INSERT STUDENT I.D. NUMBER (PEN)

STICKER IN THIS SPACE

AUGUST 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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FOR OFFICE USE ONLY

INSERT STUDENT I.D. NUMBER (PEN)

STICKER IN THIS SPACE

_____ – _____

BIOLOGY 12 AUGUST 1996 PROVINCIAL

Course Code = BI Examination Type = P

1. _____ (6)

2. _____ (4)

3. _____ (6)

4. _____ (6)

5. _____ (6)

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

Option I: 6. _____ (10)

Option II: 7. _____ (10)

Option III: 8. _____ (10)

Option IV: 9. _____ (10)

Option V: 10. _____ (10)

Option VI: 11. _____ (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:	5 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. Organisms maintain pH at a constant level through the use of

   A. salts.
   B. water.
   C. buffers.
   D. carbohydrates.

2. An unsaturated fat could be changed into a saturated fat if

   A. peptide bonds were broken.
   B. hydrogen atoms were added.
   C. glycerol molecules were added.
   D. fatty acid chains were shortened.

3. Which of the following describes hydrolysis?

   A. Taking up excess hydroxide ions.
   B. Making a polymer by removing water.
   C. Making water by combining an acid and a base.
   D. Adding water to break a polymer into unit molecules.

4. The major component of a plant cell wall is a product formed from the dehydration synthesis of

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

5. Which of the following is correct?

		EUKARYOTIC CELLS	PROKARYOTIC CELLS
A.	Ribosomes	absent	present
B.	Mitochondria	present	absent
C.	Cell membrane	present	absent
D.	Endoplasmic reticulum	absent	absent

OVER

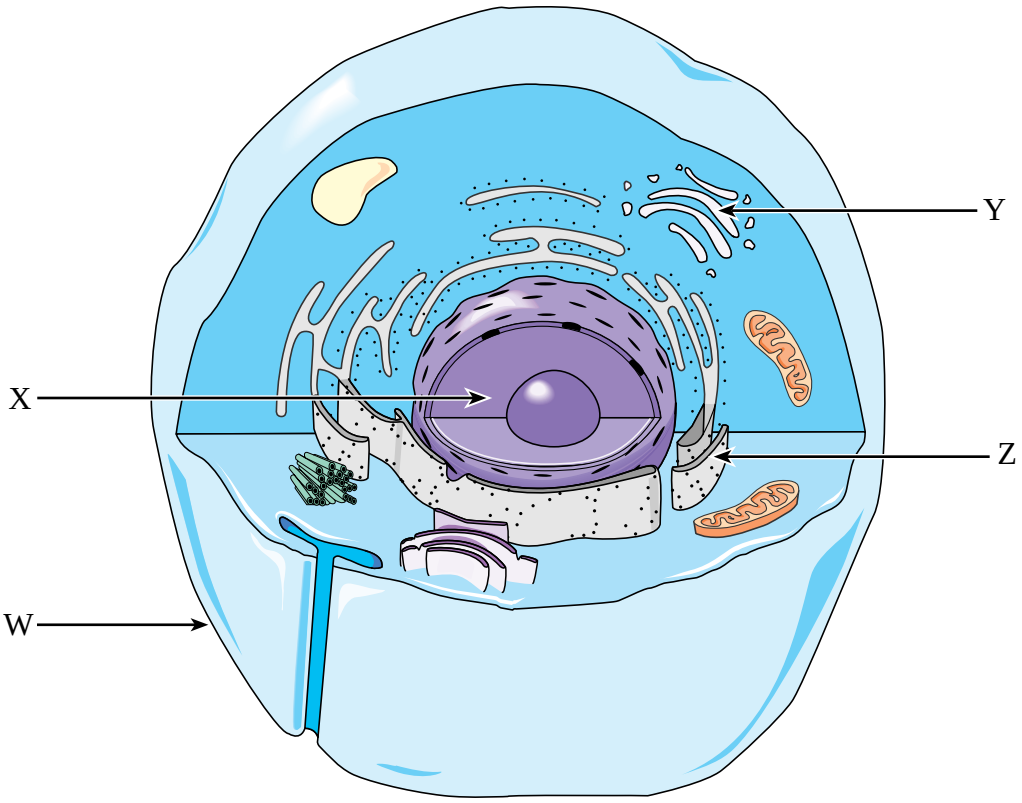
6. One of the components of a cell's cytoskeleton is composed of

