Vision Empower & XRCVC

Teacher Instruction KIT

Physical and Chemical Changes

Syllabus: NCERT
Subject: Science
Grade: 7
Textbook Name: NCERT- Science Textbook for class VII
Chapter Number & Name: 6. Physical and Chemical Changes

1. OVERVIEW

1.1 OBJECTIVES AND PREREQUISITES

Objective

- To understand physical and chemical changes.
- To know what chemical reactions are.

Prerequisite Concept

- Reversible and irreversible changes

Grade 6, chapter6: Changes around us

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*Kindly Note: Activities marked with * are mandatory*

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2. LEARN

2.1 KEY POINTS

Properties such as shape, size, colour and state of a substance are called its physical properties. A change where substance undergoes a change in its physical properties is called a physical change. A physical change is generally reversible. In such a change no new substance is formed.

A change in which one or more new substances are formed is called a chemical change. A chemical change is also called a chemical reaction.

2.2 LEARN MORE

None

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

Interest generation activity

Activity 1: Changes around us

Materials Required: None

Prerequisites: None

Activity Flow

- Tell the students that we come across many changes in our surroundings. For example, dissolving sugar or salt in water, curd from milk, etc.
- Ask the children to name a few changes that they have noticed.

3.2 CONCEPT INTRODUCTION ACTIVITIES

Physical Changes

Activity 2: Physical changes

Materials Required: ice cubes, plastic/glass tumbler
Prerequisites: None

Activity Flow

- Melt a small portion of ice by placing the tumbler in the sun.
- Now there is a mixture of ice and water.
- Now place the tumbler in a freezing mixture (ice plus common salt). Does the water become solid ice once again?

Or

Materials Required: one spoon of raw rice and one spoon of dal/kidney beans, 2 bowls
Prerequisites: None
Activity Flow

- Take one small spoon of raw rice and one spoon of dal/kidney beans and mix them together.
- Ask the student to try to separate them in two different bowls.
- We will notice that we can easily separate them and no new substance is formed.

INFERENCE: This is a physical change as it is reversible, no new compounds are formed and the chemical composition of rice and dal/kidney beans haven't changed. There is no change in the property of rice and dal.

Similarly the next activity:

- Boil some water in a container.
- Do you feel the steam rising from the surface of water?
- Hold an inverted pan by its handle over the steam at some distance from the boiling water. Observe the inner surface of the pan.
- You would observe that there are small droplets of water

In all these activities there is no change in property of the substance. And these changes are reversible.

Explain to them what physical changes are by asking for a few examples from their surroundings.

Chemical Changes

Activity 3: Chemical changes

Materials Required: matchstick and matchbox
Prerequisites: None

Activity Flow

- Take an unlit matchstick and make the student feel it.
- Next, light the matchstick and make the student feel the heat of the fire from afar.
- After it has burned completely and cooled down, make the student touch it and ask them to feel how it crumbles to ashes.
- INFERENCE: The lighting of the match stick is a chemical change as there is production of heat energy (a new product) and the match stick turns into ash which is an irreversible reaction.

Or

Materials Required: ribbon of magnesium, candle
Prerequisites: None

Activity Flow

- Get a small thin strip or ribbon of magnesium.
- Clean it's tip with sandpaper. Bring the tip near a candle flame.
- Explain to the students that it burns with a brilliant white light and when it is completely burnt it leaves behind a powdery ash.
- This change can be represented by the following equation:

Magnesium (Mg) + Oxygen (O_2) → Magnesium oxide (MgO)

- And when the mix the ash of this magnesium ribbon with a small amount of water it forms a new substance, and this change can be written as

Magnesium oxide (MgO) + Water (H_2O) → Magnesium hydroxide [$Mg(OH)_2$].

- The ash was the new substance formed when magnesium was burnt in air which is an irreversible reaction.

NOTE: In equations of this kind, the arrow implies 'becomes'.

Symbols of these chemicals in braille and how we write such symbols/equations should be told to the students.

Chemical Reactions

Activity 4: Representation of chemical reactions

Materials Required: Coins, beans and dals
Prerequisites: None

Activity Flow

- Take the equation CuO + H2 -----□ Cu + H2O
- Represent the Cu with a coin, O with a bean and H with a dal.
- So taking the LHS you have compounds CuO (1 coin and 1 bean) and H2 (2 dals).
- Now on rearranging you get the RHS Cu (1 coin) and H2O (2 dals and 1 bean).
- Explain to the students how chemical equations are being represented.

