Lesson 5. Acids, Bases and Salts

Basic concepts – A Flow Chart

SUBSTANCES

Acids

- They have a sour taste.
- They are corrosive in nature. A concentrated acid cuts through clothes and eats away the wool. If it falls on the skin, it can cause burnss,
- They are good conductors of electricity, as they allow the passage of electric current through them.

Mineral Acids

These are acids prepared from minerals present in the earth's crust.

Organic Acids

These are acids produced by plants and animals. (exception, hydrochloric acid).

Weak Acids

- These do not dissociate completely in solutions
- Example : nitric acid, sulphuric acid.

Strong Acids

- These dissociate completely in solutions.
- Example: Tartaric acid, lactic acid.

Bases

- They are soapy to touch.
- They taste bitter.
- Strong bases like sodium hydroxide are corrosive in nature.
- They react with acids to neutralize them and are hence called **antacids**.

Neutralisation

- This is the reaction between an acid and a base which results in formation of salt and water.
- Acid + Base → Salt + Water
- Example: $HCl + NaOH \rightarrow NaCl + H_2O$

Neutralisation in Everyday Life

- **Indigestion:** Too much acid in stomach causes indigestion. It is neutralized by taking an antacid like milk of magnesia.
- **Ant sting**: When an ant bites, it injects formic acid into the skin. The effect is neutralized by rubbing moist baking soda (sodium Hydrogen carbonate) or calamine (containing zinc carbonate)
- **Soil treatment** : When the soil is too acidic, it is neutralized by treating with quicklime (calcium oxide) or slaked lime (calcium hydroxide)

Weak Bases

- These naturally produce less hydroxide ions in solution.
- Example : magnesium hydroxide, ammonium hydroxide.

Strong Bases

- These produce more number of hydroxide ions on dissolving in water.
- Example: caustic soda, caustic potash.

Indicators

- It is a special chemical that changes its colour to indicate the presence of a chemical substance.
- It is used to confirm the presence of an acid, a base or a neutral solution.

Natural Indicators

Litmus

- It is extracted from lichens.
- It is available in the form of strips of paper or in the form or a solution.
- In acidic solutions, blue litmus paper turns red while the red litmus paper remains unchanged.
- In alkaline solutions, red litmus paper turns blue while the blue litmus paper remains unchanged.

Turmeric

It remains yellow in neutral and acidic solutions but turns red in alkaline solutions.

China rose

It turns acidic solutions to dark pink (magenta) and basic solutions to green.

Red Cabbage

It turns acidic solutions to red and basic solutions to blue.

Other Indicators

Methyl Orange

It gives pinkish red colour with acidic solutions and yellow colour with bases.

Phenolphthalein

- It is acid-base indicator.
- It is colourless in acidic solutions but turns pink in alkali solutions.

Know the Terms

- **Acid** : Acids are sour in taste.
- **Acidic** : An acidic substance contains an acid.
- **Base** : Bases are bitter in taste and soapy to touch.
- **Basic** : A basis substance contains a base.
- **Indicator** : An indicator is a substance that gives different colours in acidic and basis media.
- **Neutral** : A neutral substance has neither acid nor basic character.
- **Neutralization** : In a neutralization reaction, an acid reacts with a base to form salt and water.
- **Salt** : The product formed (a new substance) by neutralisation reaction between an acid and a base is called salt.
- **Acid Rain** : The rain becomes acidic when carbon dioxide, sulphur dioxide and nitrogen dioxide present in the atmosphere, dissolve in rain drops. These gases when dissolved in rain drops form carbonic acid, sulphuric acid and nitric acid respectively, Acid rain may cause damage to historical monuments, plant and animals.
- **Ant sting** : The ant sting contains formic acid which when injected into the skin causes pain and irritation.
- **Litmus Paper** : When indicator are found in the form of strips of paper, then it is known as litmus paper. Red litmus paper and blue litmus paper are two types of litmus paper. The acids change blue litmus paper into red colour and the bases change red litmus paper into blue colour.
- **Common acids** : Hydrochloric acid, Nitric acid, sulphuric acid etc.
- **Common bases** : Sodium hydroxide, potassium hydroxide, ammonium hydroxide.
- **Role of hydrochloric acid in digestion** : Our stomach contains hydrochloric acid which help in digestion.

Objective Type Questions

(1 Mark each)

I. Multiple choice questions

1. Common salt is :

(a) Acidic (b) Basic (c) Neutral (d) None of these

2. Neutralisation is a reaction between :

(a) Two acids (b) Two bases

(c) One acid and one base (d) One acid and one neutral substance

3. Sting of an ant contains :

(a) Vinegar (b) Common salt (c) Formic acid (d) Milk of magnesia

4. Stomach secretes :

(a) HCL (b) H_2SO_4 (c) CH_3COOH (d) NaOH

5. Raw mango is sour in taste due to presence of :

(a) Tartaric acid (b) Citric acid (c) Formic acid (d) Oxalic acid

6. Lactic acid is found in :

(a) Apple (b) Curd (c) Tea (d) Vinegar

7. Sodium hydroxide is :

(a) A base (b) An alkali (c) Bitter in taste (d) All of these

8. The medicine used for treating indigestion is :

(a) Antibiotic (b) Anti-acid (c) Antacid (d) Analgesic

9. The correct way of making a solution of acid in water is to ? **[NCERT Exemplar]**

(a) add water to acid (b) add acid to water

(c) mix acid and water simultaneously (d) add water to acid in a shallow container.

10. Products of a neutralisation reaction are always ?

(a) an acid and a base (b) an acid and a salt

(c) a salt and water (d) a salt and a base

11. Turmeric is a natural indicator. On adding its paste to acid and base separately. Which colours would be observed ? **[NCERT Exemplar]**

(a) Yellow in both acid and base (b) Yellow in acid and red in base

(c) Pink in acid and yellow in base (d) Red in acid and blue in base

12. Phenolphthalein is a synthetic indicator and its colours in acidic and basic solutions respectively are? **[NCERT Exemplar]**

(a) red and blue (b) blue and red (c) pink and colourless (d) colourless and pink.

13. When the soil is too basic, plants do not grow well in it. To improve its quality what must be added to the soil ? **[NCERT Exemplar]**

(a) Organic matter (b) Quick lime (c) Slaked lime (d) Calamine solution.

14. 'Litmus' a natural dye in an extract of which of the following ? **[NCERT Exemplar]**

(a) China rose (Gudhal) (b) Beetroot

(c) Lichen (d) Blue berries (Jamun)

15. Neutralisation reaction is a : **[NCERT Exemplar]**

(a) Physical and reversible change (b) physical change the cannot be reversed

(c) chemical and reversible change (d) chemical change that cannot be reversed.

16. A solution changes the colour of turmeric indicator from yellow to red. The solution is ? **[NCERT Exemplar]**

(a) basic (b) acidic (c) neutral (d) either neutral or acidic

17. Which of the following set of substances contain acids ? **[NCERT Exemplar]**

(a) Grapes, lime water (b) Vinegar, soap

(c) Curd, milk of magnesia (d) Curd,vinegar.

