

NOVEMBER 1996

PROVINCIAL EXAMINATION

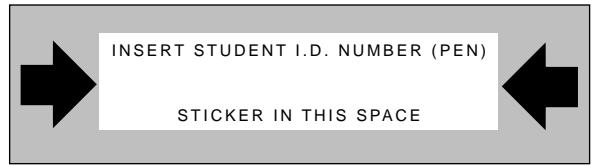
MINISTRY OF EDUCATION, SKILLS AND TRAINING

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 NOVEMBER 1996 PROVINCIAL

Course Code = BI Examination Type = P

1. _____
(5)

2. _____
(4)

3. _____
(6)

4. _____
(4)

5. _____
(6)

6. _____
(3)

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

Option I: 7. _____
(10)

Option IV: 10. _____
(10)

Option II: 8. _____
(10)

Option V: 11. _____
(10)

Option III: 9. _____
(10)

Option VI: 12. _____
(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: 6 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

- 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.
- For written-response questions, organization and planning space has been incorporated into the space allowed for answering each question.
- 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. An untested explanation for observed phenomena is
 - A. a theory.
 - B. a hypothesis.
 - C. a conclusion.
 - D. an observation.

2. Which of the following hormones does **not** promote homeostasis?
 - A. Insulin.
 - B. Oxytocin.
 - C. Calcitonin.
 - D. Antidiuretic hormone (ADH).

3. Enzymes often
 - A. absorb fatty acids.
 - B. help in hydrolysis reactions.
 - C. serve as a long term source of energy.
 - D. serve as the structural framework of cell walls.

4. Lipids are composed of
 - A. nucleotides.
 - B. amino acids.
 - C. monosaccharides.
 - D. glycerol and fatty acids.

5. When a protein loses its normal three-dimensional configuration, it is said to be
 - A. saturated.
 - B. denatured.
 - C. neutralized.
 - D. synthesized.

6. The carbon chain of a saturated fatty acid
- has no double bonds.
 - is the basis of the ATP molecule.
 - forms hydrogen bonds with itself.
 - has a repeating $\cdots\text{N} - \text{C} - \text{C}\cdots$ backbone.
7. Which of the following describes a DNA molecule?
- Double helix of glucose sugars and phosphates.
 - Ladder-like structure composed of fats and sugars.
 - Double chain of nucleotides joined by hydrogen bonds.
 - A chain of alternating phosphates and nitrogenous bases.

Use the following information to answer question 8.

Table of mRNA Codons and the Amino Acids they Code for			
CODON	AMINO ACID	CODON	AMINO ACID
AAU	Asparagine	CUC	Leucine
AUA	Isoleucine	GAA	Glutamic Acid
AUG	Methionine	GAG	Glutamic Acid
CAG	Glutamine	GCU	Alanine
CGA	Arginine	UAC	Tyrosine
CUA	Leucine	UAG	(Stop)

8. Using the above table of codons, determine the sequence of amino acids coded for by this mRNA sequence:

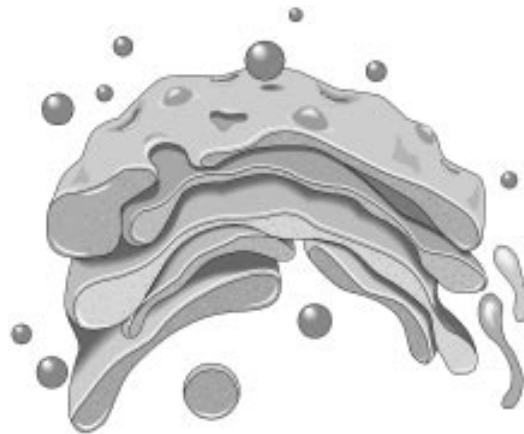
C - U - C - C - G - A - U - A - C

- Glutamine - Arginine - (Stop).
- Leucine - Arginine - Tyrosine.
- Leucine - Asparagine - Methionine.
- Glutamic Acid - Alanine - Methionine.

