Chapter 2: Exploring Substances: Acidic, Basic, and Neutral

Exercises — Let Us Enhance Our Learning

Q1 A solution turns the red litmus paper to blue. Excess addition of which of the following solution would reverse the change?
(i) Lime water
(ii) Baking soda
(iii) Vinegar
(iv) Common salt solution

SOLUTION

A solution that turns red litmus paper to blue is basic in nature (bases turn red litmus to blue).

To reverse this — i.e., to turn the litmus back from blue to red — an acidic substance must be added in excess to neutralise the base.

Among the options: lime water and baking soda are basic; common salt solution is neutral. Vinegar is acidic.

Adding excess vinegar (an acid) would neutralise the base and eventually make the solution acidic, turning the litmus back to red.

Answer: (iii) Vinegar — it is acidic and will neutralise the base, reversing the blue colour back to red.

Q2 You are provided with three unknown solutions labelled A, B, and C, but you do not know which of these are acidic, basic, or neutral. Upon adding a few drops of red litmus solution to solution A, it turns blue. When a few drops of turmeric solution are added to solution B, it turns red. Finally, after adding a few drops of red rose extract to solution C, it turns green.

Based on the observations, which of the following is the correct sequence for the nature of solutions A, B, and C?
(i) Acidic, acidic, and acidic
(ii) Neutral, basic, and basic
(iii) Basic, basic, and acidic
(iv) Basic, basic, and basic

SOLUTION

Solution A: Red litmus turns blue → the substance is basic (bases turn red litmus

to blue).

Solution B: Turmeric turns red → the substance is basic (turmeric paper turns red/changes colour only in basic solutions; it remains unchanged in acidic and neutral solutions).

Solution C: Red rose extract turns green → the substance is basic (red rose extract gives green colour in a basic solution and red colour in an acidic solution).

Therefore, A = Basic, B = Basic, C = Basic.

Answer: (iv) Basic, basic, and basic.

Q3 Observe and analyse Figs. 2.13, 2.14, and 2.15, in which red rose extract paper strips are used. Label the nature of solutions present in each of the containers.

SOLUTION

Red rose extract is an acid-base indicator: it turns red in acidic solutions and green in basic solutions. It shows no change (retains its original pink colour) in neutral solutions.

Fig. 2.13 — The red rose extract paper strip has turned GREEN. Green colour indicates a basic solution, so the container in Fig. 2.13 holds a BASIC solution.

Fig. 2.14 — The strip retains its original pink colour with NO change. No colour change indicates a neutral solution, so the container in Fig. 2.14 holds a NEUTRAL solution.

Fig. 2.15 — The strip has turned RED. Red colour indicates an acidic solution, so the container in Fig. 2.15 holds an ACIDIC solution.

Colour key applied: green strip → Basic; no change (pink) → Neutral; red strip → Acidic.

Answer: Fig. 2.13 = Basic (strip turned green); Fig. 2.14 = Neutral (strip unchanged/pink); Fig. 2.15 = Acidic (strip turned red).

Q4 A liquid sample from the laboratory was tested using various indicators:

Indicator: Red litmus — Change: No change
Indicator: Blue litmus — Change: Turned red
Indicator: Turmeric — Change: No change in colour

Based on the tests, identify the acidic or basic nature of the liquid and justify your answer.

SOLUTION

Let us analyse each indicator result:
Red litmus shows no change: bases turn red litmus to blue, so if there is no change, the liquid is NOT basic.
Blue litmus turns red: acids turn blue litmus to red, which means the liquid is acidic.
Turmeric shows no change in colour: turmeric paper changes colour (turns red) only in basic solutions; it remains unchanged in acidic and neutral solutions. Since there is no change and blue litmus turned red, this is consistent with the liquid being acidic (not basic, not neutral).
All three observations together confirm the liquid is acidic: it turns blue litmus red, does not affect red litmus, and does not change turmeric colour.

Answer: The liquid is acidic. It turns blue litmus red (characteristic of acids), does not change red litmus (rules out basic nature), and does not change turmeric paper (consistent with acidic or neutral, but blue litmus result confirms acidic).

Q5 Manya is blindfolded. She is given two unknown solutions to test and determine whether they are acidic or basic. Which indicator should Manya use to test the solutions and why?