18. On adding phenolphthalein indicator to a colourless solution, no change is observed. What is the nature of this solution ? **[NCERT Exemplar]**

(a) Basic (b) Either acidic or basic

(c) Either acidic or neutral (d) Either basic or neutral.

19. Which of the following is an acid-base indicator ?

(a) Vinegar (b) Lime water (c) Turmeric (d) Baking soda

1. (c)	2. (c)	3. (c)	4. (a)	5. (a)	6. (b)	7. (d)	8. (c)	9. (b)	10. (c)
11. (b)	12. (d)	13. (a)	14. (c)	15. (d)	16. (a)	17. (d)	18. (c)	19. (c)	

II. Multiple choice questions

1. Milk of magnesia is used as antacid because

a. It is acidic b. It is basic c. It is neutral d. All of above

2. Lime water turns

a. Red litmus into blue b. Blue litmus into red

c. No change d. None of these

1. b	2. a

I. Fill in the blanks.

1. _____is used to remove acidity of solids.
2. Ammonium chloride is an example of _____salt.
3. Acid + Metal → Salt + _____
4. Methyl orange is _____ indicator.
5. Bases turn turmeric _____
6. All acids have a _____ taste.
7. An acid found in tomatoes is _____.
8. Litmus is extracted from _____.
9. Lemon juice and vinegar taste _____because they contain _____. **[NCERT Exemplar]**
10. Turmeric and litmus are _____ acid base indicators. **[NCERT Exemplar]**
11. Phenolphthalein gives _____colour with lime water. **[NCERT Exemplar]**
12. When an acidic solution is mixed with a basic solution they _____each other forming _____and water. **[NCERT Exemplar]**

1. Slaked lime	2. acidic	3. hydrogen
4. acid-base	5. reddish brown	6. sour
7. oxalic acid	8. lichens	9. sour, acids
10. natural	11. pink	12. neutralise, salt

II. Fill in the blanks.

(i) Acetic acid is present in _____.

(ii) The reaction between an acid and base is called _____.

(iii) Lime water converts _____ litmus into _____litmus.

(iv) Chemical formula of hydrochloric acid is_____.

(v) The hydrochloric acid-changes _____ litmus into _____litmus.

(i) vinegar	(ii) neutralisation	(iii) red, blue
(iv) HCL	(v) blue, red.	

I. Match the following.

Column A	Column B
(i) Vinegar	(a) Major salt of sea
(ii) Fertilizer	(b) Basic
(iii) Sodium chloride	(c) Magnesium hydroxide
(iv) Lime water	(d) Acetic acid
(v) Milk of magnesia	(e) Potassium nitrate

i. d	**ii. e**	**iii. a**	**iv. b**	**v. c**

II. Match the following.

I. Column A	Column B
(a) Sodium chloride	(i) Turns china rose green
(b) Curd	(ii) Phenolphthalein given pink
(c) Orange Juice	(iii) Red litmus blue
(d) Soap	(iv) Manufacture of washing soda
(e) Milk of magnesia	(v) sour in taste
(f) Lime water	(vi) blue litmus red

a. iv	b. vi	c. v	d. iii	e. ii	f. i

II. Column A	Column B
(a) Tartaric acid	(i) soap
(b) Calcium hydroxide	(ii) curd
(c) Formic acid	(iii) unripe mangoes
(d) Sodium hydroxide	(iv) ant's sting
(e) Lactic acid	(v) lime water

(a)-(iii)	(b)-(v)	(c)-(iv)	(d)-(i)	(e)-(ii)

I. True or False

(a) All substances are either acidic or basic.

(b) A compound if acidic will turn all indicators red.

(c) Lime water turns red litmus blue.

(d) Common salt dissolved in water turns blue litmus red.

(e) Phenolphthalein is a natural indicator.

(f) Calamine can be used to treat ant's sting.

(g) Lemon water is basic in nature.

a. False	b. False	c. True	d. False	e. False	f. True	g. False

II. True or False

i. Orange juice turns blue litmus red.

ii. Alum acts as antacid.

iii. Acids are bitter in taste.

iv. Milk of magnesia contains magnesium hydroxide.

v. Sting of an ant contains vinegar.

i. True	ii. False	iii. False	iv. True	v. False

Quiz Time

1. How can you identify the acids by their taste?

2. Name the reaction that takes place between an acid and a base.

3. What is the effect of neutral substances on the colour of litmus?

4. Which is the most common indicator?

5. Name the plant from which litmus is extracted.

6. Write the various types of litmus on the basis of their colour.

7. Give two examples of acidic substances.

8. Name two commonly used acids.

9. A red litmus paper is dipped in a solution. the colour of litmus becomes blue. What is the nature of solution?

10. Name two natural indicators.

1. Acids are sour in taste

2. Neutralisation

3. Neutral substances do not affect the colour of litmus.

4. Litmus paper

5. Lichens

6. i. Red litmus ii. Blue litmus

7. i. Lemon ii. Tamarind

8. i. Nitric acid ii. Sulphuric acid

9. Basis

10. i. Litmus ii. Turmeric

NCERT Corner

Intext Questions

1. Let us recall tastes of some edible substances listed in Table 5.1. If you have not tasted any of these substances taste it now and enter the result in Table 5.1.

Substance	Taste (sour/bitter/any other)
Lemon juice	sour
Orange juice	sour
Vinegar	sour
Curd	sour
Tamarind	sour
Sugar	sweet
Common salt	salty
Amla	sour
Baking soda	bitter
Grapes	sour
Unripe mango	sour

2. Complete the table 5.2.

S. No.	Test Solution	Effect on red litmus paper	Effect on blue litmus paper	Inference
1.	Lemon juice	None	turns blue	acidic
2.	Tap water	None	None	neutral
3.	Detergent solution	turns blue	None	basic
4.	Aerated drinks	None	None	basic
5.	Soap solution	turns blue	None	basic
6.	Shampoo	turns blue	None	basic
7.	Common salt solution	None	None	neutral
8.	Sugar solution	None	None	neutral
9.	Vinegar	None	turns blue	acidic
10.	Baking soda solution	turns blue	None	acidic

11.	Milk of magnesia	turns blue	None	basic
12.	Washing soda solution	turns blue	None	basic
13.	Lime water	turns blue	None	basic

3. What do you observe ?

The turmeric becomes red.

4. Complete the Table 5. 3.

S. No.	Test solution	Effect on turmeric solution	Remarks
1.	Lemon juice	None	Acidic or neutral
2.	Orange juice	None	Acidic or neutral
3.	Vinegar	None	Acidic or neutral
4.	Milk of magnesia	turns red	base
5.	Baking soda	turns red	base
6.	Lime water	turns red	base
7.	Sugar	None	Acidic or neutral
8.	Common salt	None	Acidic or neutral

5. Complete the Table 5.4

S.No.	Test solution	Initial Colour	Final Colour
1	Shampoo (dilute solution	red	green
2	Lemon juice	red	magenta
3	Soda water	red	green
4	Sodium hydrogen carbonate solution	red	green
5	Vinegar	red	magenta
6	Sugar solution	red	red
7	Common salt solution	red	red

6. I am not getting the same result when using baking soda or dry litmus paper. Why ?

Substances attain their acidic property in solution.

