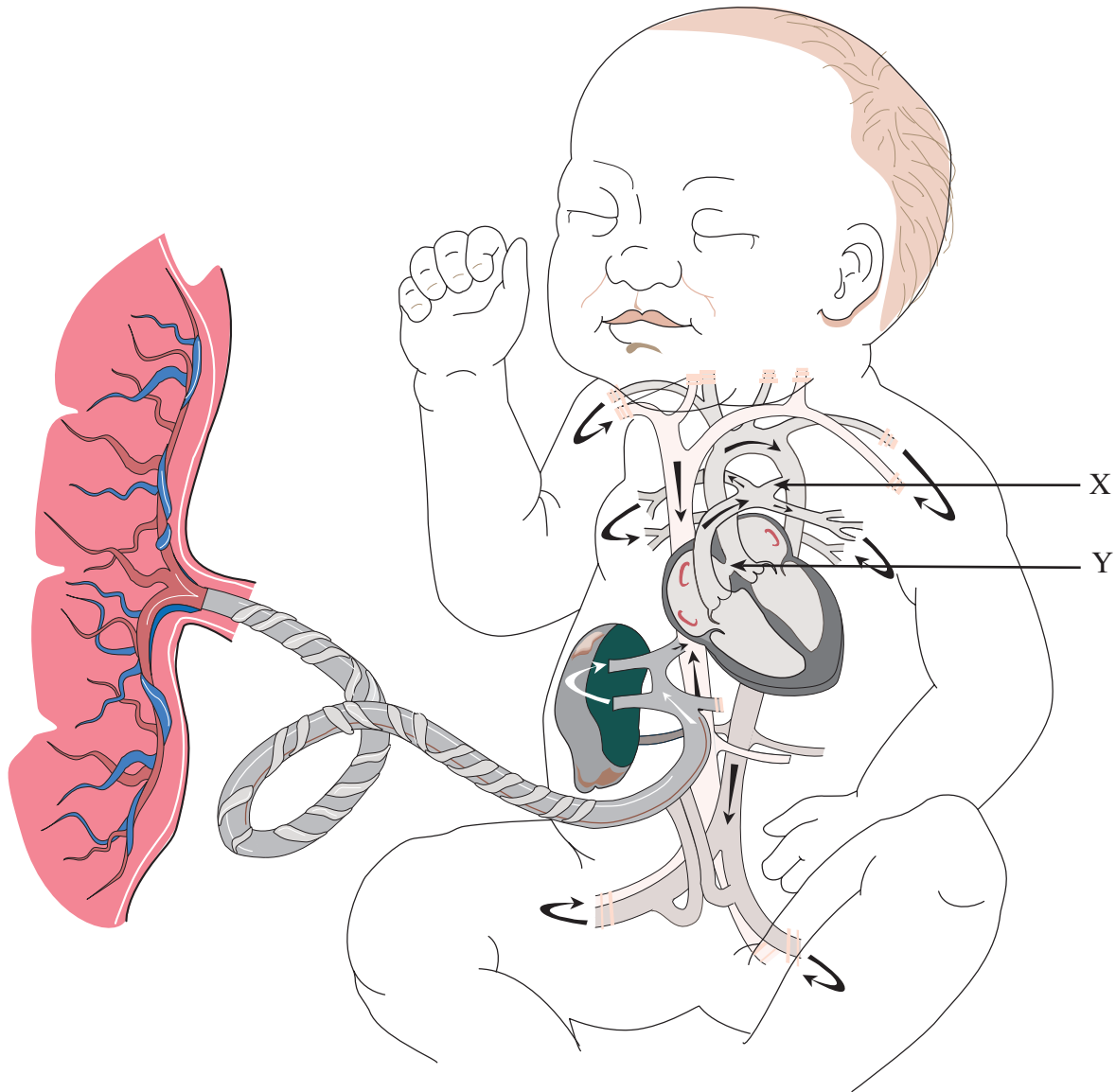
20. In the graph above, the curve levels off due to the

- A. addition of a strong acid.
 - B. addition of a competitive inhibitor.
 - C. conversion of all of the substrate into product.
 - D. substrate temporarily occupying all the active sites.
-

21. A disease of which structure could cause a high concentration of glucose in the urine?

- A. pancreas
- B. gall bladder
- C. lymph nodes
- D. thyroid gland

Use the following diagram to answer questions 22 and 23.



