



UNDERSTANDING O LEVEL BIOLOGY

RESPIRATION, GASEOUS EXCHANGE AND NUTRITION.

Senior four

By Luutu Muhammad.

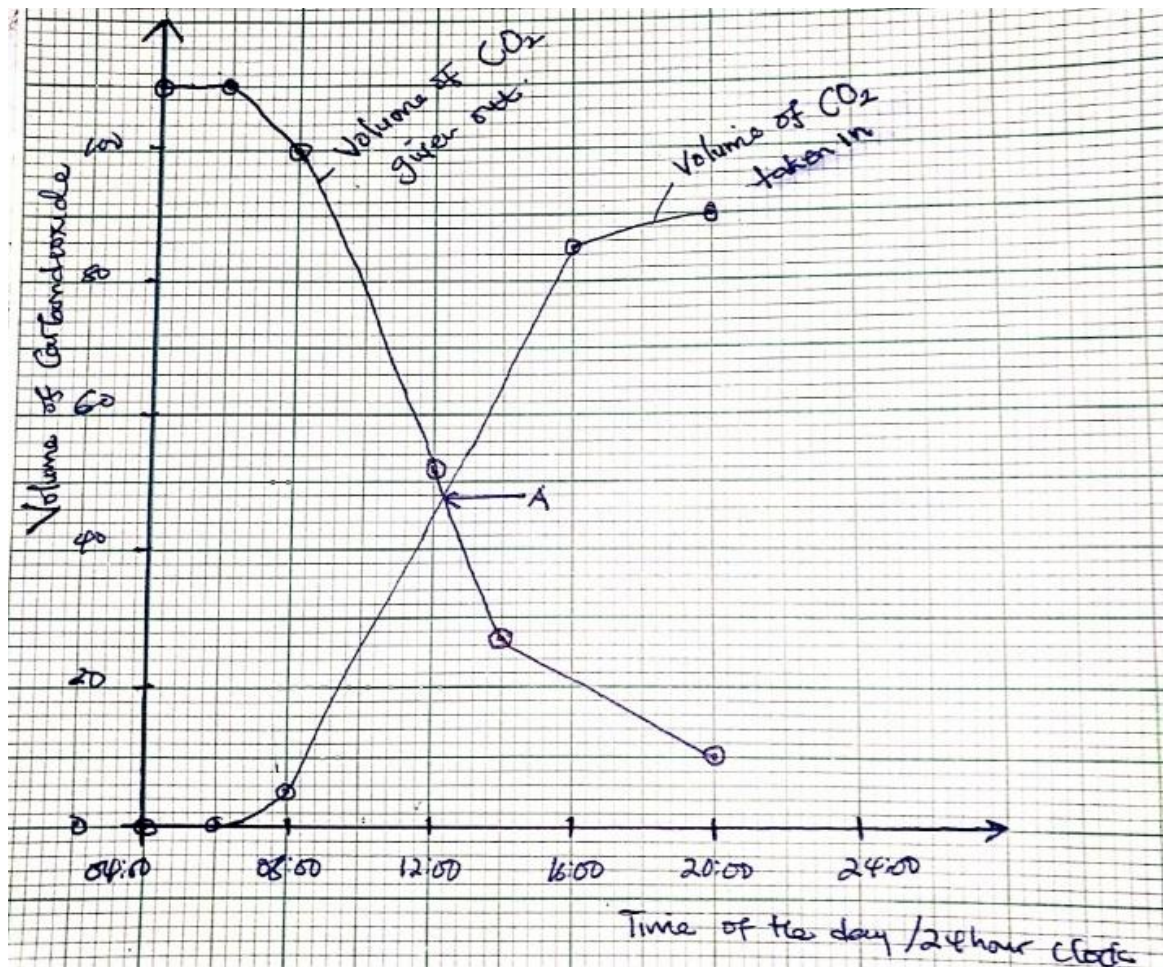
@0750380134(thalamusham@gmail.com)

1. An investigation was carried out to show how the breathing rate for trained and untrained athletes changes during the course of a vigorous exercise. Two individuals A and B were subjected to a vigorous activity and the results are shown in the table below.

| Time(minutes) | Breathing rate (cm <sup>3</sup> per minute) |    |
|---------------|---|----|
|               | A   | B  |
| 0             | 20  | 20 |
| 1             | 30  | 28 |
| 2             | 40  | 38 |
| 3             | 50  | 43 |
| 4             | 58  | 44 |
| 5             | 58  | 44 |

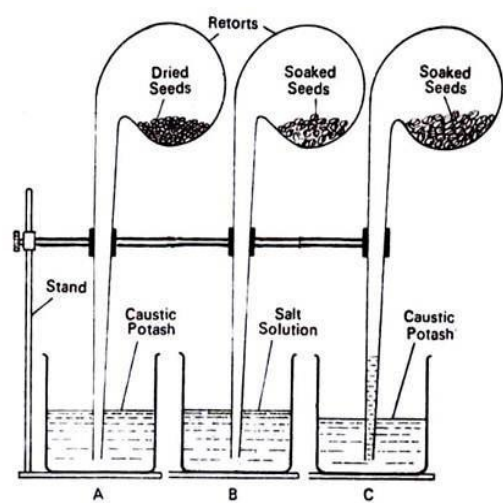
- a) Plot a graph on the same axes to show how the breathing rate of each individual varies with time of exercise (08marks).
- b) Giving a reason for your answer, identify the individual who was  
Trained athlete (02marks)  
Untrained athlete (02marks)
- c) Give two difference between the breathing rate of the two individuals (02marks)
- d) Explain the changes in the breathing rate of individual A between  
0 minutes to 4 minutes (04marks)  
4minutes to 5minutes (02marks)
- e) State on difference between expired air at rest and expired air of the two individuals after 5minutes of the exercise.

