The Punjab State Board of Technical Education and Industrial Training

Plot No. 1-A,Sector 36-A , Chandigarh PH: 0172-2615385, 2622584-85

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No. PSBTE&IT/DA/2026/5286 **Dated: 16-07-2026**

Circular

Subject: Commencement of Chemistry Bridge Course Classes.

All the institutes affiliated with PSBTE&IT are hereby informed that the detailed content and curriculum for the Chemistry Bridge Course has been finalized and attached herewith. All affiliated institutes are requested to share it among the concerned faculty members for effective planning and implementation.

Kindly ensure that the Bridge Course is conducted in accordance with the prescribed content and schedule and as per Board's circular No.PSBTE&IT/DA/2026/5279 dated 16-07-2026.

For Compliance Please.

Director Academics,
For Secretary
PSBTE&IT, Chandigarh

Day 1

Chemistry in Everyday Life

1. Introduction (05 min)

Teacher Gives Introduction to Students

Teachers introduce in their own words, how our daily life revolves around chemistry by giving examples (like: From preparing food in the kitchen, washing clothes, drinking soft drinks, chemistry plays an important role in our daily lives).

2. Learning Outcomes

By the end of this session, students will be able to:

• Recognize that chemistry is present in everyday life.

• Explain simple chemical reactions occurring during cooking, cleaning and carbonated drinks.

• Observe and interpret simple chemical changes through hands-on activities.

• Relate chemistry concepts with real-life situations.

3. Session Breakup (40 min)

3.1. Ice Breaker Activity (05 min)

Faculty should start with asking questions:

• How many of you helped your mother in the kitchen recently?

• How many of you drank a cold drink this week?

• How many of you have washed oily utensils or clothes?

Today we will discover that all these everyday activities involve Chemistry.

3.2. Chemistry of Cooking (15 min)

Story-based Engagement (Teacher will start with this story)

Imagine it is Sunday morning. Your mother is preparing for cholebhature. She asks you to buy meetha soda (baking soda) from the nearby shop. After mixing it into the dough, she does not cook it immediately. Instead, she keeps the dough aside for some time.

Have you noticed what happens after 20-30 minutes?

Teacher asks these questions from students:

• Does the dough increase in size?

• Why does it become soft and fluffy?

Take responses from students without revealing the answer.

Teacher performs this activity in lab or classroom:

Place vinegar in a flask/test tube. Fill a balloon with baking soda and fix it on the mouth. Let the baking soda fall into the vinegar. Students observe the balloon inflating.

If this activity cannot be done then faculty must play these videos on YouTube:

• https://www.youtube.com/shorts/dzzeR75Y0cw

• https://www.youtube.com/shorts/GJXmxa5pPHA

Teacher discussesthese questions with students:

• What happened?

• What filled the balloon?

• Is the same gas responsible for making dough soft?

Teacher writes this chemical reaction on the board:

Sodium Bicarbonate (baking soda) + Acetic Acid (vinegar) → Sodium Acetate + Water + Carbon Dioxide Gas

$NaHCO_3 + CH_3COOH \rightarrow CH_3COONa + H_2O + CO_2\uparrow$

Teacher explains this concept:

Baking soda reacts with an acid to produce carbon dioxide gas. This gas gets trapped in dough, making bhature, cakes and bread soft and fluffy.

3.3. Why Do Cold Drinks Fizz? (10 min)

Story-based Engagement (Teacher will start with this story)

It is a hot summer afternoon. After playing cricket, you buy a chilled bottle of Sprite or Coca-Cola. The moment you open it, you hear a "ssss..." sound and bubbles appear. Have you ever wondered where those bubbles come from?

Teacher performs this activity in lab or classroom:

Open an unopened soft drink bottle and pour it into a transparent glass. Ask students to observe the bubbles.

Teachers discuss these question with students:

• Why is the sound produced?

• Why does the drink become flat after some time?

• Why should we open a shaken bottle carefully?

Teacher explains this concept:

Carbon dioxide is dissolved in the drink under high pressure. When the bottle is opened, pressure decreases and the gas escapes as bubbles.

3.4. Chemistry of Cleaning (10 min)

Story-based Engagement (Teacher will start with this story)

Suppose you spill cooking oil on your shirt. If you wash it only with water, does the stain disappear? Why do we always use soap or detergent?

Teacher performs this activity in lab:

Oil-water experiment: Oil forms an emulsion with water on the addition of soap. Take a test tube, add 5 ml of water and 1-2 ml of oil, and observe that the layers of oil and water remain separate. Now add a few drops of soap solution to the test tube and shake vigorously; you will observe that the oil dissolves in water.