22. What is the structure labelled **X**?
- A. arterial duct
 - B. venous duct
 - C. oval opening
 - D. umbilical artery
23. Which of the following would result if structure **Y** remains functional after birth?
- A. higher than normal levels of oxyhemoglobin in the aorta
 - B. higher than normal levels of bicarbonate ions in the aorta
 - C. lower than normal levels of reduced hemoglobin in the aorta
 - D. lower than normal levels of carbaminohemoglobin in the aorta

24. Which of the following correctly describes the structure and function of a red blood cell?

	Structure	Function
A.	cell fragment	initiates clotting
B.	has a nucleus	fights infection
C.	biconcave	produces antibodies
D.	no nucleus	transports hydrogen ions

25. What occurs at the venous end of a capillary bed?

- A. Urea and ammonia exit into the tissues.
- B. Carbon dioxide and glucose enter the bloodstream.
- C. Blood pressure forces water to exit into the tissues.
- D. Osmotic pressure causes water to move into the blood.

26. When the left ventricle contracts, blood moves through

- A. a semilunar valve into the aorta.
- B. a semilunar valve into the left atrium.
- C. an AV valve into the pulmonary artery.
- D. the arterial opening into the right ventricle.

27. Which part of the heart controls the rhythmic beat of the atria?

- A. Purkinje fibres
- B. semilunar valve
- C. SA (sinoatrial) node
- D. AV (atrioventricular) node

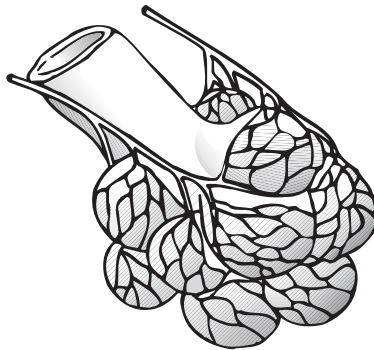
28. During inspiration, which structure receives air after the bronchiole?

- A. larynx
- B. trachea
- C. alveolus
- D. bronchus

29. Rings of cartilage strengthen which of the following structures?

- A. trachea
- B. alveolus
- C. diaphragm
- D. thoracic cavity

Use the following diagram to answer question 30.



30. Which of the following pairs of reactions occurs most frequently in the blood surrounding the structure shown?

- A. $\text{Hb} + \text{O}_2 \rightarrow \text{HbO}_2$ **and** $\text{HHb} \rightarrow \text{Hb} + \text{H}^+$
 - B. $\text{HbO}_2 \rightarrow \text{Hb} + \text{O}_2$ **and** $\text{Hb} + \text{H}^+ \rightarrow \text{HHb}$
 - C. $\text{H}^+ + \text{Hb} \rightarrow \text{HHb}$ **and** $\text{H}_2\text{CO}_3 \rightarrow \text{HCO}_3^- + \text{H}^+$
 - D. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$ **and** $\text{H}_2\text{CO}_3 \rightarrow \text{HCO}_3^- + \text{H}^+$
-

31. Within the respiratory system, debris is trapped by mucus in the

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

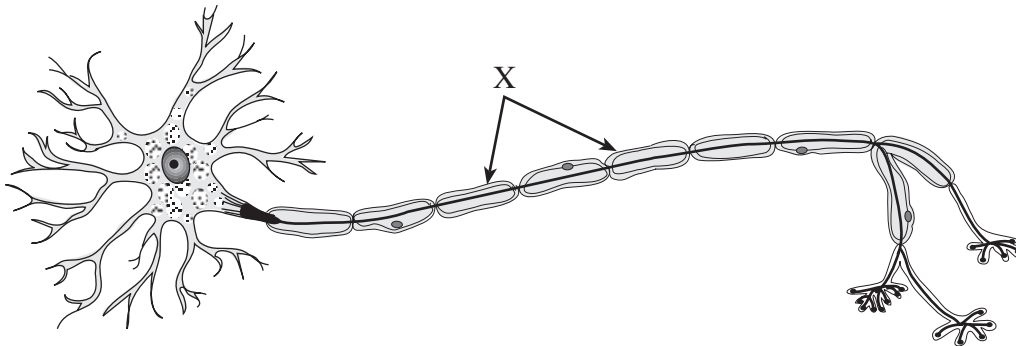
Use the following information to answer question 32.