2. The graph below shows the changes in the volume of Carbon dioxide taken in and carbon dioxide given out by a plant at various times of the day.



- Identify the processing represented by
    - Volume of carbon dioxide taken in
    - volume of carbon dioxide given out
  - Describe the changes in the volume of carbon dioxide given out during the times of the day. (03marks)
  - Explain the changes in the volume of carbon dioxide
    - At 400hours
    - Between 10:00hours to 12:00hours.
  - Identify point A
    - State what takes place at point A
  - How are the above processes mentioned in ai) and aii)
    - Similar
    - Different
3. In an experiment to investigate a biological process, the following procedures were carried out using retorts

| Setups | Treatments   |
|--------|--|
| A      | Dry seeds introduced in the bulb of the retort and its tube dipped into a beaker filled with caustic potash solution |
| B      | Soaked seeds introduced into the bulb of the retort and its tube dipped into a beaker filled with salt solution      |
| C      | oaked seeds introduced into the bulb of the retort and its tube dipped into a beaker filled with caustic potash      |



- a) What is the aim of the above experiment (01mrk)
- b) Give an account for the observations made in the setups at the end of the experiment
- i) **Setup A** (02mrks)
- ii) **Setup B** (03mrks)
- iii) **Setup C** (02mrks)
- c) State the importance of soaking the seeds in setup B and C (02mrks)

4. The Bicarbonate indicator is a red solution, that changes color whenever it reacts with carbon dioxide as shown below.

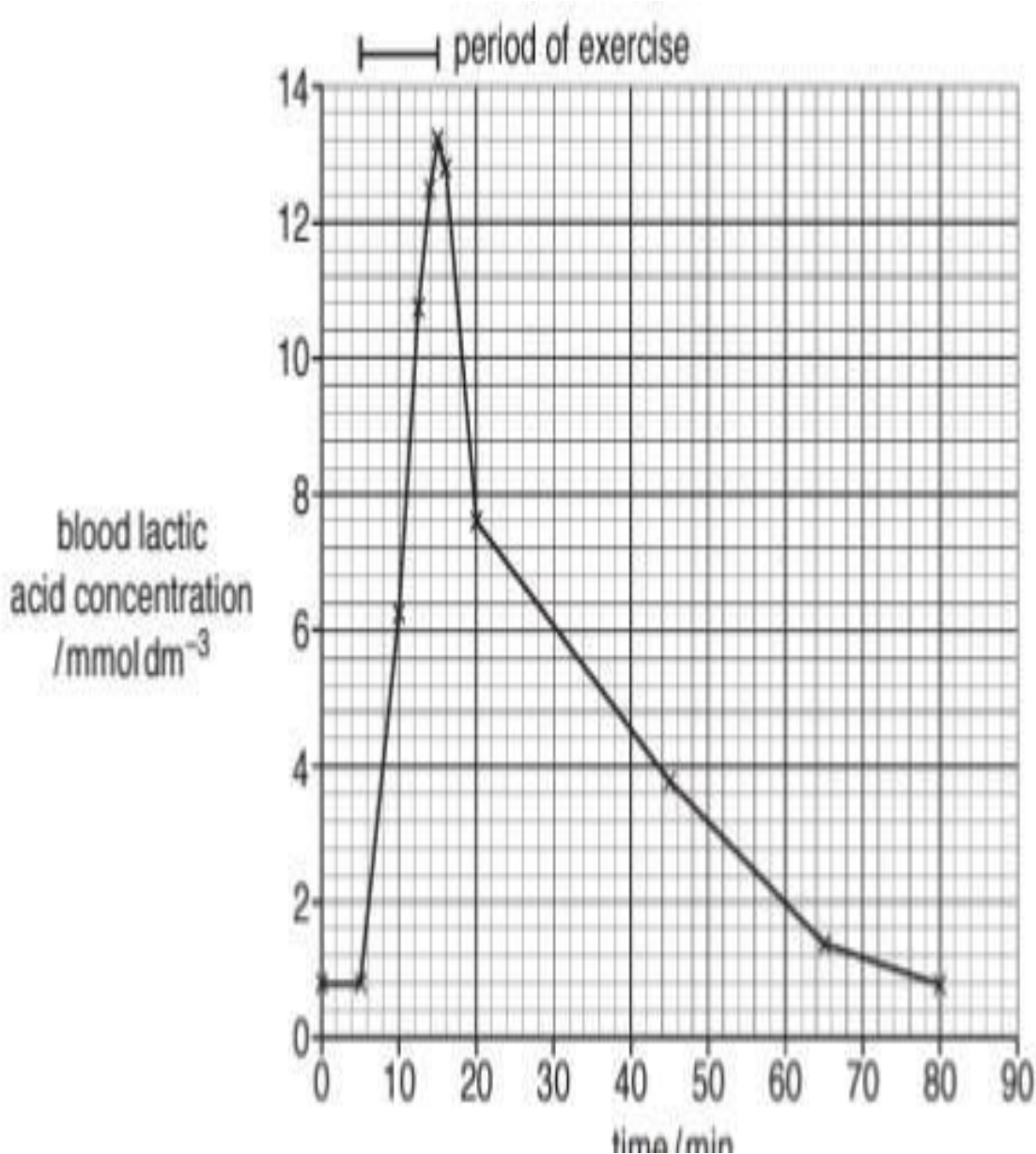
$\text{HCO}_3 + \text{CO}_2 \longrightarrow \text{reduced HCO}_3$

(Red) (Yellow)

In an investigation about a physiological process in yeast cells, three test tubes were used and placed in a water bath maintained at 30c. The content in each test tube are shown in the table below. The color of the contents in each test tube was recorded before and after 15minutes

