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BRITISH COLUMBIA

Biology 12

NOVEMBER 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. ☐ . ☐

(3)

Question 9:

9. ☐ . ☐

(6)

Question 2:

2. ☐ . ☐

(4)

Question 3:

3. ☐ . ☐

(4)

Question 4:

4. ☐ . ☐

(6)

Question 5:

5. ☐ . ☐

(5)

Question 6:

6. ☐ . ☐

(8)

Question 7:

7. ☐ . ☐

(8)

Question 8:

8. ☐ . ☐

(6)

BIOLOGY 12

NOVEMBER 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: 9 written-response questions	50	75
	Total:	**100 marks**	**120 minutes**

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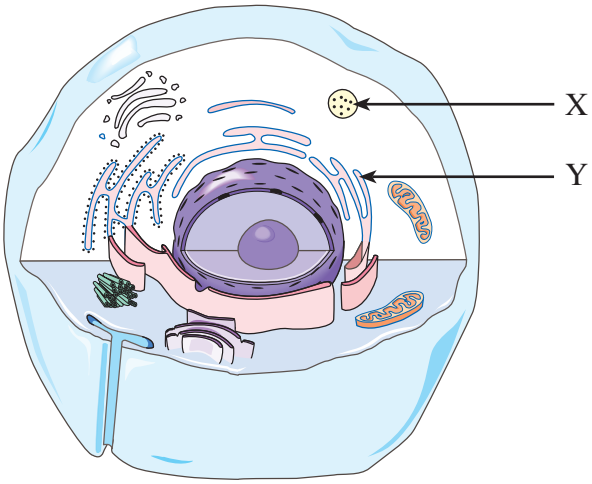
PART A: MULTIPLE CHOICE

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 questions 1 and 2.



1. Structure **X** contains enzymes and is a

   A. ribosome.
   B. lysosome.
   C. chromosome.
   D. mitochondrion.

2. The structure labelled **Y** is the site of

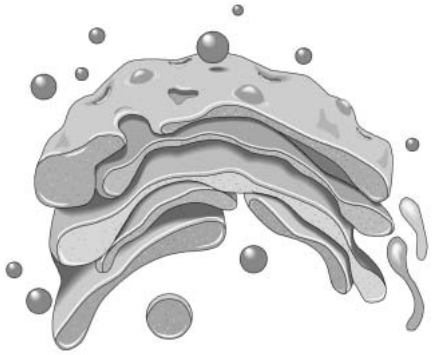
   A. lipid synthesis.
   B. protein synthesis.
   C. packaging and modification of proteins.
   D. chemical reactions that release energy from glucose.

OVER

3. The products of ribosomes are long chains composed of

   A. glucose.
   B. fatty acids.
   C. nucleotides.
   D. amino acids.

Use the following diagram to answer question 4.



4. Which of the following is packaged and stored by the structure above?

   A. water
   B. enzymes
   C. carbon dioxide
   D. messenger RNA

---

5. A water molecule is capable of forming hydrogen bonds because

   A. the oxygen atom gives up an electron to a hydrogen atom.
   B. the electrons are shared at an equal distance between the hydrogen atoms and the oxygen atom.
   C. both the hydrogen atoms and the oxygen atom have the same number of protons.
   D. there is an unequal sharing of electrons between the oxygen atom and the hydrogen atoms.

6. Which of the following is **not** a function of water in living systems?

   A. to act as a solvent
   B. to lubricate the joints
   C. to buffer changes in pH
   D. to regulate body temperature

7. Which of the following food molecules is classified as a disaccharide?

   A. $C_6H_{12}O_6$

   B. $C_{12}H_{22}O_{11}$

   C. $C_{18}H_{32}O_{16}$

   D. $C_{120}H_{300}O_{120}$

8. Which of the following is an example of hydrolysis?

   A. production of mRNA from DNA
   B. conversion of glucose to glycogen
   C. absorption of fatty acids and glycerol
   D. formation of amino acids from proteins

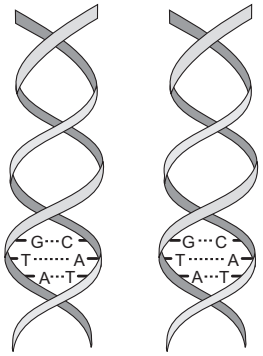
9. Which of the following is the energy source produced in mitochondria?

   A. ATP
   B. glucose
   C. enzymes
   D. acetylcholine

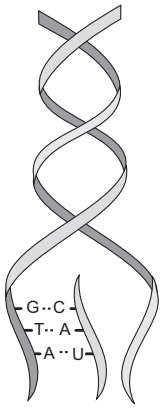
OVER

10. Which of the following represents complementary base pairing in DNA replication?

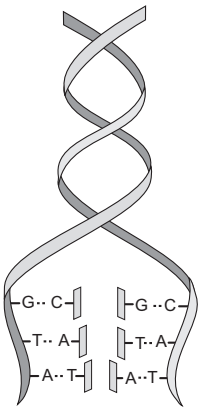
A.



