

KENYA CERTIFICATE OF BASIC EDUCATION

SENIOR SCHOOL ASSESSMENT

DECEMBER ACTIVITIES 2026

GRADE 10 – BIOLOGY

Time: 2 Hours

LEARNER'S DETAILS

Name: _____ School: _____

Assessment Number: _____ Date: _____

School Code: _____ Signature: _____

INSTRUCTIONS TO CANDIDATES

1. Write your name in the spaces provided above.
2. Write the name of your school and your school code in the spaces provided.
3. Write your assessment number and the date of the assessment and sign in the spaces provided.
4. This paper consists of two sections: A and B.
5. Answer all questions in section A and section B.
6. Answer the questions in English.
7. All answers **MUST** be written in the spaces provided in the paper.
8. Do NOT remove any page from this question paper.

FOR OFFICIAL USE ONLY (EXAMINER'S USE)

SECTION	SECTION A	SECTION B	% SCORE	EE1	EE2	ME1	ME2	AE1	AE2	BE1	BE2
SCORE RANGE	30 MARKS	50 MARKS		90-100	75-89	58-74	41-57	31-40	21-30	11-20	1-10
POINTS				8 POINTS	7 POINTS	6 POINTS	5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT
LEARNER'S TOTAL SCORE											

SECTION A (30 MARKS)

Answer **ALL** questions in this section.

1. A group of Grade 10 learners visited a forest to observe different organisms.

a) State **one characteristic** that all living organisms possess. (1 mark)

b) Give **two reasons** why Biology learners study organisms in their natural habitats. **(2 marks)**

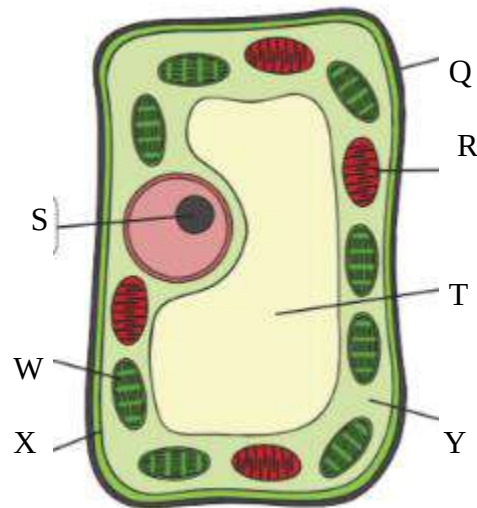
- i. _____
- ii. _____

2. A learner accidentally left a prepared biological specimen exposed to high temperatures for several hours.

a) What is meant by **preservation of a specimen**? **(1 mark)**

b) State **one method** of preserving a biological specimen. **(1 mark)**

3. The diagram below represents a typical plant cell.



a) Name the structure that controls the activities of the cell. **(1 mark)**

b) State **one function** of the cell wall. **(1 mark)**

c) Name the organelle responsible for photosynthesis. **(1 mark)**

4. A student observed onion cells under a microscope.

a) Why was iodine solution added to the specimen? **(1 mark)**

b) State **one advantage** of using a stain when observing cells. **(1 mark)**

5. A learner tested a food sample using Benedict's solution and heated the mixture.

a) What food substance was being tested? **(1 mark)**

b) State the colour change that indicates a positive result. **(1 mark)**

6. A farmer watered a young maize plant adequately but kept it in complete darkness.

a) Explain why the plant could not manufacture enough food. **(1 mark)**

b) Name the green pigment required for photosynthesis. **(1 mark)**

7. Plants require mineral salts for healthy growth.

a) Name **one mineral element** required by plants. **(1 mark)**

b) State **one function** of the mineral element named in (a). **(1 mark)**

8. A learner noticed that water droplets disappeared from the surface of a leaf after several hours.

a) Name the process responsible for the loss of water vapour from leaves. **(1 mark)**

b) Through which structures does most water vapour leave the leaf? **(1 mark)**

9. During a football match, players breathe faster and their hearts beat more rapidly.

a) Why does the heartbeat increase during vigorous exercise? **(1 mark)**

b) State **one substance** transported in the blood from the lungs to actively respiring muscles. **(1 mark)**

10. A learner compared aerobic and anaerobic respiration.

a) Which type of respiration requires oxygen? **(1 mark)**

b) State **one product** of anaerobic respiration in human muscles. **(1 mark)**

11. A balanced diet contains different nutrients in appropriate proportions.

a) Name **two vitamins** required by humans. **(2 marks)**

i.

ii.

b) State **one function** of vitamins in the body. **(1 mark)**

12. State **three differences** between diffusion and osmosis. (3 marks)

Diffusion	Osmosis

SECTION B: 50 MARKS

Answer all questions.

