KENYA NATIONAL EXAMINATION AND ASSESSMENT PREDICTION SERIES

ENDTERM 2 ASSESSMENT 2025

GRADE 7

INTEGRATED SCIENCE PAPER 2

MARKING SCHEME

QUESTION ONE (20 marks)

You are required to investigate the factors affecting the rate at which a solid dissolves in a liquid. You are provided with the following:

a) Sugar crystals (solid A)

b) Powdered sugar (solid B)

c) Warm water (Liquid C)

d) Cold water (Liquid D)

e) Beakers (labelled 1, 2, 3, 4)

f) Stirring rods

g) Stop clock/watch

Procedure:

1. Add approximately 50 cm^3 of cold water (Liquid D) into Beaker 1.
2. Add approximately 50 cm^3 of warm water (Liquid C) into Beaker 2.
3. Add approximately 50 cm^3 of cold water (Liquid D) into Beaker 3.
4. Add approximately 50 cm^3 of warm water (Liquid C) into Beaker 4.
5. Carefully add one teaspoon of sugar crystals (Solid A) into Beaker 1. Stir continuously and start the stop watch immediately. Record the time taken for all the sugar crystals to dissolve.
6. Carefully add one teaspoon of sugar crystals (Solid A) into Beaker 2. Stir continuously and start the stop watch immediately. Record the time taken for all the sugar crystals to dissolve.
7. Carefully add one teaspoon of powdered sugar (Solid B) into Beaker 3. Stir continuously and start the stop watch immediately. Record the time taken for all the powdered sugar to dissolve.
8. Carefully add one teaspoon of powdered sugar (Solid B) into Beaker 4. Stir continuously and start the stop watch immediately. Record the time taken for all the powdered sugar to dissolve.

Record your results in the table below. (12 marks)

Beaker	**Liquid Used**	**Solid Used**	**Stirring**	**Time taken to dissolve (seconds)**
1	Cold Water	Sugar Crystals	Continuous	**(Sample Answer: 120-180)** (3 marks)
2	Warm Water	Sugar Crystals	Continuous	**(Sample Answer: 40-70)** (3 marks)
3	Cold Water	Powdered Sugar	Continuous	**(Sample Answer: 50-90)** (3 marks)
4	Warm Water	Powdered Sugar	Continuous	**(Sample Answer: 15-30)** (3 marks)

Marking Guidance for Table:

- Award 3 marks for each correctly recorded time that aligns with the expected trend.
- Times should reflect: Warm water < Cold water, Powdered sugar < Sugar crystals.
- Beaker 4 time should be the shortest, Beaker 1 time the longest.
- Accept reasonable time ranges for a practical setup. Exact values are not required, but relative values must be correct.

(a) Based on your results, state how temperature affects the rate of dissolution. (2 marks)

- **Answer:** Increasing the temperature of the solvent (water) increases the rate of dissolution. / Sugar dissolves faster in warm water than in cold water. (1 mark for stating the relationship, 1 mark for linking to results/explanation).
- **Explanation:** Compare Beaker 1 vs 2, or Beaker 3 vs 4. In both cases, warm water results in a shorter dissolution time.

(b) Based on your results, state how particle size affects the rate of dissolution. (2 marks)

- **Answer:** Decreasing the particle size (using powdered sugar) increases the rate of dissolution. / Powdered sugar dissolves faster than sugar crystals. (1 mark for stating the relationship, 1 mark for linking to results/explanation).
- **Explanation:** Compare Beaker 1 vs 3, or Beaker 2 vs 4. In both cases, powdered sugar results in a shorter dissolution time.

(c) Name three basic science skills you applied in this experiment. (3 marks)

- **Answer (any three, 1 mark each):**
    1. **Observing:** Noting changes in the sugar, appearance of the solution, disappearance of solid.
    2. **Measuring:** Using a measuring cylinder for water volume, stop clock for time, and visually assessing one teaspoon of sugar.
    3. **Recording Data:** Filling in the results table.
    4. **Inferring/Interpreting Data:** Drawing conclusions about temperature and particle size effects from the recorded times.
    5. **Controlling Variables:** Keeping stirring constant, amount of sugar constant, volume of water constant.
    6. **Experimenting/Investigating:** Setting up and carrying out the procedure to test a hypothesis.

(d) State one safety precaution you took during this practical activity. (1 mark)

- **Answer (any one, 1 mark):**
    1. Handling glassware (beakers) carefully to avoid breakage.
    2. Using a stirring rod gently to avoid splashing.
    3. Ensuring the work area is clear and tidy to prevent accidental knocks.
    4. Avoiding ingestion of the sugar/water.
    5. Being careful with warm water to prevent minor burns/scalds.
    6. Keeping the stop clock dry and away from spills.

QUESTION TWO (10 marks)

You are provided with a rock sample and some laboratory apparatus. You are required to determine the volume of the irregular rock sample. You are provided with the following:

a) Stone sample

b) Measuring cylinder

c) Water

Procedure:

1. Add some water into the measuring cylinder. Record the initial volume of water.
2. Carefully lower the rock sample into the water in the measuring cylinder until it is fully submerged.
3. Record the final volume of the water with the submerged rock sample.

(a) Record your measurements:

(i) Initial volume of water (V_1) = **(Sample Answer: 40.0 cm^3)** (2 marks)

Marking Guidance: Accept any reasonable initial volume. Value must include units and be precise to one decimal place if the measuring cylinder allows. (1 mark for value, 1 mark for correct unit).

(ii) Final volume of water with rock sample (V_2) = **(Sample Answer: 55.0 cm^3)** (2 marks)

Marking Guidance: Final volume must be greater than initial volume. Value must include units and be precise to one decimal place. (1 mark for value, 1 mark for correct unit). If V1 was 40, V2 should be significantly greater, e.g., 50-60.

(b) Calculate the volume of the rock sample. Show your working. (3 marks)

- **Formula (1 mark):** Volume of rock sample = Final volume (V_2) - Initial volume (V_1)
- **Substitution (1 mark):** Volume of rock sample = 55.0 cm^3 - 40.0 cm^3
- **Answer with units (1 mark):** Volume of rock sample = **15.0 cm^3**

  (Using sample answers from 2a)

  - *Working:*
    - Volume of rock sample = V_2 - V_1
    - = 55.0 cm^3 - 40.0 cm^3
    - = **15.0 cm^3**

(c) State the principle you used to determine the volume of the irregular rock sample. (1 mark)

- **Answer:** Archimedes' Principle / Principle of Water Displacement (or simply "displacement method").

(d) Name two pieces of apparatus necessary for this practical activity. (2 marks)

- **Answer (any two, 1 mark each):**
    1. **Measuring cylinder**
    2. **Water** (as a substance, but often implied as an apparatus component in volume measurement)
    3. **Rock sample** (given as 'stone sample', but also a required item for the practical)
    4. **Thread/string** (optional, but useful for lowering the rock gently)
    5. **Beaker/container** (to hold water before transferring to measuring cylinder, or if the rock is too large)

General Marking Instructions:

- **Accuracy:** For numerical values, accept values within a reasonable range that reflects typical experimental results and the precision of the apparatus.
- **Units:** Penalize missing or incorrect units once per section where applicable, or as specified per mark.
- **Working:** For calculations, award marks for formula, substitution, and final answer with correct units.
- **Clarity:** Answers should be clear, concise, and directly address the question.
- **Language:** Accept answers in clear English.
- **Practicality:** Consider the nature of a junior school practical exam; minor deviations from ideal scientific conditions might be acceptable if the core concept is demonstrated.

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