**KENYA JUNIOR SCHOOL EDUCATION ASSESSMENT (KJSEA)**

**GRADE 9: INTEGRATED SCIENCE (Practical)**
**CODE: 011 YEAR: 2025 TIME: 2 HOURS**

**Candidate’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Assessment Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**School Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. School Code: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**Candidate’s Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**INSTRUCTIONS TO CANDIDATES:**

1. Write the **name** and **code of your school** in the spaces provided above.
2. **Sign** and write the **date** of the assessment in the spaces provided above.
3. This paper consists of **2** questions.
4. Answer **BOTH** questions in the spaces provided on this **QUESTION PAPER**.
5. Do **NOT** remove any page from this question paper.
6. Answer the questions in English.

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| **Task** | **Task 1** | **Task 2** | **TOTAL** |
| **Question** | 1 | 2 | 3QUESTIONS |
| **Maximum Score** | 20 | 10 | 30 MARKS |
| **Candidate’s Score** |  |  |  |

*This paper consists of 6 printed pages. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*

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**Task 1 (20 marks) – Biology Experiment: Osmosis**

**Experiment: Investigating osmosis using Irish potato tubers**

**Materials provided:**

1. Two potato tubers
2. Two beakers
3. Sugar solution
4. Distilled water
5. Knife and spoon

**Procedure:**

1. Cut two equal-sized potato tubers and scoop out a cavity in each using a spoon.
2. Place the potato cups in separate beakers.
3. Pour concentrated sugar solution into the cavity of the first potato and distilled water into the cavity of the second potato.
4. Add a little distilled water into both beakers to partially cover the outer surface of the potato tubers.
5. Leave the setup for 30 minutes.

**Questions:**
a. State the aim of this experiment. (2 marks)
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b. Record the expected observations in each potato cavity after 30 minutes. (4 marks)
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d. Define the term **osmosis.** (2 marks)
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**Task 2 (10 marks) – Physics Experiment**

**Experiment: Determining the focal length of a concave mirror**

You are provided with:

* A concave mirror mounted on a stand
* A screen
* A meter rule
* A distant object (e.g., the sun or a lamp across the room)

**Procedure:**

1. Place the concave mirror facing a distant object.
2. Adjust the screen until a sharp image of the object is obtained.
3. Measure the distance between the mirror and the screen.

**Questions:**
a. What does the distance measured represent? (1 mark)
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$\frac{1}{f}=\frac{1}{u}+\frac{1}{v}$
(3 marks)

f. State one precaution taken when performing this experiment. (1 mark)

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**MARKING SCHEME AND GUIDE**

**TASK 1 – Biology Experiment: Osmosis in Potato Tubers**

**Experiment Aim:**

**To investigate osmosis using Irish potato tubers.**

**Materials/Tools/Apparatus:**

* 2 potato tubers
* 2 beakers
* Knife
* Spoon
* Concentrated sugar solution
* Distilled water

**Procedure:**

1. Cut two equal-sized potato tubers.
2. Scoop out a cavity in each using a spoon.
3. Place each potato in a separate beaker.
4. Pour concentrated sugar solution into the cavity of the first potato.
5. Pour distilled water into the cavity of the second potato.
6. Add a little distilled water in both beakers to partially cover the outer surface of the potatoes.
7. Leave the setup for 30 minutes.
8. Observe changes in the cavities of both potatoes.

**Expected Observations Table**

|  |  |  |
| --- | --- | --- |
| **Potato Cavity** | **Observation** | **Explanation** |
| Potato in sugar solution | Water level in cavity decreases; cavity may shrink | Water moves from the potato (high water potential) into the sugar solution (low water potential) by osmosis |
| Potato in distilled water | Water level in cavity increases; cavity swells | Water moves from distilled water (high water potential) into the potato (low water potential) by osmosis |

**Answers to Questions:**

**a. Aim of the experiment (2 marks)**

* To investigate the movement of water into or out of potato cells through osmosis.

**b. Expected observations (4 marks)**

* Potato in sugar solution: cavity shrinks
* Potato in distilled water: cavity swells

**c. Explanation of observations (6 marks)**

* Osmosis is the movement of water molecules from a region of high water potential to a region of low water potential through a selectively permeable membrane.
* In the sugar solution, water moves out of the potato into the solution, causing the cavity to shrink.
* In distilled water, water moves into the potato, causing the cavity to swell.

**d. Define osmosis (2 marks)**

* Osmosis is the movement of water molecules from a region of high water potential to a region of low water potential through a selectively permeable membrane.

**e. Precautions (2 marks)**

1. Use equal-sized potato pieces to ensure fair comparison.
2. Avoid spilling solutions to prevent incorrect results.

**f. Importance of osmosis in plants (2 marks)**

1. Maintains turgor pressure for support.
2. Helps in absorption of water from soil.

**g. Real-life application in food preservation (2 marks)**

* Soaking vegetables in salt or sugar solution to remove water and preserve them (e.g., making jam, pickles).

**TASK 2 – Physics Experiment: Focal Length of a Concave Mirror**

**Materials/Tools/Apparatus:**

* Concave mirror mounted on a stand
* Screen
* Meter rule
* Distant object (sun or lamp)

**Procedure:**

1. Place the concave mirror facing a distant object.
2. Place the screen behind the mirror and adjust it until a sharp image of the object is formed.
3. Measure the distance between the mirror and the screen. This is the focal length of the mirror.

**Answers to Questions:**

**a. What does the distance measured represent? (1 mark)**

* The focal length of the concave mirror.

**b. If the distance measured is 12 cm, state the focal length of the mirror. (1 mark)**

* Focal length = 12 cm

**c. Characteristics of the image formed (2 marks)**

1. Real
2. Inverted
3. Diminished or magnified depending on object distance

**d. Daily life application of concave mirrors (2 marks)**

1. Shaving mirrors
2. Headlights of vehicles
3. Dental mirrors
4. Solar concentrators

**e. Calculate the image distance using the mirror formula (3 marks)**

Mirror formula:

1f=1u+1v\frac{1}{f} = \frac{1}{u} + \frac{1}{v}f1​=u1​+v1​

Given:

* f = 12 cm
* u = 24 cm

Step 1: Substitute values



**f. Precaution (1 mark)**

* Handle the mirror carefully to avoid scratches.
* Ensure the screen is adjusted slowly to get a sharp image.

**Confidential Notes for Teachers:**

* Ensure all students measure carefully; improper handling of potatoes or mirrors can affect results.
* Emphasize correct units in measurements.
* Mark answers based on scientific explanation, not just observation.
* For Task 2e, check that students show all steps in calculation for full marks.