

Class:7	Subject: Science	Topic: Acids, Bases & Salts
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SUMMARY SHEET		
Learner Previous Knowledge	Substances have their own characteristics and can be categorized accordingly.	
Target Knowledge for this Topic	Introduction Understand what acids and bases are; Investigate the different uses of acids; Chemical Reactions of acids Know what happens when acids and bases react and find out the application of this in daily life; Crystallization Study the process of formation of hydrated salt; Indicators Experiment and test whether the given substance is acid or base; Chemical and Physical change	
Learning Goals		
<i>More Complex Learning Goal-</i> Students will be able to make and defend predictions under what may happen to acid, base or salt in given conditions.		
<i>Target Learning Goal-</i> Students will be able to describe the properties of acids, bases and salts; explain role of indicator; define crystallization, and physical & chemical changes and describe applications of process of neutralization in daily life.		
<i>Simpler Learning Goal-</i> Students will be able to list the properties of acids, bases and salts, list applications of neutralizations and list physical and chemical changes.		
Period No.	Lesson Objectives	Teaching Learning Materials Required
1	Identify properties of acids and bases and explain what an indicator is.	- Worksheet 1 - Activity 1: For each group: Orange juice, Table Vinegar, Lemon juice, Curd, lime water [prepared by mixing Calcium Hydroxide with water], soap, Milk of Magnesia [Gelusil syrup will do], baking soda, salt, rock salt - Activity 2: Dil. Hydrochloric Acid, Vinegar, Sodium Hydroxide Solution, Calcium Hydroxide

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2 and 3	Demonstrate how different indicators are used to identify acids, bases and salt.	- Worksheet 2 - Worksheet 3 - Activity 1: For each group: Turmeric powder, water, filter paper strips, lemon juice, vinegar, soap solution, common salt, sugar, milk of magnesia - Activity 2: For each group: China Rose water [brought by students, as per instructions given in Homework], lemon juice, vinegar, soap solution, common salt, sugar, milk of magnesia
4	Experiment and find out what happens when acids and bases are mixed and then explain neutralization.	- Worksheet 4 - For each group: Dil. Hydrochloric Acid, Sodium Hydroxide solution, Phenolphthalein, test tubes, test tube stand, dropper, red and blue litmus paper
5	Deduce how neutralization can be used in daily life and list its applications.	- Worksheet 5 - Chart paper for each group
6	Describe the properties of salts and explain how we can obtain salts.	- Worksheet 6 - Activity 1: For each group: Dil. Hydrochloric Acid, Sodium Hydroxide solution, Phenolphthalein, test tubes, test tube stand, dropper - Activity 2: Hydrated copper sulphate and Anhydrous copper sulphate kept in two separate watch glasses

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Period 1

Lesson Objectives

At the end of this lesson students will be able to:

- Identify properties of acids and bases and explain what is an indicator.

Teaching Learning Materials required

- Worksheet 1
- Activity 1: For each group: Orange juice, Table Vinegar, Lemon juice, Curd, lime water [prepared by mixing Calcium Hydroxide with water], soap, Milk of Magnesia [Gelusil syrup will do], baking soda, salt, rock salt
- Activity 2: Dil. Hydrochloric Acid, Vinegar, Sodium Hydroxide Solution, Calcium Hydroxide

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5 (**This could be done in the lab**)

Lesson Beginning <u>Time:</u> 5min <u>Purpose:</u> Activate the prior knowledge	<u>Introduction</u> - Introduce the topic of acids and bases by stating that today they are all chemists and are going to find out information of substances given to them. Pose questions such as: - If a substance is given to you, what will you do to find out what is it without touching it? - If you are allowed to touch it, what will you do next? - Gather response from different groups and collate it to arrive at common answers. - Inform the students that they will now be given some substances whose properties or characteristics need to be tested.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activity</u> - Distribute Worksheet 1A to all the students. Let them go through it. - Ask the student groups to do the activities mentioned in it. Note: For Activity 2, give the set of acids and bases but the students should not know them. They are supposed to identify them using indicator. The material to be given will be: Dil. Hydrochloric Acid,

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	Vinegar, Sodium Hydroxide Solution, Calcium Hydroxide. Label the solutions 1 to 4. - After they have completed, let the groups exchange information on the conclusions that they have drawn. - Ask them to discuss the answers before drawing conclusions. - They can write the conclusion in the Worksheet. Let the students now discuss the answers and arrive at a common consensus.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish up	<u>Finish Up</u> Clear doubts of the students.

