

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

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

Answer : (iii) Vinegar

Reason : A solution that turns red litmus paper blue is basic in nature. To reverse this change and turn it back to red, an acidic solution is required. Vinegar contains acetic acid, which neutralises the base and makes the solution acidic.

Q2. You are provided with three unknown solutions labelled A, B and C. 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

Answer : (iv) Basic, basic, and basic

Reason :

- Solution A turns red litmus to blue → Basic
- Solution B turns turmeric solution to red → Basic
- Solution C turns red rose extract to green → 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.

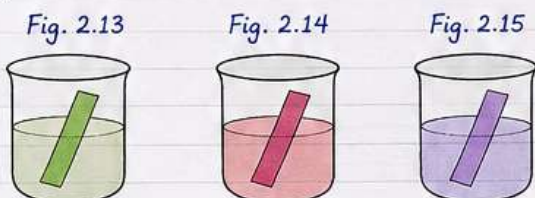


Fig. 2.13 (Green colour) : Basic solution
(Red rose extract turns green in a basic medium.)

Fig. 2.14 (Red / Magenta colour) : Acidic solution
(Red rose extract turns red in an acidic medium.)

Fig. 2.15 (No colour change) : Neutral solution
(Red rose extract shows no colour change in a neutral medium.)

Q4. A liquid sample from the laboratory was tested using various indicators : Red litmus = No change ; Blue litmus = Turned red ; Turmeric = No change in colour. Based on the tests, identify the acidic or basic nature of the liquid and justify your answer.

Answer : The liquid sample is Acidic in nature.

Justification : Substances that turn blue litmus paper red are acidic in nature. Acidic substances do not change the colour of red litmus paper or yellow turmeric paper.

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?

Answer : Manya should use an olfactory indicator (such as finely chopped onion strips or vanilla extract).

Reason : Olfactory indicators change their odour (smell) in an acidic or basic medium. Since Manya is blindfolded, she can identify the nature of the solutions by smell rather than visual colour change.

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

Writing Material (Message)	Substance in Spray Bottle	Colour of Writing Obtained
Baking soda solution (Base)	Turmeric solution	Red
Soap solution (Base)	Turmeric solution	Red
Lemon juice / Vinegar (Acid)	Blue litmus solution	Red
Baking soda solution (Base)	Red rose extract	Green
Lemon juice / Vinegar (Acid)	Red rose extract	Red

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.

Answer : When baking soda is added to the mixture, the red colour will change to green.

Justification : Grape juice contains acid, which turns red rose extract red. Baking soda is basic in nature. Adding baking soda neutralises the acid and makes the solution basic, causing the red rose extract indicator to change to 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?

Answer : Keerthi's grandmother can use red rose extract or blue litmus solution to reveal the message.

Reason : Orange juice contains citric acid (acidic in nature). Spraying red rose extract on the paper will turn the written text bright red / magenta, making the secret message clearly visible.

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

Answer : Natural indicators can be prepared by extracting natural plant pigments using warm water.

Example (Preparing Red Rose Extract) :

- ① Collect fallen petals of red roses and wash them thoroughly with water.
- ② Crush the petals using a mortar and pestle and place them in a glass tumbler.
- ③ Pour hot water over the crushed petals to ensure they are immersed.
- ④ Cover the tumbler and wait for 5 to 10 minutes until the water becomes coloured.
- ⑤ Filter the liquid; the filtrate obtained is the red rose extract indicator.

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.

Answer : Yes, we can identify all three liquids using turmeric paper as follows :

Step 1 : Put a drop of each of the three liquids on separate turmeric paper strips. The liquid that turns the yellow turmeric paper red is the baking soda solution (basic in nature).

Step 2 : Mix a few drops of the identified baking soda solution with the remaining two unknown liquids separately in two test tubes.

Step 3 : Test both resulting mixtures with fresh turmeric paper :

- The mixture that no longer turns turmeric paper red contains vinegar (acidic in nature, because the acid neutralises the base).
- The mixture that still turns turmeric paper red contains the sugar solution (neutral in nature, so the base remains unneutralised).