SOLUTION

Since Manya is blindfolded, she cannot observe colour changes in indicators like litmus paper, red rose extract, or turmeric paper.
She should use an olfactory indicator — a substance whose odour changes in acidic or basic solutions.
From the chapter, onion is described as an olfactory indicator: its odour changes when it comes into contact with acidic or basic substances.
By smelling whether the odour of the onion-soaked strip changes, Manya can

determine the nature of the solution without relying on sight.

Answer: Manya should use an olfactory indicator such as onion, whose odour changes in acidic or basic solutions. Since she is blindfolded, she cannot see colour changes, but she can detect changes in smell.

Q6 Could you suggest various materials which can be used for writing the message on the white sheet of paper (given at the beginning of the chapter) and what could be in the spray bottle? Make a table of various possible combinations and the colour of the writing obtained.

SOLUTION

The trick at the science fair works because an indicator is used to write on the paper, and an acidic or basic spray reacts with it to show a colour change.

The chapter specifically mentions one possibility: turmeric solution used to write on the paper, and soap solution (a base) in the spray bottle — when the base is sprayed, the yellow turmeric turns red, revealing the writing.

Other possible combinations based on the chapter's indicators:

Writing material: Red rose extract (original colour retained on paper); Spray: Acid (e.g., lemon juice) → Colour of writing: Red

Writing material: Red rose extract (original colour retained on paper); Spray: Base (e.g., soap solution) → Colour of writing: Green

Writing material: Turmeric solution; Spray: Base (e.g., baking soda solution or soap solution) → Colour of writing: Red

Writing material: Turmeric solution; Spray: Acid (e.g., lemon juice) → Colour of writing: No visible change (yellow remains yellow)

Table summary:

	Writing material	Spray (in bottle)	Colour of writing obtained	
	Red rose extract	Lemon juice (acid)	Red	
	Red rose extract	Soap solution (base)	Green	
	Turmeric solution	Baking soda solution (base)	Red	
	Turmeric solution	Lemon juice (acid)	No change (yellow)	

Answer: Multiple combinations work. E.g., turmeric written + base spray → red writing; red rose extract written + acid spray → red writing; red rose extract written + base spray → green writing.

Q7 Grape juice was mixed with red rose extract; the mixture got a tint of red colour. What will happen if baking soda is added to this mixture? Justify your answer.

SOLUTION

The red rose extract shows red colour in acidic solutions and green colour in basic solutions.

The mixture got a tint of red colour, which means grape juice is acidic in nature (it turned the red rose extract red).

Baking soda is a base.

When baking soda (a base) is added to the acidic mixture, a neutralisation reaction occurs: the acid in grape juice reacts with the baking soda. As more baking soda is added, the acidity decreases.

Since the red rose extract turns green in a basic solution, the colour of the mixture will change from red to green as baking soda is added and the solution becomes basic.

Answer: The red tint will change to green. Grape juice is acidic (red rose extract turned red). Adding baking soda (a base) neutralises the acid; further addition makes the solution basic, turning the red rose extract green.

Q8 Keerthi wrote a secret message to her grandmother on her birthday using orange juice. Can you assist her grandmother in revealing the message? Which indicator would you use to make it visible?

SOLUTION

Orange juice is acidic in nature (like lemon juice and other citrus fruits, it contains citric acid).

To reveal the message, an indicator that shows a clear colour change in acidic conditions must be applied to the paper.

Red rose extract turns red in acidic solutions. If the paper with the hidden (dried) orange juice message is sprayed or brushed with red rose extract, the areas where orange juice was written will turn red, making the message visible.

Alternatively, turmeric paper can be used: turmeric does not change colour in acidic solutions, so it would not directly reveal the acidic writing. However, red rose extract is the better choice as it shows a visible red colour with acids.

Another option: if baking soda solution (a base) is used as the spray, and turmeric was the indicator written on paper — but here orange juice (acid) is the ink, so red rose extract applied over the writing area would reveal the red-coloured message.

Answer: Apply red rose extract over the paper. Orange juice is acidic, so wherever the message was written, the red rose extract will turn red, revealing the secret message.

Q9 How can natural indicators be prepared? Explain by giving an example.

SOLUTION

Natural indicators are substances obtained from plants that change colour in acidic or basic solutions and can therefore be used to identify the nature of a substance.

They can be prepared by extracting the coloured compounds from flowers, leaves, or other plant parts.

