

JUNIOR LYCEUM ANNUAL EXAMINATIONS 2006
EDUCATIONAL ASSESSMENT UNIT- EDUCATION DIVISION

BIOLOGY- FORM IV
 TIME: 1H 30 MIN

NAME: _____

CLASS: _____

Question No.	Section A								Section B					THEORY TOTAL
	1	2	3	4	5	6	7	8	1	2	3	4	5	
Max mark	9	6	6	6	8	6	7	7	15	15	15	15	15	
Actual mark														

85% Theory Paper	15% Practical	100% Final Score

Section A – Answer ALL questions in this section.
This Section carries 55 marks.

1a. Name ONE site in the human body where **each** of the following substances is stored.

- (i) Fat _____
- (ii) Faeces _____
- (iii) Bile _____
- (iv) Iron _____
- (v) Urine _____

(5 marks)

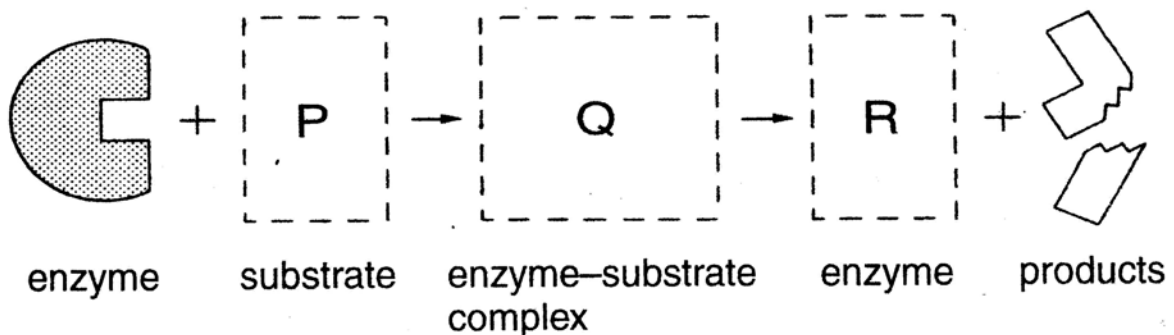
b. Name ONE site in the human body where **each** of the following processes takes place.

- (i) Deamination _____
- (ii) Mechanical breakdown of food _____
- (iii) Peristalsis _____
- (iv) Absorption _____

(4 marks)

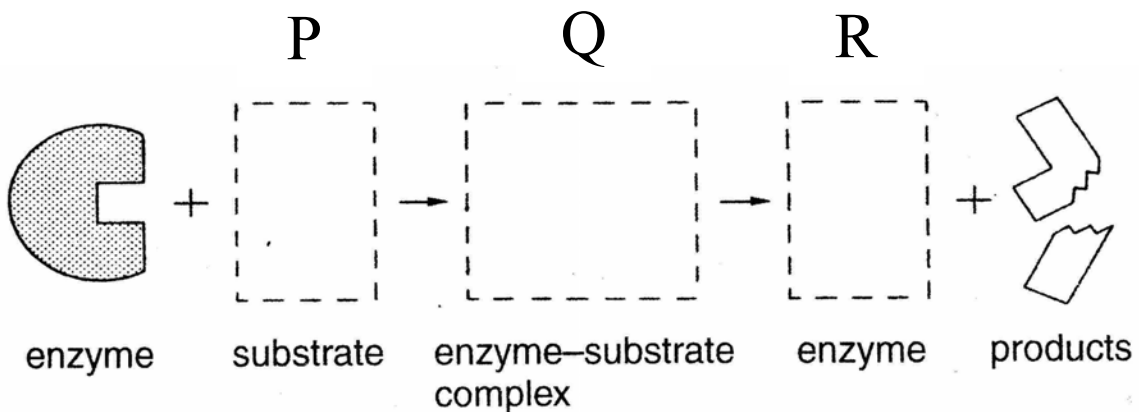
(Total 9 marks)

