

# JUNIOR LYCEUM ANNUAL EXAMINATIONS 2010

Directorate for Quality and Standards in Education  
Educational Assessment Unit

BIOLOGY – FORM 4  
TIME: 1H 30MIN

NAME: \_\_\_\_\_

CLASS: \_\_\_\_\_

Question No.	Section A							Section B				
	1	2	3	4	5	6	7	1	2	3	4	5
Max mark	5	5	8	8	7	11	11	15	15	15	15	15
Actual mark												<b>TOTAL MARK</b>

85% Theory Paper	15% Practical	100% Final Score

## Section A

Answer ALL questions in this section.

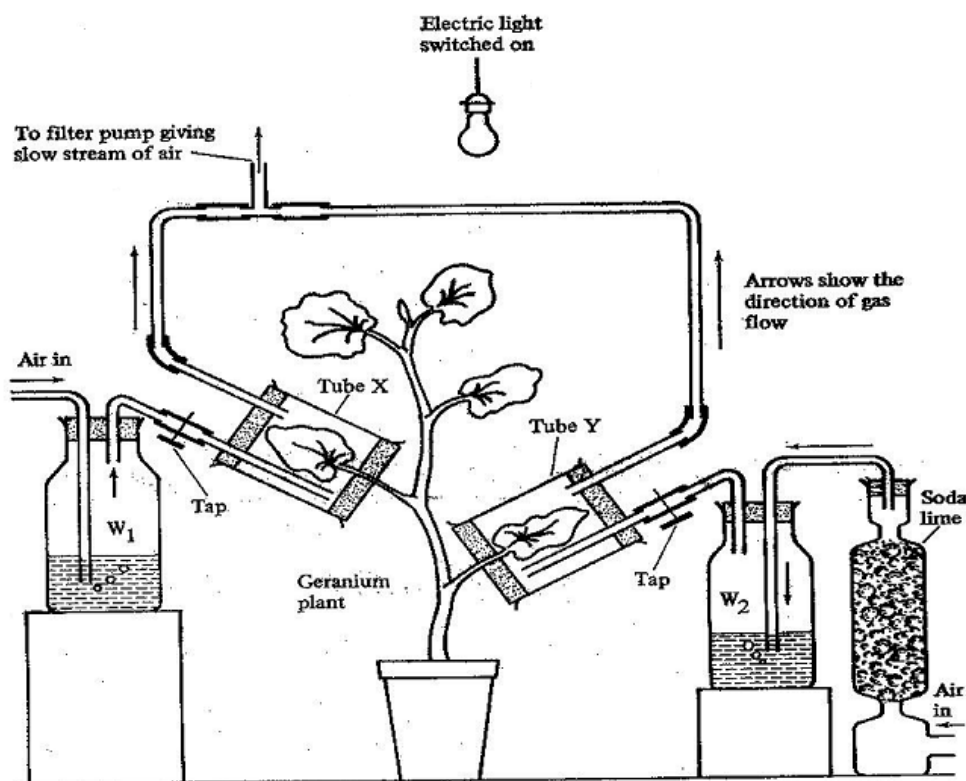
1. Write the term that best describes **each** of the following descriptions:

Description	Term
The building blocks of protein	
The energy released during respiration	
The chemical elements present in carbohydrates	
The disaccharide made up of two glucose molecules joined together	
The liquid part of blood	

(1, 1, 1, 1, 1 mark)

**Total: 5 marks**

2. The following apparatus was set up to investigate the factors necessary for photosynthesis. Bottles W1 and W2 contained distilled water. The geranium plant used in the investigation was illuminated continuously and watered regularly. Before the setting up of the experiment the geranium plant was kept in a dark cupboard for three days.



- a. What is being investigated with the apparatus shown above?

(1 mark)

- b. Why is destarching an essential process before starting the investigation?

\_\_\_\_\_ (1 mark)

- c. What test would you carry out to decide whether photosynthesis had taken place after the investigation had been set up for three days?

\_\_\_\_\_ (1 mark)

- d. The apparatus needs to be re-used to investigate the effect of light on the process of photosynthesis. List TWO modifications that need to be carried out to the apparatus such that the investigation can be carried out.

\_\_\_\_\_ (2 marks)

**Total: 5 marks**

3. After frequent visits to a pond near their school and a long practical study, a class of biology students identified and observed many organisms. The students compiled the following information.

