

JANUARY 1996

PROVINCIAL EXAMINATION

MINISTRY OF EDUCATION

BIOLOGY 12

GENERAL INSTRUCTIONS

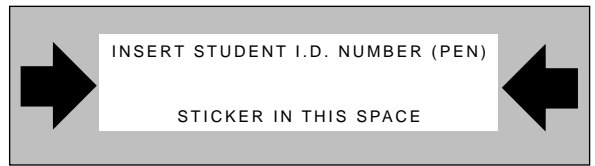
1. Insert the stickers with your Student I.D. Number (PEN) in the allotted spaces above.
Under no circumstance is your name or identification, other than your Student I.D. Number, to appear on this paper.
2. Take the separate Answer Sheet and follow the directions on its front page.
3. Be sure you have an HB pencil and an eraser for completing your Answer Sheet.
Follow the directions on the Answer Sheet when answering multiple-choice questions.
4. For each of the written-response questions, write your answer in INK in the space provided.
5. 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 .

6. At the end of the examination, place your Answer Sheet inside the front cover of this booklet and return the booklet and your Answer Sheet to the supervisor.

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BIOLOGY 12 JANUARY 1996 PROVINCIAL

Course Code = BI Examination Type = P

1. _____
(6)

2. _____
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5. _____
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6. _____
(3)

7. _____
(5)

OPTIONS: Score **only two** of the following options.

Option I: 8. _____
(10)

Option IV: 11. _____
(10)

Option II: 9. _____
(10)

Option V: 12. _____
(10)

Option III: 10. _____
(10)

Option VI: 13. _____
(10)

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BIOLOGY 12 PROVINCIAL EXAMINATION

	Value	Suggested Time
1. This examination consists of three parts:		
PART A: 52 multiple-choice questions	52	40
PART B: 7 written-response questions	28	50
PART C: Option section consisting of only written-response questions. Select only two options. Each option is worth 10 marks.	20	30
	Total: 100 marks	120 minutes
2. Multiple-choice questions must be answered in HB pencil on the answer sheet provided. All other questions are to be answered in INK in the spaces provided in this booklet.		
3. For written-response questions, organization and planning space has been incorporated into the space allowed for answering each question.		
4. You have two hours to complete this examination.		

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PART A: MULTIPLE-CHOICE

Value: 52 marks

Suggested Time: 40 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 circle that has the letter corresponding to your answer.

1. Using the information below, what is the correct order for the steps of scientific inquiry?

1. Theory
2. Conclusion
3. Hypothesis
4. Experimentation

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

2. The maintenance of the body's constant internal environment is termed

- A. synthesis.
- B. hydrolysis.
- C. replication.
- D. homeostasis.

3. Water allows chemical reactions in cells to occur because it

- A. acts as a solvent.
- B. evaporates readily.
- C. is less dense as a solid.
- D. promotes dehydration synthesis.

4. Acids are defined as compounds that dissociate in water to release

- A. chloride ions (Cl^-).
- B. calcium ions (Ca^{2+}).
- C. hydrogen ions (H^+).
- D. hydroxide ions (OH^-).

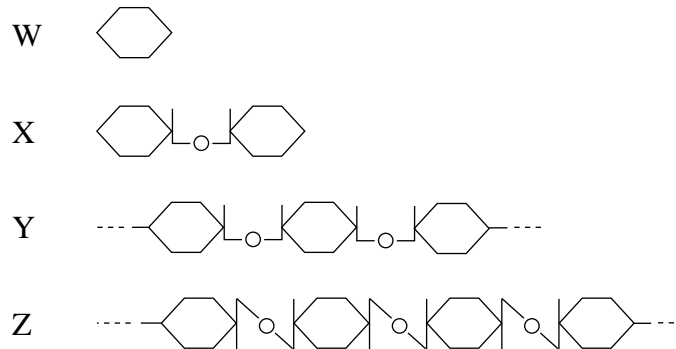
5. The digestion of starch is catalyzed by a polymer made up of

- A. fatty acids.
- B. nucleotides.
- C. amino acids.
- D. monosaccharides.

6. The tertiary structure of an enzyme is

- A. its helical orientation in space.
- B. its three-dimensional, globular shape.
- C. the particular sequence of amino acids.
- D. the arrangement of several proteins to create a functional unit.

7. Which of the diagrams below represents a disaccharide?



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

8. A role of mRNA in protein synthesis is to

- A. form ribosomes.
- B. form the protein's tertiary structure.
- C. carry appropriate amino acids into place.
- D. carry genetic information out of the nucleus.