7. Paheli brought the following paheli (riddle) for you.

Coffee is brown

and bitter in taste.

Is it an acid ?

Or a base ?

Don't give the answer

Without any test

You are in the dark

With its taste.

Acidic.

8. Complete the table 5.5.

S. No.	Name of acid	Effect of litmus paper	Effect on turmeric paper	Effect on China rose solution
1	Dilute hydrochloric acid	turns red	None	magenta
2	Sulphuric acid	turns red	None	magenta
3	Nitric acid	turns red	None	magenta
4	Sodium hydroxide	turns blue	red	green
5	Ammonium hydroxide	turns blue	red	green
6	Lime water	turns blue	red	green

9. Is there any changes in colour.

The solution turns pink again.

10. Touch the test tube immediately after neutralisation, what do you observe ?

Test tube becomes hot i.e., heat is evolved.

Textbook Questions

1. State differences between acids and bases.

Acids	Bases
(i) Acids are sour in taste.	Bases are bitter in taste.
(ii) Acids turn blue litmus to red.	Bases turn moist red litmus to blue.
(iii) They give no colour with phenolphthalein.	They give pink colour with phenolphthalein

2. such as window cleaners. It turns red litmus blue. What is its nature ?

Since ammonia solution turns red litmus blue, therefore, it is basic in nature.

3. Name the source from which litmus solution is obtained. What is the use of this solution ?

Litmus is a natural dye which is extracted from lichens. Litmus is used in identifying acidic, basic and neutral solutions.

4. Is the distilled water acidic, basic or neutral ? How would you verify it ?

Distilled water is neutral in nature, this fact is verified by litmus solution, because no change in colour takes place by litmus solution.

5. Describe the process of neutralisation with the help of an example.

The reaction between an acid and a base is known as Neutralisation. Salt and water are formed in neutralisation, with the evolution of heat. For example, when hydrochloric acid is mixed with sodium hydroxide solution, sodium chloride and water will be formed.

HCL	+	NaOH	→	NaCL	+	H2O
Hydrochloric acid		Sodium hydroxide		Sodium chloride (Salt)		Water

6. State whether the following are true (T) or false (F) :

i. Nitric acid turns red litmus blue. (T/F)

ii. Sodium hydroxide turns blue litmus red. (T/F)

iii. Sodium hydroxide and hydrochloric acid neutralise each other and form salt and water. (T/F)

iv. Indicator is a substance which shows different colours in acidic and basic solution. (T/F)

v. Tooth decay is caused by the presence of a base. (T/F)

i. F	ii. F	iii. T	iv. T	v. F

7. Dorji has a few bottles of soft drink in his restaurant. But, unfortunately, these are not labelled. He has to serve the drinks on the demand of customers. One customer wants acidic drink, another wants basic and third one wants neutral drink. How will Dorji decide which drink is to be served to whom ?

Put a drop of soft drink on a strip of the litmus paper with the help of a dropper. On the basis of the colour formed on the paper, the nature of that soft drink can be found out.

S. No.	Test Solution	Effect on Red Litmus Paper	Effect on Blue Litmus paper	Inference
1	Soft drink	Red Litmus turns blue	No Effect	Basic soft drink
2	Soft drink	No Effect	Blue Litmus turns red	Acidic soft drink
3	Soft drink	No Effect	No effect	Neutral soft drink

8. Explain why :

(a) An antacid tablet is taken when you suffer from acidity.

(b) Calamine solution is applied on the skin when an ant bites.

(c) Factory waste is neutralised before disposing it into the water bodies.

(a) Too much of acid in the stomach causes indigestion, which is known as acidity. Antacid like milk of magnesia neutralises this acid and brings about relief from indigestion.

(b) When an ant stings human body, formic acid enters the skin that causes acute pain. Calamine solution contains zinc carbonate which neutralises formic acid, thus bringing about relief from pain.

(c) Waste product from many factories has acid. When it is drowned off into water bodies, it will kill aquatic animals like fish. To avoid this harm to the aquatic animals, the industrial waste is neutralised by basic substance before throwing it into water bodies.

9. Three liquids are given to you. One is hydrochloric acid, another is sodium hydroxide and third is a sugar solution. How will you identify them? You have only turmeric indicator.

Turmeric solution becomes red in contact with bases. It is not affected by acids and neutral substances. First of all let us identify the base. The base is taken and turmeric is mixed. It will turn red. Then, one of the solutions is added to it gradually. If the solution turns

yellow again, the added liquid is hydrochloric acid (because it neutralises the base). Otherwise the added liquid is a sugar solution.

10. Blue litmus paper is dipped into a solution. It remains blue. What is the nature of the solution? Explain.

The solution may be neutral or basic. Both types of substances produce no effect on blue litmus.

11. Consider the following statements :

(a) Both acids and bases change colour of all indicators.

(b) If an indicator gives a colour change with an acid, it does not give a change with a base.

(c) If an indicator changes colour with a base, it does not change colour with an acid.

(d) Change of colour in an acid and a base depends on the type of indicator.

Which of these statements are correct ?

(i) All four (ii) (a) and (d) (iii) (b) and (c) (iv) only (d)

(iv) only (d).

I. Very Short Answer Type Question

1. What are acids?

The chemical compounds which are sour in taste are called acids.

2. Name two substances which are acidic in nature?

Lemon and tamarind

3. What are bases?

The substances which are soapy in touch and bitter in taste are called bases.

4. Name two substances which are basic in nature.

Washing soda and baking soda

5. What are indicators?

The substances which are used to test whether the given substance is acidic or basic are called indicators.

6. What are the types of indicators?

There are two types of indicators:

(i) Natural (ii) Man-made.

7. Name some natural indicators.

Turmeric, litmus and china rose petals are some natural indicators.

8. Which is the most common indicator?

Litmus

9. From which plant litmus is extracted?

Lichens

10. How many types of litmus are there?

There are two types of litmus: (i) Red litmus (ii) Blue litmus.

11. What is the effect of acid and base on litmus?

Acid converts blue litmus into red while base converts red litmus into blue.

12. What are neutral substances?

The substances which do not show any effect on litmus are called neutral substances.

13. Why does a turmeric stain on white shirt is turned to red when it is washed with soap?

It is because the soap solution is basic.

14. Dip some crushed China rose petals in warm water to make coloured water. Add a few drops of an acid and a base separately in two different containers. Write effect of it on acid and base.

China rose indicator turns acidic solution to dark pink and basic solution to green.

15. Name a substance which is used to neutralise the effect of excessive acid in stomach.

Milk of magnesia which contains magnesium hydroxide (base).

16. Give two examples of acids.

(i) Hydrochloric acid; (ii) Nitric acid.

17. Give examples of two bases.

(i) Sodium hydroxide; (ii) Ammonium hydroxide.

18. Name the substances which are used to test acidic or basic nature.

Indicators.

19. Write the two types of common indicator.

(i) Blue litmus (ii) Red litmus.

20. Name two man-made indicators.

(i) Phenolphthalein (ii) Methyl orange.

