THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

033/2 **BIOLOGY 2**

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2014**

Instructions

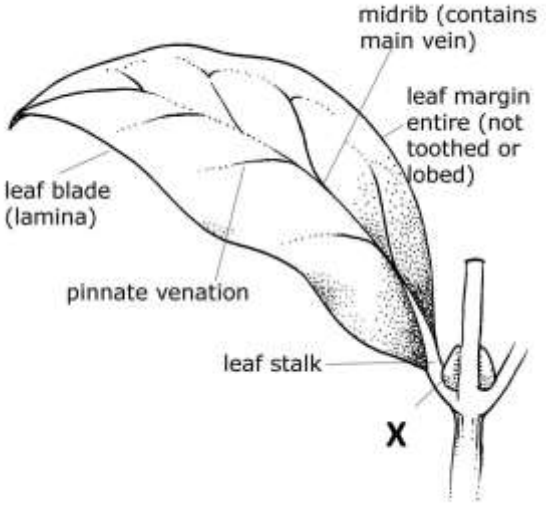
1. This paper consists of sections Five questions. Answer all questions

2. Each question carries ten marks.

1. A form two biology teacher was teaching a topic on plant nutrition. He went to the garden and picked up a leaf with network veins.

(a) (i) Draw a well-labeled diagram of the leaf that the teacher picked up.

- The leaf picked by the teacher is a dicotyledonous leaf, which has a network of veins (reticulate venation). The diagram should include the following parts:
A dicotyledonous leaf exhibits several distinct external features that are crucial for its function and identification.



1. Lamina (Leaf Blade)
   - Description: The broad, flat part of the leaf responsible for photosynthesis.
   - Function: Captures sunlight and facilitates gas exchange.
2. Petiole (Leaf Stalk)
   - Description: The stalk that attaches the lamina to the stem.
   - Function: Supports the leaf and transports nutrients and water between the leaf and stem.

3. Midrib
   - Description: The central, prominent vein running along the length of the lamina.
   - Function: Provides structural support and houses vascular tissues for nutrient and water transport.
4. Veins
   - Description: A network of smaller veins branching from the midrib, forming a reticulate (net-like) pattern.
   - Function: Distribute water, nutrients, and photosynthates throughout the leaf.
5. Leaf Margin
   - Description: The edge of the leaf blade, which can be smooth, serrated, lobed, or otherwise shaped.
   - Function: Varies among species; can influence water runoff and deter herbivory.
6. Apex
   - Description: The tip of the leaf farthest from the petiole.

- Function: May aid in water drainage and can vary in shape, aiding in species identification.

7. Base
   - Description: The part of the leaf that connects to the petiole.
   - Function: Serves as the attachment point and can vary in shape, affecting leaf orientation.
8. Stipules
   - Description: Small, leaf-like appendages located at the base of the petiole in some dicot plants.
   - Function: Can protect young leaves or buds and may have various forms.

(ii) State the role played by each part of the leaf labeled in 1(a)(i) above.

- Lamina: Provides a large surface area for light absorption during photosynthesis.
- Midrib: Supports the structure of the leaf and distributes nutrients and water.
- Veins: Transport water, minerals, and food within the leaf.
- Petiole: Attaches the leaf to the stem and allows movement for better light capture.
- Stomata: Facilitate gas exchange by allowing carbon dioxide in and oxygen out.

(b) What is the general function of the leaf?

- The general function of the leaf is photosynthesis, the process by which plants use light energy to synthesize food (glucose) from carbon dioxide and water.

(c) List two raw materials and two conditions necessary for the leaf to carry out the function you mentioned in 1(b) above.

- Raw materials:
  1. Carbon dioxide
  2. Water

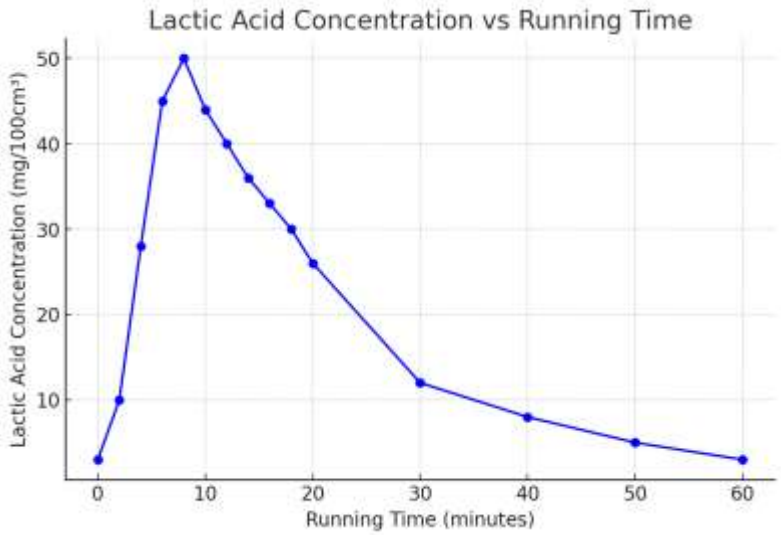
- Conditions:
  1. Light energy (sunlight)
  2. Presence of chlorophyll

2. A biologist collected data from an athlete after a period of running. The following table shows his data.

Running time (in minutes)	Concentration of lactic acid in blood (mg/100cm³)
0	3
2	10
4	28
6	45
8	50
10	44
12	40

14	36	
16	33	
18	30	
20	26	
30	12	
40	8	
50	5	
60	3	

(a) (i) Draw a graph of concentration of lactic acid against running time by using the data given.