Use the following table to answer question 9.

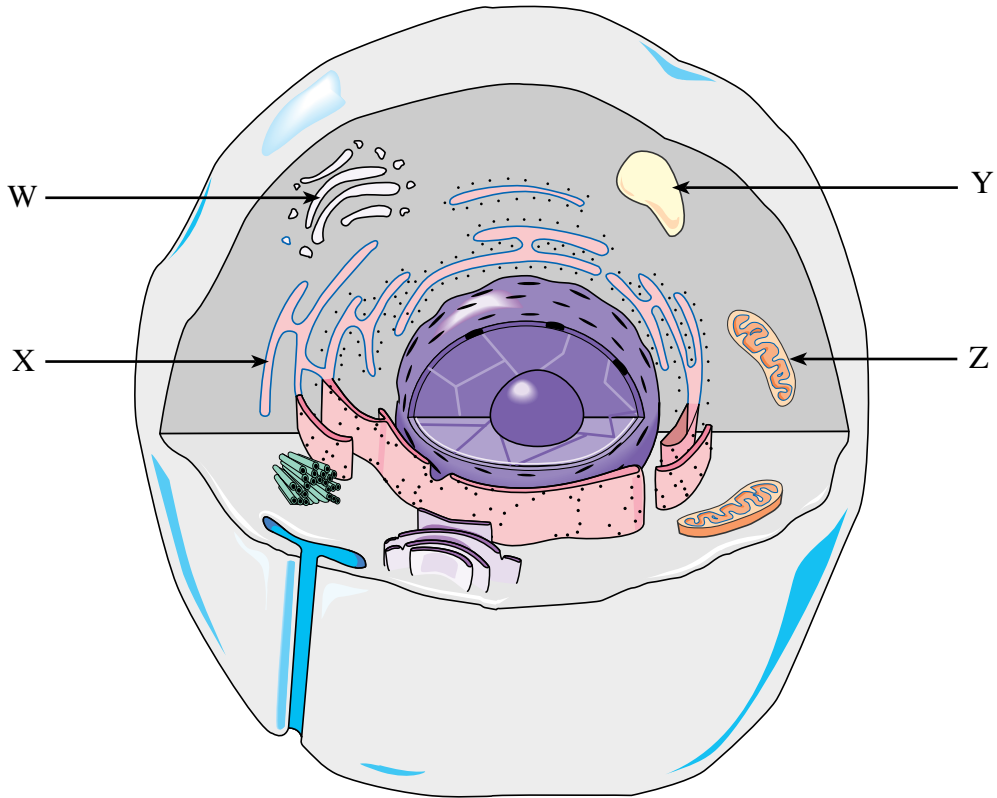
Table of mRNA Codons and the Amino Acids they code for	
CODON	AMINO ACID
AUG	Methionine
GCA	Alanine
GCC	Alanine
GCG	Alanine
GCU	Alanine

9. Using the above table of codons, determine the DNA sequence which produced the following amino acid strand:

Alanine – Methionine – Alanine

- A. G – C – A – A – U – G – G – C – G
 - B. G – C – G – A – U – G – C – G – C
 - C. C – G – G – T – A – C – C – G – A
 - D. C – G – C – T – A – G – G – C – A
10. A stack of saccules that prepares secretory vesicles is known as a
- A. plastid.
 - B. lysosome.
 - C. nucleolus.
 - D. Golgi body.

11. Which of the organelles in the diagram below is capable of synthesizing steroid hormones and detoxifying drugs?

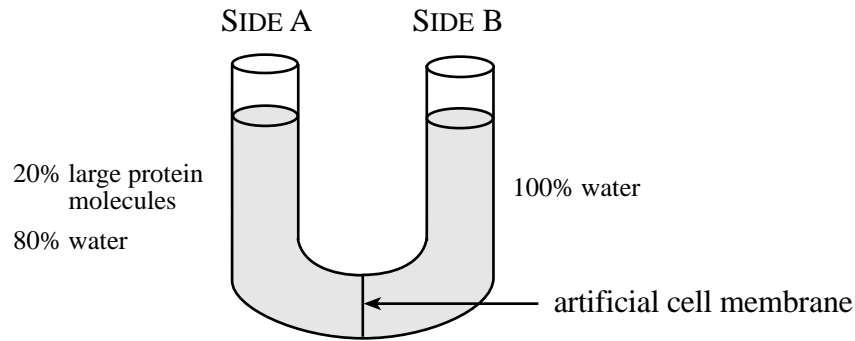


- A. W
B. X
C. Y
D. Z
12. Cell membranes are composed mainly of
- A. sugars and phosphates.
B. phospholipids and proteins.
C. carbohydrates and cellulose.
D. nucleotides and carbohydrates.
13. Which of the following conditions is required for diffusion to occur?
- A. ATP energy.
B. A living cell.
C. A concentration difference.
D. A selectively-permeable membrane.