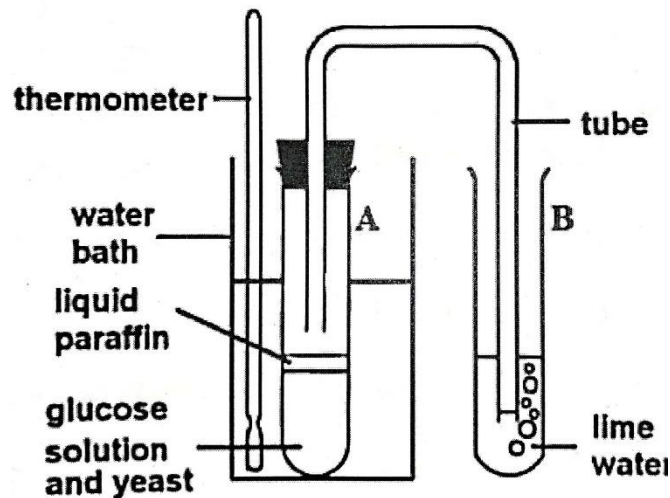
| Test tubes | Contents   | Color of the contents |                 |
|------------|--|-----------------------|-----------------|
|            |  | At the start          | After 15minutes |
| A          | 2cm3 yeast suspension, 2cm3 glucose and 1cm3 of Bicarbonate indicator              | Red                   | Yellow          |
| B          | 2cm3 of boiled yeast suspension, 2cm3 of glucose and 1cm3 of Bicarbonate indicator | Red                   | Red             |
| C          | 2cm3 yeast suspension, 2cm3 starch and 1cm3 of Bicarbonate indicator               | Red                   | Red             |

- a) Account for the changes after 15 minutes in the test tubes  
 Test tube A  
 Test tube B  
 Test tube C
  - b) Explain why all the test tubes were put in a water bath maintained at 30°C
5. Graph in figure below shows results of blood lactic acid concentration obtained from a fitness trainee's finger before, during and after vigorous exercise. Study it carefully and answer the following questions.



- a) Describe the changes in blood lactic acid concentration before, during and after exercise. (05marks)
- b) Explain the changes in the concentration of lactic acid between
  - i) Between 0 minutes to 6 minutes
  - ii) Between 6 minutes to 17 minutes
  - iii) Between 17 minutes to 80 minutes
- c) What are the effects of lactic acid to the human body

- d) What are differences between anaerobic and aerobic respiration
  - e) State the functions of ATP in the human body
6. The figure below illustrates an experiment to demonstrate a certain biological process in yeast cells. Before addition of yeast suspension, the glucose solution was first boiled and then cooled.

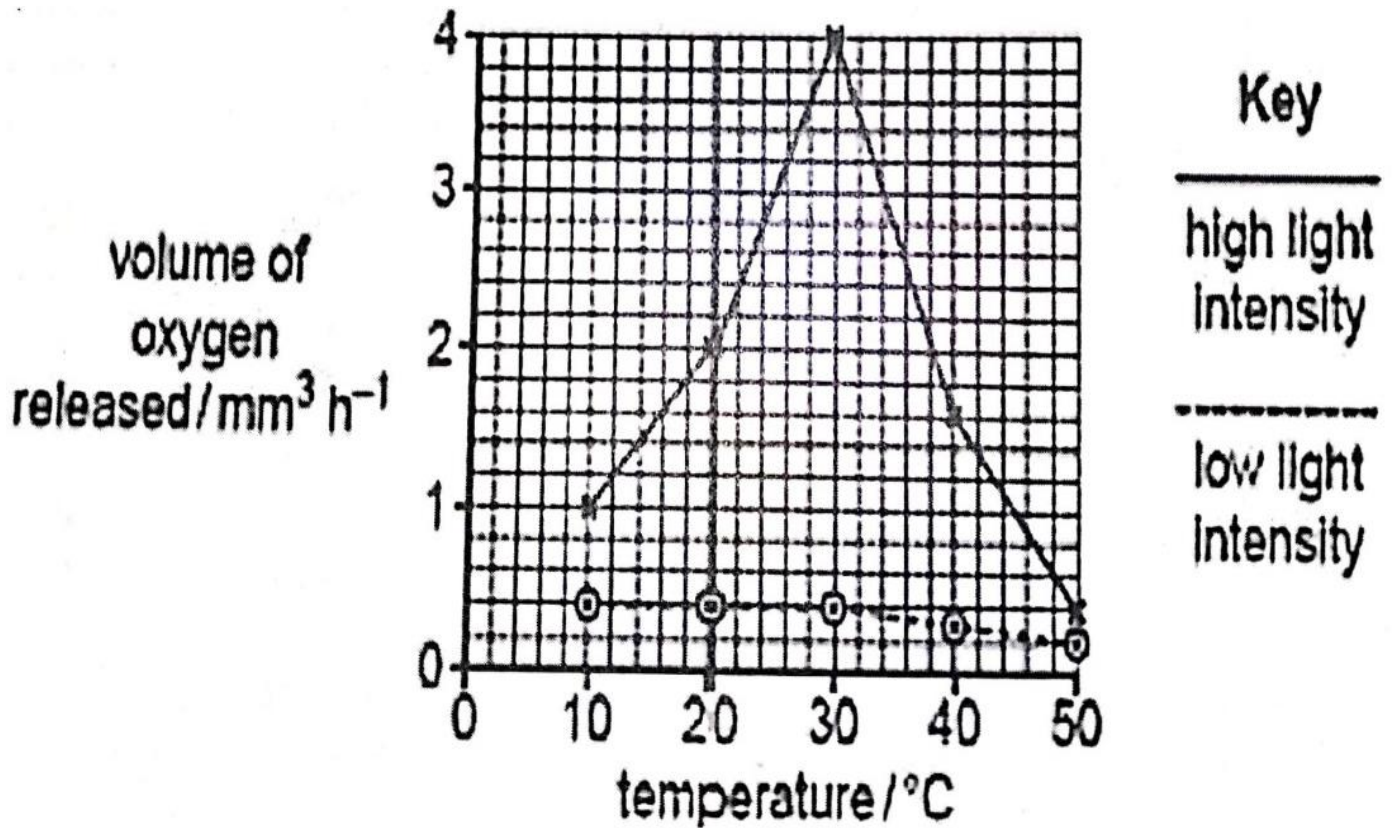


The gas produced in tube A was passed through a delivery tube and formed bubbles in lime water in B.