13. A Biology teacher gave learners a compound light microscope and a prepared slide containing plant cells.

a) Name the following microscope parts and state one function of each:

i. Eyepiece lens. (2 marks)

ii. Objective lens. (2 marks)

b) Describe how a learner should obtain a clear image of a specimen using a light microscope. (3 marks)

c) State **three precautions** that should be observed when using a microscope. (3 marks)

- i.

- ii.

- iii.

14. Different cells in organisms have structures suited to their functions.

a) Explain the meaning of **cell differentiation**. (2 marks)

b) State **two adaptations** of a red blood cell for transporting oxygen. **(2 marks)**

- i. _____
- ii. _____

c) Explain how each of the following processes occurs:

i. Crenation. **(2 marks)**

ii. Haemolysis. **(2 marks)**

d) State **two factors** that affect the rate of diffusion. **(2 marks)**

- i. _____
- ii. _____

15. A school canteen introduced a menu consisting of ugali, beans, vegetables, fruit and milk. The Biology teacher asked learners to identify the nutrients provided by the meal.

a) State the main function of each of the following nutrients:

i. Carbohydrates. **(1 mark)**

ii. Proteins. **(1 mark)**

iii. Fats and oils. **(1 mark)**

b) Explain why water is important in the human body. **(2 marks)**

c) Describe how you would test a food sample for **starch** in a laboratory. **(3 marks)**

d) State **two consequences** of consuming an unbalanced diet for a long period. **(2 marks)**

- i.

- ii.

16. A farmer noticed that some maize plants had yellow leaves and poor growth despite receiving enough water.

a) Explain how a deficiency of mineral salts can affect plant growth. **(2 marks)**

b) Describe the role of **xylem tissue** in a plant. **(3 marks)**

c) Explain how water moves from the soil into a root hair cell. **(2 marks)**

d) State **three factors** that can affect the rate of transpiration. **(3 marks)**

- i.

- ii.

- iii.

17. A group of learners investigated breathing before and after running. They recorded the following observations:

Condition	Breaths per minute
Before running	18
Immediately after running	32
Five minutes after running	24

a) Calculate the increase in breathing rate immediately after running. **(1 mark)**

b) Explain why breathing rate increased after running. **(3 marks)**

- i. _____
- ii. _____
- iii. _____

c) Distinguish between **gaseous exchange** and **respiration**. **(2 marks)**

d) State **two adaptations** of the alveoli that make them efficient for gaseous exchange. **(2 marks)**

- i. _____
- ii. _____

e) Give **two reasons** why breathing rate gradually returns towards normal after exercise. **(2 marks)**

- i. _____
- ii. _____

GRADE 10 BIOLOGY

MARKING SCHEME / ANSWERS

SECTION A: 30 MARKS

1.

a) Any one characteristic:

- Respiration.
- Nutrition.
- Growth.
- Reproduction.
- Excretion.
- Movement.
- Sensitivity/response to stimuli. **(1)**

b) Any two:

- To observe organisms in their natural environment.
- To study their adaptations.
- To identify different organisms.
- To understand interactions among organisms.
- To collect specimens for scientific study. **(2)**

2.

a) Preservation is the process of **preventing a biological specimen from decomposing or deteriorating so that it remains suitable for study. (1)**

b) Any one:

- Use of preservatives such as formalin.
- Refrigeration/freezing.
- Drying.
- Pressing, especially for plant specimens. **(1)**

3.

a) **Nucleus. (1)**

b) Any one:

- Provides support and protection.
- Maintains the shape of the cell.
- Prevents the cell from bursting when it takes in excess water. **(1)**

c) **Chloroplast. (1)**

4.