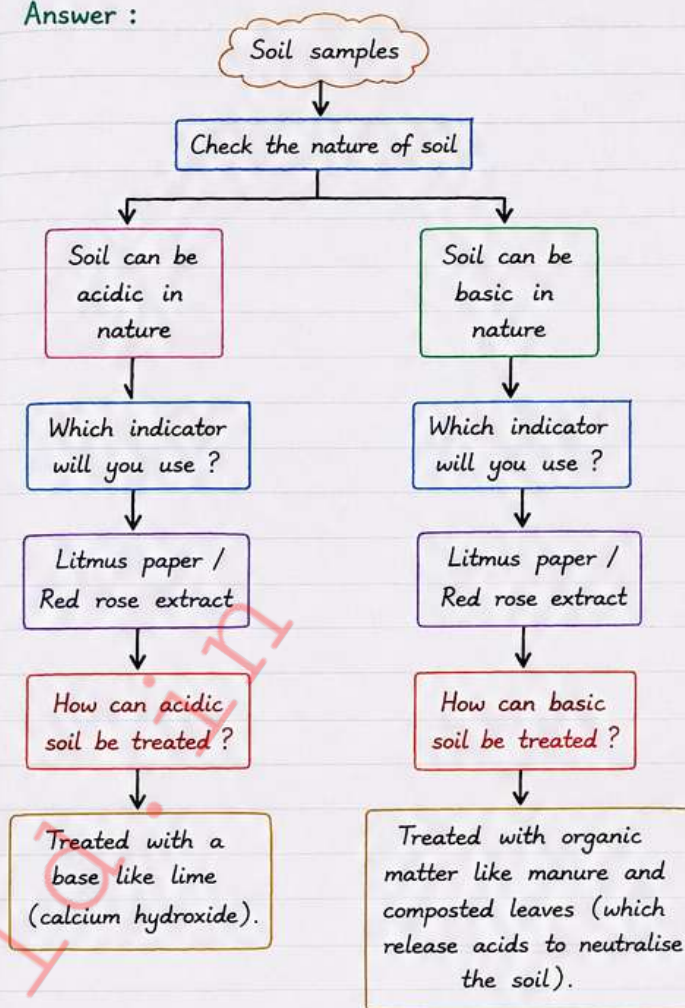
Q11. The extract of red rose turns the liquid X to green. What will the nature of liquid X be? What will happen when excess of amla juice is added to liquid X?

Answer : Liquid X is basic in nature.

Explanation : Red rose extract turns green in basic solutions. Amla juice contains acid (citric/ascorbic acid). When excess amla juice is added to liquid X, it neutralises the base. As the solution becomes acidic, the green colour will change to red.

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

Answer :



(End of Chapter Exercise Questions)

Quick Summary

- Acidic substances turn blue litmus red. They do not change red litmus.
- Basic substances turn red litmus blue. They turn yellow turmeric paper red.
- Neutral substances do not change the colour of litmus or turmeric paper.
- Natural indicators like red rose extract, turmeric, cabbage leaf extract, etc., help us test the nature of substances.
- Acids and bases can neutralise each other.
- The pH scale helps in determining the nature of a substance.

Common Indicators and Their Behaviour

Indicator	In Acidic	In Basic	In Neutral
Red litmus paper	No change	Turns blue	No change
Blue litmus paper	Turns red	No change	No change
Turmeric paper	No change	Turns red	No change
Red rose extract	Turns red	Turns green	No change

QUICK REVISION NOTES & DEFINITIONS

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

1. INTRODUCTION & NATIONAL SCIENCE DAY

- **National Science Day** : Celebrated on 28 February every year in India.
- **Acid-Base Secret Writing** : Applying invisible base solution (like baking soda) on turmeric-coated paper turns red when an indicator reacts, revealing secret text.

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2. KEY DEFINITIONS

- **Acid** : A chemical substance that tastes sour, turns blue litmus paper red, and neutralises bases.
- **Base** : A chemical substance that tastes bitter, feels soapy or slippery to touch, turns red litmus paper blue, and neutralises acids.
- **Neutral Substance** : A substance that is neither acidic nor basic in nature and does not change the colour of blue or red litmus paper (e.g., pure water, sugar solution, salt solution).
- **Acid-Base Indicator** : A natural or synthetic substance that shows different colours in acidic and basic solutions, used to test the chemical nature of substances.
- **Olfactory Indicator** : A substance whose odour (smell) changes in an acidic or basic medium (e.g., onion, vanilla extract).
- **Neutralisation Reaction** : A chemical reaction between an acid and a base that produces salt and water along with the release of heat.