Example — Red rose extract:

1. Collect fallen petals of red roses and wash them with water.
2. Crush the petals using a mortar and pestle.
3. Place the crushed petals in a glass tumbler and pour hot water over them so they are completely immersed.
4. Cover and wait for 5–10 minutes until the water becomes coloured.
5. Filter the liquid; the filtrate (flower extract) is the natural indicator.

This red rose extract turns red in acidic solutions and green in basic solutions.

Example — Turmeric paper:

1. Make a paste of turmeric (haldi) with a little water.
2. Dip filter paper in the turmeric paste until it turns yellow.
3. Allow it to dry, then cut into strips.

These turmeric paper strips change colour (turn red) in basic solutions and can be used as a natural indicator.

Answer: Natural indicators are prepared by extracting coloured compounds from plant materials. For example, red rose petals are crushed, soaked in hot water, and filtered to get an extract that turns red in acids and green in bases. Turmeric paper is made by dipping filter paper in turmeric paste, drying it, and cutting into strips — it turns red in basic solutions.

Q10 Three liquids are given to you. One is vinegar, another is a baking soda solution, and the third is a sugar solution. Can you identify them only using turmeric paper? Explain.

SOLUTION

Turmeric paper changes colour (turns red) only in basic solutions. It does NOT change colour in acidic or neutral solutions — it remains yellow in both.

Vinegar is acidic, baking soda solution is basic, and sugar solution is neutral.

Test each liquid with turmeric paper:

The liquid that turns turmeric paper red → baking soda solution (basic).

The other two liquids (vinegar and sugar solution) will NOT change the colour of turmeric paper — both will leave it yellow.

Therefore, turmeric paper alone CANNOT distinguish between vinegar (acidic) and sugar solution (neutral), since it does not change in either acidic or neutral conditions.

Conclusion: Using turmeric paper, we can identify baking soda solution (it turns turmeric red), but we cannot tell vinegar apart from sugar solution.

Answer: No, turmeric paper cannot identify all three alone. It turns red only in basic solutions — so baking soda solution can be identified. However, both vinegar (acidic) and sugar solution (neutral) leave turmeric paper unchanged (yellow), so they cannot be distinguished from each other using turmeric paper alone.

Q11 The extract of red rose turns the liquid X to green. What will the nature of liquid X be? What will happen when excess of amla juice is added to liquid X?

SOLUTION

Red rose extract turns green in basic solutions. Since it turned liquid X green, liquid X is basic in nature.

Amla juice is acidic (amla contains ascorbic acid/Vitamin C and citric acid, as mentioned in the chapter).

When excess amla juice (an acid) is added to liquid X (a base), a neutralisation reaction occurs:

Acid + Base → Salt + Water + Heat

As amla juice is added in excess, the base is first neutralised (the solution becomes neutral), and then, with excess acid, the solution becomes acidic.

Since red rose extract turns red in acidic solutions, the colour of the mixture will change from green (basic) to the original extract colour (neutral) and eventually to red (acidic) as excess amla juice is added.

Answer: Liquid X is basic (red rose extract turns green in basic solutions). Adding excess amla juice (an acid) neutralises the base; with excess, the solution becomes acidic — the colour of the red rose extract will change from green to red.

Q12 Observe and analyse the information given in the following flowchart. Complete the missing information.

Imagine a garden with plants showing signs of poor health.

→ The soil can be _____ in nature.

→ The soil can be _____ in nature.

→ Which indicator can be used to test the nature of the soil? _____

→ The acidic soil can be treated with _____.

→ The basic soil can be treated with _____.

SOLUTION

From the chapter, plants may show poor health when the soil is either too acidic or too basic.

The soil can be acidic in nature (e.g., due to excessive use of chemical fertilisers).

The soil can be basic in nature.

To test the nature of the soil, any acid-base indicator can be used. Litmus paper (blue or red) is a commonly available indicator; alternatively, natural indicators such as red rose extract or turmeric paper can be used.

Treatment for acidic soil: lime (calcium oxide/calcium hydroxide), which is a base, is added to neutralise the excess acid. The chapter specifically states that when soil is too acidic, it can be treated with lime.

Treatment for basic soil: organic matter such as manure and composted leaves is added. Organic matter releases acids that neutralise the basic nature of the soil, as stated in the chapter.

Answer: The soil can be acidic in nature. / The soil can be basic in nature. / Indicator: Litmus paper (or red rose extract / turmeric paper). / Acidic soil is treated with lime (a base). / Basic soil is treated with organic matter (manure and composted leaves).