21. What happens when a blue litmus paper is dipped in a dilute solution of an acid?

The blue colour of litmus turns red.

22. What happens when a red litmus paper is dipped in a basic solution?

The red colour of litmus paper turns blue.

23. Name the chemical found in calamine solution.

Zinc carbonate.

24. Which chemical is found in ant sting?

Formic acid.

25. Write the chemical nature of soap.

Basic nature.

II. Very Short Answer Type Question

1. What is the chemical name of vitamin C ?

Ascorbic acid.

2. How is salt formed ?

A salt is formed when acid reacts with a base

3. What are deliquescent salts ?

Deliquescent salts absorb moisture from air and change into liquids.

Example : magnesium chloride.

4. Name the gases which cause acid rain ?

Carbon dioxide, sulphur dioxide and nitrogen dioxide in the atmosphere cause acid rain.

5. Which acid is called "King of Chemicals" ?

Sulphuric acid is called 'King of chemicals'.

6. Name two mineral acids.

Hydrochloric acid and nitric acid.

7. What are organic acids ?

Acids derived from plants and animals are called organic acids. These contain -COOH group.

8. Which is most common indicator ?

Litmus.

9. Look at the given reaction. Hydrochloric acid + Sodium hydroxide (base) → Sodium chloride Isalt) + Water Sodium chloride formed in this reaction remains in solution from. Can we get solid sodium chloride from this solution ? Suggest a method (if any). **[NCERT Exemplar]**

Evaporation.

10. Paheli is suffering from indigestion due to acidity. Is it advisable to give her orange juice in this situation and why ? **[NCERT Exemplar]**

No, because orange juice is acidic in nature.

III. Very Short Answer Type Question.

1. Ammonia is found in many household products, such as window cleaner. It turns red litmus blue. What is its nature?

Since ammonia turns red litmus blue it is basic in nature.

2. What is meant by 'basicity' of an acid?

Basicity is the measure of basic nature in an acidic substance.

3. Does an acidic solution conduct electricity?

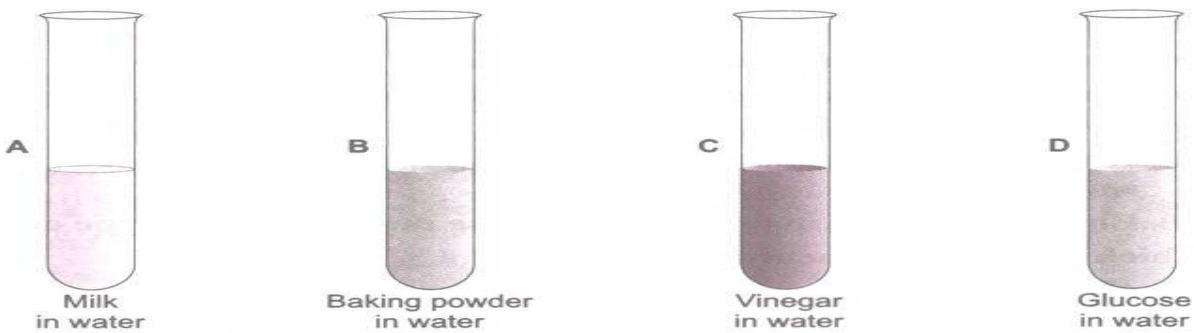
Yes, an acidic solution conducts electricity.

4. Name three organic acids which are used by us as food ingredients.

The three organic acids used as ingredients are citric acid, tartaric acid and ascorbic acid.

I. Short Answer Type Question.

1. Look at the figures given below which shows solution taken in test tubes A, B, C and D. What colour is expected when a piece of red litmus paper is dropped in each test tube? Nature of the solutions is given in the table for your help. **[NCERT Exemplar]**



Test Tube	Nature of solution	Change in colour of red litmus
A	Neutral	
B	Basic	
C	Acidic	
D	Neutral	

Test Tube	Nature of solution	Change in colour of red litmus
A	Neutral	No Change
B	Basic	Turns blue
C	Acidic	No Change
D	Neutral	No Change

2. Name the source from which litmus solution is obtained. What is the use of this solution? [NCERT]

Litmus solution is obtained from lichens. This solution is used as an indicator to distinguish between acids and bases. Acid turn blue litmus solution red and bases turn red litmus solution blue.

3. Is the distilled water acidic / basic / neutral? How would you verify it? [NCERT]

Distilled water is neutral in nature. This can be verified by using red or blue litmus paper. None of them would show any colour change with distilled water.

4. While playing in a park, a child was stung by a wasp. Some elders suggested applying paste of baking soda and others lemon juice as remedy. Which remedy do you think is appropriate and why?

Wasp sting inject a liquid in the skin which is acidic in nature. Hence, baking soda is the appropriate remedy, as it is basic in nature and neutralises the acid.

5. Blue litmus paper is dipped in a solution. It remains blue. What is the nature of the solution? Explain. [NCERT]

A solution which does not change the colour of blue litmus paper can be either basic or neutral in nature. The nature of the solution can be confirmed by placing a drop on red litmus paper. If the colour change to blue then the solution is basis and if no colour chagne is observed, the solution is neutral in nature.

6. List three properties of

a. Acids **b. Bases**

a. Acids : Acids have sour taste, are corrosive in nature and are good conductors of electricity.

b. Bases : Bases are soapy to touch, bitter in taste and react with acids to neutralise.

7. Write two uses of the following.

a. Calcium hydroxide

b. Sodium hydroxide

a. Calcium hydroxide

i. It is used to make chalks.

ii. It is used in preparation of insecticides and fungicides.

b. Sodium hydroxide

i. It is used in manufacturing of soaps and detergents.

ii. It is used to manufacture paper in wood industry.

8. Why is carbonic acid added to soft drinks?

Carbonic acid is added to soft drinks to make it fizzy. When the bottle is opened, the pressure decreases and the carbonic acid changes into carbon dioxide and water making it fizzy.

II. Short Answer Type Question.

1. What are indicators? Classify them and give one example of each.

The substances which are used to test whether a substance is acidic or basic are called indicators.

There are two types of indicators:

(i) Natural indicators

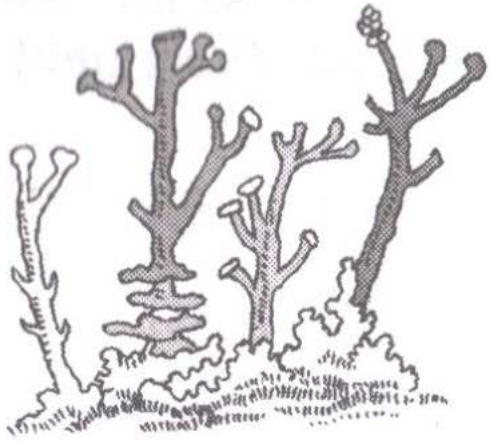
(ii) Man-made indicators.

Natural indicators: Litmus paper, turmeric etc.