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3. ACIDS AND THEIR NATURAL SOURCES

Edible Substance	Acid Present
Citrus fruits (Lemon, Orange)	Citric acid, Ascorbic acid (Vitamin C)
Curd / Milk	Lactic acid
Tamarind, Grapes, Unripe mangoes	Tartaric acid
Vinegar	Acetic acid
Tomatoes	Citric acid and Oxalic acid
Ant sting	Formic acid

5. NEUTRALISATION REACTION & EQUATION

When an acid is mixed with a base in sufficient quantity, both substances lose their characteristic properties, forming a neutral solution.



- **Lime Water Preparation** : Lime water (Calcium hydroxide solution) is prepared by dissolving lime (calcium oxide / chuna) in water, letting it settle, and filtering the clear liquid.

6. NEUTRALISATION IN DAILY LIFE

- **Ant Bites** : Red ant bites inject acidic formic acid into the skin, causing pain. It is neutralised by applying moist baking soda (a base) or calamine solution.
- **Soil Treatment** :
 - ⇒ If soil becomes too acidic due to excessive fertilizers, it is treated with bases like lime (quicklime/slaked lime).
 - ⇒ If soil becomes too basic, organic matter (manure/compost) is added, which releases acids to neutralise the soil.
- **Industrial Waste** : Acidic factory waste released into rivers kills aquatic life. It is neutralised by adding basic substances before discharge.

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4. NATURAL INDICATORS & COLOUR CHANGES

Indicator	Acidic Medium	Basic Medium	Neutral Medium
Blue Litmus Paper	Turns Red	No Change (Blue)	No Change
Red Litmus Paper	No Change (Red)	Turns Blue	No Change
Turmeric Paper	Yellow (No Change)	Turns Red	Yellow (No Change)
Red Rose Extract	Turns Red / Magenta	Turns Green	No Change

Note on Litmus : Litmus is a natural dye extracted from lichens (a symbiotic association of a fungus and an alga).

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7. SCIENTIFIC & FASCINATING FACTS

- **Acharya Prafulla Chandra Ray (P.C. Ray)** :
 - ⇒ Known as the 'Father of Modern Indian Chemistry'.
 - ⇒ Established India's first pharmaceutical company in 1901.
- **Hydrangea Plant** : Gives blue flowers in acidic soil, and pink/red flowers in basic soil. Gardeners alter soil pH to change blossom colour.
- **Golden Spice** : Turmeric (haldi) belongs to the ginger family and is widely used in Ayurveda and modern medical research.

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NCERT CLASS 7 SCIENCE SOLUTIONS

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

Q13. Four solutions A, B, C, and D are given to you. Their pH values are as follows :

Solution	A	B	C	D
pH value	3	11	7	5

Arrange these solutions in increasing order of hydrogen ion concentration.

Answer : The increasing order of hydrogen ion concentration is :
 $B < C < D < A$

Reason : Lower the pH value, higher is the hydrogen ion concentration. So, pH 11 (B) has the lowest $[H^+]$ and pH 3 (A) has the highest $[H^+]$ concentration.

Q14. Is distilled water acidic, basic or neutral? How would you verify it using an indicator?

Answer : Distilled water is neutral.

Verification : If we test distilled water with any indicator such as litmus paper, turmeric, or red rose extract, there will be no change in colour. This shows that it is neutral.

Q15. Classify the following substances as acidic, basic or neutral.

- (i) Lemon juice (ii) Baking soda solution (iii) Sugar solution
(iv) Soap solution (v) Salt solution

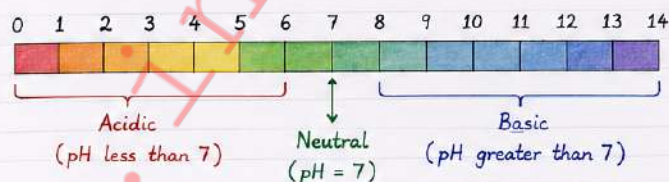
Answer :

- (i) Lemon juice - Acidic (iv) Soap solution - Basic
(ii) Baking soda solution - Basic (v) Salt solution - Neutral
(iii) Sugar solution - Neutral

Q16. What is pH scale? Write the range of pH values for acids, bases and neutral substances.

Answer :

The pH scale is a scale used to determine the acidic, basic or neutral nature of a substance.



Acids : pH less than 7 (0 to less than 7)

Neutral substances : pH = 7

Bases : pH greater than 7 (more than 7 to 14)

Q17. Why do we get relief from the pain caused by an ant bite when we apply baking soda paste?

Answer : An ant bite injects formic acid into the skin, which causes pain and irritation. Baking soda is basic in nature. When we apply baking soda paste, it neutralises the acid and gives relief from pain and irritation.