1.	medulla oblongata responds to increased CO ₂ concentration
2.	air rushes into the lungs
3.	chest cavity volume increases
4.	diaphragm relaxes

32. Which of the following is a correct sequence of events in breathing?

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

Use the following diagram to answer questions 33 and 34.



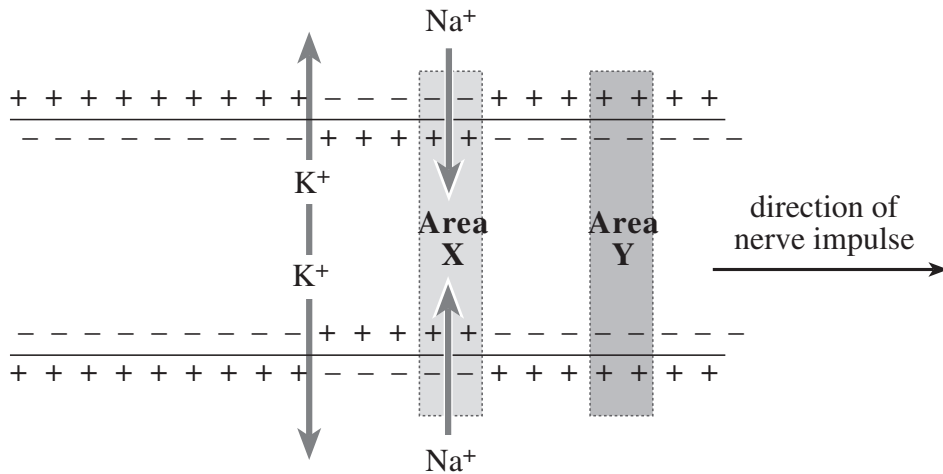
33. Which of the following is a function of structure X?

- A. to produce neurotransmitters
- B. to speed conduction of the nerve impulse
- C. to provide energy for nerve impulse conduction
- D. to receive stimulation for production of the nerve impulse

34. What type of cell is shown above?

- A. a dendrite
- B. an interneuron
- C. a motor neuron
- D. a sensory neuron

Use the following diagram to answer question 35.



35. What would occur in **Area X** when the event shown there later occurs in **Area Y**?

- A. depolarization
- B. K^+ would enter the axon
- C. generation of a new impulse
- D. the membrane potential would approach -65 mV

36. Which of the following inhibits the contraction of muscles which move food through the digestive system?

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

OVER

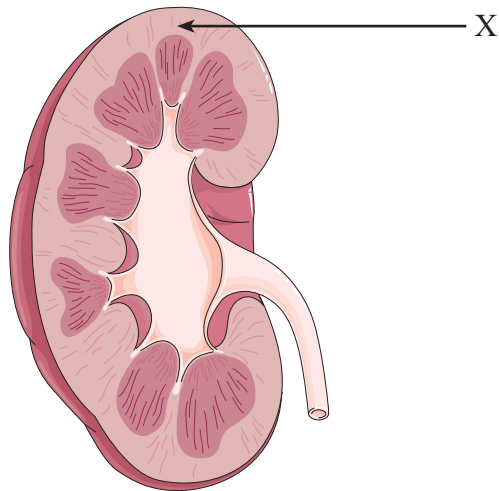
Use the following list of hormones to answer question 37.

- thyroxin
- estrogen
- oxytocin
- aldosterone
- antidiuretic hormone
- follicle-stimulating hormone