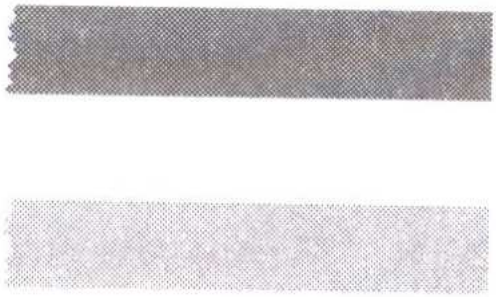
Man-made indicators: Phenolphthalein, methyl orange.

2. Wilt is litmus? How is it prepared?

The most commonly used natural indicator. It is extracted from lichens. It has a purple colour lit distilled water. It is available in the form of a solution or in the form of strips of paper. It is available as red and blue litmus paper.



(a)



(b)

3. Take tap water, vinegar and washing soda solution. Put a drop of these solutions on the red and blue litmus paper and write your observation in a tabular form.

S.No	Test Solution	Effect on red litmus paper	Effect on blue litmus paper	Inference
1	Tap water	No change	No change	Neutral
2	vinegar	No change	Turns red	Acidic
3	Washing soda	Turns blue	No change	Basic

4. How do you prepare lime water?

To prepare lime water, dissolve some lime in water in a bottle. Stir the solution and keep it for some time. Pour a little more from the top. This is lime water.

5. How can you prepare turmeric paper?

Take some turmeric powder and mix it in some water to make a paste. Deposit it on blotting paper or filter paper and dry it. Cut thin strips of the yellow paper obtained. These thin strips are turmeric paper.

6. Explain the use of china rose petals as indicators. .

China rose petals when added to warm water form a coloured solution which may be used as an indicator. This indicator turns acidic solutions to dark pink and basic solutions to green.

7. What is acid rain?

The rain containing excess of acid is called acid rain. The rain becomes acidic because carbon dioxide, sulphur dioxide and nitrogen dioxide which are released into air as pollutants dissolve in rain drops to form acids. Acid rain can cause damage to buildings, historical monuments, plants and animals.

8. What is neutralisation reaction? Explain with example.

The reaction between an acid and a base is known as neutralisation reaction. Salt and water are produced in this process along with evolution of heat.

Acid + Base →

Salt + Water (Heat is evolved)

Hydrochloric acid + Sodium hydroxide → Sodium chloride + Water

HCL + NaOH →

$NaCl + H_2O$ (Heat is evolved)

9. What do you mean by indigestion?

Our stomach contains hydrochloric acid. It helps us to digest food. But too much of acid in the stomach causes indigestion. Sometimes indigestion is too much painful. To relieve indigestion we take an antacid such as milk of magnesia.

10. What is the effect of ant bite? Explain its cure.

The sting of an ant contains formic acid. When an ant bites, it injects the acidic liquid into the skin. It causes irritation and burning effect on the skin. To relieve, skin should be rubbed by moist baking soda or calamine which are basic in nature.

11. What do you mean by soil treatment?

When a farmer uses excessive chemical fertilisers in the soil then the soil becomes acidic. Plants do not grow well when the soil is either too acidic or too basic. When soil is too acidic, it is treated with bases. If the soil is basic, organic matter is added to it. Organic matter releases acids which neutralise the basic nature of the soil.

12. What are the acids? Write the characteristic of acids.

The substances which are sour in taste and change blue litmus into red.

Characteristics:

(i) Acids are sour in taste.

(ii) Corrosive in nature.

(iii) Change blue litmus into red.

(iv) Soapy touch.

13. What are the bases? Write the properties of bases.

The substances which are bitter in taste and change red litmus into blue.

Properties:

(i) Bases are bitter in taste.

(ii) Corrosive in nature.

(iii) Change red litmus into blue.

(iv) Soapy touch.

14. What are neutral substances?

The substances which are neither acidic nor basic and do not give any effect on any type of indicator are called neutral substances. Examples are distilled water, common salt.

15. Name the acid which is found in the following substances:

Vinegar, Curd, Tamarind, Tomato

Vinegar	-	Acetic acid
Curd	-	Lactic acid
Tamarind	-	Tartaric acid
Tomato	-	Oxalic acid

III. Short Answer Type Question – I (2 Marks)

1. What happens when a non-metallic oxide is dissolved in water ? Give example.

When a non-metallic oxide is dissolved in water, it forms acid.

Examples : (i) $CO_2 + H_2O \rightarrow H_2CO_3$ (Carbonic acid)

(ii) $SO_2 + H_2O \rightarrow H_2SO_4$ (Sulphuric acid)

2. How will you test the presence of an acid in a substance ?

Place a drop of the liquid/a crystal of solid of the given acid on a moist blue litmus paper. If the colour changes from blue to red, it is an acid. Also metallic sodium gives hydrogen with brisk effervescence on reaction with an acid.

3. How will you treat a person suffering from ant-sting and wasp sting ?

(i) Wasp sting is basic, so it should be treated with vinegar.

(ii) Ant sting is acidic, so it should be washed with a solution of baking soda or soap solution.

4. What are two commonly used bases in the laboratory ? Give their formula.

Two commonly used bases in the laboratory are ammonium hydroxide (NH_4OH) and sodium hydroxide (NaOH).

5. What type of substance is formed when a metal oxide is dissolved in water ? What are these generally called ?

When a metal oxide is dissolved in water, a base is formed e.g., sodium oxide (Na_2O) in water gives sodium hydroxide. These are called alkalies.

6. Which acid does each cell in our body contains ?

Each cell of our body contains deoxyribonucleic

7. Which part of our body contains hydrochloric acid ?

Stomach contains hydrochloric acid.

8. Why does a vegetable stain turns reddish brown when washed with soap ?

Vegetable stain is due to turmeric which gives reddish brown colour with base (presence of soap solution).

9. Which indicator is generally used to observe neutralization reaction ?

Phenolphthalein indicator is generally used in neutralization reactions.

10. What is litmus ? How is it prepared ?

The most commonly used natural indicator is litmus. It is extracted from lichens. It has a purple colour in distilled water.

It is available in the form of a solution or in the form of strips of paper. It is available as red and blue litmus paper.

III. Short Answer Type Question – II (3 Marks)

1. Describe the process of neutralization with the help of an example.

Take 20 mL dilute hydrochloric acid in a conical flask. Add 2-3 drops of phenolphthalein indicator (colourless) to it. Gently shake the flask and start adding drop by drop a dilute solution of sodium hydroxide with the help of a dropper. Continue shaking conical flask gently. Continue adding sodium hydroxide till the solution in the flask becomes light pink. At this point the solution is neutral. This can be tested because at this point if a drop of hydrochloric acid is added, the solution will become colourless again.

2. You are provided with liquids A, B and. C. One contains NaOH, another contains HCl and third is sugar solution. You are given phenolphthalein solution. How will you identify these solutions ?

Add a drop of phenolphthalein separately in liquids A, B and C. The one which turns pink is sodium hydroxide, let it be A. Divide this into two parts. Now add a few drops of other solutions in the above solution taken into parts. The solution which again turns solution A colourless is hydrochloric acid. Let it be B. Then solution left is sugar.

3. Write products of the following reactions.

(1) Sulphuric acid reacts with sodium hydroxide.