Activity 5: Chemical reaction of copper sulphate with iron

Materials Required: copper sulphate , water, beaker, dilute sulphuric acid, nail/blade
Prerequisites: None

Activity Flow

- Dissolve about a teaspoonful of copper sulphate (blue vitriol or neela thotha) in about half a cup of water in a glass tumbler or a beaker.
- Add a few drops of dilute sulphuric acid to the solution and you will get a blue coloured solution.
- Save a small sample of the solution in a test tube or a small glass bottle.
- Drop a nail or a used shaving blade into the remaining solution. Wait for half an hour or so.
- Observe the colour of the solution. And ask the students to compare it with the colour of the sample solution saved separately.
- Children who are low vision can share what differences they observed and then the teacher can explain the colour change to everyone.
- Due to the reaction between copper sulphate and iron, the colour has changed from blue to green and it is due to the formation of iron sulphate, a new solution.
- The brown deposit on the iron nail is copper, another new substance.
- We can write the reaction as:

Copper sulphate solution (blue) + Iron → Iron sulphate solution (green) + Copper (brown deposit)

- The reaction of copper sulphate with iron produced iron sulphate and copper. Both of these are new substances. Copper was deposited on the shaving blade of iron.
- NOTE: To identify the colour, titration colour cam app can be used.

Activity 6: Chemical change

Materials Required: vinegar, test tube, baking soda, lime water
Prerequisites: None

Activity Flow

- Take about a teaspoonful of vinegar in a test tube. Add a pinch of baking soda to it.
- You will hear a hissing sound and see bubbles of a gas coming out.
- Pass this gas with the help of a connecting tube/ bridge through freshly prepared lime water.
- What happens to the lime water? The change in the test tube is as follows:

Vinegar (Acetic acid) + Baking soda (Sodium hydrogencarbonate) → Carbon dioxide + other substances.

- The reaction between carbon dioxide and lime water is as follows

Carbon dioxide (CO_2) + Lime water [$Ca(OH)_2$] → Calcium Carbonate ($CaCO_3$) + Water (H_2O)

- When carbon dioxide is passed through lime water, calcium carbonate is formed, which makes lime water milky. The turning of lime water into milky is a standard test of carbon dioxide
- In this activity vinegar and baking soda together produced carbon dioxide, which turned lime water milky. The new substance formed here is calcium carbonate .
- A change in which one or more new substances are formed is called a chemical change. A chemical change is also called a chemical reaction

Rusting of Iron

Activity 7: Rusting of Iron

Materials Required: iron nail, salt, cup of water
Prerequisites: None

Activity Flow

- Take an iron nail (preferably) or a safety pin
- Take a cup of water and add half a small spoon of salt in it and mix it.
- Make the student feel the nail before dropping it in this cup

- Let it sit like this for 3-4 days
- After you see it rusting, remove it, dry it and make the student feel it and tell them about rusting.
- INFERENCE: As the iron nail, or iron in particular remains exposed to oxygen in the atmosphere and water (or water vapour) we see a reddish brown deposition on it. This is called rusting and it is a chemical change because a new substance i.e. rust is formed.
- The process of rusting can be represented by the following equation:

Iron (Fe) + Oxygen (O_2 , from the air) + water (H_2O) → rust (iron oxide Fe_2O_3) For rusting, the presence of both oxygen and water (or water vapour) is essential.

How do we prevent rusting?

Prevent iron articles from coming in contact with oxygen, or water, or both. One simple way is to apply a coat of paint or grease. These coats should be applied regularly to prevent rusting. Another way is to deposit a layer of a metal like chromium or zinc on iron. This process of depositing a layer of zinc on iron is called galvanization.

Crystallization

Activity 8: Crystallization

Materials Required: Thick piece of thread, pen, salt, water.

Prerequisites: None

Activity Flow

- Ask the student to feel the thick piece of thread.
- Take the thread and loop it around a pen in the middle.
- Take a cup of water and go on adding salt in it until it becomes a saturated solution i.e. no more salt can be dissolved in it and salt starts to settle at the bottom.
- Now, keep the pen horizontally on top of the cup and make sure the thread is immersed in the water and set this apparatus aside without disturbing it.
- Wait for a few days or until you see crystals forming on the thread (usually 4-5 days)
- Again ask the student to observe how the thread now has hard rocky structures on it. These are salt crystals.
- INFERENCE**:** This is the process of crystallization and it is a physical change as no new compounds are formed. Only the shape of the salt changes to become crystals.

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

1. Discuss with the children where we see chemical changes in our daily life. For example: ripening of fruits, digestion of food in our body, medicines, etc.

4. EXERCISES & REINFORCEMENT

4.1 EXERCISES & REINFORCEMENT

Reinforcement

Activity 7: Identifying changes

Materials Required: Physical and chemical changes

Prerequisites: None

Activity Flow

- Ask the children to observe their surroundings, their environment and identify them as physical and chemical changes.

4.2 IMPORTANT GUIDELINES*

Exercise Reading

It is very important that the children practice their learnings as well as their reading. Hence have the children read out the newly learned concepts from their textbooks or other available resources.

Perform Textbook Activity

It is good practice to have the children perform the textbook activities. Your textbook activities might not be accessible hence go through this resource to learn how to make textbook content accessible.

Provide Homework

To evaluate their understanding and to help the student revise and implement the new learnt concept ensure to provide them with homework. Students should perform one or two of the questions mentioned above or from the textbook exercises with the teacher in Class and the remaining may be given for homework. Also, ensure that the student knows their special skills linked to independently using their accessible books as it will be critical to doing homework independently

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