37. How many of the hormones above are released by the pituitary gland?

- A. 2
- B. 3
- C. 4
- D. 5

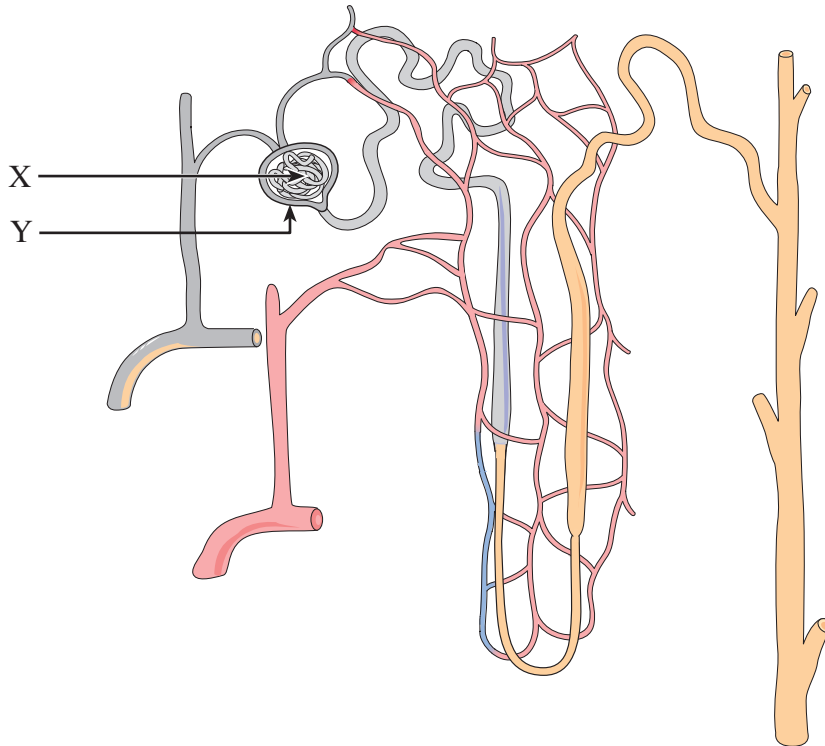
Use the following diagram to answer question 38.



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

- A. renal pelvis.
- B. renal cortex.
- C. renal medulla.
- D. urinary bladder.

Use the following diagram to answer question 39.



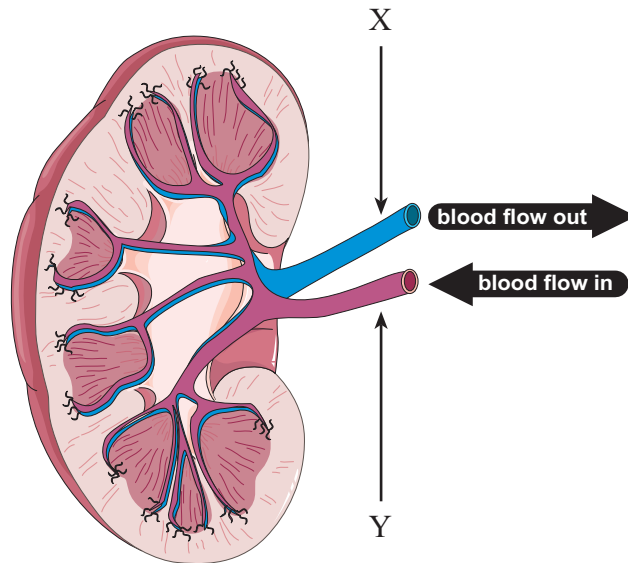
39. Which of the following occurs between **X** and **Y**?

- A. tubular excretion
- B. pressure filtration
- C. selective reabsorption
- D. counter-current exchange

40. Tubular excretion occurs when molecules move from the

- A. loop of Henle to the renal medulla.
- B. Bowman's capsule into the glomerulus.
- C. proximal tubule into the peritubular capillary network.
- D. peritubular capillary network into the distal convoluted tubule.

Use the following diagram to answer question 41.



41. Compared to structure **Y**, structure **X** contains

- A. a higher concentration of urea.
 - B. a higher concentration of glucose.
 - C. a lower concentration of uric acid.
 - D. a lower concentration of carbaminohemoglobin.
-