   A. plastids.
   B. cytoplasm.
   C. microtubules.
   D. chromosomes.

7. Which organelle functions as a storage and packaging site?

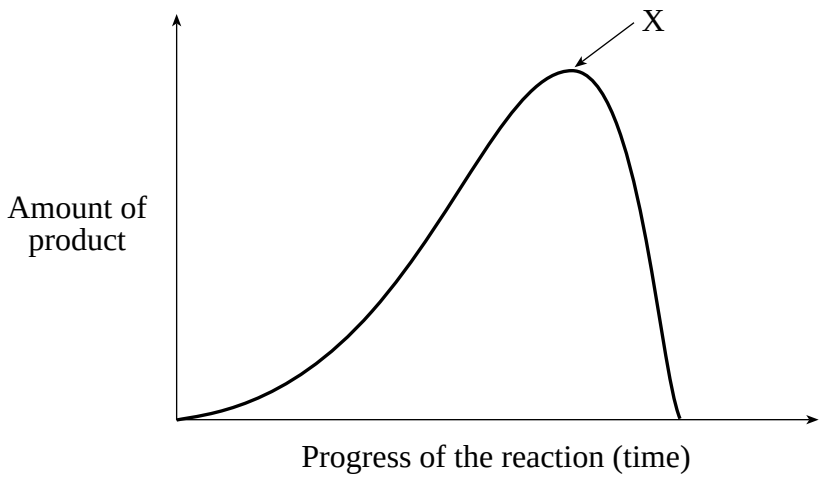
   A. Ribosome.
   B. Lysosome.
   C. Mitochondrion.
   D. Golgi apparatus.

8. During the production and secretion of a protein, in what order would the structures shown below be involved?



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

9. The graph below shows the rate of product formation in an enzyme-catalyzed reaction.



The change observed at **X** could result from the addition of

A. lead.
B. a coenzyme.
C. more enzyme.
D. more substrate.

10. Glycolysis occurs in the

A. grana.
B. cristae.
C. cytoplasm.
D. mitochondrial matrix.

11. In an experiment, human muscle tissue is placed in a nutrient solution. If the oxygen supply to the tissue is discontinued, which of the following substances would be found in **greater** amounts?

A. Alcohol.
B. Glucose.
C. Lactic acid.
D. Carbon dioxide.

12. Autotrophs are able to convert

A. heat energy into inorganic molecules.
B. inorganic molecules into light energy.
C. the sun's energy into inorganic molecules.
D. inorganic molecules into organic molecules.