2. The following diagram represents the action of an enzyme on its substrate.

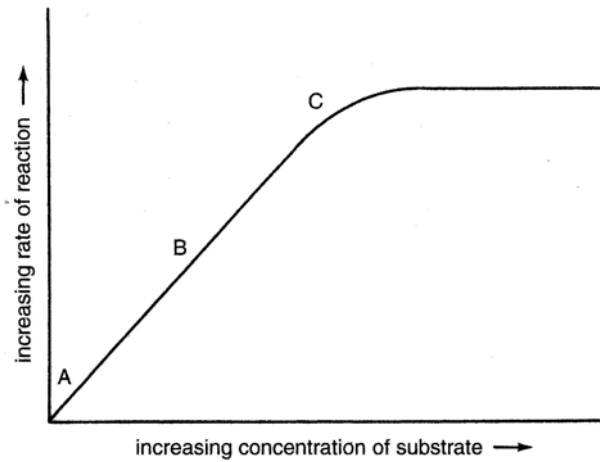


a. In the diagram below replace the boxes P, Q, and R with the missing symbols of molecules.

(3 marks)



b. The graph below summarises the results from an experiment involving an enzyme-controlled reaction, in which the enzyme concentration was kept constant.



Which letter on the graph represents the situation where:

(i) almost all the active sites of the enzymes are freely available for the substrate molecules?

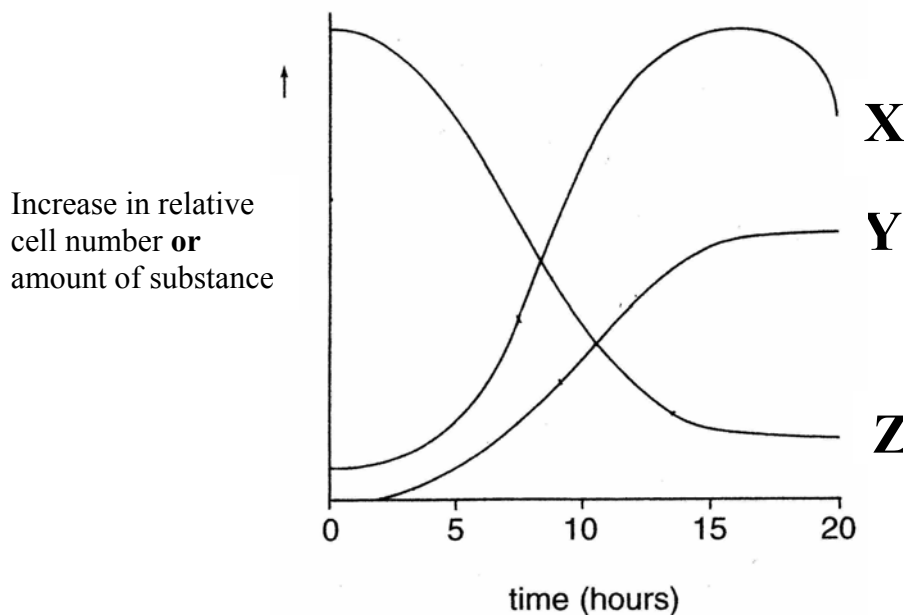
(ii) none of the active sites are freely available for the attachment of substrate molecules?

_____ (2 marks)

c. Suggest what could be done to increase the rate of reaction beyond the level that has been reached in the graph.

_____ (1 mark)
(Total 6 marks)

3. The following graph indicates the results from closely monitoring the changes that take place during the fermentation of wine inside a closed fermenter.



- a. Which letter represents
- (i) the number of living yeast cells? _____
 - (ii) the amount of glucose present in the fermenter? _____
 - (iii) the amount of alcohol present in the fermenter? _____

(3 marks)

- b. In an investigation about wine-making, four test-tubes were set up as shown in the following table.