14. Which of the following conditions would cause red blood cells to burst?

- A. pH of 7.5.
- B. Temperature of 30°C.
- C. Being placed in distilled water.
- D. Being placed in an 11% salt solution.

15. What will happen to the protein solution in Side A of the apparatus in the diagram below?



- A. It will become less concentrated since water passes from **B** to **A**.
- B. It will become more concentrated since water passes from **B** to **A**.
- C. It will become more concentrated since water passes from **A** to **B**.
- D. It will become less concentrated since protein will move from **A** to **B**.

16. Pinocytosis is accomplished by the cell using the

- A. nucleus.
- B. cell wall.
- C. cytoplasm.
- D. cell membrane.

17. Which of the following metabolic pathways may continue to operate if oxygen is unavailable?

- A. Glycolysis.
- B. Krebs cycle.
- C. Respiratory chain.
- D. Transition reaction.

18. A function of the stroma in the chloroplast is to

- A. synthesize ATP.
- B. produce glucose.
- C. capture light energy.
- D. reduce NAD to NADH₂.

19. When CO_2 is absent, which of the following molecules is still produced in photosynthesis?

- A. ATP
- B. CO_2
- C. RuBP
- D. PGAL

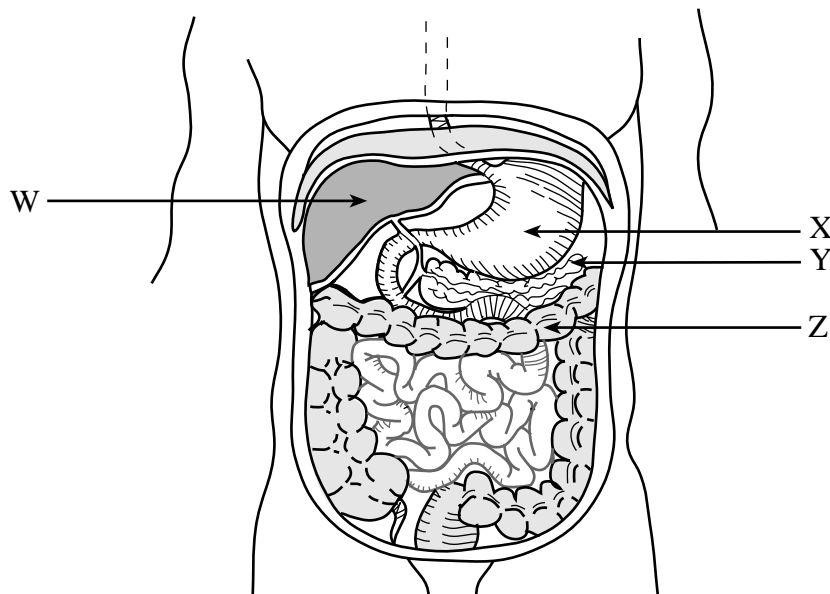
20. Which of the following is composed of neurons?

- A. Muscle tissue.
- B. Nervous tissue.
- C. Epithelial tissue.
- D. Connective tissue.

21. Which of the following structures prevents food from entering the trachea?

- A. Larynx.
- B. Pharynx.
- C. Epiglottis.
- D. Cardiac sphincter.

