Chapter-2

Exploring Substances: Acidic, Basic, and Neutral

Q.1 Write the summary of the chapter in the flow chart below, using the hints given below

1. The **substances** can be acidic, basic, or neutral depending on their nature.
2. Generally, **acids** have a sour taste and turn blue litmus red. Lemon juice and vinegar are examples of acids.
3. The **bases** are generally slippery to the touch, have a bitter taste, and turn litmus paper blue.
4. **Neutral** solutions, such as sugar solutions or salt solutions, do not change the color of an indicator such as litmus.
5. Indicators are simply means used in detecting such chemicals, and they include natural indicators such as litmus (derived from lichen), turmeric, and rose petal extract.
6. Olfactory **indicators**, for example, onion juice, alter their odor but not their color in the presence of an acid or base.
7. A **neutralization reaction** takes place when an acid and a base react in a particular proportion to give salt, water, and heat of reaction. This reaction is employed during day-to-day life to treat ant bites, where a base like baking soda is applied. To treat the soil, the process of neutralisation is used. If the soil has an acidic nature, it is treated with lime. Similarly, a basic soil can be made fertile with the

Q.2 Multiple Choice Questions

1. **Which of the following substances is acidic in nature?**
   d. Vinegar
2. **Select a substance that turns red litmus paper blue is:**
   b. Base
3. **From where do we obtained Litmus:**
   c. Lichens
4. **Which one out of these is neutral?**
   b. Sugar solution
5. **The reaction between an acid and a base is called:**
   b. Neutralisation
6. **The products formed in a neutralisation reaction are:**
   d. Salt, water, and heat
7. **Name a natural indicator that turns yellow to red in bases.**
   d. Turmeric paper

8. **Acid is present in curd is**

   c. Lactic acid

9. **An ant bite injects:**

   b. An acid

10. **Which plant shows soil pH by flower colour?**

    c. Hydrangea

Q.3 Assertion and Reason

1. Assertion (A): Turmeric paper is an effective indicator for checking if the substance is acidic.

   Reason (R): Turmeric paper changes color to reddish brown if the substance is mixed in it.

Ans: (e) Both A and R are false.

2. Assertion (A): The farmer must add organic matter such as manure to the soil because the soil is too basic for plant growth.

   Reason (R): During the decay of organic matter, acids are released, which then neutralizes the basic property of the soil.

Ans: (a) Both A and R are true, and R is the correct explanation of A.

Q.4 Case-Based Question

Rina is in her kitchen, trying some small experiment in chemistry. She has three colorless liquids with her: lemon juice, a baking soda solution, and a sugar solution. She is also provided with a piece of red litmus paper and a turmeric paper. She wants to use these materials to identify each of the liquids.

1. **Rina places the red litmus paper into each liquid. What will she observe, and what can she conclude from this test?**

   The red litmus paper will turn blue when Rina dips it in the solution of baking soda. It would mean that the baking soda solution is a base. Red litmus paper will remain red in lemon juice and a sugar solution since one is acidic and the other neutral.

2. **She next uses the turmeric paper. What will she see for each liquid, and what does that tell her about the identity of the substances?**

   When Rina uses her turmeric paper, which is yellow, she will discover that her yellow turmeric paper turns reddish-brown whenever it touches her baking soda solution. On the other hand, her yellow turmeric paper will remain yellow whenever it touches her lemon juice and sugar solution. This experiment will prove that the baking soda solution is a base.

3. **Can she distinguish between all three liquids using only these two indicators? Why or why not?**

   No, she cannot do so as she will not be able to identify all three liquids using only these two tests. Although these tests enable her to identify all three liquids as bases, neither of these tests has litmus paper that changes its colour if an acidic or neutral liquid is present. Thus, she would not be able to know whether lemon juice was acidic, sugar solution was neutral, or if they were some other pure liquid.

Q.5 Picture-Based Questions

1. **What colour change indicates acid?**
   Blue litmus turns red.
2. **What colour change indicates base?**
   Yellow turns red.
3. **What colour in base?**
   Green.
4. **What colour in acidic soil?**
   Blue.
5. **What happens in base?**
   Smell disappears.