**Pond snails feed on algae and pond-weed.**  
**Pond-skaters feed on water-fleas.**  
**Water beetles feed on water-fleas and mayfly larvae.**  
**Roach feed on pond snails, water-beetles and pond-skaters.**  
**Hydras feed on water-fleas.**  
**Mayfly larvae feed on algae.**  
**Water-fleas feed on algae.**

- a. Use the information above to construct a food web in the space below.

(4 marks)

- b. From the food web, name:

(i) ONE primary consumer \_\_\_\_\_

(ii) ONE tertiary consumer. \_\_\_\_\_ (1, 1 mark)

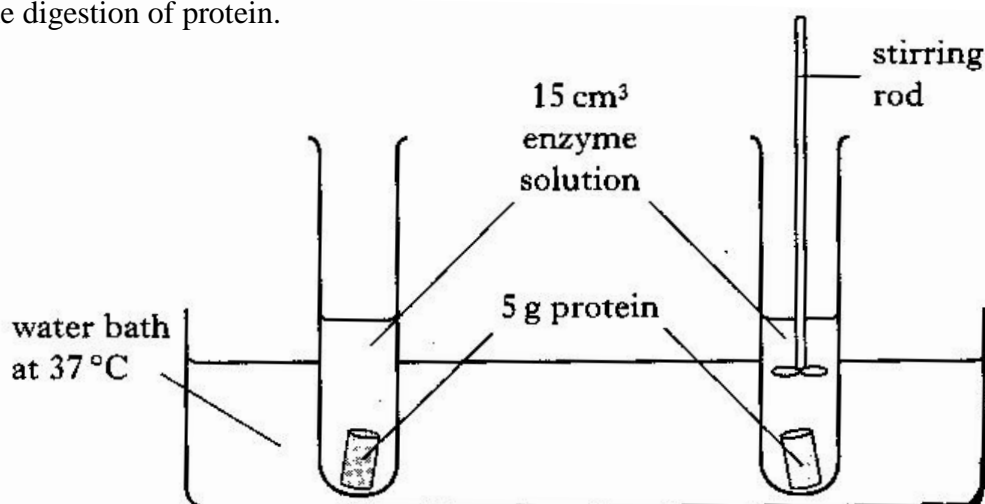
- c. In winter much of the pond becomes covered with ice. Explain the detrimental effect of this.

\_\_\_\_\_ (2 marks)

**Total: 8 marks**

4. Chronic (long lasting) kidney disease is identified by a blood test for creatinine. High levels of creatinine indicate a falling glomerular filtrate and as a result a decreased capability of kidneys to excrete waste products. In persons suffering from chronic kidney disease, the kidney allows the loss of protein and red blood cells into the urine.
- a. The glomerular filtration rate is the volume of fluid filtered from the renal glomerular capillaries into the Bowman's capsule per unit time.
- (i) What is enclosed in the Bowman's capsule?
- \_\_\_\_\_
- (ii) Name the process of filtration of the blood in the Bowman's capsule.
- \_\_\_\_\_
- (iii) Name TWO substances that pass freely into the Bowman's capsule.
- \_\_\_\_\_
- (1, 1, 2 marks)
- b. Name the nitrogenous waste present in urine.
- \_\_\_\_\_ (1 mark)
- c. Urine flows through these structures: the kidney, ureter, urinary bladder and finally the urethra.
- (i) Write the function of the urinary bladder.
- \_\_\_\_\_
- \_\_\_\_\_
- (ii) Explain the changes taking place in the quantity and composition of the urine in a person who played a game of tennis.
- \_\_\_\_\_
- \_\_\_\_\_
- (2 marks)
- d. Describe the kidney's other function besides the excretory function.
- \_\_\_\_\_ (1 mark)
- Total: 8 marks**

