QUESTION ONE (20 marks)

Objective: To use a natural indicator to test whether different solutions are acidic, basic, or neutral.

Assumptions for Solution X (Natural Indicator):

a) **Red Cabbage Indicator:**
   - ✓ Acidic: Red/Pink
   - ✓ Neutral: Purple
   - ✓ Basic: Green/Blue/Yellow
b) **Hibiscus Flower Indicator:**
   - ✓ Acidic: Bright Pink/Red
   - ✓ Neutral: Purple/Pale Pink
   - ✓ Basic: Green/Blue

Assumed Test Solutions (for typical results):

a) Known Acidic: Lemon juice, vinegar (expect Red/Pink with red cabbage, Bright Pink/Red with hibiscus)
b) Known Basic: Soap solution, baking soda solution (expect Green/Blue/Yellow with red cabbage, Green/Blue with hibiscus)
c) Clean Water: Neutral (expect Purple with red cabbage, Purple/Pale Pink with hibiscus)
d) Test Solution A: Likely Acidic (e.g., dilute HCl, soda)
e) Test Solution B: Likely Basic (e.g., dilute NaOH, ammonia solution)
f) Test Solution C: Likely Neutral (e.g., sugar solution, distilled water)
g) Test Solution D: Likely Acidic (e.g., fruit juice, battery acid)
h) Test Solution E: Likely Basic (e.g., bleach, oven cleaner)

Expected Observations and Conclusions Table (using Red Cabbage as Solution X example):

Substance Tested	Observed Colour Change with Solution X	Conclusion (Acidic, Basic, or Neutral)
Known Acidic	Red/Pink	Acidic
Known Basic	Green/Blue	Basic
Clean Water	Purple	Neutral
Test Solution A	Red/Pink	Acidic
Test Solution B	Green/Blue	Basic
Test Solution C	Purple	Neutral
Test Solution D	Red/Pink	Acidic
Test Solution E	Yellow/Green	Basic

(a) Name one example of a natural source from which solution X could have been prepared. (1 mark)

    a) Red cabbage
    b) Hibiscus flowers
    c) Beetroot
    d) Turmeric
    e) Grape juice

(b) Name one alternative solution that could be used as a known acidic solution in place of lemon juice/vinegar. (1 mark)

    a) Dilute hydrochloric acid
    b) Dilute sulfuric acid
    c) Orange juice
    d) Pineapple juice
    e) Tomato juice

(c) State three basic science skills you applied during this practical activity. (3 marks)

    a) **Observing:** Noticing and describing the color changes of the indicator.
    b) **Measuring:** Accurately obtaining 5 cm³ of solutions.
    c) **Inferring/Drawing Conclusions:** Using observations to determine whether a solution is acidic, basic, or neutral.
    d) **Communicating:** Recording observations and conclusions in the table.
    e) **Handling Apparatus:** Using beakers, test tubes, droppers accurately and safely.

(d) Name three laboratory apparatus necessary to carry out this practical. (3 marks)

    a) Test tubes (or beakers/watch glasses)
    b) Dropper (or pipette)
    c) Test tube rack (to hold solutions)
    d) Measuring cylinder (to measure 5 cm³ of solutions)
    e) Stirring rod (optional, for mixing)

(e) State two safety precautions you took during the practical. (2 marks)

    a) **Wearing safety goggles/eye protection:** To protect eyes from accidental splashes of solutions.
    b) **Handling solutions carefully:** Avoiding spillage and direct contact with skin.
    c) **Washing hands thoroughly:** Before and after the experiment.
    d) **Working on a clean, stable surface:** To prevent accidents.
    e) **Keeping the working area tidy:** To avoid clutter and spills.
    f) **Not tasting or smelling chemicals directly:** To prevent ingestion or inhalation of harmful substances.

QUESTION TWO (10 marks)

Objective: To determine the density of a liquid (Liquid Y).

Procedure involves:

1. Mass of empty beaker.
2. Volume of Liquid Y.
3. Mass of beaker + Liquid Y.
4. Calculation of mass of Liquid Y.
5. Calculation of density of Liquid Y.

Example Measurements (for Liquid Y, e.g., cooking oil, which has a density around 0.92 g/cm³):

Let's assume the following hypothetical measurements for the purpose of demonstrating the calculations.

(a) Record your measurements: (6 marks)

(i) Mass of empty beaker/container = **50.0 g** (Hypothetical measurement)

(ii) Exact volume of Liquid Y (V) = **40.0 cm³** (As per instruction to measure approximately 40 cm³, this is the precise reading from measuring cylinder)

(iii) Mass of beaker/container + Liquid Y = **86.8 g** (Hypothetical measurement, reflecting a density of ~0.92 g/cm³ for 40 cm³)

(b) Calculate the mass of Liquid Y (M). Show your working. (2 marks)

Mass of Liquid Y (M) = (Mass of beaker + Liquid Y) - (Mass of empty beaker/container)

M = 86.8 g - 50.0 g **M = 36.8 g**

(c) Calculate the density of Liquid Y. Show your working and state the units. (2 marks)

Density = Mass / Volume Density = 36.8 g / 40.0 cm³ Density = **0.92 g/cm³** (or 0.92 g cm⁻³)

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