Teacher explains this concept:

Soap molecules act like tiny magnets with water-loving heads and oil-grabbing tails. It traps oily dirt in tiny droplets (micelles), allowing water to wash it away.

4. Exit Questions for students in End (10 min)

Today we observed that chemistry is present in:

• Cooking

• Soft drinks

• Cleaning

Chemistry explains many everyday experiences around us.

Ask these questions from students for revision:

• Which gas inflated the balloon?

• Why do soft drinks produce bubbles?

• Why is soap more effective than plain water for oily stains?

• Write one example of chemistry from your daily life.

5. Homework for students (05 min)

Observe any three examples of chemistry at home and explain the science behind them in 2-3 lines each in the next class. Only observe daily-life activities and do not perform any experiment or handle household chemicals on your own.

Day 2

Chemistry in Everyday Life II

Duration: 60 Minutes

6. Learning Outcomes

By the end of this session, students will be able to:

- Recognize the role of chemistry in everyday household products and healthcare.
- Explain how acids and bases are used in daily life for cleaning and neutralization reactions.
- Observe and interpret simple chemical changes through hands-on activities.
- Relate chemistry concepts with common real-life situations such as cleaning limescale, using hand sanitizers, and treating acidity.

6.1:- Recap and Questions (5 mins)

Teacher starts with a quick revision:

Ask students:

- What gas made the balloon inflate yesterday?
- Why do soft drinks produce bubbles?
- How does soap remove oily stains?

Allow students to answer and appreciate all responses.

7. Session Breakup (40 mins)

7.1. Ice Breaker Activity (05 min)

Faculty should start by asking these questions:

- How many of you have seen a white layer inside a kettle, water bottle, or tap at home?
- Has anyone seen your parents use vinegar or lemon to clean kitchen utensils?
- How many of you have used hand sanitizer today?
- Have you or your friends ever had an ant bite or insect bite?
- Has anyone in your family ever taken an antacid for stomach acidity?

Yesterday, we learned that chemistry is involved in cooking, soft drinks, and cleaning. Today, we will discover how chemistry helps us clean household items, protect us from germs, and even treat common health problems.

7.2. Chemistry of Cleaning (10 mins)

Story-Based Engagement (Teacher will start with this story)

Suppose your mother boils water every day in a steel kettle. After a few weeks, a white layer appears inside it.

Have you ever noticed this?"

Teacher Asks these questions from students:

- What is this white deposit?
- Can washing with plain water remove it?
- What do people use to clean it?

Take responses from the students before explaining.

Teacher Explain this concept

The white layer is called limescale.It forms because hard water contains dissolved calcium and magnesium salts.Vinegar contains acetic acid.Acetic acid reacts with calcium carbonate and dissolves it.Therefore, vinegar is commonly used to clean kettles and utensils.

7.3. Teacher Perform this activity in lab or classroom(10 mins)

Fill the glass with vinegar. Place an egg inside. Leave it overnight. Observe the egg the next day.

Teacher asks these questions from students

- Why did the eggshell become soft?
- Why is vinegar used for cleaning kettles?
- Can plain water dissolve the eggshell?

Teacher Explain this concept

Eggshell is mainly made of calcium carbonate.Acetic acid reacts with calcium carbonate and dissolves it.The same reaction removes limescale from kettles.

7.4. More Everyday Examples

Non-stick cookware

- Non-stick pans are coated with Teflon (Polytetrafluoroethylene/PTFE). Food does not stick because Teflon has a very low friction surface.

Hand Sanitizer

- Sanitizers contain ethanol or isopropyl alcohol.Alcohol damages the outer covering of many germs and helps reduce their numbers on hands.

8. Chemistry in Healthcare (10 mins)

8.1. Story-Based Engagement(Teacher will start with this story)

Imagine you are bitten by an ant. The place becomes red, swollen and starts burning.

Teacher asks these questions from students

- Why does it burn?
- What should we apply?
- Has anyone used baking soda on an insect bite?

Teacher Explain this concept

Many ants and some insect bites introduce formic acid.The acid causes irritation and inflammation.Baking soda (sodium bicarbonate) is a mild base.It neutralizes the acid and helps reduce irritation.

Another Example

Sometimes our stomach produces excess hydrochloric acid (HCl).This causes acidity or heartburn.Antacids contain weak bases that neutralize the extra acid.This gives quick relief.

8.2. Teacher Perform this activity in lab or classroom (10 mins)

Neutralization Activity : Take 5 ml dilute HCl. Measure its pH.Add a small amount of antacid. Stir gently. Measure the pH again.