(2) Copper oxide reacts with hydrochloric acid.

(3) Sulphur dioxide reacts with sodium hydroxide.

(a) Sodium sulphate and water

$(2NaOH + H_2SO_4 = Na_2SO_4 + 2H_20)$

(b) Copper chloride and water

$(CuO + 2HCl = CuCl_2 + H_2O)$

(c) Sodium sulphite and water

$(SO_2 + 2NaOH = Na_2SO_3 + H_2O)$

4. Write three differences between an organic acid and a mineral acid.

Differences between an organic acid and mineral acid :

S.No	Organic Acid	Mineral Acid
1	These acid are naturally occurring acids and are found in plants and animals.	These are derived from the minerals of the earth.
2	These contain COOH as functional group as reactive part	These contain H^+ ions as reactive part.
3	These acids are week. Examples : Lactic acid, acetic acid, citric acid.	These acids are strong. Examples : Hydrochloric acid, sulphuric acid, nitric acid.

5. Distinguish between the following :

(a) Acid and alkali

(b) Base and alkali

(c) Organic acid and mineral acid.

(a) An acid is the compound formed by the reaction of acidic oxide with water. e.g., HCL, whereas alkali is the hydroxide of metals dissolved in water. e.g., KOH.

(b) A base is a substance containing hydroxide group. e.g., NH_4OH, whereas alkali is the base which is soluble in water. e.g.,NaOH.

(c) Organic acid is a weak acid derived from plants or animals. e.g., acetic acid. Mineral acid is a strong acid derived from earth minerals. e.g., HCL.

6. Give the colour of the following indicators in acidic and basic medium : Blue litmus, turmeric, china rose, methyl orange, phenolphthalein, and red litmus.

Indicator	Colour in Acidic Medium	Colour in Basic Medium
i. Blue litmus	Red	Blue
ii. Turmeric	Yellow	Reddish brown
iii. China rose	Dark pink	Green
iv. Methyl orange	Orange	Yellow
v. Phenolphthalein	Colourless	Pink
vi. Red litmus	Red	Blue

7. Form a sentence using the following words- baking soda, ant bite, moist, effect, neutralised, rubbing. [NCERT Exemplar]

The effect of an ant bite can be neutralised by rubbing moist baking soda.

I. Long Answer Type Question.

1. State the nature of following solution and give effects of these solution on litmus paper.

(a) Detergent solution

(b) Lime water

(c) Soft drink

(d) Sugar solution

(e) Vinegar.

(a) Detergent solution - Basic solution, gives blue colour with litmus paper.

(b) Lime water - Basic solution, gives blue colour with litmus paper.

(c) Soft drinks - Acidic solution, gives red colour with litmus paper.

(d) Sugar solution - Neutral solution, gives purple colour with litmus paper.

(e) Vinegar - Acidic solution, gives red colour with litmus paper.

2. Explain the following with examples :

(a) Acidic oxides

(b) Basic oxides

(c) Amphoteric oxides

(d) Neutral oxides

(a) Acidic oxides : Non-metals burn in oxide and form acidic oxides. These form an acid on treatment with water. Such oxides turn blue litmus red. For example, carbon dioxide (CO_2), sulphur dioxide (SO_2).

(b) Basic oxides : These are also called metallic oxides. These oxides form bases on treatment with water. These are generally basic in nature and turn red litmus blue. For example, sodium oxide (Na_20), magnesium oxide (MgO).

(c) Amphoteric oxides : These oxides show properties of both acidic oxides and basic oxides. For example, aluminium oxide (Al_20_3), silicon dioxide ($Si0_2$).

(d) Neutral oxides : These are neither acidic nor basic and have no effect on litmus paper. For example, water (H_2O).

3. Boojho, Paheli and their friend Golu were provided with a test tube each containing China rose solution which was pink in colour. Boojho added two drops of solution 'A' in his test tube and got dark pink colour. Paheli added 2 drops of solution 'B' to her test tube and got green colour. Golu added 2 drops of solution 'C' but could not get any change in colour. Suggest the possible cause for the variation in their results.

[NCERT Exemplar]

'A' is an acidic solution.

'B' is a basic solution.

'C' is a neutral solution.

4. A farmer was unhappy because of his low crop yield. He discussed the problem with an agricultural scientist and realised that the soil of his field was either too acidic or too basic. What remedy would you suggest the farmer to neutralise the soil ?

[NCERT Exemplar]

If the soil is too acidic, it is treated with bases such as quick lime (calcium oxide) or slaked lime (calcium hydroxide). If the soil is too basic, organic matter is added to it. Organic matter releases acids which neutralises the basic nature of the soil.

5. You are provided with four test tubes containing sugar solution, baking soda solution, tamarind solution, salt solution. Write down an activity to find the nature (acidic/basic/neutral) of each solution. **[NCERT Exemplar]**

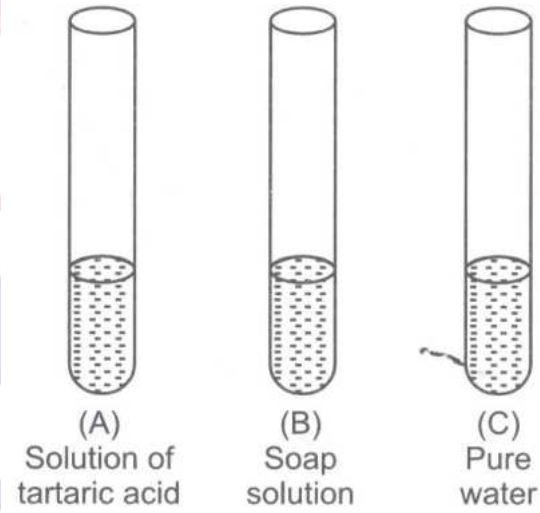
Use both red and blue litmus solution and predict the colours in each case. In acidic medium, blue litmus solution turns to red. In basic medium, red litmus solution turns to blue.

6. You are provided with three test tubes A, B and C as shown in given figure with different liquids. What will you observe when you put

(a) a piece of blue litmus paper in each test tube.

(b) a piece of red litmus paper in each test tube.

(c) a few drops of phenolphthalein solution to each test tube. [NCERT Exemplar]



7. Paheli observed that most of the fish in the pond of her village were gradually dying. She also observed that the waste of a factory in their village is flowing into the pond which probably caused the fish to die.

(a) Explain why the fish were dying ?

(b) If the factory waste is acidic in nature, how can it be neutralised?

[NCERT Exemplar]

(a) Since factory waste may contain. acids or bases, it can kill the fish.

(b) If the factory waste is acidic in nature, it can be neutralised by adding basic substances.

8. Explain two neutralisation reactions related to daily life situation. [NCERT Exemplar]

1. Indigestion : To relieve indigestion, we take an antacid such as milk of magnesia, it neutralizes the effect of excessive acid.

2. Ant sting : When an ant bites, it injects acidic liquid (formic acid) into the skin, the effect of acid can be neutralized by rubbing moist baking soda (sodium hydrogen carbonate).