9. Which of the following terms describes the process shown below?

DNA \longrightarrow mRNA

- A. Unzipping.
 - B. Translation.
 - C. Replication.
 - D. Transcription.
10. A function of transfer RNA (tRNA) is to
- A. stay in the nucleus and be copied by DNA.
 - B. carry amino acids to the growing polypeptide chain.
 - C. copy DNA and carry the information to the ribosome.
 - D. read the codons and provide the site for protein synthesis.
11. Bacteria are prokaryotic cells. Which of the following structures is found in **both** bacteria and plant cells?
- A. Cell wall.
 - B. Chloroplast.
 - C. Mitochondrion.
 - D. Nuclear membrane.
12. The function of the organelle shown in the diagram below is to

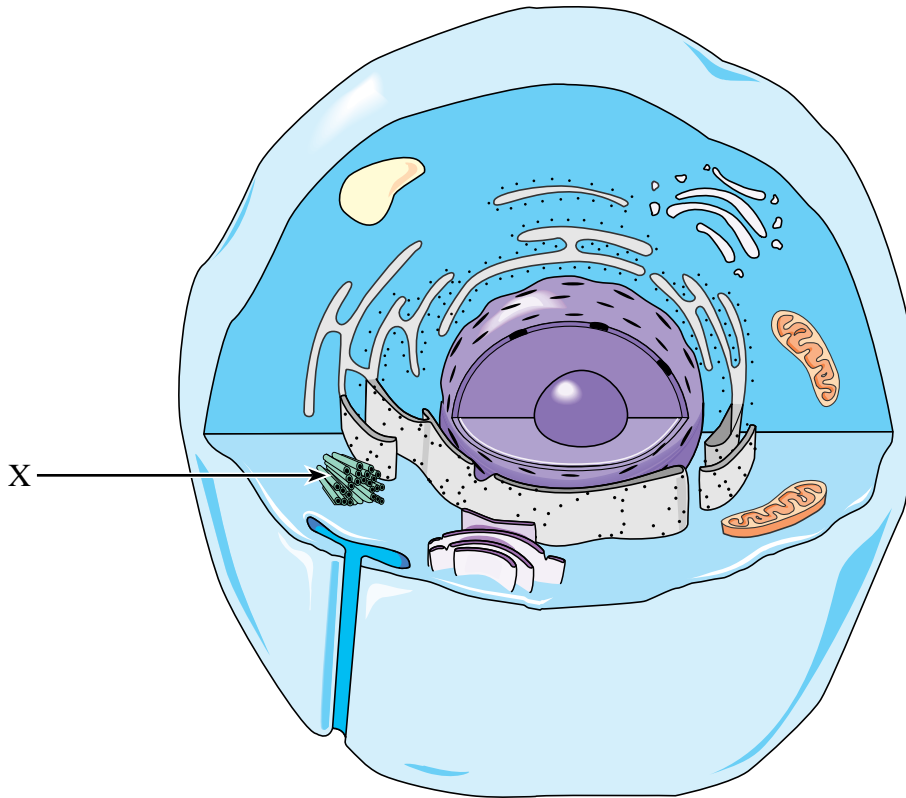


- A. make lipids.
- B. move the cell.
- C. package products.
- D. produce ATP energy.

13. Cells which require large amounts of energy would **likely** contain relatively high numbers of

- A. centrioles.
- B. chloroplasts.
- C. Golgi bodies.
- D. mitochondria.

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

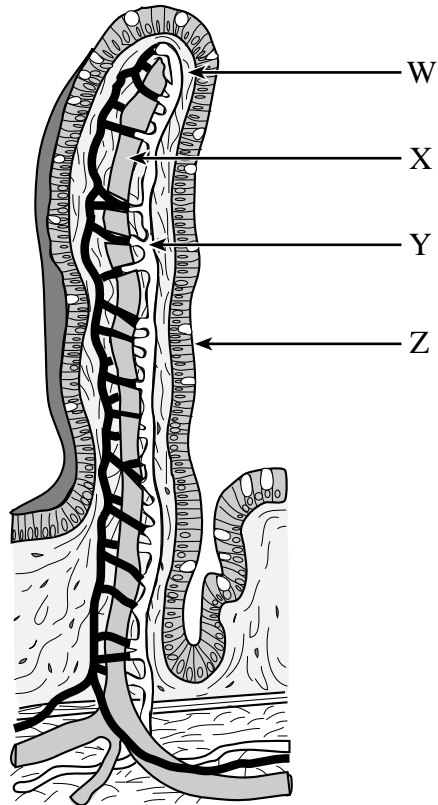


- A. a centriole.
- B. a lysosome.
- C. a Golgi body.
- D. endoplasmic reticulum.