a) To **stain the cells and make their structures more visible under the microscope. (1)**

b) It increases the **contrast between cell structures and the surrounding material**, making them easier to see. **(1)**

5.

a) **Reducing sugars. (1)**

b) A positive result produces a colour ranging from **green/yellow/orange to brick-red precipitate**, depending on the amount of reducing sugar present. **(1)**

6.

a) Photosynthesis requires **light energy**, so without light the plant cannot manufacture sufficient food. **(1)**

b) **Chlorophyll. (1)**

7.

a) Any one:

- Nitrogen.
- Phosphorus.
- Potassium.
- Magnesium.
- Calcium. **(1)**

b) Depends on the element named. Examples:

- **Nitrogen:** required for synthesis of proteins and chlorophyll.
- **Magnesium:** forms part of the chlorophyll molecule.
- **Phosphorus:** important in ATP and nucleic acids.
- **Potassium:** assists enzyme activity and general plant growth. **(1)**

8.

a) **Transpiration. (1)**

b) **Stomata. (1)**

9.

a) The heartbeat increases to **pump more blood and oxygen to actively respiring muscles and remove carbon dioxide more rapidly. (1)**

b) **Oxygen. (1)**

10.

a) **Aerobic respiration. (1)**

b) **Lactic acid. (1)**

11.

a) Any two:

- Vitamin A.
- Vitamin B.

- Vitamin C.
- Vitamin D.
- Vitamin E.
- Vitamin K. (2)

b) Vitamins help to **regulate body processes and maintain good health.** (1)

12.

Any three differences:

Diffusion	Osmosis
Movement of particles from a region of high concentration to low concentration	Movement of water molecules from a region of high water potential to low water potential
Can involve gases or dissolved substances	Involves water molecules only
Does not necessarily require a selectively permeable membrane	Requires a selectively permeable membrane
May occur in solids, liquids or gases	Occurs across a selectively permeable membrane

(3)

13.

a) **Microscope parts**

i. **Eyepiece lens**

- Magnifies the image formed by the objective lens.
- It is the lens through which the specimen is viewed. (2)

ii. **Objective lens**

- Magnifies the specimen.
- Provides different levels of magnification, depending on the objective used. (2)

b) **Obtaining a clear image**

Any three correct steps:

1. Place the prepared slide correctly on the microscope stage.
2. Secure it using the stage clips.
3. Start with the **low-power objective lens**.
4. Use the coarse adjustment knob to bring the specimen into approximate focus.
5. Use the fine adjustment knob to obtain a sharp image.
6. Move to a higher-power objective if greater magnification is required and use fine adjustment to refocus. (3)

c) **Precautions**

Any three:

- Carry the microscope with both hands.
- Do not touch lenses with fingers.
- Clean lenses using lens paper.
- Begin observation using the low-power objective.
- Avoid forcing the adjustment knobs.
- Handle glass slides carefully.
- Keep the microscope on a stable surface. (3)

14.

a)

Cell differentiation is the **process by which unspecialised cells develop specialised structures and functions.** (2)

b) Red blood cell adaptations

Any two:

- Contains **haemoglobin**, which combines with oxygen.
- Has a **biconcave shape**, giving a large surface area for gas exchange.
- Lacks a nucleus, providing more space for haemoglobin.
- Is small and flexible, allowing it to pass through narrow capillaries. (2)

c)

i. Crenation — (2 marks)

Crenation occurs when a **red blood cell loses water by osmosis** when placed in a **hypertonic solution**, causing it to **shrink and develop a wrinkled/spiky appearance.**

ii. Haemolysis — (2 marks)

Haemolysis occurs when a **red blood cell gains too much water by osmosis** when placed in a **hypotonic solution**, causing the cell to **swell and burst.**

d)

Any two:

- Concentration gradient.
- Temperature.
- Surface area.
- Distance/thickness of the exchange surface.
- Size of particles. (2)

15.

a)

i. Carbohydrates: provide energy for body activities. (1)

ii. Proteins: growth and repair of body tissues. (1)

iii. Fats and oils: provide energy and help in insulation/protection of body organs. (1)

b) Importance of water

Any two:

- Acts as a solvent and medium for chemical reactions.
- Transports dissolved substances around the body.
- Helps regulate body temperature.
- Assists digestion.
- Helps remove waste products through urine and sweat. **(2)**

c) Test for starch

1. Place a small amount of the food sample on a white tile/test tube. **(1)**
2. Add a few drops of **iodine solution**. **(1)**
3. A **blue-black colour** indicates the presence of starch. **(1)**

d)

Any two:

- Malnutrition.
- Obesity.
- Deficiency diseases.
- Poor growth and development.
- Reduced immunity.
- Anaemia, depending on the nutrient lacking. **(2)**

16.

a)

Mineral deficiencies may:

- Cause **abnormal or stunted growth**.
- Cause symptoms such as **yellowing of leaves (chlorosis)**, poor root development or poor flowering, depending on the mineral deficient. **(2)**

b) Role of xylem

- Transports **water** from the roots to the stem and leaves. **(1)**
- Transports **dissolved mineral salts** from the roots to other parts of the plant. **(1)**
- Provides mechanical support because xylem vessels have lignified walls. **(1)**

c)

- Water moves from the soil into the root hair cell by **osmosis**.
- This occurs because the water potential of the soil solution is higher than that of the root hair cell sap. **(2)**

d)

Any three:

- Temperature.
- Light intensity.
- Wind/air movement.

- Humidity.
- Availability of water.
- Leaf surface area. **(3)**

17.

a)

Increase:

$$32 - 18 = 14 \text{ breaths per minute.}$$

Answer: 14 breaths per minute. (1)

b)

The breathing rate increased because:

- Muscles require more energy during running.
- Increased energy demand increases the rate of respiration.
- More oxygen is required and more carbon dioxide is produced.
- Therefore, breathing becomes faster and deeper to increase gaseous exchange. **(3)**

c)

Gaseous exchange: movement of respiratory gases, mainly oxygen and carbon dioxide, between an organism and its environment or between exchange surfaces and body fluids.

Respiration: a series of chemical reactions in cells that release energy from food substances. **(2)**

d) Adaptations of alveoli

Any two:

- They have a **large surface area**, allowing rapid gaseous exchange.
- Their walls are **very thin**, providing a short diffusion distance.
- They have a rich supply of blood capillaries.
- They have a moist surface to allow gases to dissolve.
- Continuous ventilation maintains concentration gradients. **(2)**

e)

Any two:

- The muscles require less oxygen as exercise stops.
- Less carbon dioxide is produced.
- The need to remove excess carbon dioxide decreases.
- Lactic acid/oxygen debt is gradually dealt with.
- The heart and respiratory systems gradually return to their resting rates. **(2)**

KENYA CERTIFICATE OF BASIC EDUCATION
SENIOR SCHOOL ASSESSMENT
TERM 3: PROJECT BASED ASSESSMENT 2026

GRADE 10 – BIOLOGY

Time: 2 Hours

LEARNER'S DETAILS

Name: _____ . School: _____ .

Assessment Number: _____ . Date: _____ .

School Code: _____ . Signature: _____ .

PROJECT TITLE

INVESTIGATION OF FACTORS AFFECTING SEED GERMINATION

Background

Seeds require suitable environmental conditions for successful germination. In this project, the learner will investigate **one environmental factor affecting seed germination**, collect data, present the findings and draw a scientifically supported conclusion.

The project should demonstrate the learner's ability to:

- formulate a simple biological problem;
- identify variables;
- make a prediction/hypothesis;
- plan and carry out a biological investigation;
- observe and record biological changes;
- collect and analyse data;
- present findings scientifically;
- draw conclusions from evidence;
- apply knowledge of biology to everyday life.

LEARNER'S PROJECT TASK

You are provided with suitable seeds such as **beans, maize or green grams**, containers, cotton wool or soil, water and other locally available materials.

Investigate:

How does the availability of water affect seed germination?

The investigation should have at least **three experimental conditions**, for example:

- **Set A:** Adequate water
- **Set B:** Limited water
- **Set C:** Excessive water

Use an equal number of seeds in each set and keep other conditions as similar as possible.