OVER

13. In the plant cell, chlorophyll is located in the

A. grana.
B. matrix.
C. stroma.
D. vacuole.

14. Which of the following is a connective tissue?

A. Skin.
B. Brain.
C. Blood.
D. Muscle.

15. Emulsification of fat is the function of

A. bile.
B. lipase.
C. pepsin.
D. sodium bicarbonate $\left(NaHCO_3\right)$.

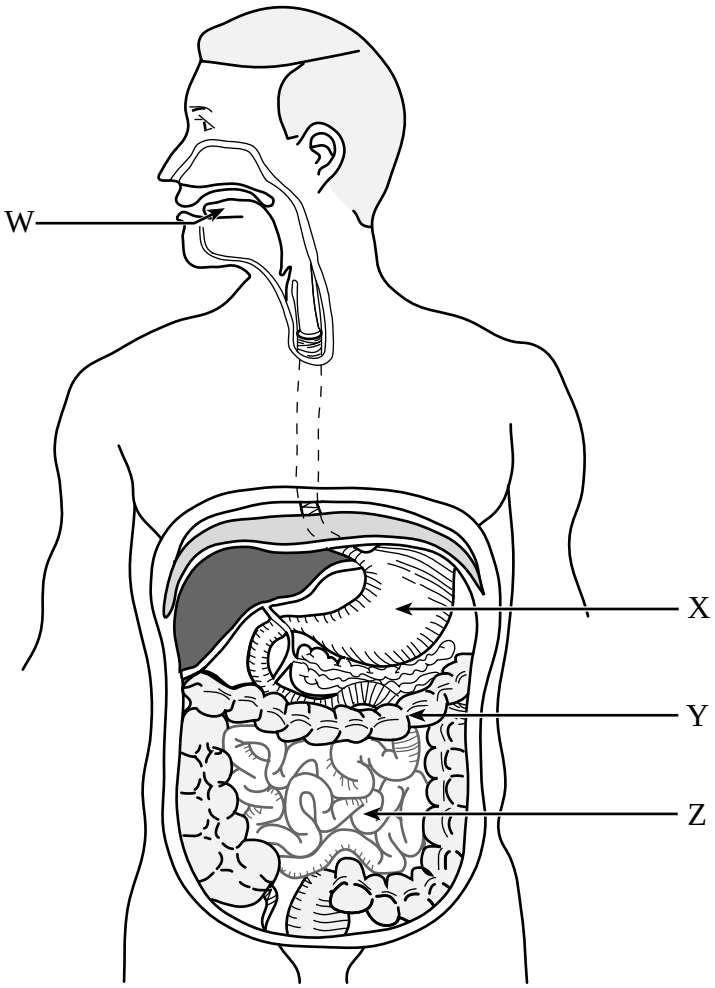
16. The **main** source of energy in food is

A. proteins.
B. vitamins.
C. nucleic acids.
D. carbohydrates.

17. Chewing food aids digestion by

A. stimulating the release of bile.
B. increasing the surface area of the food.
C. breaking up large protein molecules into peptides.
D. completing the chemical breakdown of carbohydrates.

18. Which organ in the diagram below is **specialized** for the absorption of water?



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

19. Bread that has been partially digested by saliva tends to have a sweet taste. Which enzyme and substrate are involved?

A. Pepsin and starch.
B. Pepsin and protein.
C. Amylase and starch.
D. Amylase and protein.

OVER

20. Which of the following carries out chemical digestion?

A. Insulin.
B. Gastrin.
C. Trypsin.
D. Secretin.

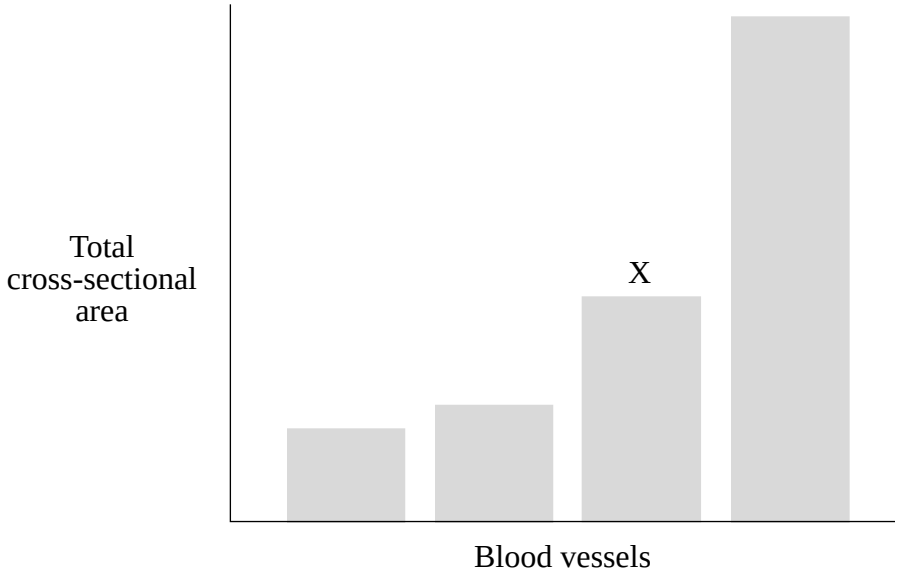
21. A role of hydrochloric acid in the stomach is to