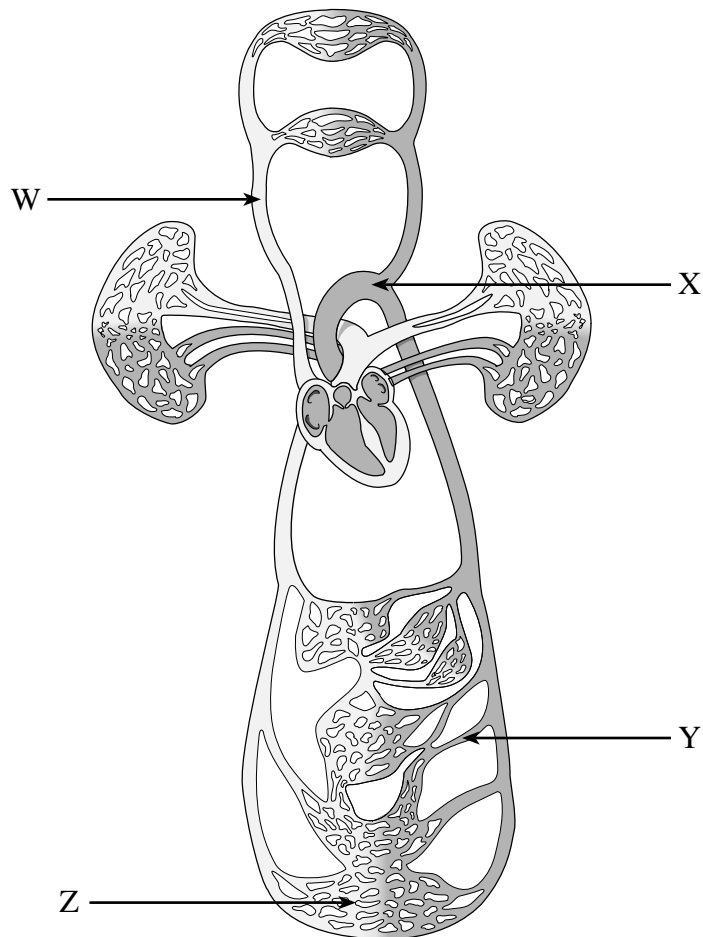
22. A patient complains of diarrhea (watery feces). It is concluded that part of the digestive system is not functioning properly. Which organ in the diagram below is **most likely** causing the problem?



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

23. In a demonstration, 10 grams of raw meat were suspended in an enzyme solution. After several hours the meat was weighed and was found to have a mass of 3 grams. The solution **most likely** contained
- A. bile.
 - B. pepsin.
 - C. maltase.
 - D. amylase.
24. Which of the following is an example of physical digestion?
- A. Hydrolysis.
 - B. Release of gastrin.
 - C. Churning in the stomach.
 - D. Action of lipase in the small intestine.
25. Peristalsis may refer to the
- A. capillary beds of the digestive tract.
 - B. closing of the glottis upon swallowing.
 - C. activity of the sympathetic nervous system.
 - D. rhythmic contraction of the wall of the esophagus.
26. Removal of the gall bladder would affect a person's ability to digest
- A. lipids.
 - B. sugars.
 - C. proteins.
 - D. carbohydrates.
27. *E. coli* are beneficial to humans because they
- A. convert pepsinogen to pepsin.
 - B. produce vitamins and amino acids.
 - C. absorb water from the large intestine.
 - D. synthesize urea from the breakdown of amino acids.

28. Which letter on the diagram below indicates where the velocity of blood flow is **lowest**?



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

29. One function of the lymphatic system is to

- A. deliver oxygen to body tissues.
- B. store fluids during dehydration.
- C. absorb fats from the digestive system.
- D. carry platelets to sites of vessel injury.

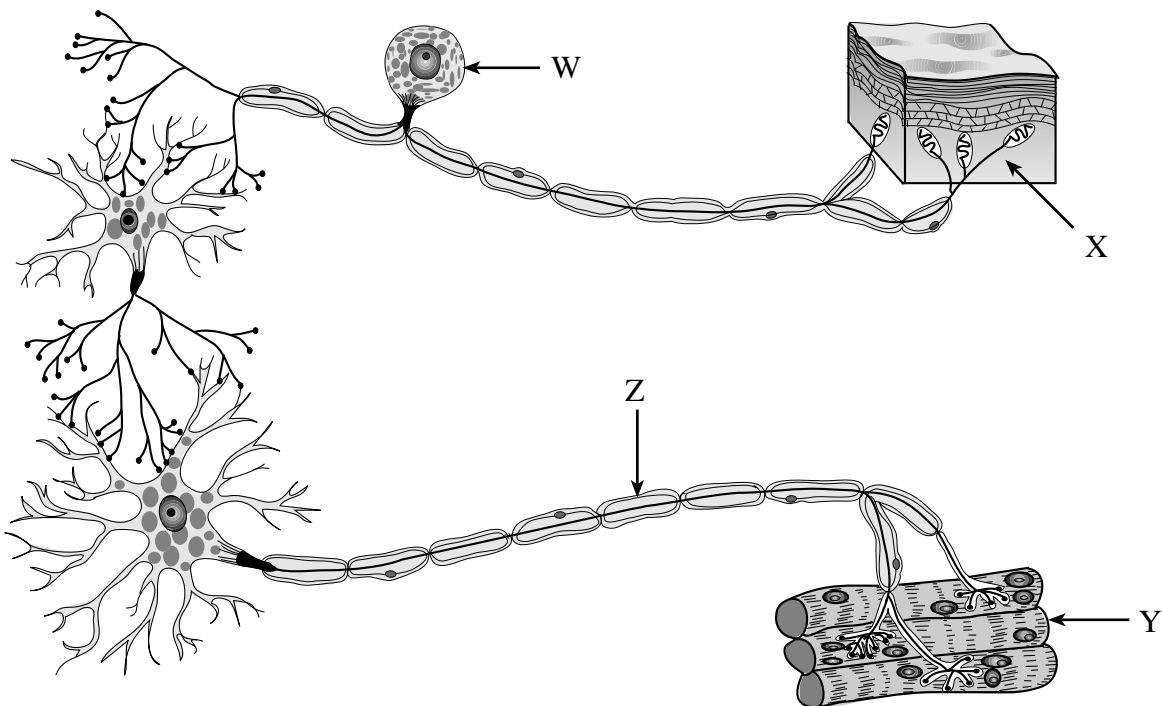
30. The major component of human blood is

