Chapter 5 – Acids, Bases and Salts- Textbook Exercise -(Solved)

Exercises

1.State differences between acids and bases.

Answer - Differences between Acids and Bases are as follows -

Criteria	Acids	Bases
Source	Found in citrus fruits, vinegar, stomach acid.	Found in baking soda, soap, and ammonia solutions.
Ion Production	Produce Hydrogen ions (H+) in solution.	Produce Hydroxide ions (OH-) in solution.
pH Level	Have a pH less than 7.	Have a pH more than 7.
Litmus Paper Test	Turn blue litmus paper red.	Turn red litmus paper blue.
Taste	Sour taste (e.g., lemon, vinegar).	Bitter taste and slippery feel (e.g., soap).
Reaction with Metals	React with metals to produce hydrogen gas.	Generally don't react with metals like acids do.
Neutralisation	React with bases to form water and salt.	React with acids to form water and salt.

Examples	Hydrochloric acid (HCl), Sulphuric acid (H2SO4).	Sodium hydroxide (NaOH), Ammonia (NH3).
Use in Daily Life	Used in batteries, digestion, cleaning agents.	Used in cleaning agents, baking, antacid preparations.

Class 7 science -Chapter 5-Acids, Bases and Salts- Complete Notes

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

Answer- Ammonia has a basic nature. Since it turns red litmus paper blue, this is a characteristic property of bases. In household products, ammonia works effectively to remove stains and clean surfaces due to its basic properties.

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

Answer-

Source of Litmus Solution-

- Litmus solution is obtained from lichen plants. The lichens are processed, and the colouring substances are extracted to prepare the litmus solution.

Use of Litmus Solution-

- Litmus solution is widely used as an indicator in acid-base titrations and to generally test whether a solution is acidic or basic.
- When added to an acidic solution, it turns red, and when added to a basic solution, it turns blue.
- It's an essential tool in laboratories for quick and straightforward acidic and basic identification tests.

Question- Is the distilled water acidic/basic/neutral? How would you verify it?

Answer- Distilled water is neutral with a pH of 7. It neither has excess hydrogen ions (H+) nor hydroxide ions (OH-). To verify the nature of distilled water, you can use indicators like litmus paper or universal indicator.

Procedure using Litmus Paper-

- Take red and blue litmus papers.
- Dip each litmus paper into the distilled water.
- Observe any changes in the colour of the litmus papers.

Answer-

Since distilled water is neutral, it won't change the colour of the red or blue litmus paper, confirming its neutrality.

Question- Describe the process of neutralisation with the help of an example.

Description

Neutralisation is the process where an acid reacts with a base to form water and salt, and heat is evolved. The acidic and basic properties of the reacting substances get nullified, making the resulting solution neutral.

Example of Neutralisation-

Consider the reaction between hydrochloric acid (HCl) and sodium hydroxide (NaOH).

Procedure-

- Take a certain volume of hydrochloric acid in a beaker.
- Similarly, take sodium hydroxide in another beaker.
- Slowly add the sodium hydroxide solution to the hydrochloric acid while stirring.
- Continue adding until no more reaction seems to be occurring and the solution is neutral.

Chemical Equation-

$HCl(aq)+NaOH(aq)\rightarrow NaCl(aq)+H$

In this reaction-

- Hydrochloric acid (HCl) acts as the acid,
- Sodium hydroxide (NaOH) acts as the base,
- The resulting products are sodium chloride (NaCl), which is the salt, and water (H_2O).

Heat is also evolved during this process, which can be felt by touching the container where the reaction is happening.

This example illustrates the neutralisation process where an acid and a base react to form water and salt, neutralising each other's effect.

Also Check - Rapid Revision - Class 7 Science - Chapter 5-Acids, Bases and Salts

6. Mark 'T' if the statement is true and 'F' if it is false-

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

Answer- F

Explanation

Nitric acid is an acid and it will turn blue litmus red, not red litmus blue.

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

Answer- F

Explanation-

Sodium hydroxide is a base and it turns red litmus blue, not blue litmus red.

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

Answer- T

Explanation-

Sodium hydroxide (a base) and hydrochloric acid (an acid) react together in a neutralisation reaction to form sodium chloride (a salt) and water.

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

Answer- T

Explanation-

An indicator indeed shows different colours in acidic and basic solutions, helping to identify the nature (acidic or basic) of the solution being tested.

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

Answer- F

Explanation-

Tooth decay is actually caused by acids produced by bacterial action on sugar present in the mouth, not by bases. The acids demineralize the tooth enamel, leading to tooth decay.

Also Check - NCERT Exemplar Solutions- Class 7 Science Chapter - 5- Acids, Bases and Salts

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 an acidic drink, another wants basic, and the third one wants a neutral drink. How will Dorji decide which drink is to be served to whom?