15. Chlorophyll is contained within a
- A. plastid.
 - B. nucleus.
 - C. lysosome.
 - D. microtubule.
16. A function of lysosomes is
- A. synthesis.
 - B. hydrolysis.
 - C. replication.
 - D. respiration.
17. Which of the following processes would be directly affected by a lack of cellular ATP?
- A. Osmosis.
 - B. Diffusion.
 - C. Active transport.
 - D. Facilitated transport.
18. In an experiment, frog's eggs were placed in a salt solution. After several hours their mass increased significantly. We can therefore conclude that, compared to the frog's eggs, the solution was
- A. isotonic.
 - B. saturated.
 - C. hypotonic.
 - D. hypertonic.
19. Carbon dioxide is produced during
- A. glycolysis.
 - B. the Krebs cycle.
 - C. the Calvin cycle.
 - D. the respiratory chain.
20. The majority of ATP produced in aerobic respiration results from which of the following subpathways?
- A. Glycolysis.
 - B. Krebs cycle.
 - C. Fermentation.
 - D. Respiratory chain.

21. Which of the following occurs during photosynthesis?
- A. Oxygen is used.
 - B. PGAL is produced.
 - C. Chlorophyll is released.
 - D. Carbon dioxide is released.
22. Cells that line the surface of the body or of an organ are called
- A. adipose.
 - B. muscular.
 - C. epithelial.
 - D. connective.
23. Absorption of **most** nutrients from the digestive tract occurs in the
- A. liver.
 - B. stomach.
 - C. pancreas.
 - D. small intestine.
24. The gall bladder functions to
- A. store bile.
 - B. digest fats.
 - C. store urine.
 - D. release sodium bicarbonate.
25. Which of the following reactions has an optimal pH of 3?
- A. $\text{starch} + \text{H}_2\text{O} \xrightarrow{\text{amylase}} \text{maltose}$
 - B. $\text{protein} + \text{H}_2\text{O} \xrightarrow{\text{pepsin}} \text{peptides}$
 - C. $\text{maltose} + \text{H}_2\text{O} \xrightarrow{\text{maltase}} \text{glucose}$
 - D. $\text{fat} + \text{H}_2\text{O} \xrightarrow{\text{lipase}} \text{fatty acids} + \text{glycerol}$

26. In the diagram below, amino acids are transported into structure

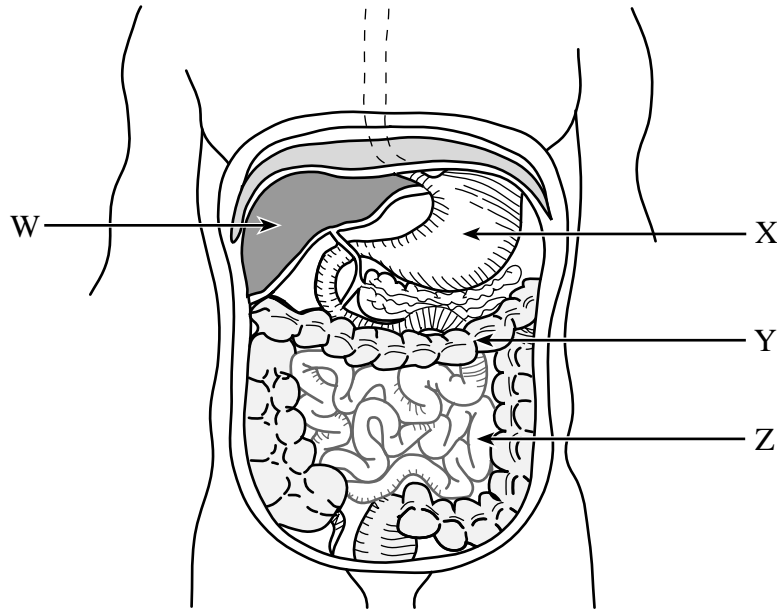


- A. W.
- B. X.
- C. Y.
- D. Z.