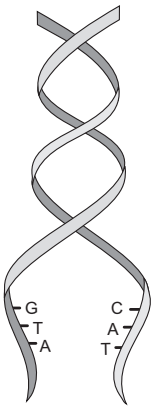
B.



C.



D.



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11. Which of the following base pairs would form between mRNA and tRNA during protein synthesis?

A. adenine—uracil
B. uracil—guanine
C. thymine—adenine
D. cytosine—thymine

Use the following chart of mRNA codons to answer question 12.

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 AGA, AGG — Arginine	CGU, CGC, CGA, CGG — Arginine	GGU, GGC, GGA, GGG — Glycine	UGU, UGC — Cysteine UGA — Stop UGG — Tryptophan
AUU, AUC, AUA — Isoleucine AUG — Methionine	CUU, CUC, CUA, CUG — Leucine	GUU, GUC, GUA, GUG — Valine	UUU, UUC — Phenylalanine UUA, UUG — Leucine

12. Which DNA code represents the polypeptide chain:

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

---

13. Disorganized and uncontrolled growth of cells is called

A. anaplasia.
B. metastasis.
C. vascularization.
D. loss of contact inhibition.

OVER

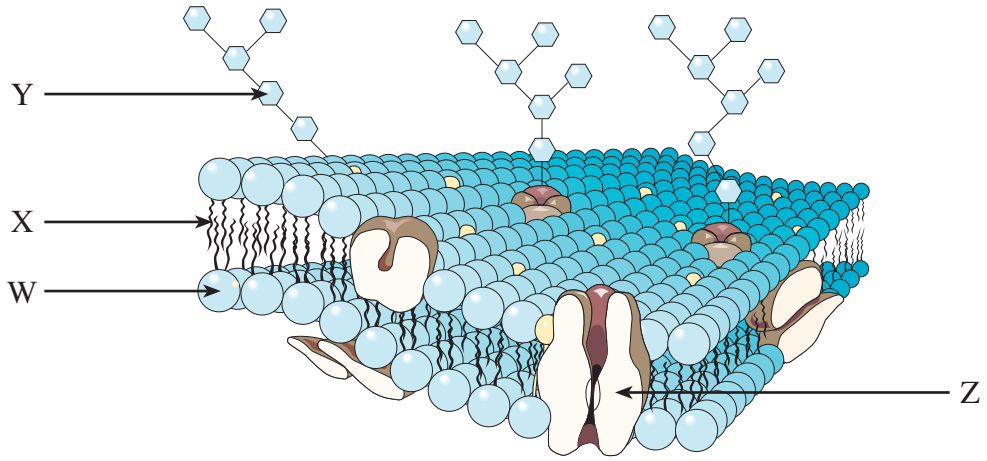
14. A malignant tumour is characterized by cells that

A. are differentiated.
B. divide a maximum of 50 times.
C. have a large nucleus when compared to the amount of cytoplasm.
D. stop growing once they come into contact with neighbouring cells.

15. Which of the following could change the order of bases in a DNA molecule causing a proto-oncogene to be converted into an oncogene?

A. ATP
B. viruses
C. mRNA
D. competitive inhibitors

Use the following diagram to answer question 16.



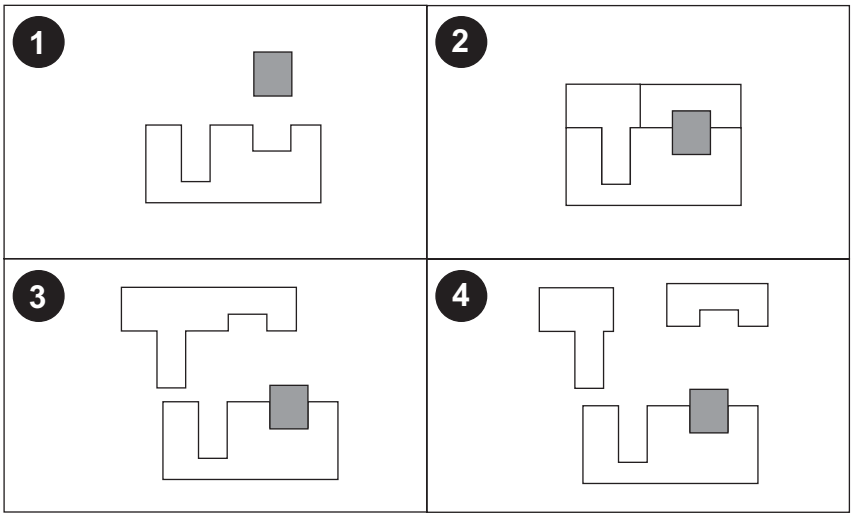
16. Which of the following represents the part of a cell membrane that requires the breakdown of ATP for the transport of sodium ions?