Q18. Explain why it is important to test the nature of soil before growing plants.

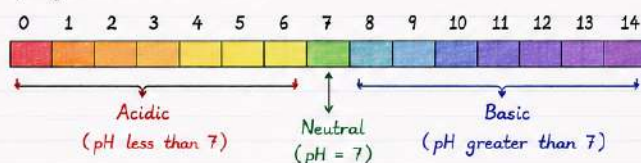
Answer : It is important to test the nature of soil before growing plants because different plants grow best in soil of different pH. If the soil is too acidic or too basic, plants may not grow well. By testing and treating the soil, we can provide suitable conditions for healthy growth of plants.

NCERT CLASS 7 SCIENCE – QUICK REVISION NOTES & DEFINITIONS

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

8. pH SCALE

- The pH scale is used to measure how acidic or basic a substance is.
- The scale ranges from 0 to 14.
- pH less than 7 → **Acidic**
- pH equal to 7 → **Neutral**
- pH greater than 7 → **Basic**



9. EXAMPLES OF ACIDS, BASES AND NEUTRAL SUBSTANCES

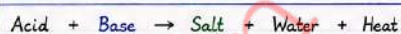
Acidic Substances (pH < 7)	Basic Substances (pH > 7)	Neutral Substances (pH = 7)
- Lemon, Orange juice - Vinegar - Curd, Buttermilk - Tamarind - Tomato (Contain natural acids)	- Baking soda solution - Soap solution - Lime water - Toothpaste (Contain bases)	- Pure water - Sugar solution - Common salt solution - Distilled water

10. TESTING THE NATURE OF SUBSTANCES

- Use natural indicators like turmeric, red rose extract, or litmus paper.
- Observe the colour change.
- Decide whether the substance is acidic, basic or neutral.
- If needed, use more than one indicator to confirm the result.

11. NEUTRALISATION REACTION

When an acid reacts with a base in the right amount, both lose their properties and form salt and water.



Example :



12. NEUTRALISATION IN DAILY LIFE

- Ant Bites :**
Red ants inject formic acid (acidic) into the skin, causing pain and irritation. It is neutralised by applying baking soda (base) or calamine solution.
- Soil Treatment :**
⇒ If soil is too acidic (due to excess use of fertilisers), it is treated with bases like lime (quicklime / slaked lime).
⇒ If soil is too basic, organic matter (manure / compost) is added. It releases acids which neutralise the soil.
- Industrial Waste :**
Factory waste may be acidic. Before releasing it into rivers and streams, it is neutralised by adding basic substances.

13. IMPORTANT POINTS

- Acids taste sour and turn blue litmus **red**.
- Bases taste bitter and turn red litmus **blue**.
- Neutral substances do not change the colour of litmus.
- Indicators help us test the nature of substances.
- Acid and base reactions are useful in daily life.

14. SUMMARY CHART

Property	Acid	Base	Neutral
Taste	Sour	Bitter	No taste
Feel	Not slippery	Slippery / soapy	Not slippery
Blue Litmus Paper	Turns Red	No Change (Blue)	No Change (Blue)
Red Litmus Paper	No Change (Red)	Turns Blue	No Change (Red)
Turmeric Paper	Yellow (No Change)	Turns Red	Yellow (No Change)
Red Rose Extract	Turns Red / Magenta	Turns Green	No Change
pH Value	Less than 7	Greater than 7	Equal to 7

15. KEY TAKEAWAY

Understanding acids, bases and neutral substances helps us in many ways – in experiments, in daily life and in keeping our environment safe and healthy.

NCERT CLASS 7 SCIENCE

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

EXTRA PRACTICE QUESTIONS

Test Your Understanding

A. Multiple Choice Questions (MCQs)

- Which of the following turns red litmus paper blue?
(a) Lemon juice (b) Vinegar
(c) Baking soda solution (d) Orange juice
- Turmeric paper turns red in the presence of a _____.
(a) acid (b) base
(c) neutral substance (d) salt

Ans : (b) base

- Which of the following is a natural indicator?
(a) Phenolphthalein (b) Methyl orange
(c) Red rose extract (d) Universal indicator

Ans : (c) Red rose extract

- A solution has pH value 3. It is _____ in nature.
(a) acidic (b) basic
(c) neutral (d) both acidic and basic

Ans : (a) acidic

- Which acid is present in curd?
(a) Acetic acid (b) Lactic acid
(c) Citric acid (d) Formic acid