A. kill bacteria.
B. hydrolyze fat.
C. digest protein.
D. activate trypsin.

22. The release of cholecystokinin (CCK) would **most likely** be triggered after a meal of

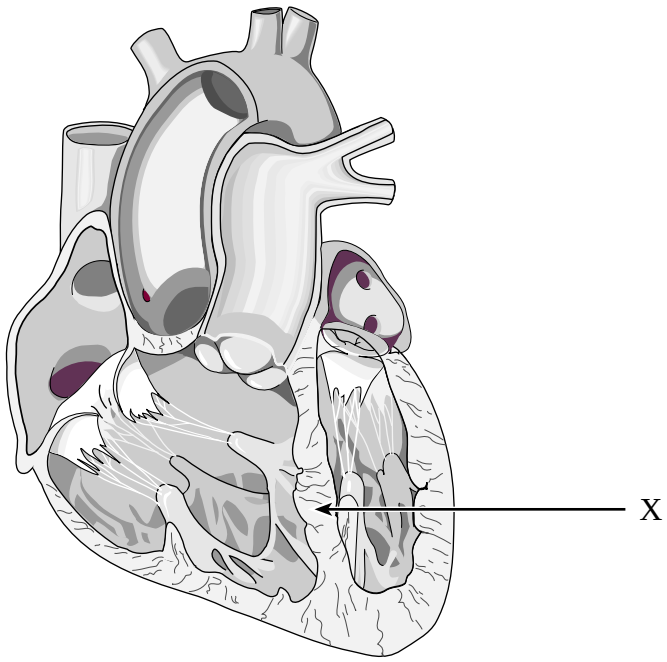
A. fruit.
B. meat.
C. bread.
D. lettuce.

23. Which of the following vessels would be represented by **X** in the graph below?



A. Veins.
B. Arteries.
C. Arterioles.
D. Capillaries.

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



A. septum.
B. left ventricle.
C. semilunar valve.
D. chordae tendineae.

25. The structures attached to the atrioventricular valves are called

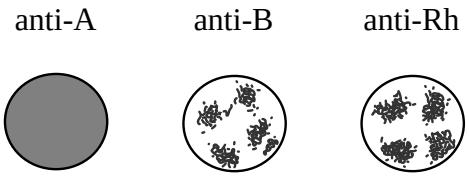
A. atria.
B. pulmonary veins.
C. semilunar valves.
D. chordae tendineae.

26. Which of the following would describe the path of the blood in the pulmonary circuit?

A. Right ventricle → pulmonary trunk → pulmonary vein → left atrium.
B. Left ventricle → pulmonary vein → pulmonary trunk → right atrium.
C. Right ventricle → pulmonary vein → pulmonary artery → left atrium.
D. Right atrium → pulmonary trunk → aorta → vena cava → right atrium.