42. In which structure is activity increased by raised concentrations of urea and salts in the blood?

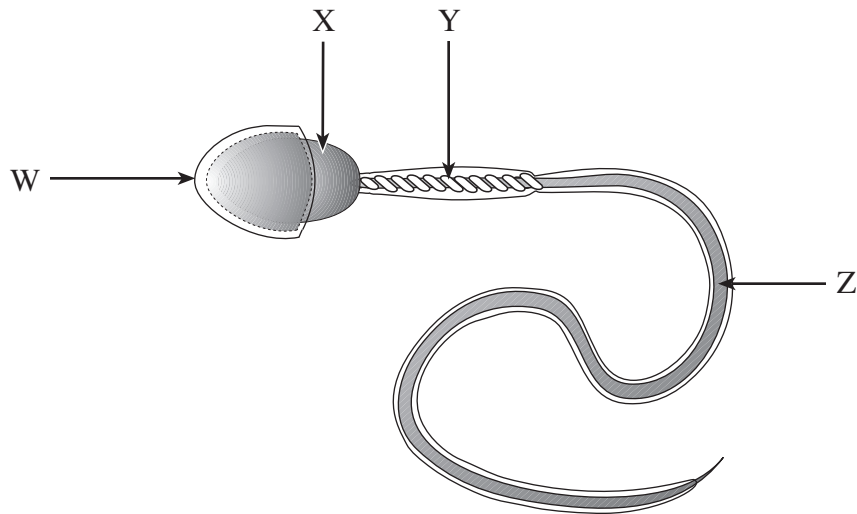
- A. pancreas
- B. adrenal cortex
- C. anterior pituitary
- D. posterior pituitary

43. Aldosterone causes sodium to be reabsorbed by which part of the nephron?

- A. loop of Henle
- B. collecting duct
- C. proximal tubule
- D. distal convoluted tubule.

44. All of the following have a similar function **except** for the
- A. prostate gland.
 - B. Cowper's gland.
 - C. seminal vesicles.
 - D. seminiferous tubules.
45. Which of the following is the correct order of structures through which sperm pass as they leave the body?
- A. epididymis → urethra → vas deferens → seminiferous tubules
 - B. epididymis → urethra → seminiferous tubules → vas deferens
 - C. seminiferous tubules → urethra → vas deferens → epididymis
 - D. seminiferous tubules → epididymis → vas deferens → urethra

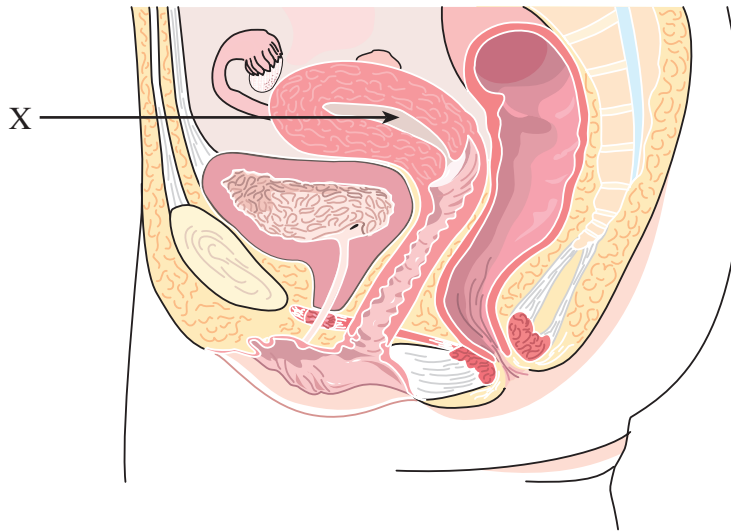
Use the following diagram to answer question 46.



46. Which of the following provides energy to propel the sperm?
- A. W
 - B. X
 - C. Y
 - D. Z

47. Higher levels of a hormone released from which of the following structures results in an increase in muscle mass at puberty?
- A. thyroid
 - B. interstitial cells
 - C. adrenal medulla
 - D. seminiferous tubules
48. Testosterone secretion is controlled through negative feedback due to increased amounts of which hormone?
- A. oxytocin
 - B. testosterone
 - C. progesterone
 - D. follicle-stimulating hormone (FSH)

Use the following diagram to answer question 49.



49. What is the function of the structure labelled X?
- A. It stores urine.
 - B. It matures ova before ovulation.
 - C. It receives the penis during copulation.
 - D. It is the site of embryonic development.

50. During birth, the concentration of a particular hormone in the mother's blood was measured at various times. Which of the following describes the feedback mechanism and the hormone involved?