Ans : (b) Lactic acid

B. Fill in the Blanks

- Pure water is a _____ substance.
Ans : neutral
- The pH value of a neutral solution is _____.
Ans : 7
- Red rose extract turns _____ in a basic medium.
Ans : green
- Formic acid is present in the sting of a _____.
Ans : ant
- When an acid and a base react, they form _____ and _____ along with the release of _____.
Ans : salt, water, heat

C. True or False

- Acids turn red litmus paper blue.
Ans : False
- Bases feel soapy or slippery to touch.
Ans : True
- Turmeric paper shows no colour change in an acidic medium.
Ans : True
- Distilled water has a pH value of 7.
Ans : True
- Red rose extract turns green in a basic medium.
Ans : True

D. Short Answer Questions

- Why do acids taste sour?
Ans : Acids taste sour because they release hydrogen ions (H^+) in water, which give a sour taste.
- Name two natural indicators and the colours they show in acidic and basic media.
Ans : (i) Turmeric : Yellow in acid, Red in base.
(ii) Red rose extract : Red in acid, Green in base.
- What is the pH value of a basic solution?
Ans : pH value is greater than 7 (from 8 to 14).
- Give one example each of an edible substance containing (i) citric acid (ii) acetic acid.
Ans : (i) Lemon (citric acid)
(ii) Vinegar (acetic acid)
- What happens to turmeric paper when a neutral solution is added to it?
Ans : There is no change in colour; it remains yellow.

E. Very Short Answer Questions

- Which indicator is obtained from lichens?
Ans : Litmus.
- Name the gas released during neutralisation reaction.
Ans : No gas is released. Heat is released.
- Name a base used to treat acidic soil.
Ans : Lime (calcium hydroxide).
- What is the pH value of a strong base (for example, sodium hydroxide solution)?
Ans : Around 14.

F. Long Answer Questions

- Explain with the help of an example how a natural indicator is prepared.
Ans : Natural indicators can be prepared by extracting coloured pigments from plants using warm water.
Example : Red rose extract
(i) Collect fallen petals of red roses and wash them.
(ii) Crush the petals using a mortar and pestle.
(iii) Add hot water and keep for 5-10 minutes.
(iv) Filter the liquid. The coloured filtrate is the red rose extract, which can be used as an indicator.
- How can you identify a given solution as acidic, basic or neutral using litmus paper?
Ans :
• If blue litmus paper turns red $\rightarrow$ the solution is acidic.
• If red litmus paper turns blue $\rightarrow$ the solution is basic.
• If there is no change in either red or blue litmus paper $\rightarrow$ the solution is neutral.
- Why is it important to test the nature of soil before growing plants?
Ans : Different plants grow best in soil of different pH. If the soil is too acidic or too basic, plants may not grow well. By testing the soil and treating it with suitable substances (lime or organic matter), we can provide better conditions for healthy growth of plants.

G. Application Based Questions

- You are given three solutions A, B and C. You do not know which is acidic, basic or neutral. You test them with red litmus paper and get the following results :

Solution	Observation with red litmus paper
A	Turns blue
B	No change
C	No change

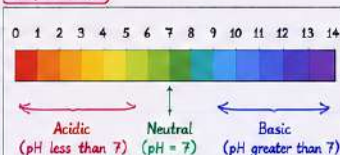
- Which solution is basic?
 - Which solution could be neutral?
 - How will you confirm between B and C?
- Ans : (i) A is basic.
(ii) B or C could be neutral.
(iii) Test with blue litmus paper. The solution that turns blue litmus red is acidic. The one that shows no change is neutral.

- Grape juice turns red rose extract red. What will happen if baking soda is added to it? Why?

Ans : The red colour will change to green because baking soda is basic in nature. It neutralises the acid in grape juice and makes the solution basic, causing red rose extract to turn green.

H. Diagrams & Quick Reference

1. pH Scale



2. Colour change of indicators

Indicator	Acidic	Basic	Neutral
Blue litmus	Turns red	No change (Blue)	No change
Red litmus	No change (Red)	Turns blue	No change
Turmeric paper	Yellow (No change)	Turns red	Yellow (No change)
Red rose extract	Red / Magenta	Green	No change

Remember These Points

- Acids taste sour, bases taste bitter and feel soapy.
- pH less than 7 $\rightarrow$ acidic, pH = 7 $\rightarrow$ neutral, pH greater than 7 $\rightarrow$ basic.
- Neutralisation reaction produces salt, water and heat.
- Natural indicators help us in testing the nature of substances in a safe and eco-friendly way.