Q.6 Very Short Answer Questions

1. **What is litmus made from?**
   Lichens.
2. **Name one olfactory indicator.**
   Onion
3. **What is the taste of acids?**
   Sour.
4. **What is the taste of bases?**
   Bitter.
5. **What is neutralisation?**
   Reaction of acid and base forming salt, water, and heat.

Q.7 Short Answer Questions

1. **A student is trying to remove a stain of turmeric from their clothes using soap, and they have observed that the turmeric stain turns red. Explain why this is so.**
   The reason behind this phenomenon is that turmeric is an indicator property. The soap solution is of basic nature, and when it gets mixed with basic soap and the turmeric in the stain, the color of the turmeric changes from yellow to red.
2. **How is the extract of the red rose prepared, and what color changes can be observed with acids and bases?**
   Red rose extract is made by crushing the petals of fresh red roses and soaking them in hot water. The hot water extract behaves as an indicator, changing color to red in acidic substances and green in basic substances.
3. **What are salts? Write the examples for acidic, basic, and neutral salts.**
   Salts are ionic compounds formed through the reaction of a base and an acid. Salts can be acidic, basic, and neutral., Example:

   Acidic Salt: Magnesium Chloride

Basic Salt: Sodium bicarbonate

Neutral Salt: Sodium Chloride

4. **List two examples each of common acids and common bases.**

   Acids: Curd, lemon juice, vinegar.

   Bases: Baking soda, Lime water.

5. **Explain why factory waste must be neutralized before disposal in water bodies.**

   Many factories produce waste that is usually acidic in nature. When this waste is directly let into the water bodies, such as rivers or lakes, it contains acids that may kill the fish and some other life present in the water body. Therefore, factory wastes have to be neutralised by adding bases into them before their disposal to save the environment from their bad effects.

Q.8 Long Answer Questions

1. **What is the process of neutralization? Use a chemical example.**

   Neutralization is a chemical reaction that occurs between an acid and a base when they are combined. In this reaction, the acid and base properties of the acid and base, respectively, are destroyed to give water, and sometimes a salt, and heat, which means that they give out heat in this reaction.

   Acid + Base → Salt + Water + Heat

   For example, in an acid-base reaction, where hydrochloric acid (HCl) reacts with sodium hydroxide (NaOH), the products will be sodium chloride (NaCl), which is a salt, and water

   $HCl + NaOH \rightarrow NaCl + H_2O$

   Hydrochloric acid + Sodium hydroxide → Sodium chloride + Water)

2. **You are asked to identify three liquids that you have never seen before, namely, vinegar, baking soda solutions, and sugar solutions. You have access to only one test tube of red rose extract. Can you identify the three liquids correctly and, if not, why not?**

A. **Using the information from the preceding chapter, what would you observe if each of these liquids were tested with red rose extract?**

   Vinegar: Vinegar is an acid. According to the chapter, red rose extract changes color to red in an acid solution.

   Baking Soda Solution: The baking soda solution is a base, and extract from a red rose turns green in a basic solution.

   Sugar Solution: The sugar solution is a neutral solution. No effect will occur on the color of red rose extract.

B. **What is the main limitation of using only the red rose petal extract for the purpose of distinguishing the three liquids?**

   The biggest limitation with this method is that you cannot conclusively tell what the vinegar and the sugar solution are since they would show different reactions than the baking soda solution but the same as each other. In the case of the red rose extract, it would be possible to conclude that the baking soda solution was a base because it would turn green, and that would be the

only difference since the acidic and the neutral solutions would show no such change. In the same chapter, it is noted that the red rose extract would turn the solution red if it were acidic, and the neutral substance would also not change colour.