Observe the seeds over an appropriate period and record your findings.

PROJECT REQUIREMENTS

1. Identify the problem and state the objective — 2 marks

a) Write the **problem/question** being investigated. **(1 mark)**

b) State the **objective of the investigation**. **(1 mark)**

2. State the hypothesis — 2 marks

Write a suitable **testable hypothesis** predicting how availability of water will affect seed germination.

(2 marks)

3. Identify variables — 3 marks

Identify the following variables in the investigation:

a) **Independent variable** — 1 mark

b) **Dependent variable** — 1 mark

c) **Two controlled variables** — 1 mark

4. Materials and apparatus — 2 marks

List **four materials/apparatus** that you will require to carry out the investigation.

(4 × ½ = 2 marks)

5. Experimental procedure — 4 marks

Write a clear, step-by-step procedure showing how you will conduct the investigation.

Your procedure should demonstrate that:

- equal numbers of seeds are used;
- the experimental groups are clearly labelled;
- different water conditions are provided;
- other important conditions are controlled;
- observations are made regularly;
- results are recorded systematically.

(4 marks)

6. Observation and data recording — 3 marks

Record your observations in a suitable table.

Your table should include:

- observation days;
- experimental sets;
- number of seeds germinated or appropriate germination observations;
- appropriate units/labels.

(3 marks)

Suggested format

Day	Set A – Adequate Water	Set B – Limited Water	Set C – Excess Water
1			
2			
3			
4			
5			
6			
7			

The teacher may extend the observation period depending on the seed used.

7. Data presentation and interpretation — 2 marks

- Present your results using an appropriate **bar graph or line graph**. **(1 mark)**
- State **one significant observation/pattern** from your results. **(1 mark)**

8. Conclusion — 1 mark

Write a conclusion based on the evidence obtained from the investigation. **(1 mark)**

9. Application — 1 mark

State **one practical application of knowledge about seed germination** in agriculture, food production or environmental conservation.

(1 mark)

SCHOOL-BASED PRACTICAL ASSESSMENT INSTRUCTIONS

Teacher's instructions

- Provide learners with locally available seeds and safe materials.
- The project may be conducted individually or in small groups.
- Where learners work in groups, **each learner should maintain an individual project record** and demonstrate individual competence.
- Learners should collect their own observations and results.
- The teacher should supervise the practical work and ensure appropriate laboratory/safety procedures.
- Learners should not be awarded marks merely for producing a neat report; marks should reflect demonstrated competence.
- The project should be assessed using the accompanying marking guide.
- Learners should present their completed work for assessment at the end of the investigation.

Suggested project report format

Cover Page



Title



Problem/Research Question



Objective



Hypothesis



Variables



Materials and Apparatus



Procedure



Observations/Data Table



Graph



Results/Interpretation



Conclusion



Application

GRADE 10 BIOLOGY PROJECT

ANSWERS AND MARKING SCHEME

Note to teacher: Since this is a practical investigation, learners' actual numerical results may differ. Award marks for scientifically reasonable observations, correctly presented data and conclusions that are supported by the learner's own results.

1. Problem and Objective — 2 Marks

Expected answer

a) Problem/Research question:

How does the availability of water affect seed germination? **(1 mark)**

b) Objective:

To investigate the effect of availability of water on seed germination. **(1 mark)**

Marking

- Correct research question/problem – **1 mark**
- Appropriate objective – **1 mark**

2. Hypothesis — 2 Marks

Expected answer

Seeds supplied with an adequate amount of water will germinate better/faster than seeds supplied with limited or excessive water.

Marking

- Predicts that water availability affects germination – **1 mark**
- Makes a clear comparison/prediction about the expected germination – **1 mark**

Accept: Any scientifically reasonable testable hypothesis.