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

17. If a 0.9% salt solution is isotonic to a certain type of animal cell, the cell will lose mass if it is placed in

A. distilled (pure) water.
B. 0.5% salt solution.
C. 0.9% salt solution.
D. 1.2% salt solution.

Use the following diagrams to answer question 18.



18. To represent the "lock and key" model of enzymatic action, in which order would the diagrams above have to be placed?

A. $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$
B. $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$
C. $2 \rightarrow 3 \rightarrow 4 \rightarrow 1$
D. $2 \rightarrow 4 \rightarrow 3 \rightarrow 1$

---

19. A person's ability to breathe and swallow is impaired when the tonsils are swollen. What region is affected?

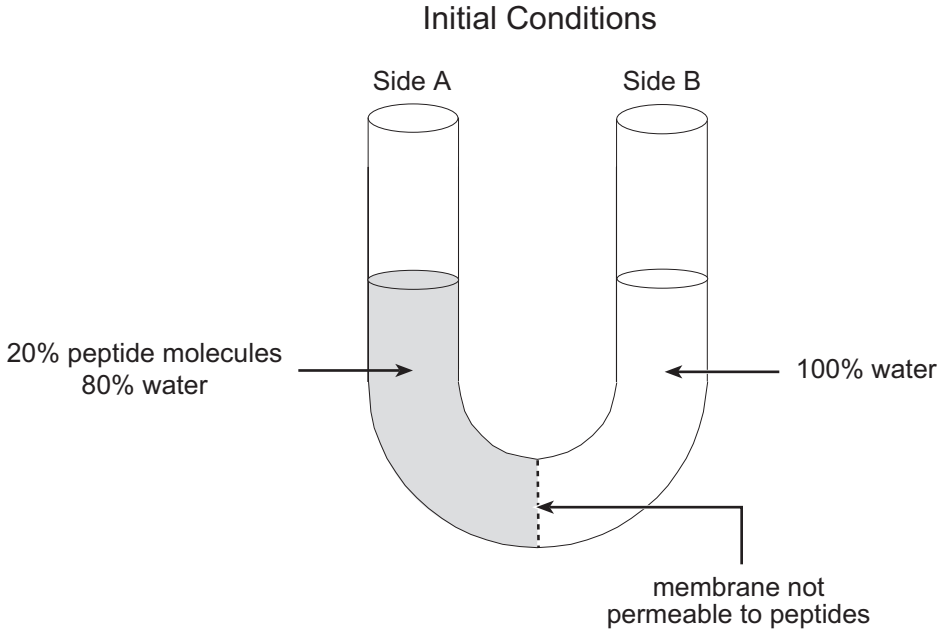
A. larynx
B. trachea
C. pharynx
D. esophagus

OVER

20. The amount of chyme (stomach contents) which enters the small intestine is controlled by

A. the release of gastric juice.
B. peristalsis in the esophagus.
C. secretions from the pancreas.
D. constrictions of the pyloric sphincter.

Use the following diagram to answer question 21.



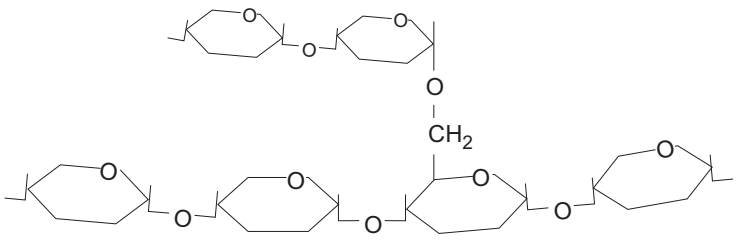
21. If peptidase were added to side **A**, what would occur?

A. Amino acids would be found on side **A** only.
B. Amino acids would be found on side **B** only.
C. Amino acids would be found on both sides **A** and **B**.
D. No amino acids would be found on either side **A** or side **B**.

22. Which of the following digestive enzymes is correctly matched with its optimum pH?

	Digestive Enzyme	Optimum pH
A.	trypsin	3
B.	lipase	3
C.	amylase	8
D.	pepsin	8

Use the following diagram to answer question 23.