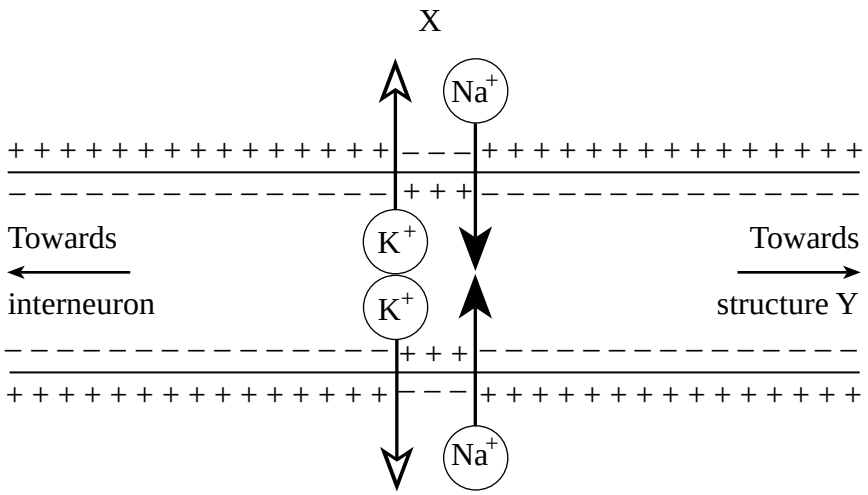
OVER

27. The blood type identified in the test below is



A. A^+
B. AB^-
C. B^+
D. O^+

28. In the diagram below, the action potential at **X** is moving



A. from an interneuron towards a muscle located at **Y**.
B. towards an interneuron from a muscle located at **Y**.
C. towards an interneuron from a receptor located at **Y**.
D. from an interneuron towards a receptor located at **Y**.

29. The resting potential in a neuron is maintained by

A. exocytosis.
B. active transport.
C. passive diffusion.
D. facilitated transport.

30. Nerve impulses travel in only one direction because of the location of the

A. effectors.
B. myelin sheath.
C. synaptic vesicles.
D. nodes of Ranvier.

31. Which of the following would increase the heart rate?

A. Corpus callosum.
B. Somatic nervous system.
C. Sympathetic nervous system.
D. Parasympathetic nervous system.

32. In a reflex arc, interneurons initiate nerve impulses in

A. effectors.
B. motor neurons.
C. sensory neurons.
D. sensory receptors.

33. Stimuli coming to the brain are sorted and channelled by the

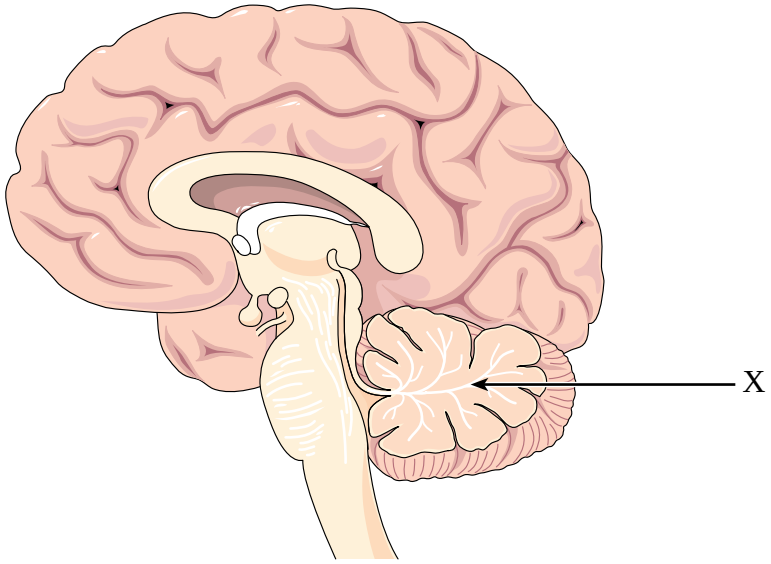
A. thalamus.
B. cerebrum.
C. cerebellum.
D. hypothalamus.

34. A person with a damaged medulla oblongata would have difficulty

A. reading.
B. breathing.
C. tasting food.
D. problem solving.

OVER

35. In the diagram below, the structure labelled **X** controls



A. speech.
B. problem solving.
C. muscle coordination.
D. relaying sensory impulses.

36. Which of the following lobes of the cerebrum is responsible for vision?

A. Frontal.
B. Parietal.
C. Occipital.
D. Temporal.

37. Cilia are found in the

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

38. Hydrogen ions produced during internal respiration will not affect the pH of the blood because the hydrogen ions combine with

A. ammonia to form urea.
B. oxygen to form oxyhemoglobin.
C. hemoglobin to form reduced hemoglobin.
D. carbon dioxide (CO_2) to form carbonic acid (H_2CO_3).