27. A patient complains of a burning sensation in the chest. This was found to be caused by gastric juice in the esophagus. The structure **most likely** not functioning properly is the

- A. pharynx.
- B. epiglottis.
- C. pyloric sphincter.
- D. cardiac sphincter.

28. Which organ in the diagram below is responsible for removing toxins from the blood?



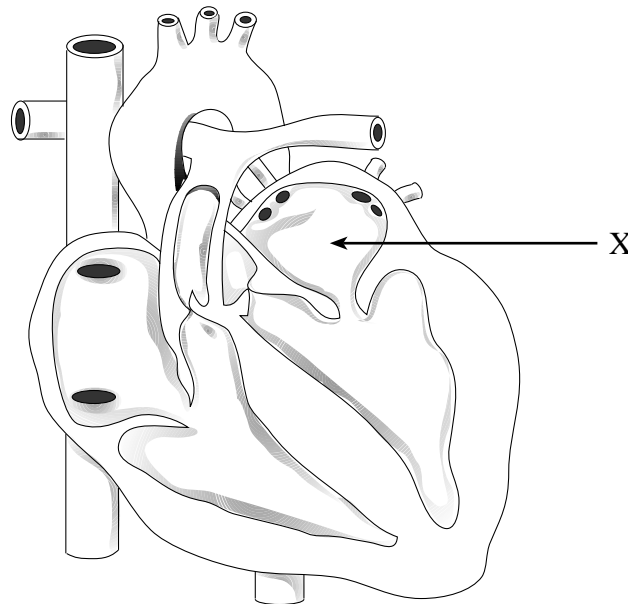
- A. W
- B. X
- C. Y
- D. Z

29. The **main** function of capillaries is to

- A. return blood to the heart.
- B. prevent the backflow of blood.
- C. take blood away from the heart.
- D. exchange nutrients and wastes with tissues.

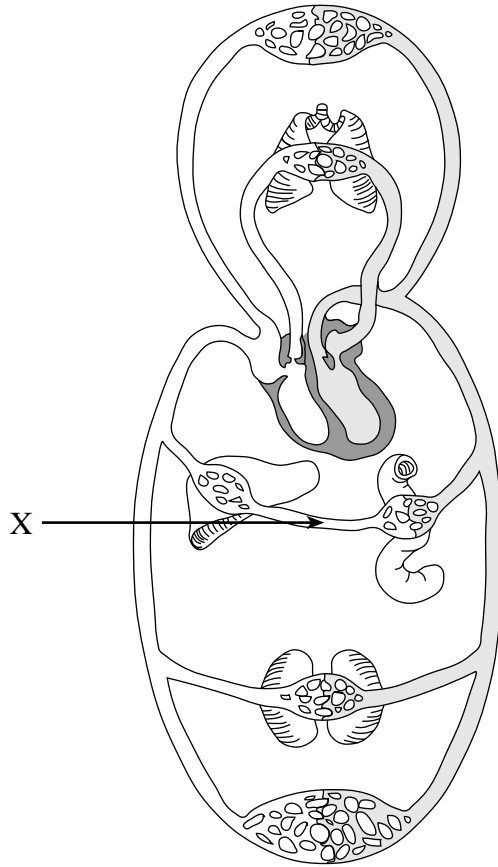
30. A blood vessel which has numerous valves is a(n)
- A. vein.
 - B. artery.
 - C. arteriole.
 - D. capillary.
31. Which of the following blood vessels has a thin elastic layer?
- A. Aorta.
 - B. Pulmonary artery.
 - C. Posterior vena cava.
 - D. Mesenteric capillary.

32. The function of the structure labelled **X** in the diagram below is to



- A. pump deoxygenated blood to the lungs.
- B. receive oxygenated blood from the lungs.
- C. pump oxygenated blood to the body tissues.
- D. receive deoxygenated blood from the body tissues.