(ii) Which period on the graph shows the period of recovery?

- The recovery period is observed from 10 to 60 minutes, where the concentration of lactic acid in the blood gradually decreases back to the initial level (3 mg/100cm³).

(b) (i) Name the process which led to the production of lactic acid in the body of the athlete.

- Anaerobic respiration

(ii) Define the process named in (b)(i) above.

- Anaerobic respiration is the breakdown of glucose in the absence of oxygen to produce energy and lactic acid as a byproduct.

(iii) Which tissue was responsible for the production of the lactic acid?

- Muscle tissue

(iv) State one effect of the excessive accumulation of lactic acid in the body.

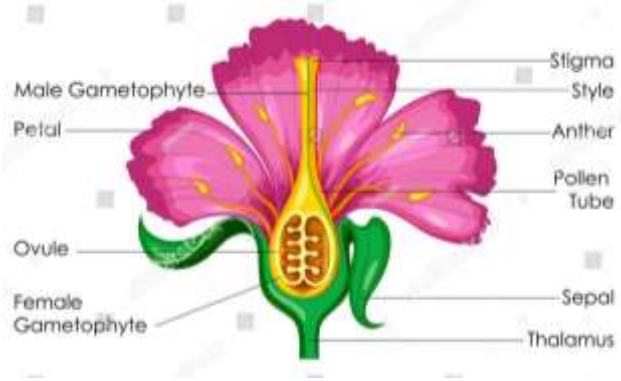
- Causes muscle fatigue and cramps, leading to pain and reduced performance.

(c) Describe five factors which affect the rate of respiration.

1. Temperature – High temperatures increase enzyme activity, speeding up respiration.
2. Oxygen concentration – More oxygen allows efficient aerobic respiration, increasing ATP production.
3. Type of substrate – Carbohydrates are respired faster than fats or proteins.
4. Age – Young, growing cells have higher respiration rates than older cells.
5. Activity level – More active organisms have a higher demand for energy, increasing respiration rates.

3. (a) Draw a well-labeled diagram of a half longitudinal section of hibiscus flower.

- The diagram should include:
  - Petal
  - Sepal
  - Stigma
  - Style
  - Ovary



  - Anther
  - Filament

(b) What is the mode of pollination shown by the flower? Give three reasons.

- Mode of pollination: Insect pollination (Entomophily)

- Reasons:
  1. Brightly colored petals attract insects.
  2. Presence of nectar to attract pollinators.
  3. Sticky stigma to trap pollen from visiting insects.

4. In an experiment, 5cm³ of starch solution was placed in each of 4 test tubes labeled A, B, C, and D. The contents of the test tubes were maintained at 37°C but varied as shown in the table below.

Test tube	Contents
A	5cm³ of starch + 2 cm³ of saliva and few drops of dilute hydrochloric acid.
B	5cm³ of starch and few drops of dilute hydrochloric acid.
C	5cm³ of starch + 2 cm³ of saliva and few drops of sodium carbonate.
D	5cm³ of starch.

(a) (i) What was the aim of the experiment?

- To investigate the effect of saliva (amylase enzyme) and pH conditions on the breakdown of starch into simple sugars.

(ii) Explain the changes which occurred in each test tube shown in the table above.

- Test tube A: No starch breakdown due to acidic conditions, which denature amylase.
- Test tube B: No starch breakdown as there is no amylase present.
- Test tube C: Starch was broken down into maltose because saliva (amylase) is active in alkaline conditions (due to sodium carbonate).
- Test tube D: No starch breakdown as no enzyme is present.

(b) Explain the changes observed after adding Benedict's solution and boiling the content from the test tube C.

- The solution turned brick red, indicating the presence of reducing sugars (maltose), showing that starch was successfully broken down by amylase in alkaline conditions.

5. You are provided with a list of seven different organisms named butterfly, fish, owl, bat, rat, honey bee, and lizard. Answer the following questions:

(a) (i) Identify four organisms from the list which show the same mode of locomotion.

- Butterfly, bat, honey bee, owl

(ii) Name the mode of locomotion shown by organisms mentioned in (a)(i) above.

- Flight

(b) For each organism listed in the table below, name structure(s) that they use for locomotion.

S/n	Organism	Structure(s) used for movement
1	Butterfly	Wings
2	Lizard	Limbs
3	Bat	Wings
4	Rat	Limbs
5	Honey bee	Wings
6	Fish	Fins

(c) State three importance of movement in animals.

1. Enables animals to search for food and water.
2. Helps in escaping predators for survival.
3. Aids in finding mates for reproduction.