Condition	Test Tube			
	A	B	C	D
boiled and cooled fruit juice	✓	✓	☉	✓
live yeast	✓	☉	✓	✓
boiled yeast	☉	✓	☉	☉
temperature at 40 ⁰ c	✓	☉	☉	☉
temperature at 30 ⁰ c	☉	✓	✓	✓

✓=present ☉=absent

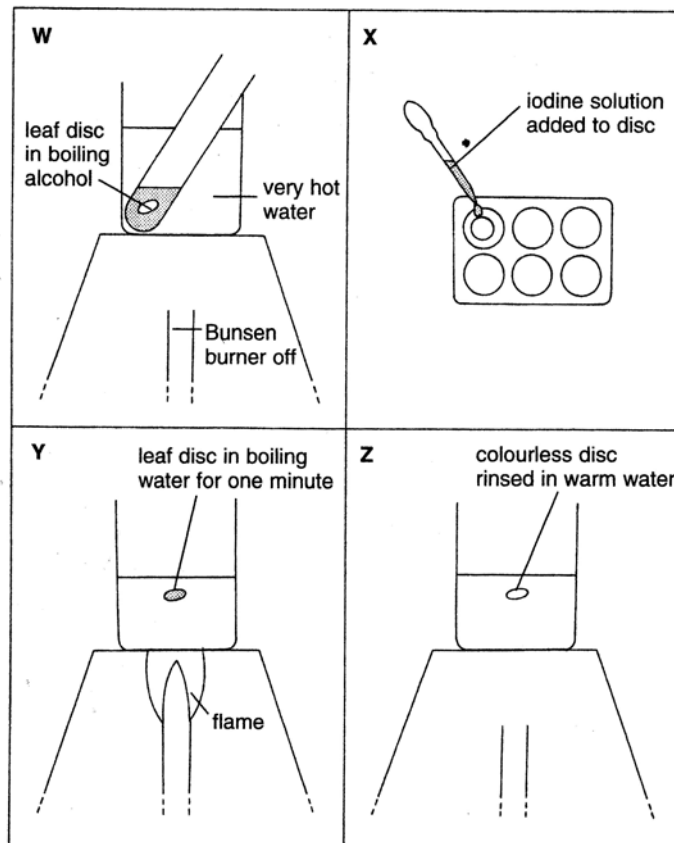
Write the letters of TWO test-tubes in which alcohol is **not** formed.

_____ (2 marks)

- c. Name ONE other industrial process in which yeast performs fermentation.

_____ (1 mark)
(Total 6 marks)

4. A disc was cut from a living leaf. The following diagrams show the steps necessary to carry out the test for the presence of starch in the leaf disc.



- a. Write the letters in order to show the correct sequence of events in the experiment.

_____ (2 marks)

- b. What is the purpose of step W?