33. The function of the vessel labelled **X** in the diagram below is to transport blood



- A. high in urea to the kidneys.
 - B. high in nutrients to the liver.
 - C. low in carbon dioxide to the intestines.
 - D. low in bicarbonate ions (HCO_3^-) to the lungs.
34. Based on its function, the heart is often referred to as a “double pump”. Which of the following would explain this?
- A. The heart has two sets of valves.
 - B. The heart is controlled by both nerves and hormones.
 - C. The heart moves blood through two circulatory pathways.
 - D. The heart moves blood containing both nutrients and wastes.

35. How do the oxygen and nutrient levels in the adult vena cava compare to those levels in the fetal vena cava?
- A. The fetal oxygen and nutrient levels are higher.
 - B. The adult oxygen and nutrient levels are higher.
 - C. The fetal nutrient levels are higher, while the oxygen levels are lower.
 - D. The adult nutrient levels are higher, while the oxygen levels are lower.
36. Increased parasympathetic stimulation of the SA node will result in
- A. decreased heart rate.
 - B. decreased heart volume.
 - C. increased diastolic pressure.
 - D. increased ventricular contraction rate.
37. Within an axon, an increased concentration of sodium ions and a decreased concentration of potassium ions is observed during
- A. upswing.
 - B. downswing.
 - C. resting potential.
 - D. synaptic transmission.
38. Using the information below, what is the correct order for the transmission of an impulse across a synapse?
1. Calcium interacts with proteins.
 2. Vesicles fuse with synaptic membrane.
 3. Neurotransmitter diffuses into synaptic cleft.
 4. Receptor sites are occupied.
- A. 1, 2, 3, 4
 - B. 2, 3, 1, 4
 - C. 3, 2, 1, 4
 - D. 4, 1, 3, 2
39. The part of the brain responsible for consciousness is the
- A. cerebrum.
 - B. cerebellum.
 - C. hypothalamus.
 - D. pituitary gland.

40. A drug was observed to have the following effects on an individual:

- increased breathing rate
- increased blood pressure
- increased heart rate

The part of the brain affected by this drug is the

- A. thalamus.
- B. cerebellum.
- C. corpus callosum.
- D. medulla oblongata.

41. Urine is stored in the

- A. ureter.
- B. kidney.
- C. urethra.
- D. urinary bladder.

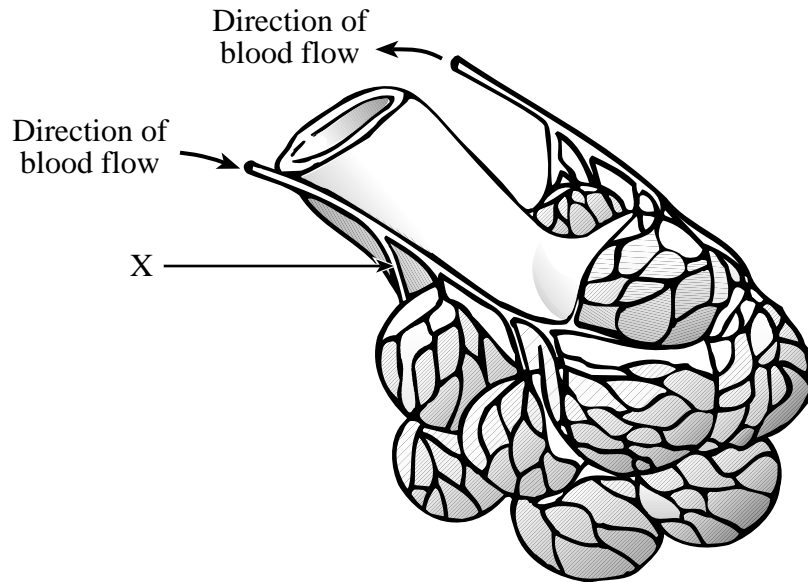
42. Which of the following is an example of internal respiration?

- A. $\text{H}^+ + \text{HCO}_3^- \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$.
- B. $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 6\text{CO}_2 + 38 \text{ ATP}$.
- C. Diffusion of oxygen from the alveoli to the pulmonary vein.
- D. Diffusion of carbon dioxide from the nephron to the renal capillary.