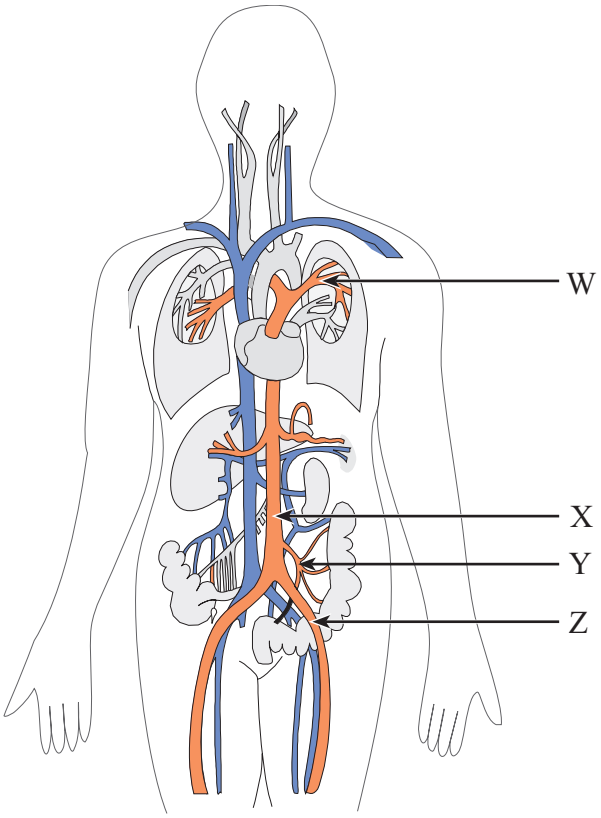


23. The production of the molecule above increases in the body when a hormone is released from the

A. liver.
B. pancreas.
C. thyroid gland.
D. adrenal glands.

OVER

Use the following diagram to answer question 24.



24. Which of the following indicates an iliac artery?

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

---

25. Which of the following correctly describes the level of oxygen in the blood of each chamber of the heart?

	Right Atrium	Left Atrium	Right Ventricle	Left Ventricle
A.	low	low	low	low
B.	low	low	high	high
C.	low	high	low	high
D.	high	low	high	low

26. The fetal blood vessel that joins the aorta and the pulmonary artery and normally closes at birth is the

A. arterial duct.
B. venous duct.
C. oval opening.
D. umbilical artery.

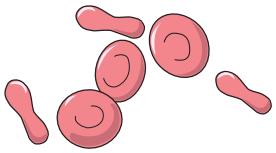
Use the following information to answer question 27.

Blood Vessel	Pressure mm Hg	Velocity cm/sec.
W	80	50
X	less than 5	35
Y	60	20
Z	20	2

27. What is the correct sequence of blood vessels that a red blood cell passes through while travelling from the left ventricle to the right atrium?

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

Use the following diagram to answer question 28.



28. The function of the blood cells shown is to

A. carry oxygen.
B. fight infection.
C. produce lymphocytes.
D. initiate blood clotting.

OVER

29. Blood plasma leaves and re-enters the circulatory system by

A. active transport.
B. pressure filtration.
C. selective reabsorption.
D. capillary-tissue fluid exchange.

30. Contraction of the right atrium forces blood through

A. a semi-lunar valve into the aorta.
B. an AV valve into the right ventricle.
C. an AV valve into the pulmonary artery.
D. a semi-lunar valve into the posterior vena cava.

31. The normal 120/80 blood pressure reading is a measurement of

A. atrial systole and ventricular systole.
B. ventricular diastole and atrial systole.
C. atrial diastole and ventricular diastole.
D. ventricular systole and ventricular diastole.

32. Initiation of the cardiac cycle is dependent on the

A. sinoatrial (SA) node.
B. sympathetic nervous system.
C. parasympathetic nervous system.
D. nerve impulses from the cerebrum.

33. The movement of mucus up the trachea is caused by

A. beating of cilia.
B. waves of peristalsis.
C. contraction of the diaphragm.
D. constriction of smooth muscle.

34. The increased surface area for gas exchange in the lungs is due to the

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

35. The level of carbon dioxide in the blood is monitored by the

A. cerebrum.
B. cerebellum.
C. hypothalamus.
D. medulla oblongata.

36. Which of the following correctly compares the concentration of CO_2 in exhaled air to the concentration of CO_2 in the pulmonary artery?

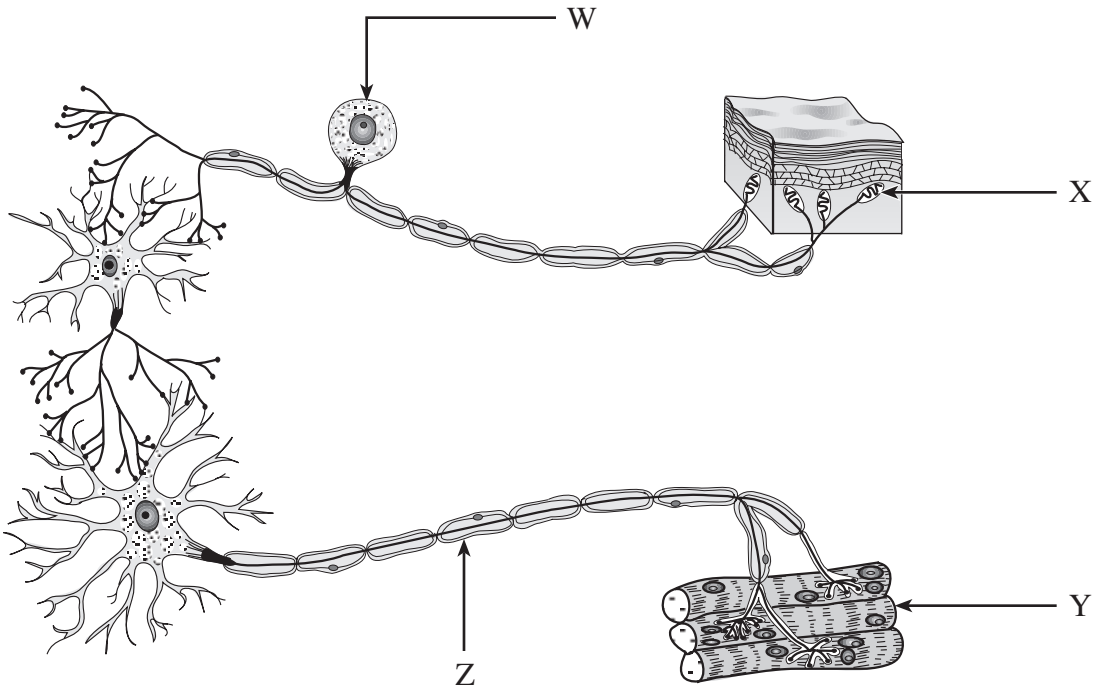
	$[CO_2]$ in Exhaled Air	$[CO_2]$ in the Pulmonary Artery
A.	low	low
B.	high	high
C.	low	high
D.	high	low

