

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

KENYA JUNIOR SCHOOL EDUCATION ASSESSMENT

805/2 INTEGRATED SCIENCE

PAPER 2 (practical)

TERM 2 ENDTERM 2025

Experiment: Acid/Base Testing with Natural Indicator

Overall Guidance for Teachers:

- ☒ This experiment focuses on chemical properties, observation, and drawing conclusions based on evidence.
- ☒ The preparation of the natural indicator (Solution X) is critical and should be done in advance.
- ☒ Ensure a clear range of acidic, basic, and neutral test solutions are available.
- ☒ Safety with unknown solutions and proper disposal should be emphasized.

Preparation of Materials (Prior to Exam):

- ⊖ **Solution X (Natural Indicator):**
  - ✦ **Red Cabbage Indicator:** Chop red cabbage, boil in water for 10-15 minutes, strain the liquid. The liquid should be purple.
  - ✦ **Hibiscus Flower Indicator:** Steep hibiscus petals in hot water until the water turns dark red/purple. Strain.
  - ✦ **Known Acidic Solution:** Lemon juice, vinegar (acetic acid).
  - ✦ **Known Basic Solution:** Soap solution, baking soda solution (dissolve baking soda in water), dilute ammonia solution.
  - ✦ **Clean Water:** Distilled or clean tap water (neutral).
- ⊖ **Test Solutions A, B, C, D, E:** A mix of acidic, basic, and neutral solutions (e.g., dilute fruit juice, dilute soda, dilute detergent, salt solution, sugar solution, milk). Ensure sufficient quantity. Label clearly A-E.
- ⊖ **Beakers/Test Tubes:** Small beakers or test tubes for each solution and for testing.
- ⊖ **Droppers/Pipettes:** For adding solution X.

Question One (20 marks)

Procedure Monitoring:

- ⊖ **Steps 1-4 (Calibration of Indicator):**
  - ✦ **Teacher's Role:** Crucial for learners to establish the color changes for known acid, base, and neutral solutions. This baseline is used for comparison with unknown solutions.
  - ✦ **Expected Outcomes (Approximate - depends on indicator source):**
    - ✦ Red Cabbage: Acidic (red/pink), Neutral (purple/blue), Basic (green/yellow).
    - ✦ Hibiscus: Acidic (bright red/pink), Neutral (purple/dark red), Basic (green/yellow).
- ⊖ **Steps 5-6 (Testing Unknown Solutions):**
  - ✦ **Teacher's Role:** Observe careful addition of indicator, observation of color change, and linking observations to conclusions.

- ✳ **Common Challenges:** Difficulty in distinguishing subtle color changes, subjective interpretation of colors, rushing observations.

### Recording Observations and Conclusions in Table (10 marks):

- **Marking Guidance:**
  - ✳ 1 mark for each correct observation of color change with Solution X (5 marks for Test Solutions A-E).
  - ✳ 1 mark for each correct conclusion (Acidic, Basic, or Neutral) based on their observed color change and the known indicator reactions (5 marks for Test Solutions A-E).
  - ✳ **The "Known" rows are for reference but not directly marked for observation/conclusion within the 10 marks for A-E.**
- **Expected Outcome:** A completed table showing consistent color changes and accurate classification of test solutions.