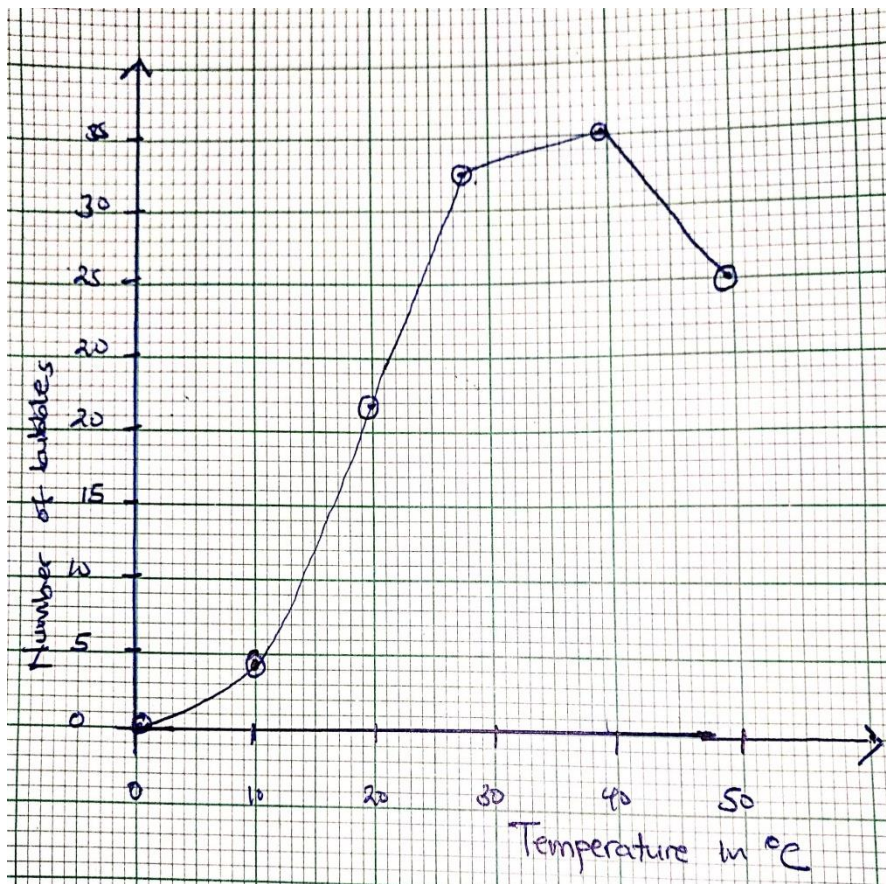
The number of bubbles produced at different temperatures at interval of 5 minutes was recorded and a graph of changes in the number of bubbles released by yeast with temperature was recorded.

- a) Describe the changes in the number of bubbles with temperature (04marks)
  - b) Explain for the changes in number of bubbles
    - At 0c
    - Between 0c and 10c. (03marks)
    - Between 10c and 27c. (03marks)
    - Between 40c and 50c. (03marks)
  - c) Determine the rate of bubbling at 15c (02marks)
  - d) What observations would u make in lime water a few minutes after the experiment. Explain your observation. (02marks)
  - e) Explain why the following were done.
    - Glucose was boiled
    - Glucose was cooled
    - Liquid paraffin was poured over the reaction mixture.
7. The figure below shows results of an investigation by a biologist on the effect of temperature and light intensity on the rate of photosynthesis of an aquatic plant.





- a) Describe the effect of increasing temperature on the rate of photosynthesis at



High light intensity

Low light intensity

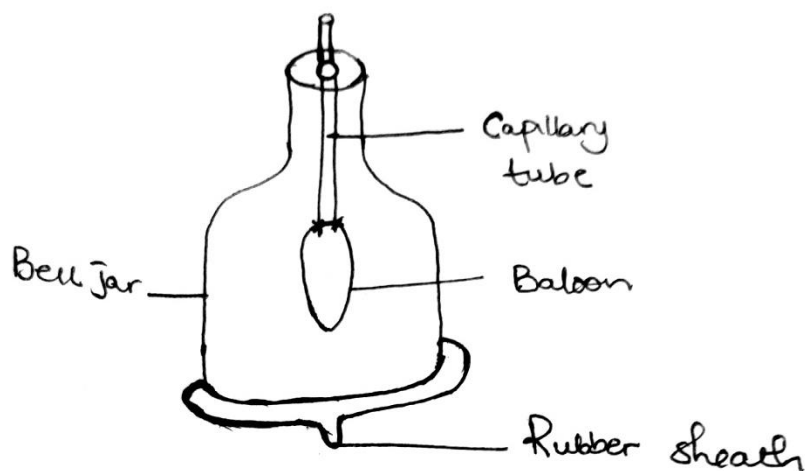
- b) Explain the effect of increasing temperature on the rate of photosynthesis at high light intensity
- c) Explain why volume of oxygen released from the plant doesn't give a true rate of photosynthesis.
- d) Apart from the factors investigated, outline other environmental factors which affect the rate of photosynthesis.