37. A semiconscious patient has lower than normal blood pH. The high concentration of which component of blood is used to indicate this condition?

A. albumin
B. hydrogen ions
C. potassium ions
D. oxyhemoglobin

OVER

Use the following diagram to answer question 38.



38. Which of the following indicates the structure that initiates a nerve impulse during a reflex?

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

---

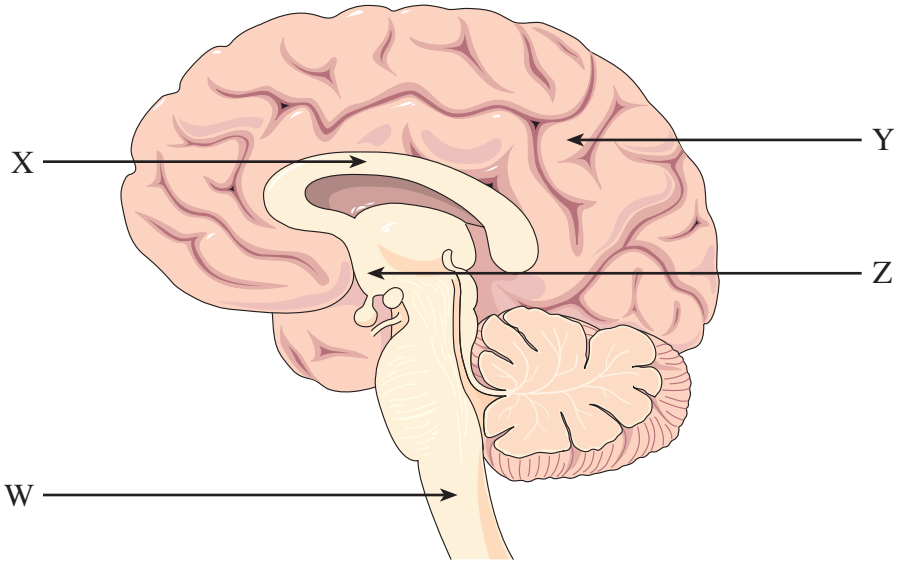
39. In a synaptic cleft, neurotransmitters move to the receptor sites by

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

40. After a “fight or flight” response, parasympathetic nervous system stimulation will cause

A. pupils to dilate.
B. peristalsis to decrease.
C. the bronchioles to dilate.
D. the heart rate to decrease.

Use the following diagram to answer questions 41 and 42.



41. Elevated body temperature due to a prolonged infection is due to a stimulation of which of the following structures?

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

42. When the hormone estrogen was administered to patients with Alzheimer’s disease, the memory of these patients improved. On which structure in the diagram could estrogen have had an affect?

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

OVER

43. When blood volume increases beyond normal levels, the release of hormone **H** is inhibited. As a result, the reabsorption of water decreases. Hormone **H** is

A. insulin.
B. thyroxin.
C. aldosterone.
D. antidiuretic hormone (ADH).

Use the following information to answer question 44.