	Type of Feedback	Hormone
A.	positive	oxytocin
B.	negative	oxytocin
C.	positive	progesterone
D.	negative	progesterone

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

OVER

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. Give **two** functions of each of the following.

water: **(2 marks)**

i) _____

ii) _____

lipids: **(2 marks)**

i) _____

ii) _____

lysosome: **(2 marks)**

i) _____

ii) _____

2. Complete the table below by giving **three** differences between DNA and RNA.
(3 marks: 1 mark for each contrasting pair)

DNA	RNA

3. Describe the structure and function of each of the following molecules.
(4 marks: 1 mark each for structure; 1 mark each for function)

mRNA:

structure: _____

function: _____

tRNA:

structure: _____

function: _____

4. Explain how enzymes catalyze reactions in cells.

(4 marks)

5. a) Describe how carbohydrates are digested and absorbed in the human digestive system. **(6 marks)**

b) Describe the role of the pancreas and the liver in maintaining blood sugar levels. **(3 marks)**

6. In an effort to improve fitness level, an adult participates in a tennis program for five months. The following data were collected over this time period.

	April	August
resting pulse rate (beats/min)	75	65
pulse rate during exercise (beats/min)	140	110
time for pulse to return to resting rate after exercising (min)	13	2
resting blood pressure (mm Hg)	125/89	120/80
resting breathing rate (breaths/min)	17	15
breathing rate during exercise (breaths/min)	35	25

- a) In August the person's resting blood pressure is 120/80. Explain how the numbers 120 and 80 relate to heart function. **(2 marks)**

- b) Explain why the pulse rate during exercise went down between April and August. **(1 mark)**

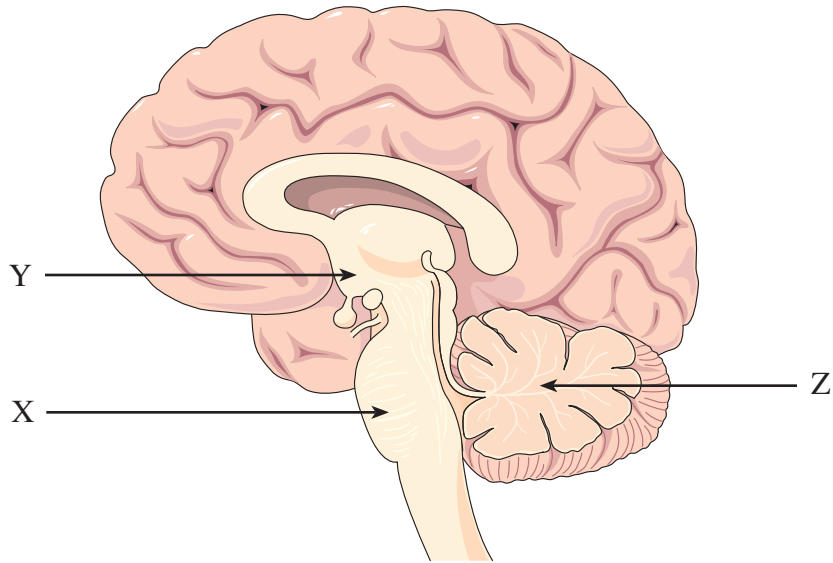
- c) Explain the change in breathing rate from resting to exercise. **(2 marks)**

7. Explain how the lymphatic and circulatory systems respond to a viral infection. **(3 marks)**

8. Using the following table, distinguish between the chemical composition of the blood in the arterial end and the venous end of a capillary bed in a muscle. **(3 marks)**

Arterial End	Venous End

Use the following diagram to answer question 9.



9. Identify structures **X**, **Y** and **Z** and give **one** function of each.
(6 marks: 1 mark each for name; 1 mark each for function)

structure **X**:

name: _____

function: _____

structure **Y**:

name: _____

function: _____

structure **Z**:

name: _____

function: _____

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

(3 marks: 1 mark each)

renal pelvis:

proximal convoluted tubule:

ureter:

11. a) Complete the table for a typical 28-day ovarian cycle.

(2 marks)

Days	Pituitary Hormone Responsible for Changes in the Ovary
1-12	
15-28	

b) Describe the hormonal changes that occur as a result of implantation.

(2 marks)

END OF EXAMINATION