8. The table below shows some information about some plants after , the had been grown in different soils for 12 weeks. The plant are of the same species.

| Features                 | Plant G              | Plant H          |
|--------------------------|----------------------|------------------|
| Height/cm                | 30                   | 23               |
| Number of leaves         | 26                   | 17               |
| Appearance of new leaves | Large and dark green | Small and yellow |
| Condition of root system | Well developed       | Poorly developed |

- a) i) which one of the plants was growing in soil lacking mineral ions?  
ii) State 3 ways in which the above plant differs from the normal one.
- b) Suggest two mineral ions which are lacking from the soil in which the plant was grown. Explain your answer.
- c) How would the soil deficient in such minerals be improved
- d) i) Name the substance missing in plant H after 12 weeks  
ii) How would the above missing substance affect the yield of the above crop plant

9. The figure below is an apparatus that is used to demonstrate breathing mechanism in a mammal

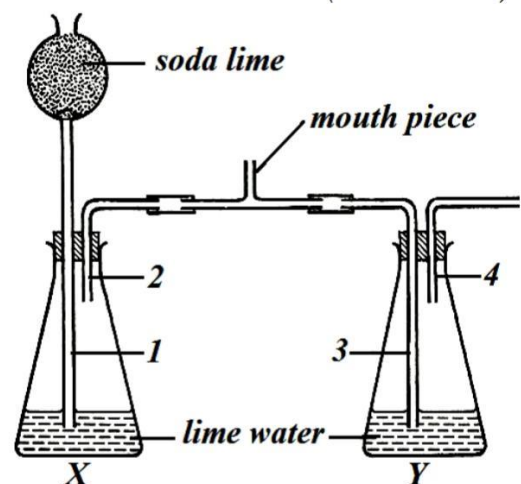


- a) Describe what happens when the rubber sheath is pulled downwards (03mrks)
- b) What do the following parts represent in a mammal (1 ½mrks)
- I) Balloon
- ii) Rubber sheath

ii) Capillary tube

c) What does this mechanism lack to give an accurate demonstration of the breathing mechanism (02mrks)

d) A student setup an experiment to investigate some aspect of gaseous exchange using the apparatus represented below



The student placed the mouth at the mouth piece and breathed in and out several times through the tube

I) Using arrows, show the direction of air movement along tubes 1 and 4 on the diagram during the experiment (½mrks)

ii) Suggest the possible aim of this experiment (01mrk)

ii) What results were expected after breathing in and out through the mouth piece several times (02½mrks)

10. Four test tubes A, B, C and D where filled with pond water, prepared as shown below and then placed under bright light.

| Test tube A      | Test tube B                      | Test tube C      | Test tube D                               |
|------------------|----------------------------------|------------------|---|
| Pond weed at 25c | Pond weed and water snail at 25c | Pond weed at 10c | Pond weed enclosed in aluminum foil at 25 |

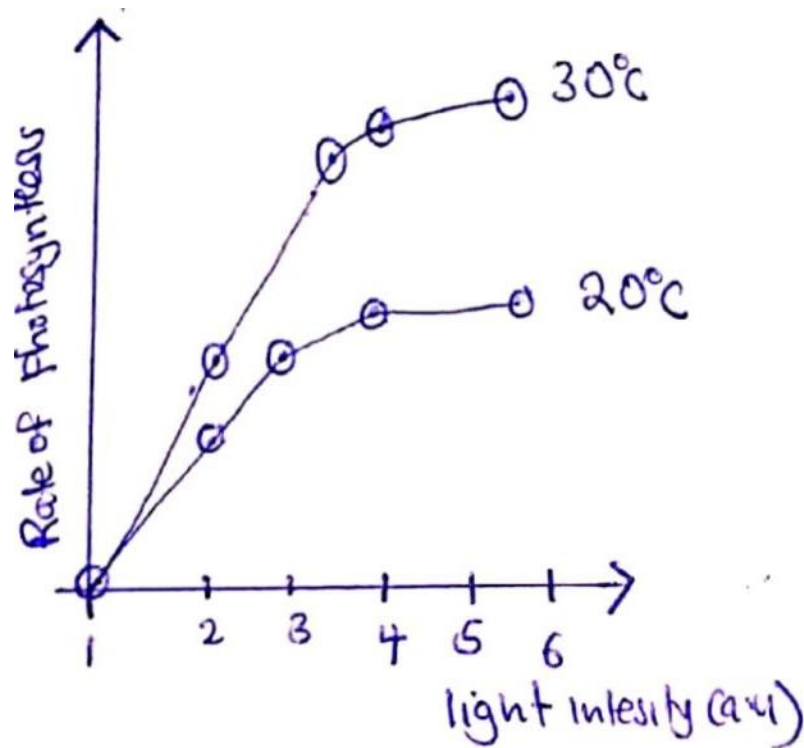
a).which tube would produce the most oxygen (01mark)

b) Explain why the other tubes will produce less oxygen

c) What is the role of light in photosynthesis



11. The graph below shows the rate of photosynthesis at different light intensities and temperature.



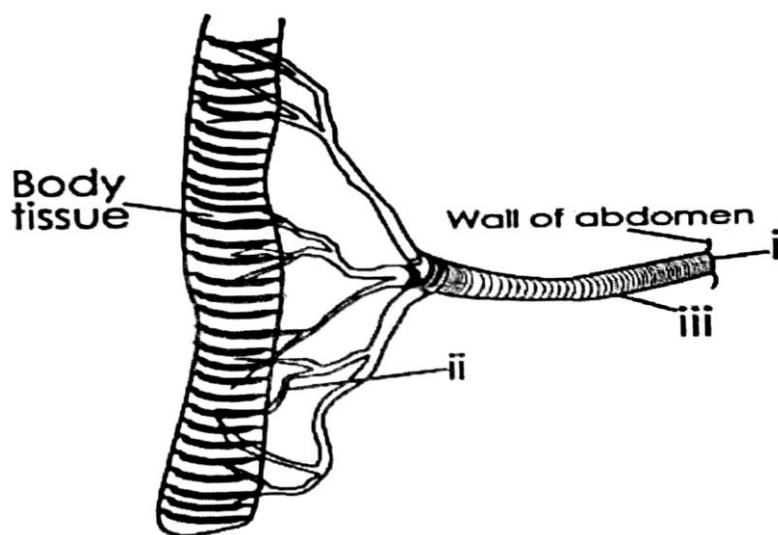
- a) Describe how light intensity affected the rate of photosynthesis at 20c
- b) Explain the effect of light intensity on the rate of photosynthesis at 20c
- c) Explain the difference in the rate of photosynthesis at 20c and 30c
- d) State any 3 differences between rate of photosynthesis at 20c and 30c

12. The table below shows the results of an experiment in which the thoracic volume of an individual at rest was measured with time of breathing. Study it carefully.