Relative Concentrations in a Human Nephron			
water	glucose	hydrogen ions	urea
low	low	high	high

44. Where in the kidney could the conditions indicated in the table above be found?

A. distal tubule
B. proximal tubule
C. afferent arteriole
D. Bowman's capsule

---

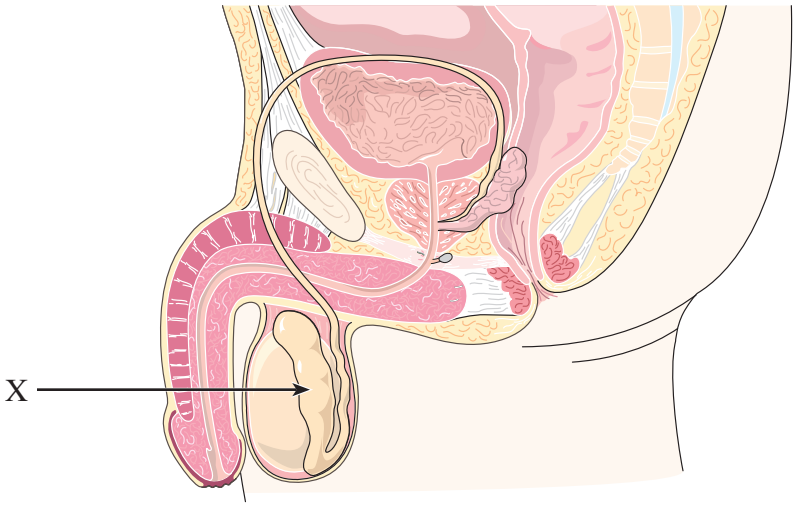
45. An increase of ADH in the blood affects the water content of the blood plasma by

A. changing the permeability of Bowman's capsule.
B. increasing the permeability of the collecting duct.
C. stimulating the loop of Henle to reabsorb more salt.
D. making the filtrate in the proximal tubule more concentrated.

46. Cell division resulting in the production of sperm cells occurs in the

A. epididymis.
B. interstitial cells.
C. seminal vesicles.
D. seminiferous tubules.

Use the following diagram to answer question 47.



47. Structure **X** is the site of

A. maturation of sperm.
B. production of testosterone.
C. secretion of an alkaline substance to neutralize vaginal fluids.
D. production of luteinizing hormone (LH) and follicle-stimulating hormone (FSH).

---

48. The correct pathway that sperm travel to leave the body is

A. epididymis → testes → urethra.
B. testes → vas deferens → urethra.
C. epididymis → urethra → vas deferens.
D. testes → prostate gland → vas deferens.

49. Which part of the female body is structurally similar to the penis in a man and functions as a sexually sensitive organ?

A. uterus
B. vagina
C. clitoris
D. follicle

OVER

50. Human chorionic gonadotropic (HCG) hormone is produced by the

A. hypothalamus.
B. corpus luteum.
C. developing embryo.
D. lining of the oviduct.

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. For each of the following structures, identify a cellular process in which the structure is involved. **(3 marks: 1 mark each)**

chromosomes:

_____

_____

mitochondria:

_____

_____

lysosomes:

_____

_____

OVER

2. Complete the following table showing the products and locations of the cellular processes indicated. **(4 marks)**

	Translation	Replication
Product		
Location		

3. Identify and describe the process by which each of the following substances moves into a cell.
(4 marks: 1 mark each for process; 1 mark each for description)

oxygen:

Name of process: _____

Description: _____

_____

_____

macromolecule:

Name of process: _____

Description: _____

_____

_____

OVER

4. The following experiment was conducted to observe the effect of temperature on the rate of enzyme activity.

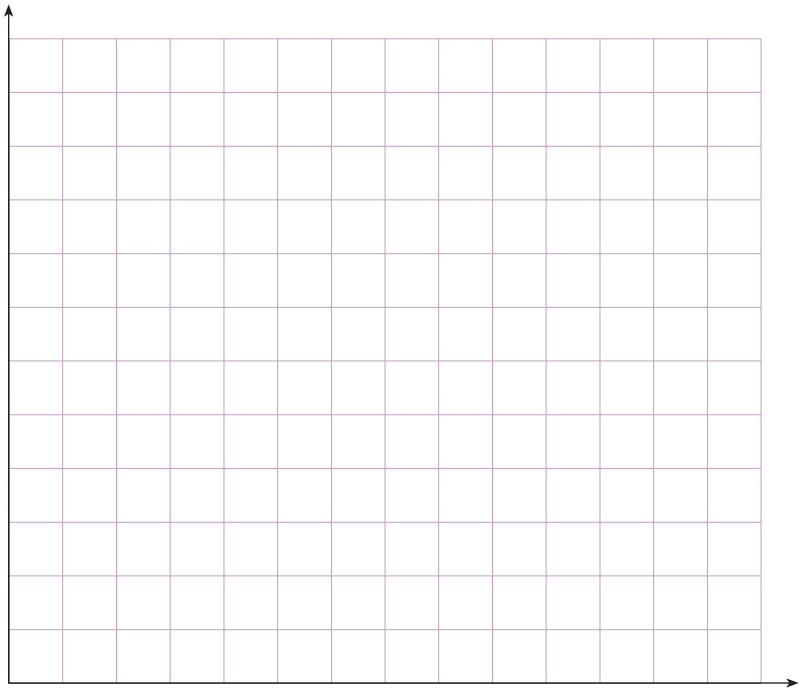
   - 10 mL of a starch solution was added to each of five lettered test tubes.
   - Each test tube was placed in a different water bath as shown in the table below.
   - An equal amount of salivary amylase was added to test tubes **W**, **X**, **Y** and **Z**.
   - A sample was taken from each test tube every minute and tested with IKI, an indicator that turns from yellow to black when mixed with starch.

