CONFIDENTIAL GUIDE FOR TEACHERS

THE KENYA NATIONAL EXAMINATION AND ASSESSMENT PREDICTION SERIES

Teacher's Name		**TSC NO.**	
School Name		**School Code**	
Teacher's Signature		**Date**	

KENYA JUNIOR SCHOOL EDUCATION ASSESSMENT

705/2
PAPER 2 (*project*)
TERM 2 ENDTERM 2025

INTEGRATED SCIENCE (PRACTICAL)

Experiment: Factors Affecting Rate of Dissolution

Overall Guidance for Teachers:

a) This experiment introduces basic scientific inquiry, observation, measurement, and data recording.
b) Ensure all materials are readily available and prepared beforehand.
c) Emphasize careful measurement and accurate timing.
d) Safety with water and glassware should be highlighted.

Preparation of Materials (Prior to Exam):

a) **Sugar Crystals (Solid A):** Regular granulated sugar.
b) **Powdered Sugar (Solid B):** Finely ground sugar (can be made by crushing sugar crystals). Ensure a noticeable difference in particle size from Solid A.
c) **Warm Water (Liquid C):** Prepared and kept warm (not boiling, just significantly warmer than cold water). Approximately 40-50°C is ideal.
d) **Cold Water (Liquid D):** Tap water or water kept at room temperature (if room is cold) or slightly chilled.
e) **Beakers:** Four clearly labeled beakers (1, 2, 3, 4) per group.
f) **Stirring Rods:** One per beaker, or enough for rotation.
g) **Stop clock/watch:** One per group or easily accessible.
h) **Teaspoons:** For measuring sugar (consistency is key, even if exact mass isn't controlled).

Question One (20 marks)

Procedure Monitoring:

a) **Steps 1-4 (Setting up Beakers):** Ensure learners correctly add the specified water to each beaker. Monitor approximate volumes.
b) **Steps 5-8 (Adding Sugar, Stirring, Timing):** This is the core.
   - **Teacher's Role:** Observe groups to ensure continuous stirring. Stress starting the stopwatch immediately upon adding sugar and stopping it precisely when *all* sugar dissolves.
   - **Common Challenges:** Inconsistent stirring, inaccurate timing, difficulty determining when *all* sugar has dissolved (especially with crystals). Guide them on visual cues.
- **Expected Results:**
  - Warm water (Beakers 2 & 4) should dissolve sugar faster than cold water (Beakers 1 & 3).
  - Powdered sugar (Beakers 3 & 4) should dissolve faster than sugar crystals (Beakers 1 & 2).

- Therefore, Beaker 4 (Warm Water + Powdered Sugar) should be the fastest, and Beaker 1 (Cold Water + Sugar Crystals) should be the slowest.

Recording Results in Table (12 marks):

- **Marking Guidance:**
  - 3 marks for each row of correctly recorded time (1 mark for each beaker, max 12 marks).
  - Times should reflect the expected trends (Warm > Cold, Powdered > Crystals). Allow for slight variations due to practical execution, but significant deviations should be questioned (e.g., if cold water dissolves faster than warm).
- **Expected Outcome:** A completed table with recorded dissolution times, demonstrating the expected relationships.

Analysis of Results:

- **(a) How Temperature Affects Rate of Dissolution (2 marks):**
  - **Teacher's Role:** Guide learners to compare results from Beaker 1 vs. 2, and Beaker 3 vs. 4.
  - **Marking Guidance:**
    - 2 marks for stating that an increase in temperature increases the rate of dissolution (or vice versa), supported by a comparison of relevant beaker times.
    - 1 mark for stating the relationship without direct reference to their results or an incomplete explanation.
  - **Expected Answer:** "Warm water dissolves sugar faster than cold water. (e.g., Beaker 2 time is less than Beaker 1 time)."
- **(b) How Particle Size Affects Rate of Dissolution (2 marks):**
  - **Teacher's Role:** Guide learners to compare results from Beaker 1 vs. 3, and Beaker 2 vs. 4.
  - **Marking Guidance:**
    - 2 marks for stating that smaller particle size increases the rate of dissolution (or vice versa), supported by a comparison of relevant beaker times.
    - 1 mark for stating the relationship without direct reference to their results or an incomplete explanation.
  - **Expected Answer:** "Powdered sugar dissolves faster than sugar crystals because it has a larger surface area. (e.g., Beaker 3 time is less than Beaker 1 time)."
- **(c) Three Basic Science Skills Applied (3 marks):**
  - **Teacher's Role:** Prompt learners to reflect on the actions they performed during the experiment.
  - **Marking Guidance:**
    - 1 mark for each correct skill (max 3 marks).
    - Examples: Observing, Measuring, Recording, Communicating, Inferring, Predicting, Experimenting, Classifying.
  - **Expected Answer:** "Observation, Measurement, Recording data." (Any three valid skills are acceptable).
- **(d) One Safety Precaution (1 mark):**
  - **Teacher's Role:** Reinforce general lab safety.
  - **Marking Guidance:**
    - 1 mark for a relevant safety precaution.
    - Examples: "Handle glassware carefully to avoid breakages," "Do not taste the chemicals/solutions," "Avoid spilling warm water," "Clean up spills immediately."
  - **Expected Answer:** "Carefully handle glassware to prevent breakage."

Question Two (10 marks) Experiment: Determining Volume of Irregular Rock Sample

Preparation of Materials:

- **Stone Sample:** Irregularly shaped small stones that fit into the measuring cylinder.
- **Measuring Cylinder:** At least 100 cm^3 capacity, clearly graduated.
- **Water:** Tap water.

Procedure Monitoring:

- **Steps 1-3 (Measuring Volume by Displacement):**
  - **Teacher's Role:** Emphasize reading the measuring cylinder at eye level (meniscus). Ensure the rock is fully submerged without splashing or air bubbles.
  - **Common Challenges:** Incorrect reading of the meniscus, parallax error, splashing water when lowering the rock, air bubbles trapped on the rock.

Recording Measurements:

- **(a) Initial and Final Volumes (2 marks each, total 4 marks):**
  - **Marking Guidance:**
    - 2 marks for correct reading of V_1 (within ±1 cm3 of expected value).
    - 2 marks for correct reading of V_2 (within ±1 cm3 of expected value).
    - Units (cm3) must be present for full marks.
  - **Expected Outcome:** Accurate readings with units.
- **(b) Calculate Volume of Rock Sample (3 marks):**
  - **Teacher's Role:** Remind learners of the formula if needed, but primarily assess their application.
  - **Marking Guidance:**
    - 1 mark for the correct formula ($V=V2-V1$).
    - 1 mark for correct substitution of their values.
    - 1 mark for the correct final answer with units (cm3).
  - **Expected Working:** $Vrock=V2-V1$. (e.g., If $V_1 = 40\ cm^3$, $V_2 = 65\ cm^3$, then Vrock=25 cm3).
- **(c) Principle Used (1 mark):**
  - **Teacher's Role:** Ensure learners link the method to the underlying scientific principle.
  - **Marking Guidance:**
    - 1 mark for stating Archimedes' Principle or "principle of water displacement."
  - **Expected Answer:** "Archimedes' Principle" or "Principle of water displacement."
- **(d) Two Necessary Apparatus (2 marks):**
  - **Teacher's Role:** Check if learners can identify the core tools for this specific task.
  - **Marking Guidance:**
    - 1 mark for each correct apparatus (max 2 marks).
    - Examples: Measuring cylinder, water, string (optional for lowering), stone sample.
  - **Expected Answer:** "Measuring cylinder" and "Water."

General Notes for Exams:

- ☞ **Teacher Supervision:** Continuous supervision is crucial, especially for practical aspects involving tools, heat, and chemicals.
- ☞ **Differentiation:** For group projects, encourage varied roles for learners with different strengths.
- ☞ **Record Keeping:** Ensure learners are diligently recording their observations and data as they go.
- ☞ **Post-Practical Discussion:** A follow-up discussion helps reinforce the concepts and correct any misconceptions.
- ☞ **Cleanliness:** Emphasize keeping the workspace clean and tidy throughout and after the practical.
- ☞ **Fairness:** Ensure equal access to materials and tools for all groups/learners.

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