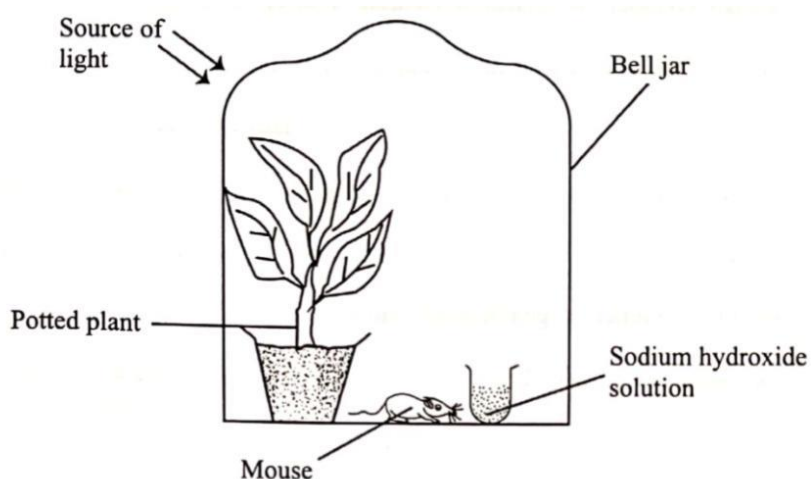
|                        |    |    |    |    |    |    |    |
|------------------------|----|----|----|----|----|----|----|
| Thoracic volume in cm3 | 20 | 40 | 60 | 70 | 50 | 35 | 20 |
| Time in seconds        | 0  | 12 | 24 | 30 | 40 | 50 | 60 |

- a) Represent the above data graphically (08marks)
- b) Describe the change in thoracic volume with time (02marks)
- c) Identify the phase in ventilation that led to change in thoracic volume from
  - I) 0 to 30 seconds. (01mark)
  - ii) 30 seconds to 60 seconds. (01mark)
- d)What mechanisms led to change the thoracic volume from
  - I) 0 to 30 seconds. (04marks)
  - ii)30 to 60 seconds. (04marks)

The figure below shows one of the structure used by an organism to enhance ventilation

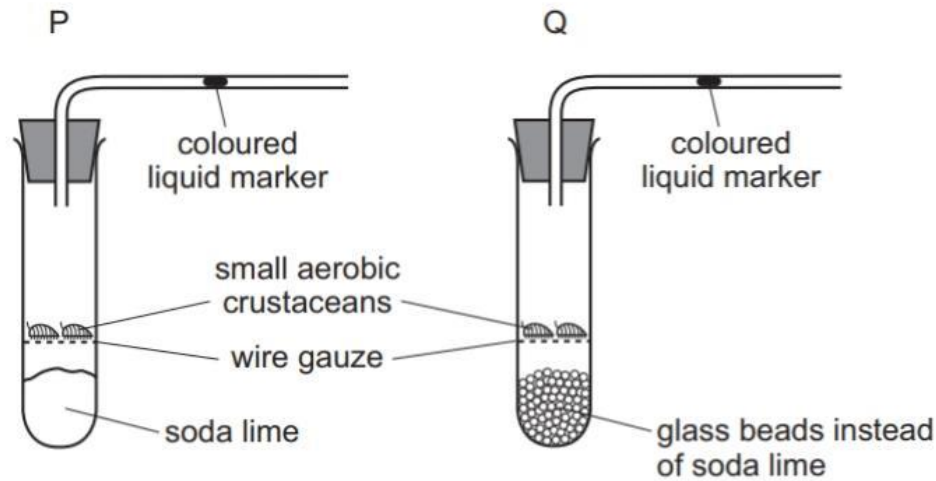


- Suggest the name the structure (1mrks)
  - Name the parts labelled (i) to (iii) (03mrks)
  - Basing on the evidence from the structure, explain how it is adapted to its function (03mrks)
  - Describe how air from the atmosphere can reach the body tissues of the organism in the structure (03mrks)
13. The figure below shows the interrelationship in living organisms . study it carefully and answer the questions that follow.



- Identify the biological processes being investigated in the experiment. (02marks)
- State the role of sodium hydroxide in the experiment (01marks)
- Explain the effect of the following on the mouse
  - Light (02marks)
  - Sodium hydroxide solution (02marks)
- Explain briefly what would happen to the mouse if sodium hydroxide is replaced with water. (03marks)

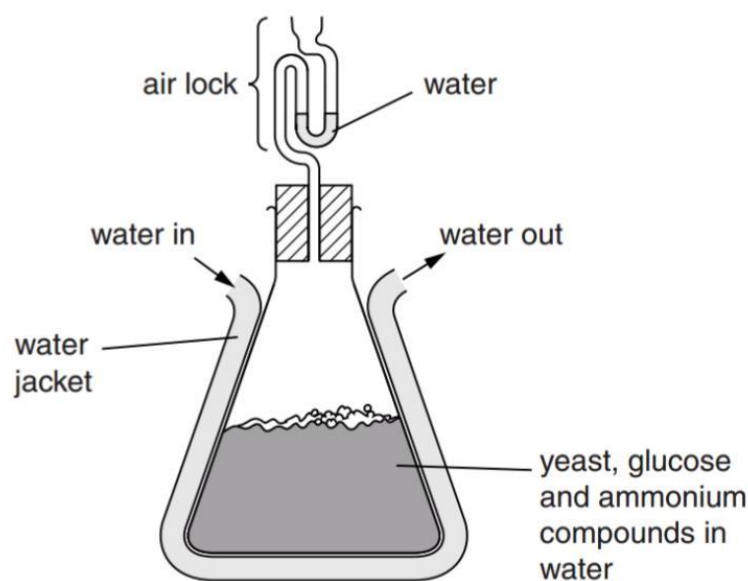
14. The diagram below shows two experiments to investigate a certain biological process in two crustaceans. Study it carefully and answer the questions that follow.