Worksheet 1

Skill: Spirit of inquiry

Activity 1

Each group will be given materials and they will do the activity as per given instructions.

Material: Orange juice, Table Vinegar, Lemon juice, Curd, lime water [prepared by mixing Calcium Hydroxide with water], soap, Milk of Magnesia [Gelasil syrup will do], baking soda, salt, rock salt

Instructions

1. Touch each item and feel the texture.
2. Taste vinegar, lemon juice, curd, milk of magnesia, lime water
3. Fill in the observation table given below.

Substance	Taste[sour, bitter or any other]	Feel [soapy, watery, non-soapy]
Orange Juice		
Lemon Juice		
Table Vinegar		
Curd		
Lime water		
Milk of Magnesia		
Salt		

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Baking Soda		
Rock Salt		

Information

- Acids are substances which are sour in taste.
- Bases are substances which are bitter in taste and soapy to touch.
- Salts are either tasteless or salty in taste and may not have any particular texture.

Based on the above information, categorise the given substances into acids, bases and salts.

Acids	Bases	Salts

Activity 2

Note to the teacher: Keep the solutions given below in individual test tubes and arrange them in a test tube stand. Each group should have one set of them.

Material: Five solutions labelled 1 to 4, Litmus paper, phenolphthalein, few clean test tubes

Instructions

1. Dip a small piece of litmus in each solution and note the colour change.
2. Now take a clean test tube, take little quantity of solution 1, add few drops of phenolphthalein to the solution and shake the test tube.
3. Observe the colour change.
4. Repeat steps 2 & 3 for each solution.
5. Record the observation.

Solution Number	Change in colour with Litmus paper	Change in colour with Phenolphthalein
1		
2		
3		
4		

Information

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- Blue litmus changes to red in presence of acids. It will not change colour in presence of base.
- Red litmus turns blue in presence of bases. It will not change colour in presence of acid.
- Blue and red litmus will not change colour in presence of salts.
- Phenolphthalein is a colorless liquid. In presence of acid it remains colorless and does not change colour. But in the presence of base, it changes to pink colour.
- There is no colour change in presence of salts.

You have been given acids and bases as solution for your activity. Based on the above information, categorise substances as acids and bases.

Solution Number	Acid/Base
1	
2	
3	
4	

Some special substances are used to identify acids or bases. They can be used to test if a given substance is acidic or basic. These substances are called indicators. Based on this information, name the indicators used in Activity 2.

The indicators used in Activity 2 are _____ and _____.

Note :- Collect some China Rose petals in a glass and add warm water to them. Leave the beaker undisturbed for some time. You will observe that the water has changed colour. Take this solution to school to use it as indicator.

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Period 2 and 3

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate how different indicators are used to identify acids, bases and salt.

Teaching Learning Materials required

- Worksheet 2
- Worksheet 3
- Activity 1: For each group: Turmeric powder, water, filter paper strips, lemon juice, vinegar, soap solution, common salt, sugar, milk of magnesia
- Activity 2: For each group: China Rose water [brought by students, as per instructions given in Homework], lemon juice, vinegar, soap solution, common salt, sugar, milk of magnesia

Details of Teaching Learning Experience

Seating Arrangement: In groups of 4-5 each. (This could be done in the lab)

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> • Activate prior knowledge.	<u>Whole Class Discussion</u> • Ask a few students to now define indicator and write the definitions on the board. • Inform the students that they will now make an indicator themselves and use it to identify acids and bases. • Distribute Worksheet 2 to all the students.
Lesson Middle <u>Time:</u> 25min. <u>Purpose:</u> • Develop conceptual understanding	<u>Activities and Observation</u> • Distribute the material to make the indicator as given in the Worksheet. • Ask the students to follow the instructions and do the activities. • Ask them to record their observations. • Now distribute Worksheet 3 to all groups. • Let them attempt it. • After the students have completed the Worksheet 3, let there be a whole class discussion in which the students can share their observations and arrive at a common consensus.