Answer-
Dorji can use indicators to determine whether each bottle contains an acidic, basic, or neutral solution. Here's a step-by-step method for Dorji to figure out which drink to serve to each customer-

1. Using Litmus Paper-

- Acidic Drink- Dorji can use blue litmus paper. If a drink is acidic, it will turn blue litmus paper red.
- Basic Drink- He can use red litmus paper. A basic (alkaline) drink will turn red litmus paper blue.
- Neutral Drink- A neutral drink won't change the colour of either red or blue litmus paper.

2. Using Phenolphthalein-

- Acidic Drink- The phenolphthalein will stay colourless in an acidic drink.
- Basic Drink- It will turn pink in a basic drink.
- Neutral Drink- No colour change will be observed for a neutral solution.

3. Using Turmeric Solution-

- Acidic Drink- There will be no colour change in turmeric solution.
- Basic Drink- Turmeric solution will change colour to red or brown in a basic drink.
- Neutral Drink- There will be no colour change in the turmeric solution for a neutral drink.

4. Applying Taste (Not Recommended for Strong Acids or Bases)-

- Acidic Drink- Usually has a sour taste.
- Basic Drink- Usually has a bitter taste and feels soapy.
- Neutral Drink- Doesn't have a sour or bitter taste, rather it tastes bland.

By conducting these small tests using different indicators, Dorji can identify the nature of the drinks (acidic, basic, neutral) and serve them according to the customers' demands. However, it should be noted that using taste as a method to identify acids and bases is not recommended due to potential safety risks. Always use safe and proper methods to test the pH of unknown solutions.

Explain why-

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

Answer-
An antacid tablet is taken during acidity to neutralise the excess amount of hydrochloric acid (HCl) present in the stomach. Our stomach naturally contains hydrochloric acid, which helps in the digestion of food. However, at times, the stomach produces more acid than what is necessary for digestion, causing discomfort and pain, a condition referred to as acidity.

Antacids contain basic substances, such as magnesium hydroxide or aluminium hydroxide. When an antacid tablet is consumed, it reacts with the excess acid in the stomach, neutralising it. This reaction between the antacid (base) and the stomach acid (acid) is a neutralisation reaction, resulting in the formation of salt and water, which helps alleviate the symptoms of acidity.

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

Answer-
Calamine solution is applied to the skin when an ant bites because it helps in neutralising the acidic effect caused by the formic acid injected by the ant. When an ant bites, it injects formic acid into the skin, causing pain and irritation.

Calamine solution contains zinc carbonate, which is a basic substance. When applied to the ant bite, it reacts with the formic acid (acid) from the ant bite, leading to a neutralisation reaction. This reaction helps in reducing the acidity at the bite site, alleviating pain, irritation, and discomfort.

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

Answer-
Factory wastes are often neutralised before disposing of them into water bodies to minimise environmental pollution and harm to aquatic life. Many factories produce wastes that contain harmful acids and chemicals. If these acidic wastes are directly released into the water bodies, they could lead to water pollution, causing harm to aquatic organisms, disrupting the ecological balance, and making the water unsafe for consumption and other uses.

By neutralising the factory wastes (making them neither acidic nor basic), the harm caused to the environment and aquatic life is reduced. Basic substances are added to the acidic wastes to neutralise them, ensuring that the waste released into water bodies is less harmful and more environmentally friendly. This process of neutralisation helps in maintaining the pH level of the water bodies, thus protecting aquatic life and preserving the ecosystem.

Class 7 science -Chapter 5-Acids, Bases and Salts – Definition and Explanation of Important Keywords

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

Answer-
Turmeric is a natural indicator that can help us identify acids and bases. When a turmeric indicator comes into contact with a basic solution, it turns red or brown, but it shows no colour change in the presence of an acid or a neutral solution.

- Identifying Hydrochloric Acid (HCl)- When a few drops of turmeric indicator are added to hydrochloric acid, there would be no colour change because hydrochloric acid is acidic, and turmeric does not change colour in an acidic medium.
- Identifying Sodium Hydroxide (NaOH)- Adding a few drops of turmeric indicator to the sodium hydroxide solution will result in a colour change to red or brown. This is because sodium hydroxide is a base, and turmeric turns red or brown in a basic solution.
- Identifying Sugar Solution- When turmeric indicator is added to the sugar solution, there won't be any colour change, as the sugar solution is neutral, and turmeric remains unaltered in a neutral solution.

Also Check - Acid Rain

Question- Blue litmus paper is dipped in a solution. It remains blue. What is the nature of the solution? Explain.

Answer-
If blue litmus paper is dipped into a solution and it remains blue, it indicates that the solution is either basic (alkaline) or neutral in nature.

- **Basic (Alkaline) Solution-** A basic solution does not change the colour of blue litmus paper. This is because bases have a property of keeping blue litmus paper blue due to their alkaline nature.
- **Neutral Solution-** A neutral solution also won't change the colour of blue litmus paper because it is neither acidic nor basic, meaning that there are no excess H+ (hydrogen) or OH- (hydroxide) ions to cause a colour change in the litmus paper.

Therefore, in this case, the solution could be either a base or neutral because both these types of solutions will not alter the blue colour of the litmus paper.