43. The pleural membranes function to

- A. strengthen the thoracic cavity.
- B. stimulate the medulla oblongata.
- C. increase the surface area of the lungs.
- D. maintain negative pressure in the thoracic cavity.

44. Which of the following represents the composition of blood at X shown in the diagram below?

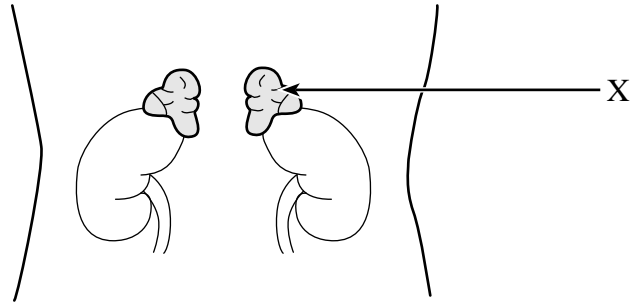


	OXYHEMOGLOBIN (HbO ₂)	BICARBONATE ION (HCO ₃ ⁻)	REDUCED HEMOGLOBIN (HHb)
A.	low	high	high
B.	high	low	low
C.	low	low	high
D.	high	high	low

45. The cilia lining the trachea function to

- A. keep the tract open.
- B. move air down the tract.
- C. stop food from entering the tract.
- D. sweep debris and mucus from the tract.

46. The structure identified by X in the diagram below is the



- A. adrenal gland.
- B. thyroid gland.
- C. hypothalamus.
- D. pituitary gland.

47. A hormone released by the posterior pituitary gland is

- A. gastrin.
- B. glucagon.
- C. parathyroid hormone (PTH).
- D. antidiuretic hormone (ADH).

48. Secretions of growth hormone (GH) cause increased

- A. cell division, protein synthesis and bone growth.
- B. blood glucose levels, adrenalin and gastric secretions.
- C. oxygen uptake, calcium excretion and metabolic activity.
- D. sodium reabsorption, potassium retention and glucose excretion.

49. The hormone aldosterone is involved in the regulation of

- A. the body's metabolic rate.
- B. water excretion by the kidneys.
- C. sodium and potassium levels in the plasma.
- D. calcium and phosphorous levels in the plasma.

50. Which of the following are **immediately** involved when a person is in a “fight or flight” situation?

- | | |
|---------------------|---------------------------|
| 1. Adrenal glands | 4. Thyroid glands |
| 2. Pancreas | 5. Sympathetic system |
| 3. Pituitary glands | 6. Parasympathetic system |

- A. 1, 3
- B. 1, 5
- C. 2, 4
- D. 2, 6

51. The pituitary gland secretes a hormone into the bloodstream which stimulates the production of thyroxin. In turn, production of thyroxin is inhibited by

- A. the effect of thyroxin on the adrenal gland.
- B. the effect of thyroxin on the pituitary gland.
- C. decreasing the amount of calcium in the diet.
- D. increasing the amount of iodine in the blood.

52. The level of calcium in the blood is regulated by

- A. thyroxin.
- B. aldosterone.
- C. parathyroid hormone (PTH).
- D. antidiuretic hormone (ADH).

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

OVER

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. Each of four Biology 12 students carries out the following procedures to determine his/her blood type. Each student is provided with a prepared card with four squares:


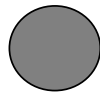



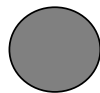










Square **W** is prepared with anti-A solution which causes agglutination in blood containing the A antigen.

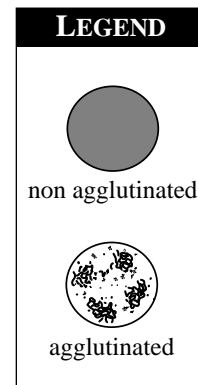
Square **X** is prepared with anti-B solution which causes agglutination in blood containing the B antigen.

Square **Y** is prepared with anti-Rh solution which causes agglutination in blood containing the Rh antigen. Blood which contains the Rh antigen is said to be Rh⁺, while blood without the Rh antigen is said to be Rh⁻.

Square **Z** is a control (no solutions added).