39. Diffusion of carbon dioxide from the intestinal tissues to the mesenteric capillaries is called

A. breathing.
B. internal respiration.
C. cellular respiration.
D. external respiration.

40. The extensive capillary network which surrounds each alveolus

A. prevents the alveoli from collapsing.
B. produces mucus which protects the lungs.
C. increases surface area for the exchange of gases.
D. cools the air so diffusion of gases occurs more quickly.

41. Which of the following is caused by the contraction of the diaphragm?

A. Exhalation.
B. Relaxation of the rib muscles.
C. Downward movement of the rib cage.
D. Increase in volume of the chest cavity.

42. Which of the following conditions would cause the **greatest** increase in the exchange of gases?

	Concentration of CO_2 in pulmonary arterioles	Concentration of O_2 in alveoli
A.	high	high
B.	low	low
C.	high	low
D.	low	high

43. Excretion can be defined as the removal of

A. toxins from the blood.
B. bacteria from the body.
C. metabolic wastes from the body.
D. excess red blood cells from the blood.

44. Production of urea occurs in the

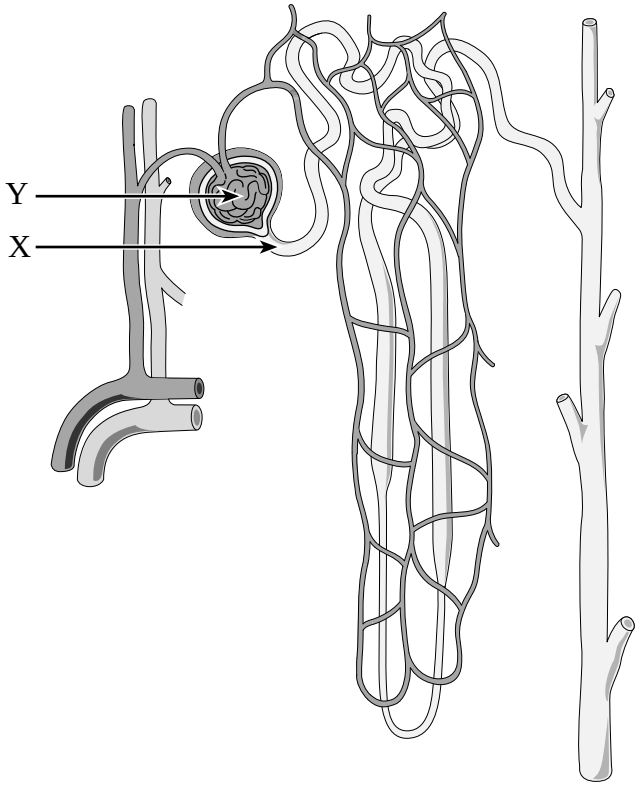
A. skin.
B. liver.
C. lungs.
D. kidneys.

OVER

45. The tonicity of the tissue surrounding the loop of Henle is vital to the maintenance of blood volume because it

A. adjusts the pH of the urine.
B. filters the blood going back to the heart.
C. moves water from the urine back into the blood.
D. moves glucose from the urine back into the blood.

46. In the diagram below, which of the following should be found in structure **Y**, but **not** in **X** ?



A. Urea.
B. Water.
C. Glucose.
D. Formed elements.

47. Which of the following organelles is found in large numbers in the cells which line the proximal convoluted tubule?

A. Cilia.
B. Mitochondria.
C. Golgi apparatus.
D. Rough endoplasmic reticulum.

48. Increased levels of aldosterone cause

A. acidic blood.
B. hypotonic urine.
C. low blood pressure.
D. decreased urine production.

49. The two categories of hormones are

A. fats and steroids.
B. lipids and enzymes.
C. peptides and steroids.
D. peptides and enzymes.

50. If there is no dietary source of glucose, which series of hormones will be released?

A. Hypothalamic releasing hormone, insulin, glucagon.
B. Hypothalamic releasing hormone, adrenocorticotropic hormone, cortisol.
C. Hypothalamic releasing hormone, thyroid stimulating hormone, thyroxin.
D. Hypothalamic releasing hormone, gonadotropic hormone, luteinizing hormone.