- A. plasma.
- B. platelets.
- C. red cells.
- D. white cells.

31. A substance that combines with calcium in the blood may affect the circulatory system's ability to
- A. fight infection.
 - B. maintain blood pressure.
 - C. transport oxygen to tissues.
 - D. clot blood at damaged sites.

32. The distribution of sodium and potassium ions during resting potential is maintained by
- A. osmosis.
 - B. diffusion.
 - C. active transport.
 - D. facilitated transport.

33. Which letter indicates the structure that is responsible for increasing the speed of nerve impulse transmission?

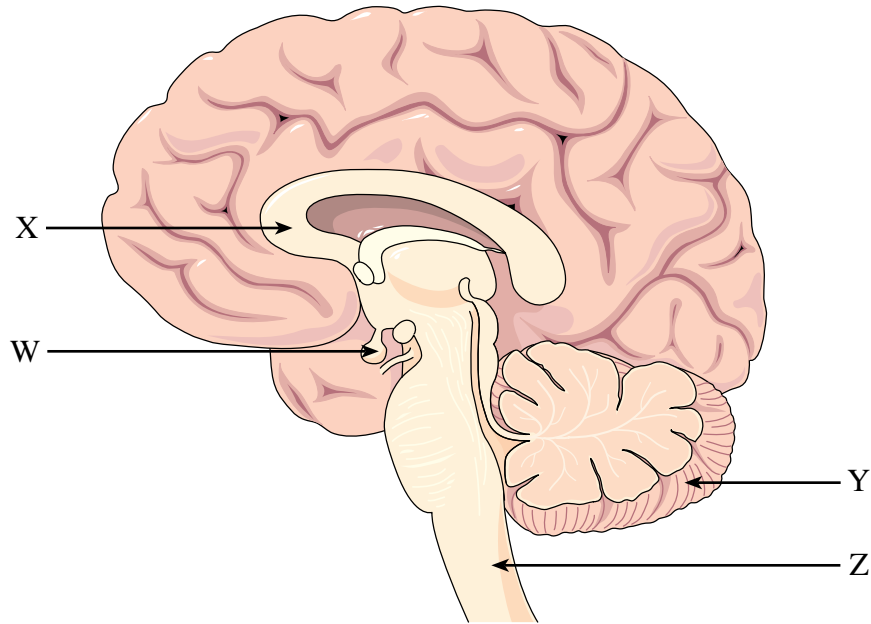


- A. W
- B. X
- C. Y
- D. Z

34. The function of enzymes in the synaptic cleft is to ensure that
- A. neurotransmitters are released.
 - B. neurotransmitters are destroyed.
 - C. nerve impulses reach receptor sites.
 - D. nerve impulses travel in both directions.
35. In a reflex arc, the
- A. brain is stimulated by the effector.
 - B. effector is stimulated before the brain.
 - C. sensory receptor directly stimulates the effector.
 - D. brain is stimulated at the same time as the receptor.
36. Which of the following would be contained within the central nervous system?
- A. A neuron connecting the sensory and motor neurons.
 - B. A sensory nerve running from a hand to the spinal cord.
 - C. A motor nerve going from the brain to a skeletal muscle.
 - D. A nerve running from the spinal cord to the stomach wall.
37. The central nervous system includes the
- A. brain and spinal cord.
 - B. somatic nervous system.
 - C. cranial and spinal nerves.
 - D. parasympathetic nervous system.
38. The somatic nervous system controls
- A. peristalsis.
 - B. cardiac muscles.
 - C. smooth muscles.
 - D. skeletal muscles.
39. The body's response to immediate danger includes
- A. increased breakdown of protein in the stomach.
 - B. decreased gas exchange during internal respiration.
 - C. increased nervous stimulation of the adrenal medulla.
 - D. decreased number of open capillary beds in skeletal muscle.