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Lesson End <u>Time:</u> 5min <u>Purpose:</u> Finish Up	<u>Finish Up</u> First, clear doubts if the students have.
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Worksheet 2

Skill: Drawing Inferences

Activity 1

Material: Turmeric powder, water, filter paper strips, lemon juice, vinegar, soap solution, common salt, sugar, milk of magnesia

Instructions

1. Add some water to the turmeric powder and make a paste.
2. Apply this paste on filter paper strips and allow them to dry by putting them on window sill to dry.
3. Put a drop of solutions on turmeric paper pieces and observe the colour change. Record your observation.

Solution	Effect on turmeric paper
Lemon Juice	
Vinegar	
Soap Solution	
Common salt solution	
Milk of Magnesia	
Sugar solution	

Observation questions

1. What is the effect of acidic solutions on the turmeric paper?

2. What is the effect of basic solutions on the turmeric paper?

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3. What is the effect of neutral solutions like salt and sugar on the turmeric paper?

Activity 2

Material: China Rose water, lemon juice, vinegar, soap solution, common salt, sugar, milk of magnesia

Instructions

1. Add a few drops of prepared China Rose water to little quantity of all given solutions.
2. Observe the colour change and record your observation.

Solution	Initial Colour	Final Colour
Lemon Juice		
Vinegar		
Soap Solution		
Common salt solution		
Milk of Magnesia		
Sugar solution		

Observation questions

1. What is the effect of acidic solutions on the China Rose solution?

2. What is the effect of basic solutions on the China Rose solution?

3. What is the effect of neutral solutions like salt and sugar on the China Rose solution?

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Worksheet 3

Skill: Comprehension

1. When you wash clothes, which have turmeric stains with soap water, the stains turn red in colour. What can be the reason?

2. Look at the picture and identify the solution in the beaker.



1. The solution in the beaker is _____.

2. I could identify the solution because _____

3. What will be the colour change?

a) If phenolphthalein is added to lemon juice-_____

b) If phenolphthalein is added to soapy solution-_____

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Period 4

Lesson Objectives

At the end of this lesson students will be able to:

- Experiment and find out what happens when acids and bases are mixed and then explain neutralization.

Teaching Learning Materials required

- Worksheet 4
- For each group: Dil Hydrochloric Acid, Sodium Hydroxide solution, Phenolphthalein, test tubes, test tube stand, dropper, red and blue litmus paper

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5. (This could be done in the lab)

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Recap the previous learning	<u>Instructions for Experiment</u> • Ask the students questions such as: ○ What is an indicator? ○ What is the effect of phenolphthalein on acid and bases? ○ If red litmus turns blue in a solution, what kind of solution is it? ○ If indicators do not show any colour change in a solution, what kind of a solution is it? ○ Acids and Bases show opposite reaction. In that case, what can you expect if both are mixed? • Collect response and arrive at the same page. • Ask the students: Acids and Bases show opposite reaction. In that case, what can you expect if both are mixed? Inform the students that today they will find out what happens when they are mixed.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Experiment</u> • Distribute worksheet 4 to all the students. • Let the students carry out the experiment as given in the worksheet in pairs. • Let them observe their findings and draw conclusion. • Ask the students to discuss the questions in groups.

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	Let there be a whole class discussion on the observations and analysis and ensure that all the students arrive at a common consensus.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> - Clear any doubts of the students, if they have them. <u>Homework</u> - Write this question on the board and ask the students to copy it in their notebook: Find out ways by which neutralization is useful in daily life.