_____ (1 mark)

- c. Starch is a polysaccharide

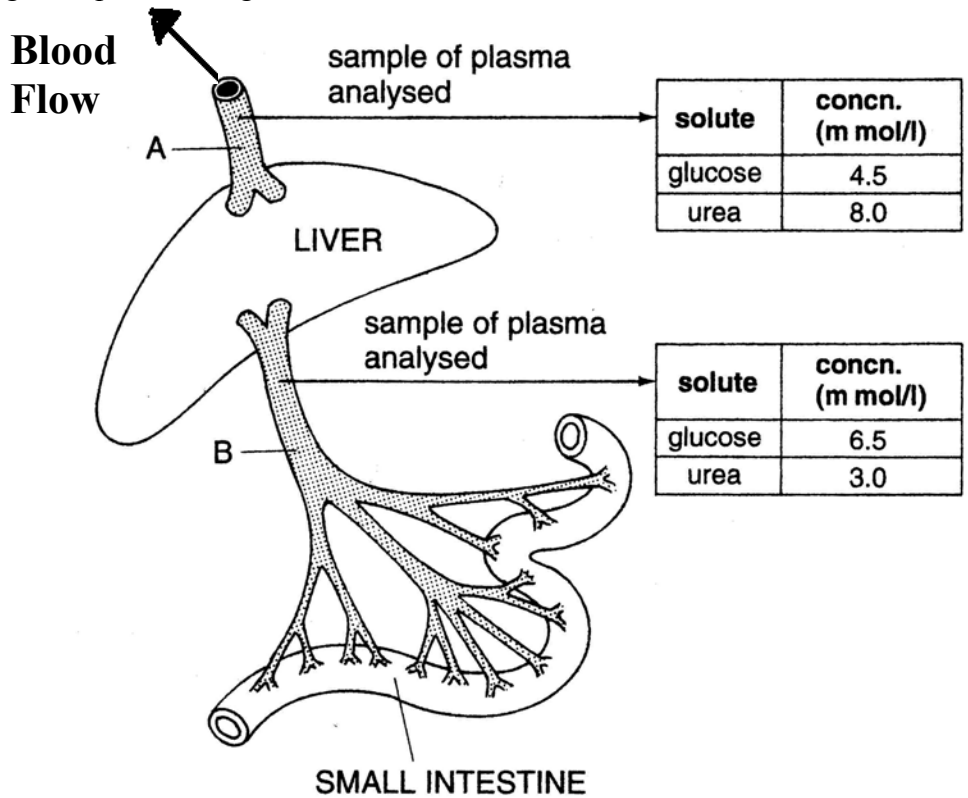
- (i) What is the simplest substance in which starch is broken down?

- (ii) What type of carbohydrate is maltose?

- (iii) Name the digestive enzyme that acts on maltose.

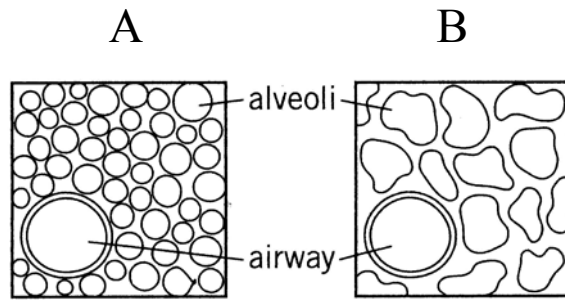
(1, 1, 1 marks)
(Total 6 marks)

5. The following diagram shows two blood vessels associated with the liver and the results of analysing their plasma for glucose and urea.



- a. Name:
- (i) Vessel A _____
- (ii) Vessel B _____ (2 marks)
- b. Explain the change in:
- (i) glucose concentration
- (ii) urea concentration
- that occurs as blood passes through the liver.
- (i) _____ (2 marks)
- (ii) _____ (2 marks)
- c. Name the blood vessel (not shown in the diagram) that brings oxygenated blood to the liver.
- _____ (1 mark)
- d. Predict the concentration of glucose present in the plasma of the blood vessel named in 'c'.
- _____ (1 mark)
- (Total 8 marks)**

6. The following diagram shows areas of lung tissue from two persons: one is a non-smoker, the other is a long term smoker who has developed emphysema.



- a. Which sample of lung tissue is from a non-smoker? Give a reason for your answer.

_____ (1, 1 mark)

- b. How does smoking cause emphysema?

_____ (2 marks)

- c. List ONE symptom of emphysema.

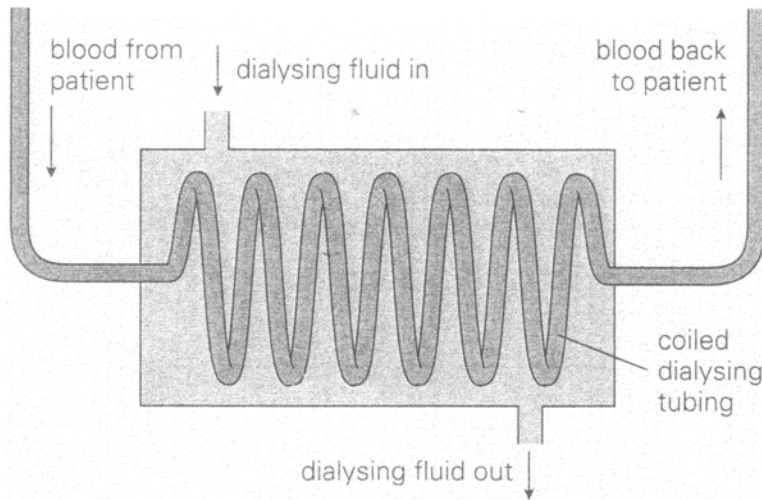
_____ (1 mark)