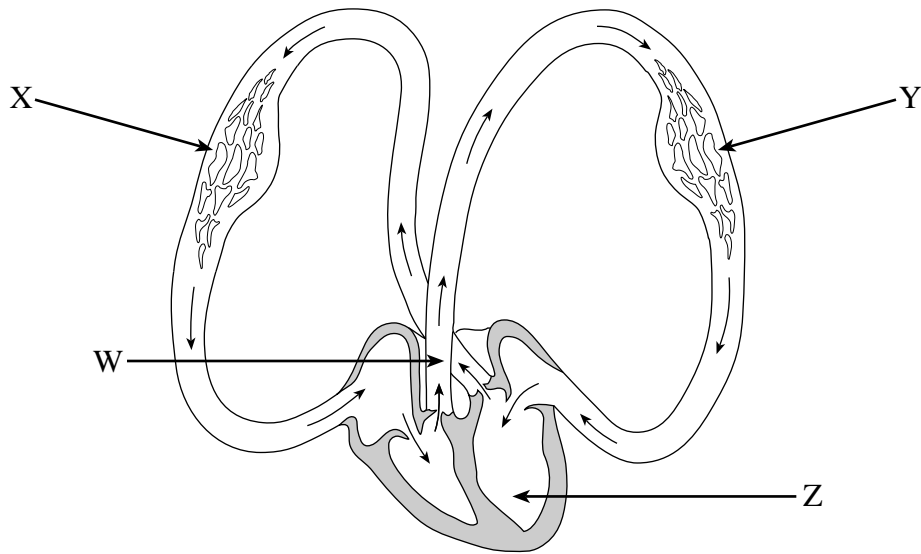
40. Two functions of the medulla oblongata are to control
- body position and vision.
 - heart beat and breathing rate.
 - sensory areas and motor areas.
 - involuntary muscle contractions and metabolic rate.
41. The occipital lobe of the cerebral cortex has association areas for
- taste.
 - smell.
 - vision.
 - hearing.

42. Which letter indicates the structure responsible for muscle tone and balance?



- W
 - X
 - Y
 - Z
43. Oxygen and carbon dioxide cross the membranes between the capillaries and alveoli by
- osmosis.
 - filtration.
 - diffusion.
 - active transport.

44. The reaction $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$ occurs in which area of the diagram below?



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

45. Increased concentrations of which gas are sensed by the brain and result in increased rate and depth of breathing?

- A. Water.
- B. Oxygen.
- C. Nitrogen.
- D. Carbon dioxide.

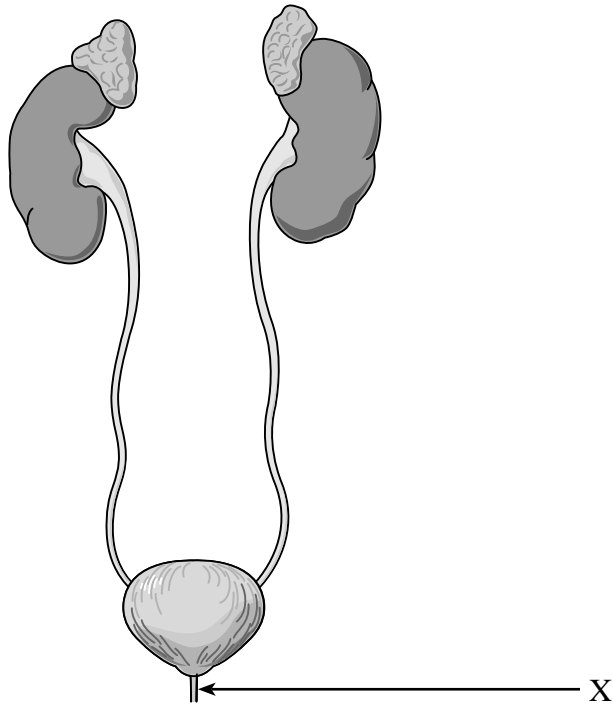
46. Which of the following mechanisms causes air to enter the lungs?