II. Long Answer Type Question.

1. You are given a number of substances. Write the taste of these substances and complete the table.

Substance	Taste (sour / bitter / any other)
Lemon Juice	
Orange Juice	
Vinegar	
Curd	
Tamarind (imli)	
Sugar	
Common salt	
Amla	
Baking soda	
Grapes	
Unripe mango	

Substance	Taste (sour / bitter / any other)
Lemon Juice	Sour
Orange Juice	Sour
Vinegar	Sour
Curd	Sour
Tamarind (imli)	Sour
Sugar	Sweet
Common salt	Salty
Amla	Sour
Baking soda	Bitter
Grapes	Sweet
Unripe mango	Sour

2. You are given some acids like acetic acid, formic acid, citric acid, lactic acid, oxalic acid, ascorbic acid (vitamin C), tartaric acid and some bases like calcium hydroxide, sodium hydroxide, potassium hydroxide and magnesium hydroxide. Name the substances in which these acids and bases are found.

Name of acid	**Found in**
Acetic acid	Vinegar
Formic acid	Ant's sting
Citric acid	Citrus fruits such as oranges, lemon, etc
Lactic acid	Curd
Oxalic acid	Spinach
Ascorbic acid (Vitamin C)	Amla, Citrus fruits
Tartaric acid	Tamarind, grapes, unripe mangoes, etc.
All the acids mentioned above occur in nature	
Name of base	**Found in**
Calcium hydroxide	Lime Water
Sodium hydroxide / Ammonium hydroxide	Window cleaner
Potassium hydroxide	soap
Magnesium hydroxide	Milk of manesia

3. Write the effect of lemon juice, orange juice, vinegar, milk of magnesia, baking soda, lime water, sugar and common salt on turmeric solution.

S. No.	**Test solution**	**Effect on turmeric solution**	**Remarks**
1	Lemon juice	Blue	Acidic
2	Orange juice	Blue	Acidic
3	Vinegar	Blue	Acidic
4	Milk of magnesia	Red	Basic
5	Baking soda	Red	Basic
6	Lime water	Red	Basic
7	Sugar	No change	Neutral

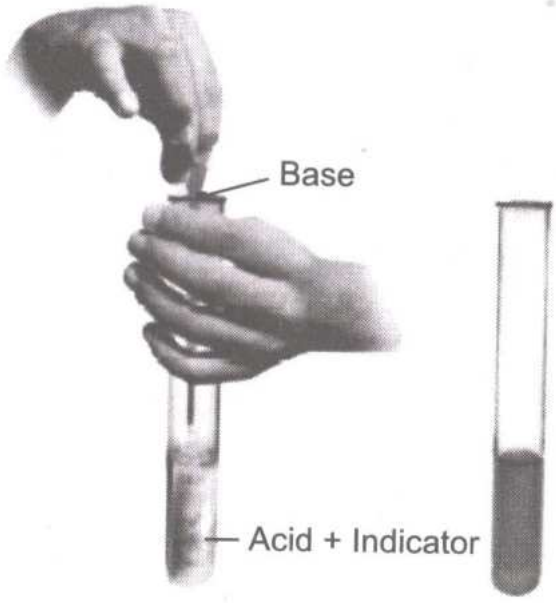
8	Common salt	No change	Neutral

4. You are given hydrochloric acid, sulphuric acid, nitric acid, acetic acid, sodium hydroxide, ammonium hydroxide and lime water. Write the effect on litmus paper, turmeric paper and China rose solution of these substances.

S.No	Name of Substance	Effect on litmus paper	Effect on turmeric paper	Effect on China rose solution
1	Dilute hydrochloric acid	blue to red	blue	dark pink
2	Sulphuric acid	blue to red	blue	dark pink
3	Nitric acid	blue to red	blue	dark pink
4	Acetic acid	blue to red	blue	dark pink
5	Sodium hydroxide	red to blue	red	green
6	Ammonium	red to blue	red	green
7	Lime water	red to blue	red	green

5. Explain the neutralisation process with the help of an activity.

Take some amount of dilute hydrochloric acid in a test tube. Note the colour of acid and phenolphthalein. Add 2-3 drops of indicator to the acid. Shake it gently. We see that solution remains colourless. Add few drops of sodium hydroxide solution in the test tube. We observe the appearance of pink colour. Now add more hydrochloric acid, we see that the solution becomes colourless again. Add sodium hydroxide again. We get pink colour again. This shows that phenolphthalein solution changes base into pink colour and it remains colourless if solution added to it is acidic. When used in a common container with phenolphthalein, acid and base neutralise the effect of each other. This process is called neutralisation.



III. Long Answer Type Question.

1. Boojho, Paheli and their friend Golu were provided with a test tube each containing China rose solution which was pinkz in colour. Boojho added two drops of solution 'A' in his test tube and got dark pink colour. Paheli added 2 drops of solution 'C' but could not get any change in colour. Suggest the possible cause for the variation in their results. [NCERT Exemplar]

China rose indicator turns acidic solution to dark pink (magenta) and basic solutions to green. Thus 'A' is an acidic solution and 'B' is a basic solution. No change in colour of solution 'C' indicates that 'C' is a neutral solution.

2. You are provided with four test tubes containing sugar solution, baking soda solution, tamarind solution, salt solution. Write down an activity to find the nature (acidic / basic / neutral) of each solution. [NCERT Exemplar]

Litmus paper as indicator

- With the help of a dropper, put a drop of sugar solution on a strip of the blue litmus paper.
- What do you observe? Write down if there is any change in colour.
- Repeat the above activity with the red litmus paper.

  You will observe that blue litmus turns red, but there is no effect on red litmus paper. Thus, sugar solution is acidic in nature.
- Now, repeat the above activity with the following substances.

  a. Salt solution

b. Baking soda solution

c. Tamarind solution

If blue litmus paper turns red while the red litmus paper remains unchanged, the solution is said to be acidic. If red litmus paper turns blue while the blue litmus paper remains unchanged, the solution is alkanine. If both the red and blue litmus papers remain unchanged, the solution is neutral.

3. Give two uses of the following acids.

a. Nitric acid

b. Hydrochloric acid

c. Sulphuric acid

a. Nitric acid

i. It is used by goldsmiths for cleaning gold and silver ornaments.

ii. It is used to make fertilisers.

b. Hydrochloric acid

i. It is secreted in stomach for digestion.

ii. It is used to remove rust from iron before galvanising and painting.

c. Sulphuric acid

i. It is used in batteries of cars, buses and inverters.

ii. It is used for preparing alum.

4. Three liquids are given to you. One is hydrochloric acid, another is sodium hydroxide and third is a sugar solution. How will you identify them? You have only turmeric indicator. [NCERT]

Following steps are taken to test the given liquids.

a. Place a drop of each liquid on turmeric indicator. The solution which changes the colour of the indicator to red is basic in nature, i.e., it is sodium hydroxide.

b. Now put a drop of sodium hydroxide on the other two liquids separately to obtain two mixtures.

c. One by one place the drop of each mixture on turmeric indicator. The mixture that changes the colour of indicator red contains neutral sugar solution. While the mixture which does not show any colour change in indicator contains hydrochloric acid which was neutralised on addition of sodium hydroxide.