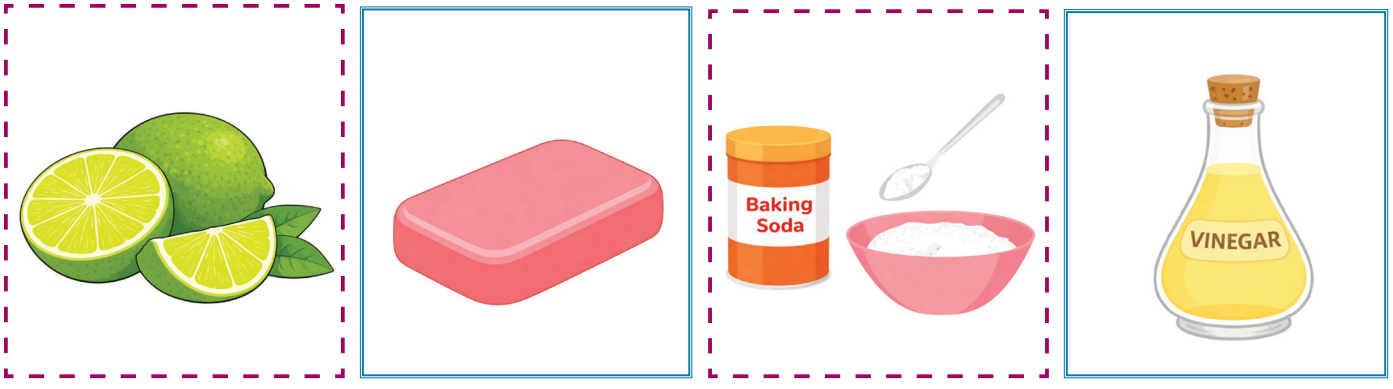
Q.9 Value-Based Questions

1. **Why is neutralization important in agriculture?**
   Maintains soil pH for healthy crops.
2. **Why must natural indicators be employed?**
   Eco-friendly, safe, and easily available.
3. **Why is neutralisation important in medicine?**
   Helps treat insect bites and acidity.
4. **Why neutralization is important in environment?**
   It also helps to prevent pollution and protect the aquatic system.
5. **Why does it happen that tasting substances to test for acidity/basicity is unsafe?**
   They could be hazardous or corrosive.

Q.10 Open-Ended Questions

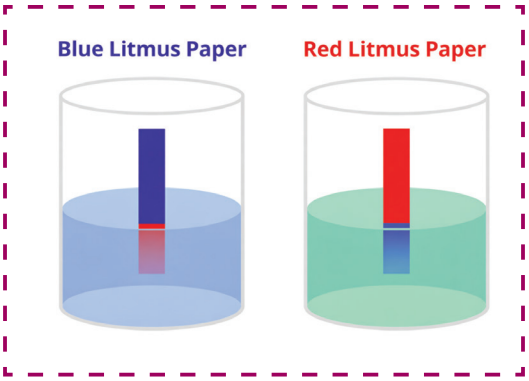
1. **How can students test acidity/basicity at home?**
   By utilizing natural indicators such as turmeric or red rose extracts.
2. **How does soil pH influence plant growth?**
   The soil prevents growth if it is acidic/basic; however, when neutral
3. **How do acids and bases relate to daily life?**
   In food, cleaning products, and medicines.
4. **How can neutralisation protect aquatic life?**
   By neutralizing the acidic waste water coming from factories.
5. **How does curiosity help in science experiments?**
   Promotes exploration, discovery, and practical learning.

Visual Warm-Up
Look at the pictures



The pH scale:

1	2	3	4	5	6	7	8	9	10	11	12	13	14



- **Sort the items into Acidic, Basic, Neutral using arrows or stickers.**
- **Color the pH scale with shades (red = strong acid, green = neutral, purple = strong base).**

"Test Tube Detective"

Fill the table with sketches or pasted images:

To be completed independently by the students.

Read the situations and respond creatively (draw, write, or role-play):

Riya spilled acid on the lab table.

1. **What should she do immediately?**
   To be completed independently by the students.
2. **Draw a "Safety Poster" showing precautions in the lab.**
   To be completed independently by the students.

A farmer uses lime (calcium hydroxide) to reduce soil acidity.

1. **Sketch a "Soil Health Badge" showing balance between acids and bases.**
   To be completed independently by the students.

Your stomach feels acidic after spicy food.

1. **Suggest a safe neutralizing substance.**
   To be completed independently by the students.**Draw a "Healthy Stomach Shield."**

Self-Evaluation

To be completed independently by the students.

Reflection & Action

Draw a "Balance Scale": one side = acids, other side = bases, middle = salts.
To be completed independently by the students.

Write one action you will take to use household acids/bases safely (e.g., handle cleaning agents carefully, avoid tasting unknown substances).
To be completed independently by the students.