- d. Air enters the nose through the nostrils and then moves through the nasal passages. What is the function of the fine hairs lining the nasal passages?

_____ (1 mark)

(Total 6 marks)

7. If a person suffers from kidney failure, a kidney dialysis machine may be used. Such a person is usually put on the kidney dialysis machine for three to four hours, and this is repeated three times a week. The dialysis machine functions like a normal kidney. The following diagram shows the kidney dialysis unit.



- a. Name the process by which urea from the patient's blood passes into the dialysing fluid.
- _____
- (1 mark)
- b. What happens to the urea concentration in the blood of a patient using the kidney dialysis machine, between visits to the hospital?
- _____
- (1 mark)
- c. Explain why the dialysing fluid in the kidney dialysis machine has exactly the same concentration of water, glucose and ions as the patient's blood.
- _____
- (1 mark)
- d. Suggest ONE reason why the dialysing tubing is coiled.
- _____
- _____
- (2 marks)
- e. A man produces a total of 180 litres glomerular filtrate in one day.
- (i) If the man produces 1.8 litres of urine per day, what percentage of glomerular filtrate is passed as urine?
- _____
- (1 mark)
- (ii) What happened to the rest of the glomerular filtrate?
- _____
- (1 mark)
- (Total 7 marks)**

8. A food chain rarely occurs in isolation in nature because the producer is normally eaten by several animals which are in turn preyed upon by several different predators. Various parts of an oak tree, for example are eaten by different animals. Bank voles and woodmice feed on the acorns, while the greenfly and the caterpillar feed on oak leaves. Greenflies are eaten by ladybirds. Shrews feed on greenflies, ladybirds and caterpillars, while the weasel feeds on the woodmice and the bank voles. Shrews, woodmice, bank voles and weasels are in turn eaten by the owl. So under natural conditions an ecosystem really contains many inter-connecting food-chains.
- a. Write the term that describes the many inter-connecting food chains present in an ecosystem under natural conditions.

(1 mark)

- b. In the space below construct a diagram to show the links between all the organisms present in the inter-connecting food chains listed in the passage above.

(6 marks)
(Total 7 marks)