	DIAPHRAGM	RIB MUSCLES	THORACIC PRESSURE
A.	contracts	contract	decreases
B.	relaxes	relax	increases
C.	relaxes	relax	decreases
D.	contracts	relax	increases

47. Which of the following metabolic wastes is excreted by the skin?

- A. Bile.
- B. Urea.
- C. Uric acid.
- D. Carbon dioxide.

48. The structure labelled **X** in the diagram below is the



- A. ureter.
- B. urethra.
- C. collecting duct.
- D. urinary bladder.

49. Alcohol affects the release of ADH. Alcohol causes an increase in the volume and a decrease in the concentration of urine produced. Therefore, ADH affects the

- A. Loop of Henle.
- B. collecting duct.
- C. proximal tubule.
- D. Bowman's capsule.

50. The correct sequence which describes the release of cortisol is
- A. hypothalamus → anterior pituitary → adrenal cortex.
 - B. hypothalamus → posterior pituitary → adrenal cortex.
 - C. hypothalamus → anterior pituitary → adrenal medulla.
 - D. posterior pituitary → hypothalamus → adrenal medulla.
51. Increased levels of thyroxin in the blood result in decreased levels of TSH. This is an example of
- A. diffusion.
 - B. active transport.
 - C. positive feedback.
 - D. negative feedback.
52. A person suffering from hypothermia has which of the following characteristics?
- A. Body temperature is less than 35°C , surface blood vessels are dilated.
 - B. Body temperature is less than 35°C , surface blood vessels are constricted.
 - C. Body temperature is greater than 37°C , surface blood vessels are dilated.
 - D. Body temperature is greater than 37°C , surface blood vessels are constricted.

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

PART B: WRITTEN-RESPONSE

Value: 28 marks

Suggested Time: 50 minutes

- INSTRUCTIONS:**
1. Use a **pen** for this part of the examination.
 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. In an experiment, three different pancreatic enzymes were placed in separate test tubes. Temperature was maintained at 37°C. Vegetable oil, egg white and starch were added to each test tube and the contents were analyzed after 30 minutes.

a) Test tube A was found to contain glycerol and fatty acids. The enzyme added was _____ **(1 mark)**

Test tube B contained trypsin. Which product of digestion would it contain?
_____ **(1 mark)**

Identify the enzyme and product of digestion contained in test tube C.
(2 marks: 1 mark each)

Enzyme: _____

Product of digestion: _____

b) Predict the effect on the speed of the reaction in test tube A if bile were added and give a reason for your answer. **(2 marks)**

Score for Question 1:
1. _____
(6)

2. Describe the process of:

a) transcription.

(1 mark)

b) translation.

(1 mark)

Score for Question 2: 2. $\frac{\quad}{(2)}$
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3. a) Draw the organelle responsible for photosynthesis. Include its internal structure.

(2 marks)

b) On your diagram:

i) indicate with an **A** where photophosphorylation occurs, and

(1 mark)

ii) indicate with a **B** where the Calvin Cycle occurs.

(1 mark)

Score for Question 3: 3. $\frac{\quad}{(4)}$
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4. Describe **three** ways in which surface area is maximized in the digestive system. **(3 marks: 1 mark each)**

i) _____

ii) _____

iii) _____

Score for Question 4: 4. _____ (3)

5. a) Explain why people with “O” type blood are termed universal donors, yet are limited in the blood they can receive. **(2 marks)**

b) If an Rh negative (Rh^-) mother has a second Rh positive (Rh^+) child, there may be fetal erythroblastosis.

i) Explain the cause of erythroblastosis. **(2 marks)**

ii) State **one** way that erythroblastosis could be prevented. **(1 mark)**

Score for Question 5: 5. _____ (5)

PART C: OPTION SECTION

Value: 20 marks

Suggested Time: 30 minutes

- INSTRUCTIONS:**
1. Select **two** options from the six options listed below.
 2. Answer **all** of the questions in each option that you select.
 3. If you answer questions in more than two options, only the **first two** will be marked.
 4. You may not need all of the space provided to answer each question.