51. A woman who exhibits male secondary sexual characteristics may have a tumor in her

A. ovary.
B. pancreas.
C. thyroid gland.
D. adrenal gland.

52. Prostaglandins are synthesized from

A. proteins.
B. glycogen.
C. carbohydrates.
D. phospholipids.

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. The following procedure was conducted to observe the effect of pH on the rate of enzyme activity.

   - 10 mL of a starch solution was added to each of 5 lettered test tubes.
   - A different pH buffer was added to each tube resulting in the pH shown in the table below.
   - An equal amount of a starch-digesting enzyme was added to each tube.
   - Fresh samples were taken from **each tube every minute** and tested with IKI, an indicator that turns from yellow to black when mixed with starch.

   Results are recorded in the table below:

Test tube	pH of the solution	Colour of a sample when IKI was added after:			
		1 minute	2 minutes	3 minutes	4 minutes
V	5	black	black	yellow	yellow
W	6	black	yellow	yellow	yellow
X	7	black	black	yellow	yellow
Y	8	black	black	black	yellow
Z	9	black	black	black	black

a) What do the results indicate is present in **all** the test tubes at one minute?

(1 mark)

b) What new substance is present in test tube **X** at three minutes? **(1 mark)**

_____

c) Which test tube has the optimal pH for the enzyme? Explain your choice. **(2 marks)**

_____

_____

d) After one hour, a sample from test tube **Z** still turned black. Using the lock and key model of enzyme action, explain these results. **(2 marks)**

_____

_____

Score for Question 1:

1. _____ (6)

OVER

2. State **one** role of each of the following.

a) Phospholipids: **(1 mark)**

b) tRNA: **(1 mark)**

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

d) Cell wall: **(1 mark)**

Score for Question 2:

2. _____ (4)

3. a) Describe the three steps of DNA replication. **(3 marks)**

b) Where in the cell does DNA replication occur? **(1 mark)**

c) What is the purpose of DNA replication? **(1 mark)**

d) Which base is found in DNA but **not** in RNA? **(1 mark)**

Score for Question 3:

3. _____ (6)

OVER

4. In the table below, state **one** function of each vessel and describe the vessel's structure that facilitates this function. **(6 marks: 1 mark for function, 1 mark for structure)**

VESSEL	FUNCTION	STRUCTURE
Arteries		
Veins		
Capillaries		

Score for Question 4:

4. _____ (6)

5. For each of the following hormones, identify its source and state its function.

(6 marks: 1 mark for source, 1 mark for function)

HORMONE	SOURCE	FUNCTION
Insulin		
Thyroxin		
Growth Hormone (GH)		

Score for Question 5:

5. _____ (6)

OVER

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
allergy	
multiple sclerosis	a) matures into a plasma cell _____
booster shot	b) second exposure to a vaccine _____
monoclonal antibody	c) responsible for cell mediated immunity _____
killer or cytotoxic T cell	d) antibody attack of the myelin sheath _____
B lymphocyte	e) overactive IgE antibody response _____
rheumatoid arthritis	f) type of antibody produced *in vitro* _____
antigen	

2. Name the causative agent of AIDS and give **one** type of host cell affected by this agent. **(2 marks)**

_____

_____

_____

3. State **two** ways in which organ rejection can be minimized. **(2 marks: 1 mark each)**

i) _____

_____

ii) _____

_____

Score for Option I:

6. _____ (10)