Each student adds a drop of his/her own blood to each square on his/her card. The results are shown below:

	W anti-A	X anti-B	Y anti-Rh	Z control
Student 1				
Student 2				
Student 3				
Student 4				



a) What is the blood type of Student 2? **(1 mark)**

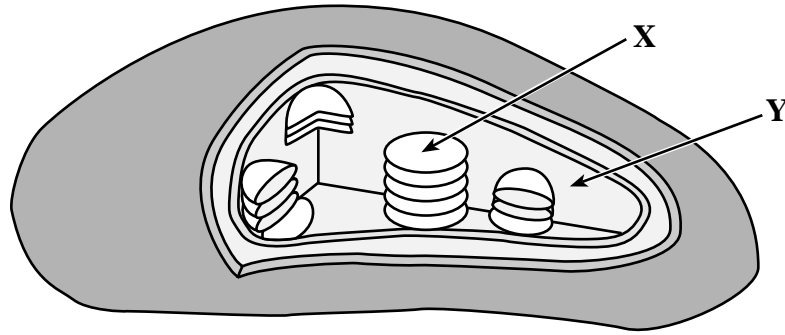
b) Which student(s) may receive a transfusion of A⁺ blood (A-type blood that is Rh⁺) with no ill effect? **(1 mark)**

c) Which student has made an error in his/her exercise? Explain how you know an error was made. **(2 marks)**

d) If Student 1 is a female, what condition should her doctor alert her to if she becomes pregnant? **(1 mark)**

Score for Question 1: 1. _____ (5)

Use the following diagram of a chloroplast to answer question 2.



2. a) Name the photosynthetic sub-reactions which occur in areas **X** and **Y** in the diagram above. **(2 marks: 1 mark each)**

X: _____

Y: _____

- b) Give **one** possible result in each photosynthetic sub-reaction if carbon dioxide is not available to the cell. **(2 marks)**

Sub-reaction X: _____

Sub-reaction Y: _____

Score for
Question 2:

2. _____
(4)

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

a) Cell membrane: **(1 mark)**

b) Ribosome: **(1 mark)**

c) Nucleolus: **(1 mark)**

d) Smooth endoplasmic reticulum: **(1 mark)**

e) Motor neuron: **(1 mark)**

f) Myelin sheath: **(1 mark)**

Score for Question 3: 3. <u> </u> (6)

4. Complete the following table summarizing digestive enzyme activity.

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

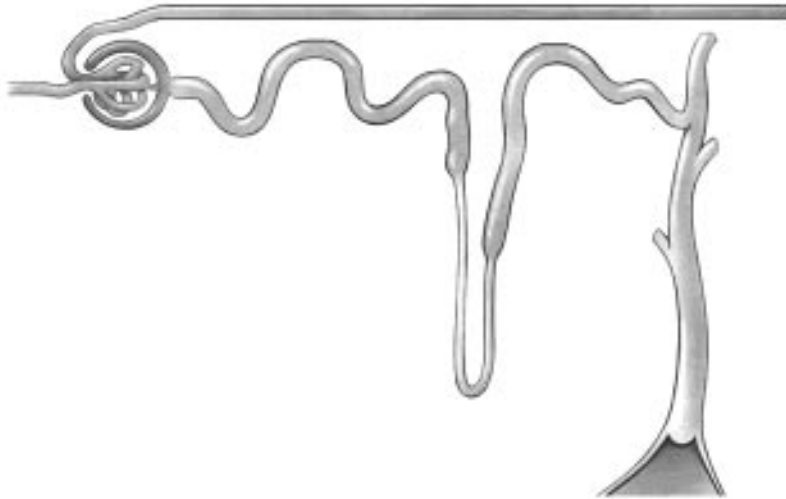
ENZYME	SUBSTRATE	SITE OF ACTIVITY
pepsin		
	fat droplets	
peptidase		
	starch	

Score for
Question 4:

4.
(4)

5. a) On the diagram below, indicate and label the appropriate location for each of the following terms associated with urine formation. **(3 marks)**

- Selective Reabsorption
- Pressure Filtration
- Tubular Excretion (Augmentation)



b) State what happens during each of the following processes.