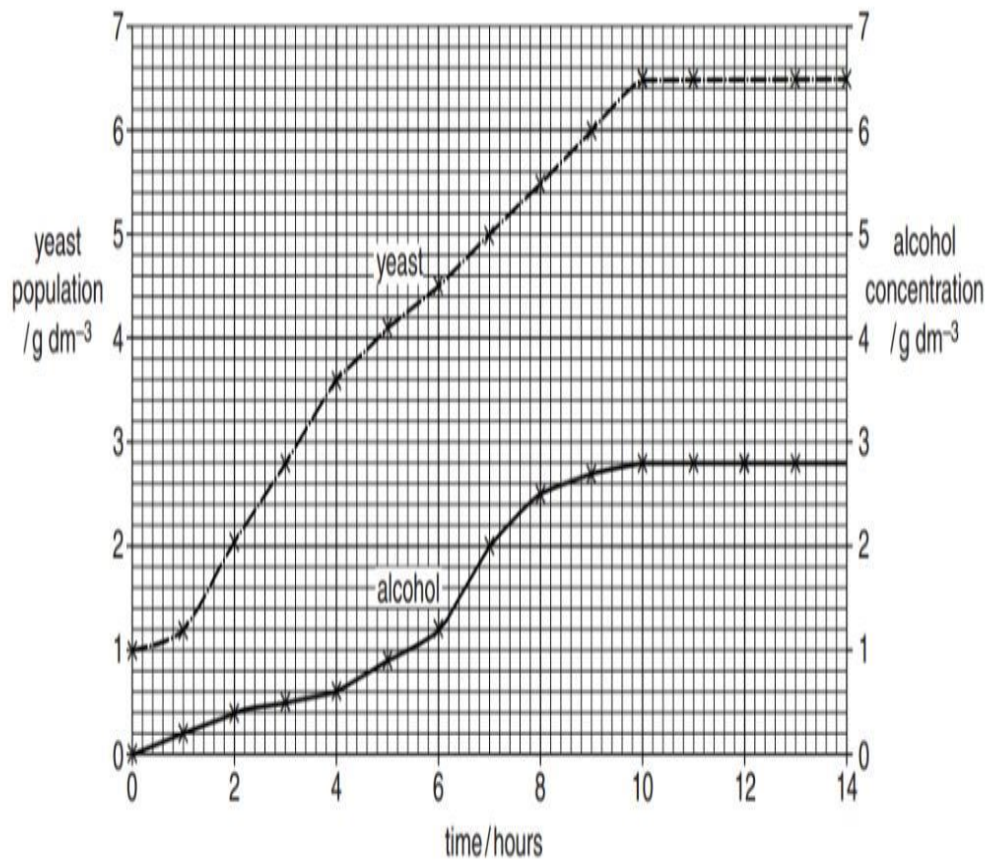
- Identify the above biological process being investigated (01mark)
  - Which of the experiment P and Q did.
    - The coloured liquid marker move. (01mark)
    - The coloured liquid remained constant. (01mark)
  - Give an explanation for your answers in (b) above (06marks)
  - What other substance can replace soda lime
15. In an experiment, a student investigated anaerobic respiration of yeast to find out how the yeast population changed and how much alcohol (ethanol) was produced over a period of 14 hours.

The student set up a small fermenter containing:

- 1.0 g dry yeast
- 250 cm<sup>3</sup> glucose solution
- a solution containing ammonium compounds as a source of nitrogen

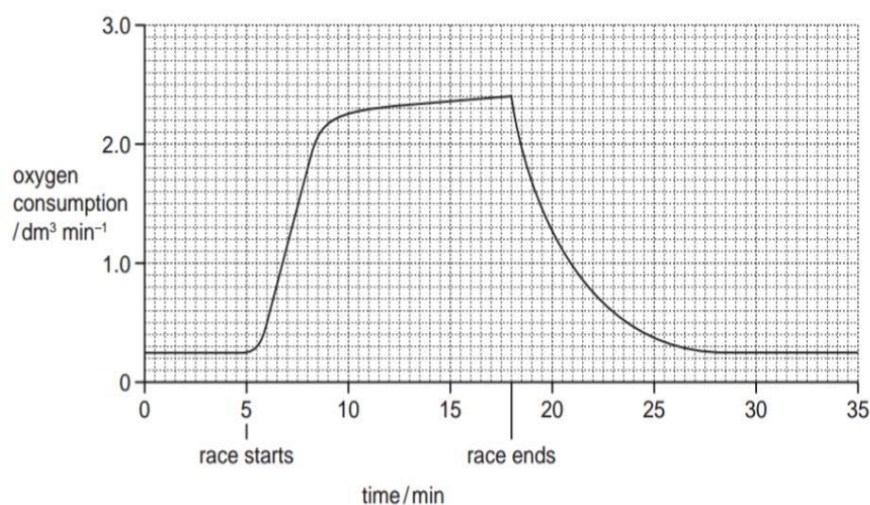


The graph below shows the changes in the population of the yeast and alcohol within the fermenter.