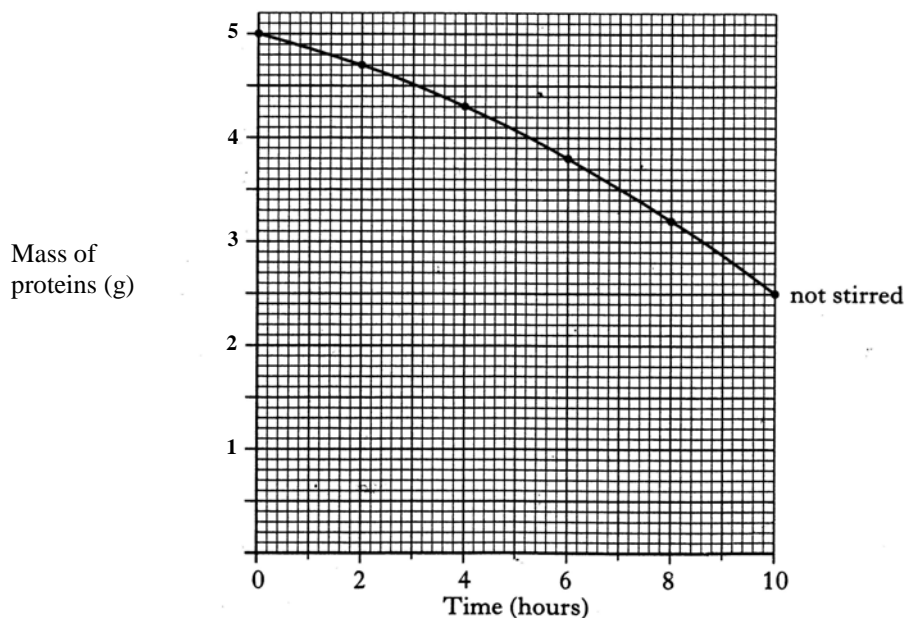
5. The following investigation was set up by a biology student to examine the effect of temperature on the digestion of protein.



The results are shown in the table below.

		Time (hours)					
Mass of protein (g)	<i>not stirred</i>	0	2	4	6	8	10
	<i>stirred</i>	5.0	4.7	4.3	3.8	3.2	2.5
		5.0	4.4	3.6	2.6	1.4	0.0

- a. Use the results in the table to plot the line graph of the protein that was stirred.



(2 marks)

- b. Name the type of enzyme that acts on proteins.

(1 mark)

- c. When the protein was completely digested no solid material remained in the tube. Explain why.

(1 mark)

- d. List TWO factors that need to be exactly the same in both test tubes.

\_\_\_\_\_ (2 marks)

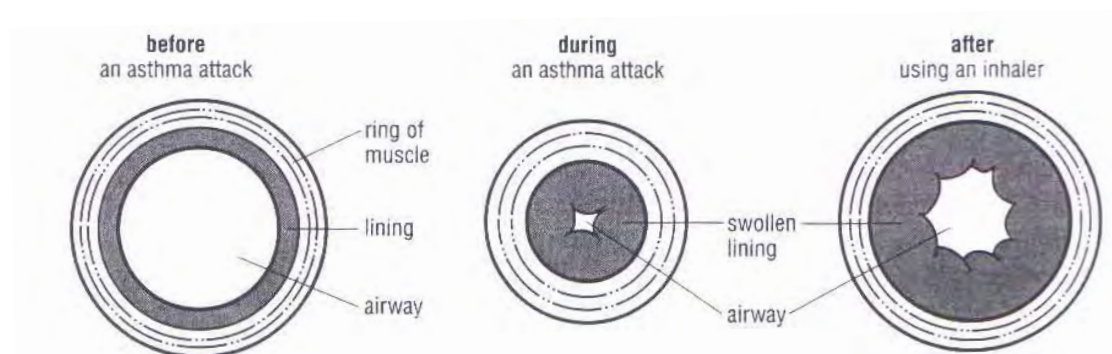
- e. Stirring increased the rate at which the protein was digested. Explain why this happened.

\_\_\_\_\_  
\_\_\_\_\_ (1 mark)

**Total: 7 marks**

6. Asthma is the chronic (long lasting) disorder that is characterised by some restriction of the airways of the lungs due to muscular spasms, inflammation or excess mucus production. As a result breathing becomes more difficult.

- a. The following diagram shows a cross section of one of the bronchioles in the lungs, before an asthma attack, during an asthma attack and after using an inhaler.



- (i) What happens to the airway during the asthma attack?

\_\_\_\_\_

- (ii) Explain the effect of the change you name in (i) in an asthmatic person.

\_\_\_\_\_

- (iii) Suggest how the use of an inhaler, relieves the asthmatic attack.

\_\_\_\_\_

(1, 1, 1 mark)

- b. What happens to air as it passes along the nasal passages?