(3 marks: 1 mark each)

Selective Reabsorption:

Pressure Filtration:

Tubular Excretion:

Score for Question 5: 5. <u> </u> (6)

6. State **one** function of each of the following hormones.

a) Insulin:

(1 mark)

b) Secretin:

(1 mark)

c) Prostaglandins:

(1 mark)

Score for Question 6: 6. _____ (3)

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
neutrophil	
allergy	a) released by T lymphocytes _____
active immunity	b) produces antibodies in the blood _____
B lymphocyte	c) marks the antigen for destruction by other agents _____
immune complex	d) provokes an allergic reaction _____
lymphokine	e) releases histamine when stimulated _____
mast cell	f) phagocytizes bacteria _____
allergen	

2. Define *auto-immune disease* and give **one** example. **(2 marks)**

3. Define *primary* and *secondary immune response*. **(2 marks: 1 mark each)**

Primary immune response: _____

Secondary immune response: _____

Score for Option I:
7. _____ (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
spongy bone	
myosin	a) network of channels and tubules _____
compact bone	b) joins bones to bones _____
immovable joint	c) holds bones of the skull together _____
creatine phosphate	d) regenerates ATP _____
ligament	e) capable of breaking down ATP _____
tendon	f) found in the shaft of long bones _____
sarcoplasmic reticulum	

2. What is the role of calcium in muscle contraction? **(2 marks)**

3. State **two** differences between cartilage and bone. **(2 marks)**

i) _____

ii) _____

Score for Option II: 8. _____ (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
ejaculation	
gastrula	a) usual site of fertilization _____
uterus	b) recognizably human stage of development _____
testis	c) may transport semen or urine _____
blastula	d) produces testosterone _____
urethra	e) propulsion of semen from penis _____
fetus	f) a hollow ball of cells _____
oviduct	

2. Name **two** parts of a mature sperm and state **one** function of each.

(2 marks: $\frac{1}{2}$ mark each for names and $\frac{1}{2}$ mark each for functions)

i) Name: _____

Function: _____

ii) Name: _____

Function: _____

3. Describe how each of the following prevents pregnancy.

a) An IUD (intrauterine device): **(1 mark)**

b) A vasectomy: **(1 mark)**

Score for
Option III:

9. _____
(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
protoplast	
DNA probe	a) stage of mitosis when chromatids move to poles _____
replication	b) method by which DNA is copied _____
ligase	c) a plant cell without a cell wall _____
telophase	d) sticks DNA bases to complementary bases _____
anaphase	e) contains genetic material from two organisms _____
recombinant DNA	f) used to diagnose certain diseases _____
conjugation	

2. a) Describe the surgical procedure of amniocentesis. **(2 marks)**

- b) List **one** benefit and **one** drawback of using amniocentesis. **(2 marks: 1 mark each)**

Benefit:

Drawback:

Score for
Option IV:

10. _____
(10)

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
anaplasia	
metastasis	a) regulates the activity of an oncogene _____
interferon	b) disorganized cell growth _____
enhancer	c) causes secondary tumors _____
leukemia	d) cancer of the blood _____
sarcoma	e) can change a proto-oncogene into an oncogene _____
radiation	f) a tumor that does not metastasize _____
benign	

2. Give the function of the following cells in fighting cancer.

a) Cytotoxic (killer) T cells: **(1 mark)**

b) B cells: **(1 mark)**

3. State **two** effects of oncogenes on a cell. **(2 marks)**

i) _____

ii) _____

Score for Option V: 11. _____ (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
chemoreceptor	
fovea	a) fibrous, protective layer of the eye _____
middle ear	b) hair cell for hearing _____
vitreous humor	c) found behind lens for refracting light _____
mechanoreceptor	d) secreted by the ciliary body _____
aqueous humor	e) area of cone concentration _____
semicircular canal	f) amplifies sound _____
sclera	

2. State where in the inner ear otoliths are located, and explain how they function. **(2 marks: 1 mark ea**

Location: _____

Function: _____

3. State **one** characteristic of and **one** possible cause for cataracts. **(2 marks: 1 mark each)**

Characteristic: _____

Possible cause: _____

Score for Option VI: 12. _____ (10)

END OF EXAMINATION