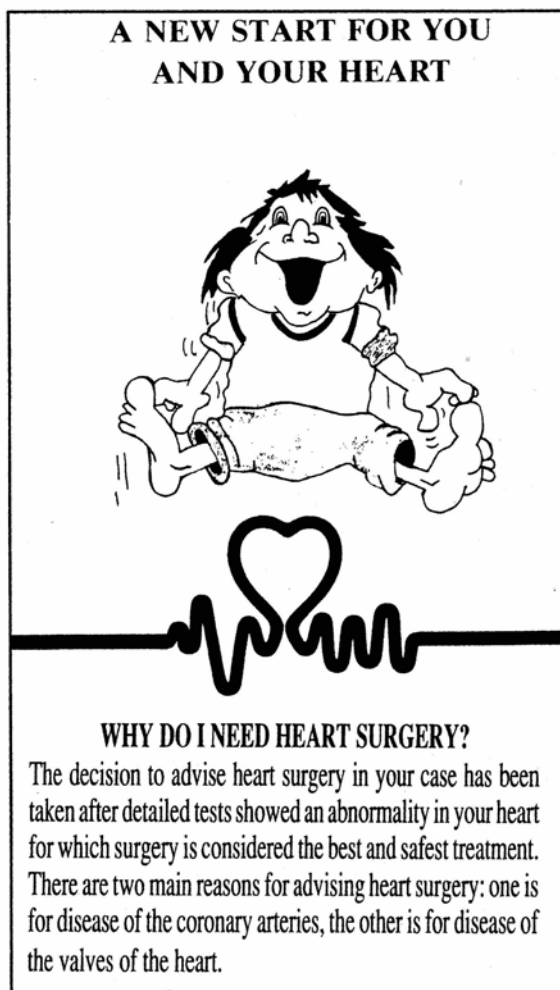
Section B

Answer question 1 and any two others. Each question carries 15 marks.

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

Heart Surgery

Many hospitals produce leaflets like the one below to give to patients who require heart surgery. If such patients understand how their heart works and the nature of their problem, they may face their operation with greater confidence.



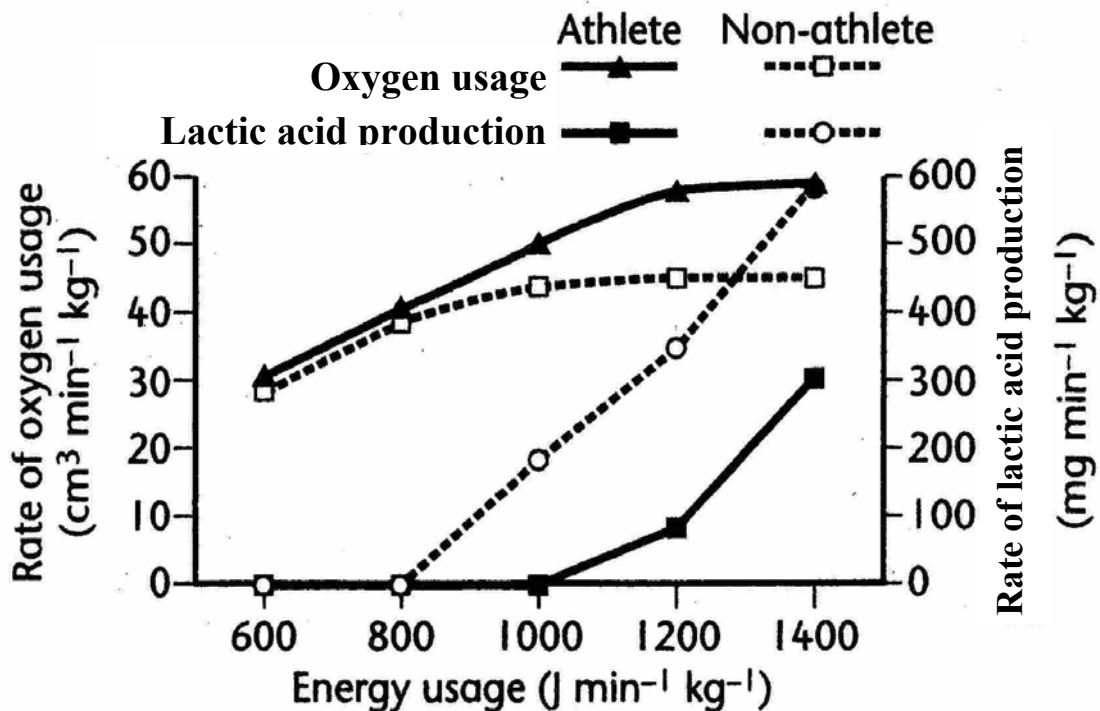
- a. The volume of blood pumped out of the heart each minute is the cardiac output. On average this amounts to 6 litres per minute.
- (i) Calculate the average volume of blood pumped out by the heart in a day. (1 mark)
- (ii) What happens to the cardiac output during physical exercise? (1 mark)
- b. What is the function of valves in the heart? (1 mark)
- c. The atrioventricular valves separate each atrium and ventricle, with the tricuspid valve between the two right chambers and the bicuspid valve between the left chambers. As a result of an illness such as the rheumatic fever, the heart atrioventricular valves become damaged and will not open or close fully.
- If this happens to the bicuspid valve what would the effect on circulation be? (2 marks)