Worksheet 4

Skill: Drawing Inferences

What will happen if Acids and Bases are mixed together?

Hypothesis: I think when acids and bases are mixed together, they will form _____

Experiment

Material: Dil, Hydrochloric Acid, Sodium Hydroxide solution, Phenolphthalein, test tubes, test tube stand, dropper, red and blue litmus paper

Instruction

- Keep all the given solutions in a test tube stand.
- Fill a clean test tube with 10 ml of Hydrochloric acid. Use a blue litmus paper and check the colour change.
- Add 2-3 drops of Phenolphthalein indicator to it. [What is the colour of the solution now? Note it.]
- Now with a dropper add Sodium hydroxide solution to the test tube which has the acid and indicator.
- Continue adding drop by drop and every time you add, shake the test tube. [Count the number of drops that you are adding].
- Check the outer side of test tube. Is it warm or is there no change in the temperature?

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- Keep on adding till the solution becomes very pale pink in colour. Now use both the litmus papers red and blue and check for colour change.
- To this very pale pink, add a drop of Hydrochloric acid to the solution and see if it becomes colourless again or not.

Observation:

- When blue litmus was dipped in Hydrochloric acid, it _____.
- When phenolphthalein was added to the acid in the test tube in step 3, the colour change was _____.
- When litmus papers were dipped in the very pale pink solution the colour change was _____.
- When the acid and base were mixed, the test tube felt _____ when touched.

Questions

- In step 6, what kind of solution did you get, acidic or basic?

- In step 7, after you added a drop of Hydrochloric acid, the solution became colourless again. What kind of solution was there in the test tube in step 7?

- What is the conclusion drawn from this experiment? What happens when acid and bases are mixed together?

- On the basis of this experiment can you say how you can make an acidic solution into a basic solution?

- On the basis of this experiment can you say how you can make an acidic solution into a basic solution?

- Can you say if heat is evolved or not in neutralization?

Was your hypothesis correct?

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Information

- When acids and basis are mixed in definite proportions, they result in neutral solution. This process is called **neutralisation**.
- In the above experiment, how many drops of sodium hydroxide were needed to neutralize 10 ml of hydrochloric acid?

 - If I add half a test tube of sodium hydroxide to some hydrochloric acid in attest tube, can I call it neutralization?

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Period 5

Lesson Objectives

At the end of this lesson students will be able to:

- Deduce how neutralization can be used in daily life and list its applications.

Teaching Learning Materials required

- Worksheet 5
- Chart paper for each group

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Recap the previous learning	<u>Recap</u> • Ask the students to recap the observations and the conclusions formed in the previous experiment. Let each group put forth the definition of neutralization. • Ask the students questions such as: ○ Can we have a neutral solution if some acid and some bases mixed together? ○ How can we make an acidic solution basic and vice versa? ○ Which indicator is best used to do the process of neutralization in the chemistry lab? • Gather the responses and collate the answers to arrive at a consensus.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Case Studies</u> • Distribute Worksheet 5 to all the groups. • Let the groups discuss each case and write the answers in their Worksheet. • Let there now be a whole class discussion in which students can exchange their observations and conclusions. Ensure that they arrive at a common consensus.

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	Now distribute chart papers to each group. Ask the group to make either a mind map or a graphic organizer and display all the applications of neutralizations in a creative way.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> Clear any doubts that the students may have.

Worksheet 4

Skill: Analytical Thinking

Case Studies

1. Ramesh was bitten by a bee when he was playing in the garden. He cried out with pain. His mother instantly made a paste of baking soda and water and put it on the place where the bee had stung. It gave Ramesh a lot of relief. Baking soda is basic in nature. How has it helped Ramesh?

2. Anish's father is a dentist. He often tells Anish that the bacteria or germs in our mouth turn the leftover food stuck in the teeth into acid and this acid then forms cavities in the teeth leading to tooth ache. So he insisted that Anish brush his teeth every night daily. Once Anish was reading out the ingredients in the toothpaste and found that it had lot of substances which were basic in nature? He wondered why it was so. Can you help Anish find the answer?