3. Variables — 3 Marks

Expected answers

a) Independent variable:

Amount/availability of water supplied to the seeds. **(1 mark)**

b) Dependent variable:

Seed germination, measured for example by the **number/percentage of seeds germinated**. **(1 mark)**

c) Controlled variables: Any two of:

- Type/species of seed
- Number of seeds used
- Size/type of containers
- Temperature
- Amount/type of growing medium
- Light conditions

- Duration of experiment

(1 mark)

Marking

- Independent variable correctly identified – **1**
- Dependent variable correctly identified – **1**
- Two appropriate controlled variables – **1**

4. Materials and Apparatus — 2 Marks

Acceptable answers

Any four:

- Seeds
- Containers/petri dishes
- Cotton wool or soil
- Water
- Measuring cylinder
- Dropper
- Labels/marker pen
- Ruler
- Tray
- Stopwatch/clock
- Notebook/recording sheet

Marking

½ mark each × 4 = 2 marks

5. Experimental Procedure — 4 Marks

Model answer

1. Obtain healthy, similar-sized seeds of the same type.
2. Label three containers **A, B and C**.
3. Place an equal number of seeds on moist cotton wool or suitable growing medium in each container.
4. Give Set A an adequate amount of water, Set B a limited amount of water and Set C excessive water.
5. Keep other conditions such as type and number of seeds, temperature, light and container size similar.
6. Place the containers in the same suitable environment.
7. Observe the seeds at regular intervals and record the number of seeds that have germinated.
8. Continue the investigation for the agreed observation period and compare the results.

Marking — 4 Marks

Award:

- Uses similar/appropriate seeds and equal numbers – **1 mark**
- Correctly establishes different water conditions – **1 mark**
- Controls other important conditions – **1 mark**
- Makes regular observations and records results – **1 mark**

6. Observation and Data Recording — 3 Marks

Sample results

The following are illustrative results. Do not require learners to reproduce these exact figures.

Day	Set A – Adequate Water	Set B – Limited Water	Set C – Excess Water
1	0	0	0
2	2	1	0
3	5	2	1
4	7	4	2
5	8	5	3
6	9	6	4
7	9	7	4

Marking

- Correctly records observations over the investigation period – **1 mark**
- Data are logically recorded and comparable between the three sets – **1 mark**
- Table has appropriate headings, units/labels and is neat/systematic – **1 mark**

Important: Award marks for the learner's actual valid data even where the values differ from the sample.

7. Data Presentation and Interpretation — 2 Marks

a) Graph — 1 Mark

Expected graph:

- **X-axis:** Days/Time
- **Y-axis:** Number or percentage of seeds germinated
- Separate representation for Sets A, B and C
- Suitable scale
- Appropriate title

Marking

- Correctly plots/presents the data using an appropriate graph – **1 mark**

b) Observation — 1 Mark

Expected observation

Seeds supplied with adequate water showed the highest/faster germination, while seeds receiving limited or excessive water showed lower/slower germination.

1 mark

Accept any valid observation supported by the learner's recorded data.

8. Conclusion — 1 Mark

Model answer

Water availability affects seed germination. Seeds provided with adequate water germinated better/faster than those exposed to limited or excessive water.

1 mark

The conclusion must be based on the learner's experimental evidence.

9. Application — 1 Mark

Expected answer

Farmers should provide seeds with an adequate supply of water during germination to promote successful crop establishment.

1 mark

Other acceptable applications

- Proper irrigation improves crop establishment.
- Excessive watering should be avoided because it may interfere with successful germination.
- Seedbeds should be maintained at suitable moisture levels.
- Knowledge of germination requirements helps farmers produce healthy crops.

Award **1 mark** for any relevant and scientifically correct application.

PERFORMANCE-BASED RUBRIC

Competency Level	Description	Suggested Interpretation
Exceeding Expectations	Learner independently plans the investigation, controls variables appropriately, records accurate observations, presents data correctly and makes a well-supported conclusion.	17–20 marks
Meeting Expectations	Learner conducts the investigation appropriately, records relevant data and provides a generally correct interpretation and conclusion.	13–16 marks
Approaching Expectations	Learner demonstrates partial understanding but requires support in planning, data collection, presentation or interpretation.	9–12 marks
Below Expectations	Learner demonstrates limited understanding and requires considerable support to complete the investigation.	0–8 marks

Teacher's final assessment

Learner's Name: _____

Admission No.: _____

School: _____

Date: _____

Marks Awarded: _____ / 20

Teacher's Signature: _____

Learner's Signature: _____