- Describe the changes in yeast population. (04marks)
- Explain the changes described above. (06marks)
- Explain for the changes in concentration of ethanol between
  - 6hours and 8hours (02marks)
  - 10hours and 14hours (02marks).
- What is the importance of each of the following in the experiment
  - Air lock (01mark)
  - Water jacket (01mark)
  - Source of nitrogen (01mark)
- Name **three** industrial processes that rely on anaerobic respiration of yeast.
- Calculate the percentage increase in the yeast cells between 2hours and 8hours.

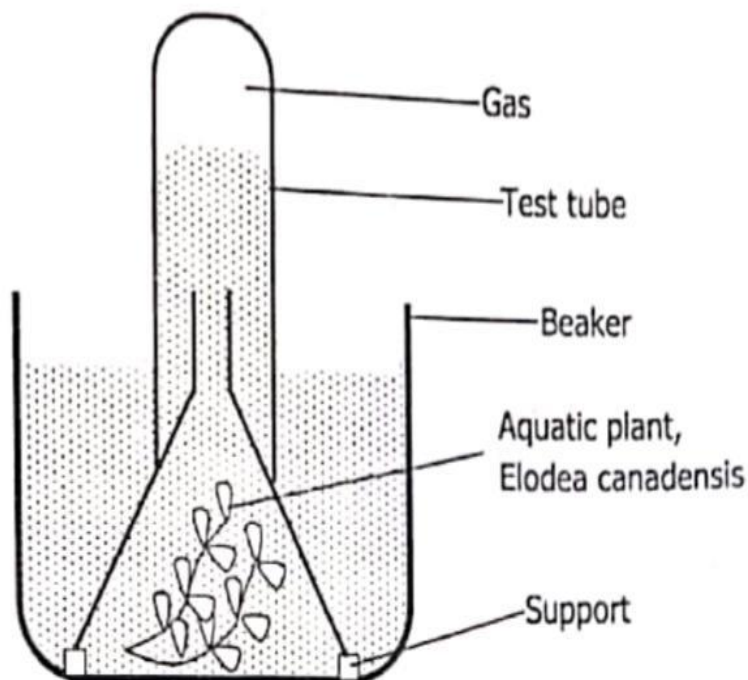
16. The figure below shows oxygen consumed by an athlete before, during and after a 5000m race.





- a) Describe the changes in oxygen consumption **during** and **after** the race (05marks)
- b) Explain for the changes in oxygen consumption of the athlete between
  - iii) 0 minutes and 5 minutes (04marks)
  - iv) 5 minutes and 7 minutes (04marks)
- c) Give reasons why the oxygen consumption does not return immediately to the resting level after the race is finished. (02marks)
- d) Apart from changes in oxygen consumed, state any other two changes that occur in the body of the athlete. (02marks)
- e) State the significance of the above changes to the body of the athlete. (04marks)

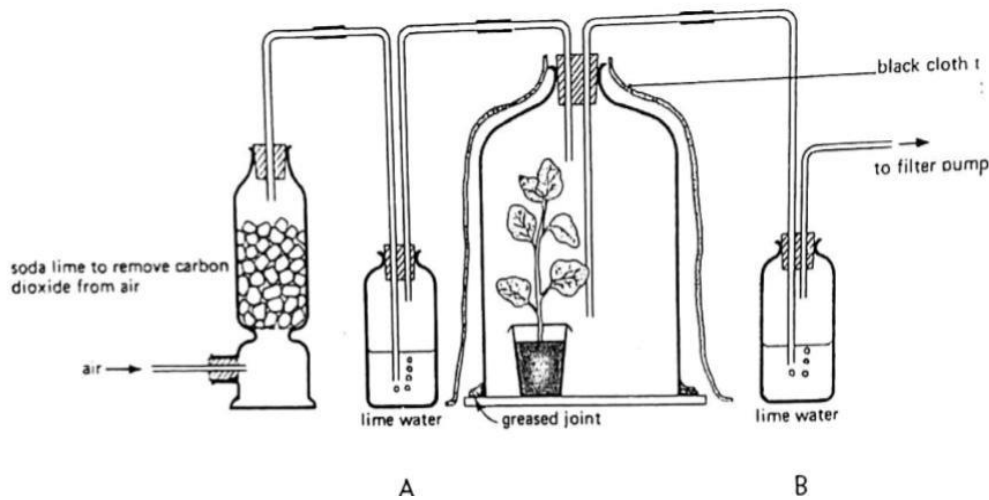
17. The figure below is an investigation about a physiological process in plants.



- a) Identify the above physiological process being investigated (01mark)
- b) If the gas produced in the above experiment was produced in the reaction similar to this.  

$$A + B \longrightarrow C + D$$
 Identify the reactants (02marks)  
 Identify the products (02marks)
- c) State the missing substance in the above experiment. State its use
- d) Explain how the above gas is tested

18. The figure below is an experimental setup to investigate a certain biological process in plants. Study it carefully and answer the questions that follow.



- State the aim of the experiment. (01mark)
- Why were the following included in the experiment (02marks)  
Grease.  
Black cloth.
- Explain what would be observed in both flasks A and B (04marks)
- Explain what would be observed in wash bottle B if the black cloth was removed before the beginning of the experiment (03mark)

### Section c

18. Describe and explain the changes in composition of the following components in inhaled and exhaled air when a person who was previously at rest engages in a vigorous exercise

- Carbon dioxide** (05mrks)
- Oxygen.** (05mrks)
- Water Vapour.** (05mrks)

18. Describe how the following structures are used by the plants during gaseous exchange

- Leaves** (06mrks)
- Stems** (04mrks)
- Roots** (05mrks)

19a).Describe how action of muscles bring about movement of air from the atmosphere into the lungs (7mrks)

- What are the adaptations of the alveoli during gaseous exchange (08rks)

7a) Describe the characteristics of a good respiratory surface (06mrks)

- Describe the mechanism of ventilation in a cockroach (09mrks)