Test Tube	Temperature of Water Bath (°C)	1 min.	2 min.	3 min.	4 min.	5 min.
V	20	black	black	black	black	black
W	0	black	black	black	yellow	yellow
X	20	black	black	yellow	yellow	yellow
Y	40	black	yellow	yellow	yellow	yellow
Z	60	black	black	black	black	yellow

a) What is the purpose of test tube **V**? **(1 mark)**

_____

b) Using the grid provided, draw a graph that relates the time it takes for the indicator to turn yellow to the temperatures of test tubes **W**, **X**, **Y** and **Z**. **(2 marks)**



temperature
(°C)

c) Explain the results of the experiment. **(3 marks)**

_____

_____

_____

_____

_____

_____

OVER

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5. a) State **one** digestive system function of the liver. **(1 mark)**

_____

_____

b) State **three** circulatory system functions of the liver. **(3 marks)**

i) _____

_____

ii) _____

_____

iii) _____

_____

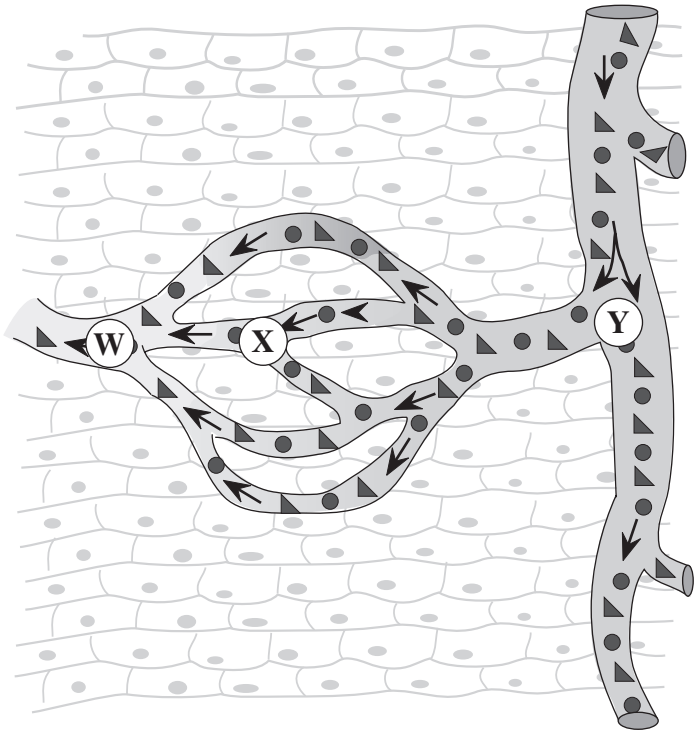
c) State **one** excretory system function of the liver. **(1 mark)**

_____

_____

OVER

Use the following diagram to answer question 6.



6. The diagram represents the capillary bed of a villus in the small intestine.

   a) Identify vessel **Y**: **(1 mark)**

   _____

   b) Describe **four** ways in which the composition of the blood at point **X** changes, two to three hours after eating a meal. **(4 marks)**

   i) _____

   _____

   ii) _____

   _____

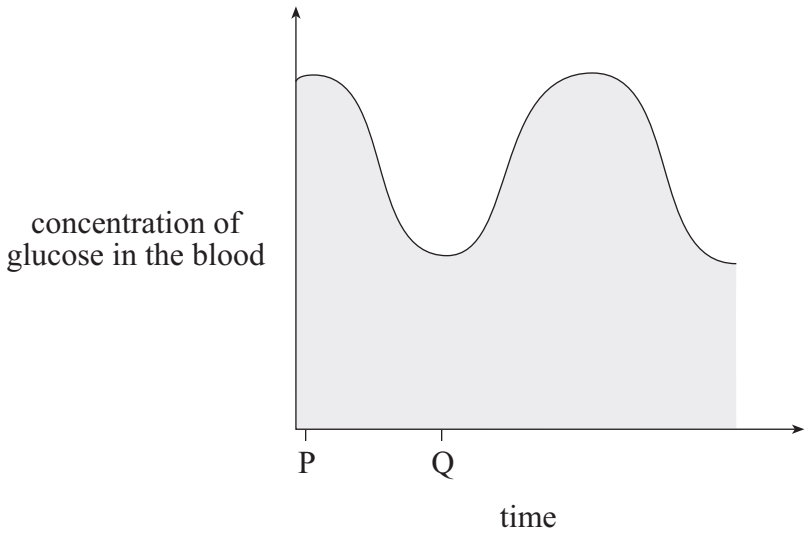
   iii) _____

   _____

   iv) _____

   _____

c) The following is a graph of glucose concentration in vessel **W** over time.