- d. The heart has two other valves called the semi-lunar valves.
- What is happening to the ventricular walls when the semi-lunar valves open?
 - Where does blood flow to when the semi-lunar valves open? (1, 1 mark)
- e. The coronary arteries supply oxygen and nutrients to the heart muscle.
- List TWO ways of reducing the chance of coronary artery disease. (2 marks)
 - Each cardiac muscle cell is within 10 μm of a coronary capillary network compared with the average 60 – 80 μm in other organs. Explain the benefit of the relatively short distance between cardiac muscle cells and the coronary capillary network. (2 marks)
- f. Sometimes a baby is born with a hole between the right and left atria or between the right and left ventricles. Such a baby is diagnosed as a blue baby. Considering that deoxygenated blood appears “blue” explain the effect on the child of this blood flow. (2 marks)
- g. Explain why the pulmonary vein is unlike all the other veins in the human body. (2 marks)
- (Total 15 marks)**

- 2a. Leukaemia is a disease characterised by an abnormally large number of immature white blood cells that fill the red bone marrow and prevent red blood cell development. Name the condition that results due to lack of red blood cell formation and list TWO symptoms of the condition you mention. (1, 2 marks)
- b. Give a biological explanation for **each** of the following statements:
- During the 16th and 17th centuries Captain Cook insisted that all British ship sailors should eat plenty of citrus fruits on long voyages. (2 marks)
 - Fevers that raise the body temperature to over 40⁰C are normally fatal to human beings. (2 marks)
 - Single celled organisms do not need a circulatory system. (3 marks)
 - Placing food in vinegar (ethanoic acid) preserves food. (2 marks)
 - Many mitochondria are present in muscle cells. (3 marks)
- (Total 15 marks)**

- 3a. Describe the skin’s role as:
- an excretory organ
 - a sense organ
 - an organ for protection of the body (2, 2, 3 marks)
- b. In each hair follicle in the skin there is a sebaceous gland.
Name the substance produced by the sebaceous gland and give TWO functions of the substance you mention. (1, 2 marks)
- c. Name the vitamin produced by the skin and explain its importance. (1, 2 marks)
- d. Young children lose heat from their body very quickly when compared to adults. Explain. (2 marks)
- (Total 15 marks)**

4. The following diagram shows the oxygen usage and the production of lactic acid for an athlete and a non-athlete.



- a. Use the graph to compare the oxygen usage for the athlete and the non-athlete, when the energy usage increases. (2 marks)
- b. From the graph list TWO differences between the production of lactic acid in an athlete and a non-athlete. (4 marks)
- c. What is the effect of a build-up of lactic acid? (2 marks)
- d. Name the type of respiration that leads to the production of lactic acid and write a word equation for it. (1, 3 marks)
- e. Carbohydrates are rich sources of energy. Name the polysaccharide storage material found in animals (often called animal starch) and give TWO sites in the body where it is stored. (1, 2 mark)
(Total 15 marks)
- 5a. Write a chemical equation to summarise the process of photosynthesis. (4 marks)
- b. Give a biological explanation for **each** of the following statements:
 (i) The leaves of a plant are often arranged in a leaf mosaic pattern.
 (ii) Aquatic plants have leaves with a very thin cuticle.
 (iii) In some trees there is leaf fall during the cold winter season.
 (iv) The leaves of most plants are often numerous and thin. (2, 1, 1, 2 marks)
- c. (i) Sulphur dioxide damages the palisade cells of the leaf. List ONE source of sulphur dioxide and explain how this gas contributes to acid rain formation. (3 marks)
- (ii) Acid rain promotes the loss of vital soil minerals such as magnesium. Predict the effect of the loss of the mineral magnesium on the plants. (2 marks)
(Total 15 marks)