\_\_\_\_\_

\_\_\_\_\_ (2 marks)

- c. Air pollution can make the situation for asthma sufferers worse. Sulphur dioxide and soot particles with a diameter of  $10\text{ }\mu\text{m}$  or less can provoke an asthma attack.

- (i) List TWO major sources of sulphur dioxide.

\_\_\_\_\_

- (ii) Passive cigarette smoking is also linked to the development of asthma. List ONE measure that helps to limit the effects of passive smoking.

\_\_\_\_\_

- (iii) Recent studies show a relationship between exposure to air pollutants from traffic and the development of childhood asthma. List TWO other air pollutants from traffic.

\_\_\_\_\_ (2, 1, 2 marks)

- d. During very severe attacks an asthma sufferer may turn blue. Explain.

\_\_\_\_\_  
\_\_\_\_\_ (1 mark)

**Total: 11 marks**

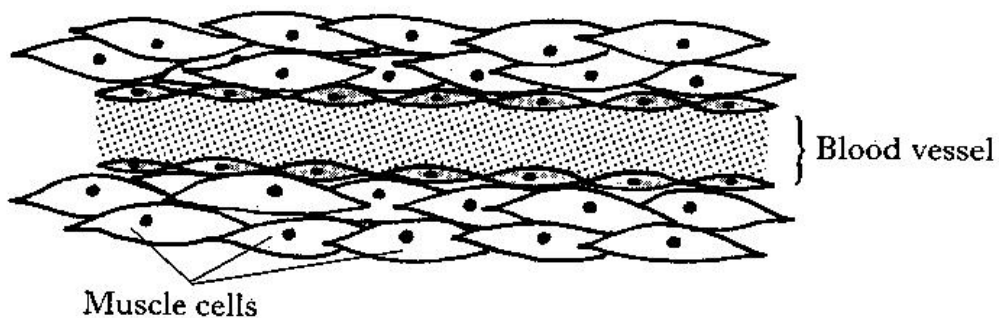
- 7a. Name ONE site in the body where blood cells are made.

\_\_\_\_\_ (1 mark)

- b. Describe TWO ways in which white blood cells fight infection.

\_\_\_\_\_  
\_\_\_\_\_ (2 marks)

- c. The following diagram shows the site of gas exchange between a blood vessel and the muscle cells of a mammal. On the diagram write the letter **H** to indicate an area where the oxygen concentration is relatively high and the letter **L** to indicate a relatively low oxygen concentration.



(2 marks)

- d. What happens to a sample of blood when it is allowed to stand?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (3 marks)



- e. The following table shows the cell composition of three samples of blood.

Cell count (number per mm <sup>3</sup> )	Sample from		
	Sandra	Stephanie	Samira
Red blood cells	7 500 000	5 000 000	2 000 000
White blood cells	500	6000	5000
Platelets	250 000	255 000	50

From the table above name the person who:

- (i) recently lived at high altitude \_\_\_\_\_
- (ii) suffers from anaemia \_\_\_\_\_
- (iii) has inefficient blood clotting. \_\_\_\_\_

(1, 1, 1 mark)

**Total: 11 marks**

## Section B

**Answer question ONE and choose any other TWO. This section carries 45 marks. Write the answers for section B on a foolscap.**

1. Read the following passage and answer the questions that follow.

Two common everyday complaints associated with the large intestine are diarrhoea and constipation. The major cause of diarrhoea is infection of the lower tract such as food poisoning caused by eating contaminated food. In such cases the intestinal wall becomes irritated and peristalsis increases. Water is not absorbed and the diarrhoea that results rids the body of the infectious organisms.

When a person is constipated the faeces are dry and hard. Two components of the diet that can help prevent constipation are water and fibre.