OPTION I: IMMUNOLOGY

OPTION II: SKELETAL SYSTEM AND MUSCLES

OPTION III: REPRODUCTION AND EMBRYOLOGY

OPTION IV: GENETIC DISORDERS AND ENGINEERING

OPTION V: CANCER

OPTION VI: SENSORY RECEPTORS

OPTION I: IMMUNOLOGY

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
active immunity	
primary response	a) administration of preformed antibodies _____
passive immunity	b) circulating T cells _____
multiple sclerosis	c) circulating memory cells _____
cell mediated immunity	d) results of HIV infection _____
rheumatoid arthritis	e) inflammation of the joints _____
AIDS	f) destruction of the myelin sheath _____
interferon	

2. Name a cell which produces interferon and explain how interferon acts in the immune response. **(2 marks: 1 mark each)**

Cell name: _____

Function of interferon: _____

3. Define *allergy* and explain the role of IgE antibodies in the allergic reaction. **(2 marks: 1 mark each)**

Allergy: _____

Role of IgE: _____

Score for
Option I:

8. _____
(10)

OPTION II: SKELETAL SYSTEM AND MUSCLES

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
appendicular skeleton	
axial skeleton	a) degeneration of muscle fibres _____
ligament	b) connects muscles to bones _____
tendon	c) causes lactic acid build-up _____
oxygen debt	d) skull and vertebral column _____
creatine phosphate	e) connects bones to bones _____
muscular dystrophy	f) regenerates ATP _____
osteoporosis	

2. Explain how actin filaments function in muscle contraction. **(2 marks)**

3. State **two** ways in which bone is different from cartilage. **(2 marks: 1 mark each)**

i) _____

ii) _____

Score for Option II:
9. _____ (10)

OPTION III: REPRODUCTION AND EMBRYOLOGY

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
cleavage	
seminal fluid	a) production of eggs _____
neurula	b) the opening between the vagina and uterus _____
oogenesis	c) essential to the maturation of sperm _____
testosterone	d) the male copulatory organ _____
cervix	e) contains fructose, water and prostaglandins _____
progesterone	f) cell division without growth _____
penis	

2. List the **four** structures which contribute to the formation of semen.

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

- i) _____
- ii) _____
- iii) _____
- iv) _____

3. Name each birth control method described below.

- a) The oviducts are cut and tied, preventing egg and sperm from meeting. **(1 mark)**

- b) A latex (rubber) sheath that prevents sperm from entering the vagina. **(1 mark)**

Score for Option III: 10. _____ (10)

OPTION IV: GENETIC DISORDERS AND ENGINEERING

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
ligase	
cell cycle	a) chromosomes line up at the cell's equator _____
metaphase	b) a series of events that includes mitosis _____
transformation	c) cuts viral DNA into pieces _____
restriction enzyme	d) a plant cell without its cell wall _____
protoplast	e) circular DNA that may be found in <i>E. coli</i> _____
plasmid	f) a change in the DNA of a cell _____
anaphase	

2. List **two** medical uses of DNA probes. **(2 marks: 1 mark each)**

i) _____
 ii) _____

3. State **two** reasons why phenotypic cures are more frequently used than genotypic cures. **(2 marks: 1 mark each)**

i) _____

 ii) _____

Score for Option IV: 11. _____ (10)
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OPTION V: CANCER

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
contact inhibition	
vascularization	a) characteristic of non-cancerous cells _____
monoclonal antibody	b) causes cells to make DNA from RNA _____
neoplasia	c) carries drugs to tumor _____
benign	d) a tumor that does not spread _____
retrovirus	e) DNA that causes cancer _____
carcinoma	f) new growth of cancer cells _____
oncogene	

2. How is the spread of cancer assisted and hindered by the lymphatic system? **(2 marks: 1 mark each)**

Assisted: _____

Hindered: _____

3. Describe the role of each of the following cells.

a) Helper T cells: **(1 mark)**

b) Macrophages: **(1 mark)**

Score for Option V:
12. _____ (10)

OPTION VI: SENSORY RECEPTORS

1. Select a term from column **A** that matches its description given in column **B**. Write the term in the blank beside each description. Each term may be used **only** once, and not all the terms will be used. **(6 marks)**

COLUMN A	COLUMN B
tympanic membranes	
eustachian tube	a) carries impulse to brain _____
auditory canals	b) calcium carbonate granules _____
otoliths	c) channel sound waves _____
round window	d) equalizes air pressure in middle ear _____
ossicles	e) organ of hearing _____
auditory nerve	f) amplify sound _____
cochlea	

2. Complete the following table: **(4 marks)**

STRUCTURE	FUNCTION
sclera	_____ (1 mark)
_____ (1 mark)	converts light to electrical impulses
ciliary body	_____ (1 mark)
_____ (1 mark)	refracting and focusing light

Score for Option VI: 13. _____ (10)
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END OF EXAMINATION