I. High Order Thinking Skills (HOTS) Questions.

1. A small amount of hydrochloric acid is always produced in the stomach. It is useful or harmful for us ? If excess of acid is produced in the stomach what should we so ?

Hydrochloric acid kills the harmful bacteria that may enter into the stomach along with the food. How ever, if excess of acid is produced, then we should take milk of magnesia as an antacid medicine to neutralise the excess acid.

2. Why do copper and brass vessels need kalai ?

Copper and brass vessels on reacting with acids get corroded. Kalai prevents their corrosion.

II. High Order Thinking Skills (HOTS) Questions.

1. Dorji has a few bottles of soft drinks in his restaurant. But, unfortunately, these are not labelled. He has to serve the drinks on the demand customers. One customer wants acidic drink, another wants basic and third one wants neutral drink. How will Dorji decide which drink is to be served to whom?

It can be decided by tasting each drink. Each drink will taste different. Acidic drink will taste sour, basic drink will taste bitter and neutral drink will not have any taste.

2. If you are given a colourless liquid, how will you find out if it is an acid or a base without tasting it?

We can find out by using an indicator like litmus paper. If on putting some drops of the liquid on blue litmus paper it turns blue, the liquid is a base and if it remains unchanged then it is an acid.

3. Why do copper and brass vessels need 'halai'?

Copper and brass vessels on reacting with acids get corroded. Kalai prevenets their corrosion.

I. Value Based Questions.

1. Brushing our teeth twice a day is well known saying. Justify this statement.

We should brush our teeth twice a day as bacteria present in the mouth produce acids by degradation of sugar and food particles that remain in the mouth after eating. The best way to prevent this is to clean the mouth using toothpaste which is generally basic. These can neutralise the excess acid and prevent tooth decay.

2. Sahyog wanted to taste the chemicals in the science lab to match their taste with that what is written in the textbook. Quickly his friend Pratik approaches the teacher and Sahyog was stopped to do so.

Now answer the following questions :

(i) Why was Sahyog stopped to taste the chemicals ?

(ii) What may happen if you directly put the unknown substance into your mouth unknowingly ?

(iii) Which value of Pratik you can see here ?

(i) As all the chemicals present in lab may not be preferred to taste because they are harmful if you consume them.

(ii) Unknown substances may be responsible to burn the skin inside our mouth or in any other way it may harm our digestive system.

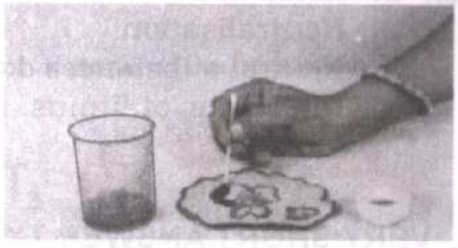
(iii) Pratik is cooperative, helpful and aware about scientific facts.

I. Skill Based Questions.

1. (a) Draw a diagram to show the preparation of greeting card.

(b) What is the effect of soap solution on turmeric paste?

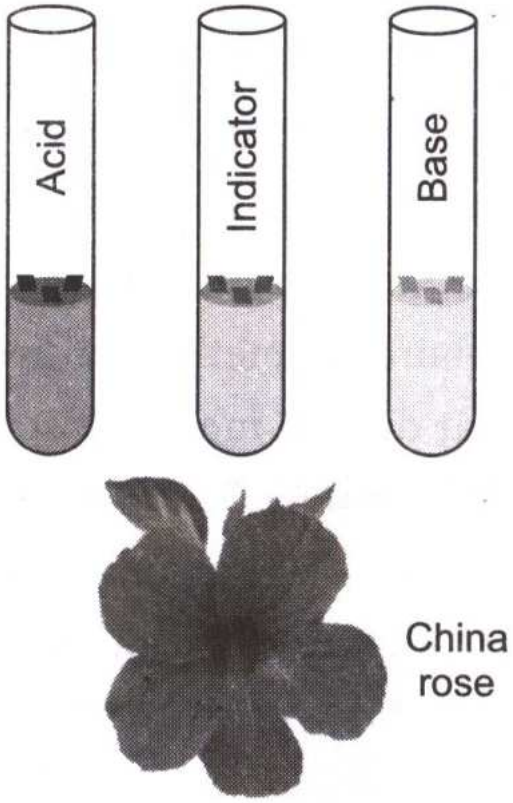
(a)



Turmeric paste Soap solution

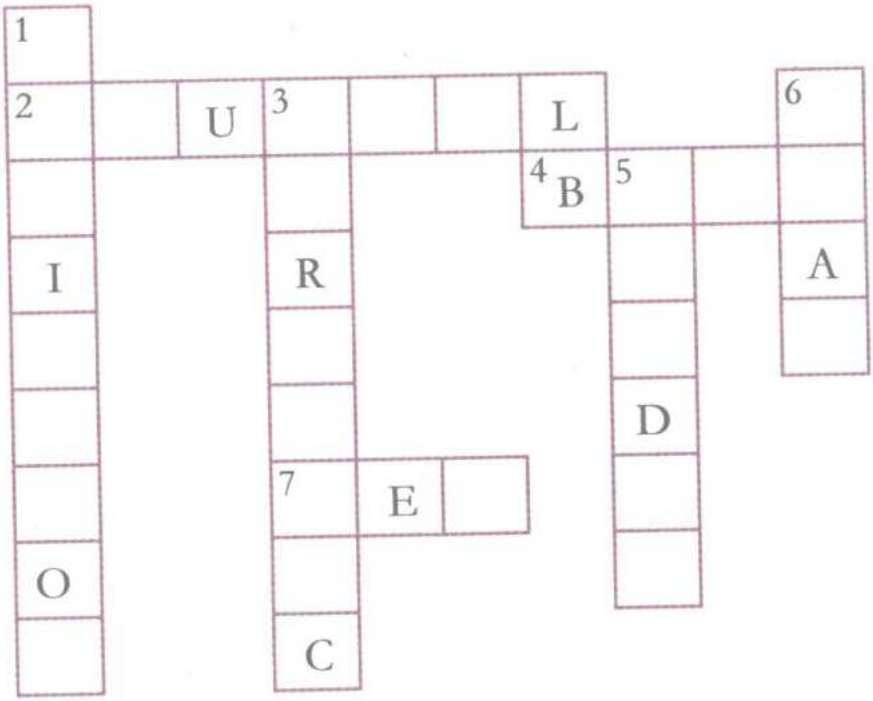
(b) The soap solution turns yellow turmeric paste into red.

2. Draw a diagram to show the China rose and indicators formed from it.



I. Cross word Puzzle.

1.



Across

2. The solution which does not change the colour of either red or blue litmus.

4. Phenolphthalein gives pink colour in this type of solution.

7. Colour of blue litmus in lemon juice.

Down

1. It is used to test whether a substance is acidic or basic

3. It is a natural indicator and gives pink colour in basic solution.

5. Nature of ant's sting.

6. It is responsible for increase in temperature during a neutralisation reaction.

Across

2. Neutral

4. Base

7. Red

Down

1. Indicator

3. Turmeric

5. Acidic

6. Heat