### Analysis of Results:

- ⊖ (a) **Natural Source of Solution X (1 mark):**
  - ✳ **Teacher's Role:** Link the indicator to its origin.
  - ✳ **Marking Guidance:**
    - ⊕ 1 mark for naming a correct natural source (e.g., "Red cabbage," "Hibiscus flowers," "Turmeric").
  - ✳ **Expected Answer:** "Red cabbage" or "Hibiscus flowers."
- ⊖ (b) **Alternative Known Acidic Solution (1 mark):**
  - ✳ **Teacher's Role:** Check understanding of common acids.
  - ✳ **Marking Guidance:**
    - ⊕ 1 mark for a correct alternative (e.g., "Dilute hydrochloric acid," "Orange juice," "Cola soft drink").
  - ✳ **Expected Answer:** "Orange juice."
- ⊖ (c) **Three Basic Science Skills Applied (3 marks):**
  - ✳ **Teacher's Role:** Prompt reflection on their actions.
  - ✳ **Marking Guidance:**
    - ⊕ 1 mark for each correct skill (max 3 marks).
    - ⊕ Examples: Observing, Classifying, Inferring, Communicating, Predicting, Experimenting.
  - ✳ **Expected Answer:** "Observing, Classifying, Inferring."
- ⊖ (d) **Three Laboratory Apparatus Necessary (3 marks):**
  - ✳ **Teacher's Role:** Identify essential lab equipment.
  - ✳ **Marking Guidance:**
    - ⊕ 1 mark for each correct apparatus (max 3 marks).
    - ⊕ Examples: Test tubes/beakers, droppers/pipettes, test tube rack, stirring rod, measuring cylinder (for initial solution X preparation).
  - ✳ **Expected Answer:** "Test tubes, Droppers, Beakers."
- ⊖ (e) **Two Safety Precautions (2 marks):**
  - ✳ **Teacher's Role:** Emphasize handling chemicals safely.
  - ✳ **Marking Guidance:**
    - ⊕ 1 mark for each relevant safety precaution (max 2 marks).
    - ⊕ Examples: "Do not taste the solutions," "Wear safety goggles," "Handle glassware carefully," "Wash hands after the experiment," "Dispose of chemicals properly."
  - ✳ **Expected Answer:** "Do not taste the solutions," "Handle glassware carefully."

### Question Two (10 marks) Experiment: Determining Density of a Liquid

#### Preparation of Materials:

- **Beaker or Small Container:** Clean and dry.
- **Measuring Cylinder:** Appropriate size for measuring liquid (e.g., 50 cm<sup>3</sup> or 100 cm<sup>3</sup>).

- **Liquid Y (e.g., cooking oil):** Sufficient quantity.
- **Weighing Scale or Beam Balance:** Calibrated and accurate.

### Procedure Monitoring:

- **Steps 1-3 (Measuring Mass and Volume):**
  - ✳ **Teacher's Role:** Emphasize reading the balance accurately and zeroing it before measuring the empty container. Ensure accurate volume reading from the measuring cylinder (meniscus).
  - ✳ **Common Challenges:** Inaccurate balance readings, parallax error when reading volume, spillage.

### Recording Measurements:

- **(a) Mass of Empty Beaker, Volume of Liquid Y, Mass of Beaker + Liquid Y (2 marks each, total 6 marks):**
  - ✳ **Marking Guidance:**
    - ⊕ 2 marks for accurate reading of empty beaker mass (with 'g' unit).
    - ⊕ 2 marks for accurate reading of liquid volume (with cm<sup>3</sup> unit).
    - ⊕ 2 marks for accurate reading of beaker + liquid mass (with 'g' unit).
    - ⊕ Allow for slight variations due to instrument precision.
  - ✳ **Expected Outcome:** Accurate readings with correct units.

### Calculations:

- **(b) Calculate Mass of Liquid Y (2 marks):**
  - ✳ **Teacher's Role:** Guide learners to use subtraction.
  - ✳ **Marking Guidance:**
    - 1 mark for correct formula (Mass of liquid = Mass of beaker + liquid - Mass of empty beaker).
    - 1 mark for correct substitution and accurate answer with units ('g').
  - ✳ **Expected Working:**  $M_{\text{liquid}} = (M_{\text{beaker+liquid}}) - (M_{\text{empty beaker}})$ .
- **(c) Calculate Density of Liquid Y (2 marks):**
  - ✳ **Teacher's Role:** Guide learners to apply the density formula.
  - ✳ **Marking Guidance:**
    - 1 mark for correct formula (Density = Mass/Volume).
    - 1 mark for correct substitution and accurate answer with correct units (e.g., g/cm<sup>3</sup> or g/mL).
  - ✳ **Expected Working:**  $\text{Density} = M_{\text{liquid}} / V_{\text{liquid}}$ . Ensure units are correctly derived.

### 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.