Question- Consider the following statements-

(a) Both acids and bases change the 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 the indicator.

Which of these statements are correct? (i) All four (ii) a and d (iii) b, c and d (iv) only d

Answer- Let's evaluate each statement-

- **Statement (a) is true.** Both acids and bases can change the colour of indicators, but the exact colour change depends on the type of indicator used.
- **Statement (b) is false**. An indicator can change colour in the presence of both an acid and a base, but the resulting colours would be different for each.
- **Statement (c) is also false** for the same reason as statement (b). An indicator can respond to both acids and bases.

- **Statement (d) is true.** The change of colour indeed depends on the type of indicator used, as different indicators react differently to acids and bases, resulting in various colour changes.

Given the analysis, the correct combination of true statements is (ii) a and d.

Extended Learning — Activities and Projects

Question 1-

Using the knowledge of acids and bases, write a secret message with the help of baking soda and beetroot. Explain how it works. (Hint- Prepare baking soda solution in water. Use this solution to write the message on a sheet of white paper with a cotton bud. Rub a slice of fresh beetroot over the message.)

Answer- Baking soda (sodium bicarbonate) is basic in nature. When you write a message on paper using a solution of baking soda and then rub a slice of fresh beetroot over it, the beetroot juice, which acts as an indicator, reacts with the basic baking soda solution. This causes a colour change, revealing the secret message.

Explanation-

- **Baking soda solution-** Being a base, baking soda remains invisible on white paper once it dries.
- **Beetroot juice-** Acts as a natural pH indicator. When it comes in contact with bases, it changes colour.

So, by rubbing beetroot juice over the paper, the areas where the message was written using the baking soda solution will undergo a colour change, making the hidden message visible.

Question 2-

Prepare red cabbage juice by boiling a piece of red cabbage in water. Use it as an indicator and test the acidic and basic solutions with it. Present your observations in the form of a table.

Answer- Red cabbage contains a natural pH indicator that changes colour depending on whether it is mixed with an acid or a base.

Table of Observations-

S. No.	Test Solution	Initial Colour of Red Cabbage Juice	Colour after adding Test Solution	Nature of Solution
1	Hydrochloric Acid	Purple	Red	Acidic
2	Sodium Hydroxide	Purple	Green/Yellow	Basic
3	Distilled Water	Purple	Purple	Neutral
...	...	...	...	...

(Note- The exact colours might vary slightly based on the concentration of the solutions and the exact pH.)

Explanation-

- Red cabbage juice- Contains anthocyanins which can be red, purple, or blue, depending on the pH of the solution they are in. In acidic solutions, it turns a reddish hue. In basic solutions, it turns greenish-yellow. Neutral solutions, like distilled water, will not cause any colour change, and the juice will remain purple.

Question-

Bring the soil sample of your area, find out if it is acidic, basic, or neutral. Discuss with farmers if they treat the soil in any manner.

Answer-

- **Collecting the Soil Sample-**
  - Collect a soil sample from your area, ensuring it's from a depth of about 4-6 inches below the surface to get a sample that is unaffected by immediate weather changes.
- **Testing the Soil-**
  - To determine whether the soil is acidic, basic, or neutral, you can use a pH test kit which is available at garden supply stores.
  - Follow the instructions on the pH test kit. Generally, it involves mixing a small amount of soil with water and then adding a reactive agent or placing a test strip.

- **Discussion with Farmers-**
    - Engage with local farmers to gain insights into how they manage soil pH.
    - Ask if they use any lime (calcium carbonate) or sulphur-based compounds to treat the soil, as lime is used to raise pH (reduce acidity), and sulphur is used to lower pH (reduce alkalinity/basicity).

Example Answer- "After collecting and testing a soil sample from my area, it was found that the soil is slightly acidic with a pH below 7. On discussing with local farmers, I learned that they occasionally add lime to the soil to neutralise the acidity. Lime, being basic, helps in raising the soil's pH, making it more favourable for the growth of plants and crops."

Question-

Visit a doctor. Find out the medicines he prescribes to treat acidity. Ask him how acidity can be prevented.

Answer-

- **Consultation-**
    - Visit a doctor and discuss the issues related to acidity.
- **Medications Prescribed-**
    - The doctor might prescribe antacids, which help neutralise stomach acid.
    - Other medications such as H2 blockers and proton pump inhibitors (PPIs) might also be suggested to reduce the production of stomach acid.
- **Prevention Strategies-**
    - The doctor might recommend lifestyle and dietary modifications like avoiding spicy and fatty foods, maintaining regular eating times, and avoiding lying down immediately after eating.
    - Smoking cessation and reducing alcohol consumption may also be advised.

Example Answer- "Upon consulting a doctor regarding acidity, I was advised that antacids are commonly prescribed to neutralise stomach acid and provide relief from acidity. The doctor also recommended avoiding overly spicy and fatty foods, and suggested not to lie down immediately after eating to prevent acid reflux. Regular exercise and maintaining a healthy weight were also emphasised for preventing acidity issues."