Explain the observed changes in the glucose concentration between time **P** and time **Q**.
(3 marks)

7. a) Use the word list below to complete the paragraph describing characteristics of a nerve impulse. (Use each word only once. Not all of the words will be used.)

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

- resting potential
- threshold
- recovery phase
- all-or-none
- stimulus
- polarized membrane

Any change in the environment that can open sodium gates is called a(n) _____ . If the change in the environment does not open a sodium gate then the _____ has not been reached. When an action potential is produced, it is called the _____ response. During the _____ , no further action potentials can be generated.

b) Describe the changes that occur in the polarity of the membrane and the distribution of ions during an action potential. **(4 marks)**

_____

_____

_____

_____

_____

_____

_____

c) Describe the structure of the myelin sheath and explain why it speeds up the transmission of nerve impulses. **(2 marks)**

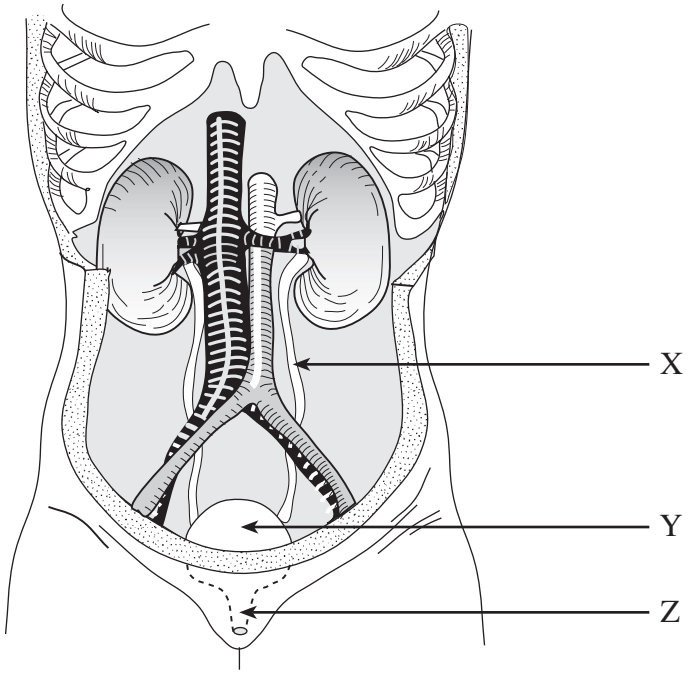
_____

_____

_____

_____

Use the following diagram to answer question 8.



8. Identify and give **one** function of each of the following structures.
(6 marks: 1 mark each for name; 1 mark each for function)

Structure **X**:

Name: _____

Function: _____

_____

Structure **Y**:

Name: _____

Function: _____

_____

Structure **Z**:

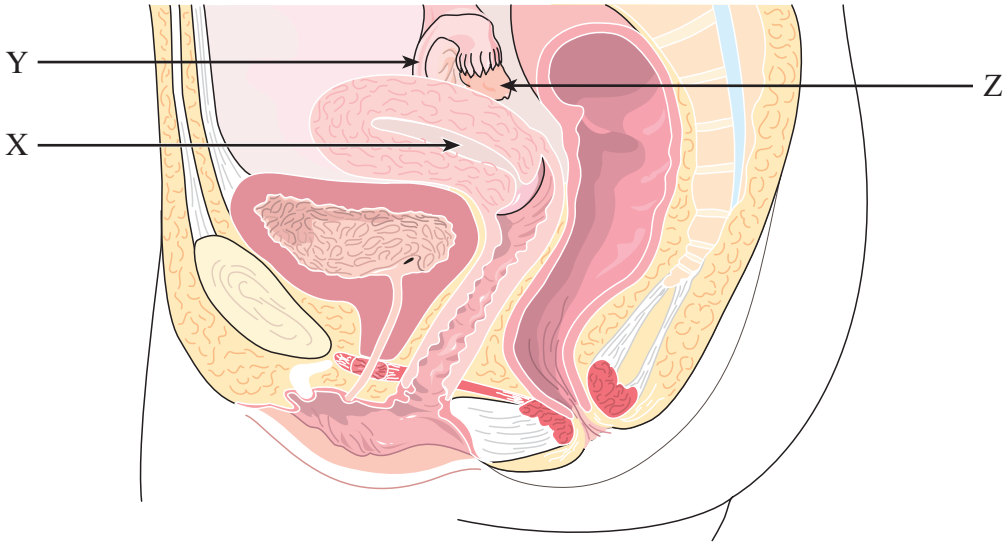
Name: _____

Function: _____

_____

OVER

Use the following diagram to answer question 9.



9. Identify and give **one** function of each of the following structures.
(6 marks: 1 mark each for name; 1 mark each for function)

Structure **X**:

Name: _____

Function: _____

_____

Structure **Y**:

Name: _____

Function: _____

_____

Structure **Z**:

Name: _____

Function: _____

_____

END OF EXAMINATION