OVER

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	
ligament		
Haversian canal	a) site of blood cell production	_____
tendon	b) thin filament that moves during muscle contraction	_____
osteomyelitis	c) the wall of the esophagus	_____
smooth muscle	d) connects muscles to bones	_____
actin	e) surrounded by concentric circles of osteocytes	_____
osteoporosis	f) infection of the bone	_____
spongy bone		

2. List **two** functions of the vertebral column. **(2 marks: 1 mark each)**

i) _____

_____

ii) _____

_____

3. Explain the role of myosin in muscle contraction. **(2 marks)**

_____

_____

_____

_____

Score for Option II:

7. _____ (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	
in-vitro fertilization testosterone implantation differentiation spermatogenesis rhythm method morphogenesis acrosome	a) production of sperm b) egg and sperm are combined in a laboratory c) a cap on the head of the sperm d) embryo embeds itself in the endometrium e) avoiding sex around the time of ovulation f) cells take on a specific structure and function	_____ _____ _____ _____ _____ _____

2. List **two** components of semen. **(2 marks: 1 mark each)**

   i) _____

   ii) _____

3. Complete this table which summarizes the ovarian and uterine cycles. **(2 marks: 1 mark each)**

	OVARY	UTERUS
Days 1-14		• endometrium is shed and then rebuilds.
Days 14-28	• corpus luteum forms and • progesterone is secreted	

Score for Option III:
8. _____ (10)

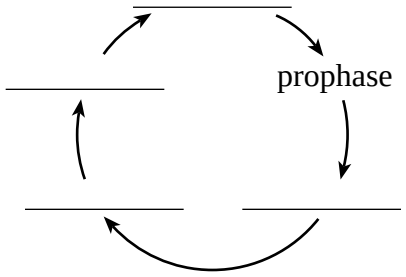
OVER

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	
meiosis mitosis conjugation DNA probe protoplast Turner syndrome trisomy replication	a) having an extra chromosome (e.g. XXY)	_____
	b) plant cell with cell wall removed	_____
	c) caused from lack of a second sex chromosome (XO)	_____
	d) cell division which occurs during growth	_____
	e) used to determine if the patient has a genetic disease	_____
	f) nuclear material of one cell is transferred to another cell	_____

2. Fill in the blanks in the cell cycle of a eukaryote as outlined below. Make sure the stages are in the correct order. **(2 marks: $\frac{1}{2}$ mark each)**



3. Give **two** safeguards that scientists have suggested to ensure safe use of viruses and bacteria in genetic engineering. **(2 marks: 1 mark each)**

i) _____

_____

ii) _____

_____

Score for Option IV:

9. _____ (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		
sarcoma	a) cancer of the connective tissue	_____
carcinoma	b) activates immune system	_____
interleukin	c) increased circulatory development	_____
benign	d) DNA that causes uncontrolled cell growth	_____
vascularization	e) cancer of the epithelial tissue	_____
oncogene	f) a type of tumor that does not spread	_____
malignant		

2. Explain the roles of initiators and promoters in the development of a cancerous tumor. **(2 marks: 1 mark each)**

   Initiators: _____

   _____

   Promoters: _____

   _____

3. What is a retrovirus? How can it affect normal cell function? **(2 marks)**

   _____

   _____

   _____

   _____

Score for Option V:
10. _____ (10)

OVER

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	
sclera		
static equilibrium	a) build up of aqueous humor	_____
cataract	b) controls the shape of the lens	_____
ciliary body	c) knowledge of angular motion	_____
photoreceptor	d) involves movement of the otoliths	_____
iris	e) found in the retina	_____
glaucoma	f) controls entrance of light	_____
dynamic equilibrium		

2. Arrange the following structures in the order in which sound waves travel to reach the auditory nerve. **(2 marks: $\frac{1}{2}$ mark each)**

Tympanic membrane
Auditory canal
Ossicles
Cochlea

1st: _____

2nd: _____

3rd: _____

4th: _____

3. Describe the function of the rods in the eye. **(2 marks)**

_____

_____

_____

Score for Option VI:

11. _____ (10)

END OF EXAMINATION