- a. List TWO functions of the large intestine. (2 marks)
- b. What is the importance of peristalsis in the digestive tract? (1 mark)
- c. Explain how water and fibre can help prevent constipation. (2 marks)
- d. Olestra is a substance made to look, taste and act like real fat but the digestive system is unable to digest it. It travels down the length of the digestive system without being absorbed. Therefore it is commonly known as fake fat. Some people who consume olestra experience diarrhoea.
- (i) Name the organ where most absorption takes place in the human gut and list TWO adaptations of it.
- (ii) Draw a diagram to represent a fat molecule.
- (iii) Distinguish between absorption and assimilation. (3, 2, 2 marks)
- e. Explain the importance of bile in the breakdown of fats. (2 marks)
- f. Bile contains hydrogencarbonate. What is the importance of hydrogencarbonate? (1 mark)

**Total: 15 marks**



2. Give a biological explanation for **each** of the following statements:

- Aquatic plants have leaves with a very thin cuticle and stomata on the upper surface.
- Smoking destroys cilia in the respiratory tubes.
- Carbon monoxide reduces the oxygen supply.
- Carbohydrate digestion does not take place in the stomach.
- Lactic acid is poisonous.
- Capillary beds are adapted to their function of exchange of substances.

(2, 2, 3, 2, 3, 3 marks)

**Total: 15 marks**

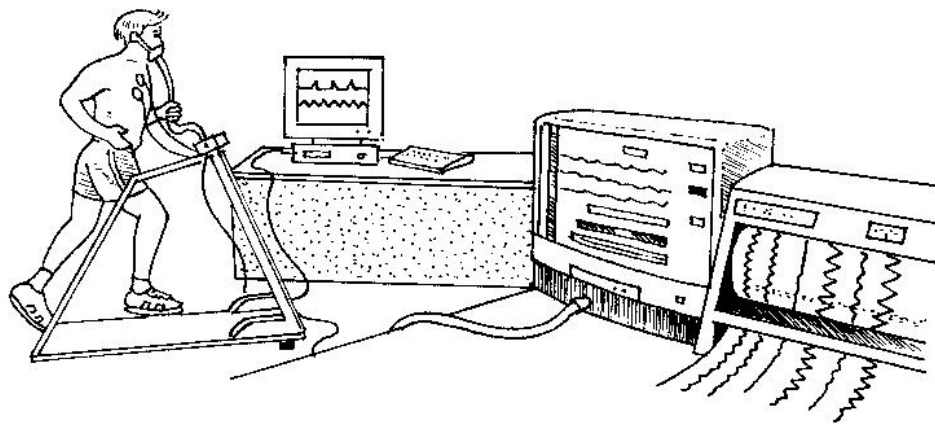
3. Compare and contrast **each** of the following:

- glycogen and starch
- haemoglobin and chlorophyll
- pancreatic amylase and salivary amylase
- the renal artery and the pulmonary artery
- the xylem and the phloem.

(3, 3, 3, 3, 3 marks)

**Total: 15 marks**

4. Alex wanted to know how much oxygen his body used every minute at rest and while running. The following table shows the results obtained when the temperature, heart rate, breathing rate and volume of air per breath were measured, at rest and during exercise.



	Temperature( $^{\circ}$ C)	Heart rate (beats/minute)	Breathing rate (breaths/minute)	Volume of air per breath ( $\text{cm}^3$ )
<i>At rest</i>	36.6	62	12	400
<i>While running</i>	37.2	128	30	900

- Explain why Alex's heart rate increased when running. (3 marks)
- Calculate the difference in the total volume of air breathed per minute at rest and while running. (2 marks)
- About 20% of the air breathed in is oxygen. Calculate how much oxygen Alex breathed in each minute at rest. (1 mark)

- d. Compare:
- (i) the movements of the intercostal muscles
  - (ii) lung volume and pressure during inspiration (breathing in) and expiration (breathing out). (2, 4 marks)
- e. In emphysema the alveoli are distended and their walls are damaged. What is the effect of this on the heart? (3 marks)

**Total: 15 marks**

- 5a. Describe the importance of
- (i) the diastema
  - (ii) chisel-shaped incisors
  - (iii) loose fitting of the upper and lower jaw in rabbits. (1, 1, 1 mark)
- b. Rabbits are primary consumers.
- (i) Define the term primary consumer.
  - (ii) Energy transfer to primary consumers in a food chain amounts to about 5-10%. List ONE reason why the energy transfer to primary consumers is not efficient. (2, 1 mark)
- c. What is a ruminant? (2 marks)
- d. Carnivores often have a large stomach and an active liver. Explain. (3 marks)
- e. Explain the importance of cellulose digesting bacteria in the gut of a cow. (3 marks)
- f. Explain why in sheep the molars and premolars grow continuously throughout the life of the animal. (1 mark)

**Total: 15 marks**