3. Sunil's mother is a chronic patient of acidity. When Sunil asked what acidity is, his mother explained that our stomach produces acid which helps digest food. But when it is in excess, it results in burning sensation.

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Her doctor has prescribed medicine called 'Antacid' which is actually a base like milk of magnesia. How does it help in giving relief to Sunil's mother?



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Period 6

Lesson Objectives

At the end of this lesson students will be able to:

- Describe the properties of salts and explain how we can obtain salts.

Teaching Learning Materials required

- Worksheet 6
- Activity 1: For each group: Dil. Hydrochloric Acid, Sodium Hydroxide solution, Phenolphthalein, test tubes, test tube stand, dropper
- Activity 2: Hydrus copper sulphate and Anhydrous copper sulphate kept in two separate watch glasses

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5. (This could be done in the lab)

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate prior knowledge	<u>Introduction of Topic</u> - Ask the students what they usually call a substance which is neither acidic nor basic. [The expected answer is 'neutral solution'] - Now pose the following questions to the students: - What happened when you carried out the process of neutralisation in the previous class? - Do you think new products were formed after neutralisation? - When hydrochloric acid was mixed with specific amount of sodium hydroxide in the experiment done in previous class, it gave two products: sodium chloride and water. Do you think this sodium chloride is neutral? - Gather response and arrive at common answers. - Inform the students that now they will find out what is produced in the process of neutralization.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u>	<u>Activity & Worksheet</u> - Let them attempt the worksheet 6 and do the activity. - After all groups have completed the worksheet and activity, there can be a whole class discussion.

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Develop conceptual understanding	Let all the groups discuss answers and arrive at a common conclusion.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> - Finish Up - Homework Distribution	<u>Finish Up</u> - Wrap up the class by clearing doubts. <u>Homework</u> - Ask the students to find out uses of salts in daily life.

Worksheet 6

Skill: Comprehension

Information:

- Neutralisation is a process in which acids and bases are mixed in specific proportion to produce salt and water.
- The salt produced in this case is a neutral substance.
- All salts are neutral but all neutral substances are not salt. For example, sugar and starch are neutral but they are not salts.

I. Given below are some examples of neutralisation. Based on the above information, underline the salt in the given examples.

[Hydroxides are basic in nature.]*

- Hydrochloric Acid + Sodium Hydroxide $\longrightarrow$ Sodium Chloride + Water
- Hydrochloric Acid + Calcium Hydroxide $\longrightarrow$ Calcium Chloride + Water
- Sulphuric Acid + Sodium Hydroxide $\longrightarrow$ Sodium Sulphate + Water
- Hydrochloric Acid + Magnesium Hydroxide $\longrightarrow$ Magnesium Chloride + Water
- Sulphuric Acid + Magnesium Hydroxide $\longrightarrow$ Magnesium Sulphate + Water

II. Activity 1

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Neutralisation

Experiment

Material: Dil, Hydrochloric Acid, Sodium Hydroxide solution, Phenolphthalein, test tubes, test tube stand, dropper

Instruction

1. Keep all the given solutions in a test tube stand.
2. Fill a clean test tube with 10 ml of Hydrochloric acid. Use a blue litmus paper and check the colour change.
3. Add 2-3 drops of Phenolphthalein indicator to it.
4. Now with a dropper add Sodium hydroxide solution to the test tube which has the acid and indicator.
5. Continue adding drop by drop and every time you add, shake the test tube.
6. Keep on adding till the solution becomes very pale pink in colour. Now use both the litmus papers red and blue and check for colour change.

Questions

1. Based on your knowledge of salts, what do you think is present in the test tube now which is very pale pink in colour? _____
2. Why is there no indication shown by litmus? _____
3. What are the characteristics of salts that you have identified from the activity?
 - i. Salts are produced when _____
 - ii. Salts are _____