Teacher Explain this concept

The acid reacts with the base.A neutralization reaction occurs.The solution becomes less acidic.

9. Exit Questions in the end (5 mins)

Ask students:

1. Why does vinegar remove white deposits from kettles?
2. Why does an eggshell soften in vinegar?
3. What chemical is present in an eggshell?
4. Why do food items not stick to a non-stick pan?
5. Which alcohols are commonly used in hand sanitizers?

6. Which acid is associated with many ant bites?
7. Which base helps neutralize that acid?
8. Why do we take antacids?
9. What happened to the pH after adding an antacid?

9.1. Homework (5 mins)

Observe any three household products that involve chemistry, such as vinegar, toothpaste, soap, detergent, sanitizer, bleach, or a non-stick pan.

Write:

- Product name
- Where it is used
- Which chemical is responsible for its action

DAY 3

Chemistry in Everyday Life III

Learning Outcomes

By the end of this session, students will be able to:

- Explain how rusting occurs and how it can be prevented.
- Describe the role of NPK fertilizers in plant growth.
- Define **monomers** and **polymers** using simple examples.
- Identify common polymers used in everyday life.
- Demonstrate polymer formation through a hands-on activity.
- Connect chemistry concepts with real-life applications.

1. Recap and Warm-up (10 mins)

Engage

Begin with a rapid-fire quiz.

Faculty Talking Points -"Last class we explored how chemistry is present in our daily lives. Let's see how much you remember!"

Ask students:

- Can you name one acid used in everyday life?
- Why do soaps clean better than plain water?
- Name one chemical used at home every day.

Encourage students to answer without worrying about being wrong.

2. Chemistry of Rusting (10 mins)

Engage (Story)

Hold up an old rusty key or show a picture.

> "Imagine your family buys a brand-new bicycle. It looks shiny and perfect. A year later, after being left outside during the rainy season, brown patches appear and the bicycle becomes weak. What happened?"

Allow students to guess.

Possible responses:

- Rain damaged it.
- It became old.
- Dirt collected on it

Discussion

Ask:

- Why do iron gates need painting?
- Why do bridges need regular maintenance?
- Have you ever seen rust on bicycles, locks, or water tanks?

Allow students to share experiences.

Concept

Explain:

Iron reacts with oxygen and moisture from the air.

$$4Fe + 3O_2 + 2xH_2O \rightarrow 2Fe_2O_3.xH_2O$$

Iron + Oxygen + Water → Iron Oxide (Rust)

Rust weakens iron over time.

Paint acts as a protective barrier that prevents oxygen and water from reaching the iron.

Other ways to prevent rusting:

- Galvanization (zinc coating)
- Oiling
- Greasing
- Plastic coating

Real-Life Connections

Examples:

- Railway tracks
- Cars
- Iron gates
- Bridges
- Water pipes
- Garden tools

3. Chemistry in Agriculture (10 mins)

Engage (Story)

> "Imagine two farmers grow the same crop using the same seeds. One farmer harvests healthy, green plants while the other gets weak plants with fewer vegetables. Why do you think this happened?"

Collect responses.

Discussion

Ask students:

- What do plants need besides sunlight and water?
- Have you seen farmers spreading white granules in fields?
- Why do farmers use fertilizers?

Concept

Plants also need nutrients from the soil.The most common fertilizer is **NPK**.

Explain simply:

Nitrogen (N)

- Helps leaves grow green and healthy.

Phosphorus (P)

- Helps roots become strong.

Potassium (K)

- Makes plants stronger and helps them resist diseases.

Explain that different crops require different nutrient combinations.

Real-Life Connections

Examples:

- Wheat
- Rice
- Tomatoes
- Mango trees
- Home gardens

Quick Assessment

Ask:

"If a plant has weak roots, which nutrient may be lacking?"

Expected answer: **Phosphorus**

4. Polymer Chemistry (15 mins)

Engage (Story)

Hold up a plastic bag.

Ask:"This bag is light enough to carry with one finger, but strong enough to hold several kilograms of groceries. Why doesn't it tear easily?"Allow students to think.

Discussion

Questions:

- What are plastic bags made from?
- Why are plastic bottles so strong?
- What other plastic items do you use every day?

Students may mention:

- Water bottles
- Lunch boxes
- Buckets
- Toys

Activity – Build a Polymer

Materials

Paperclips

Instructions

Each paperclip represents one **monomer**.

Ask students to:

- Hold one paperclip.
- Link many paperclips together.
- Compare the strength and movement of one clip versus a long chain.

Discussion

Ask:

- Which was stronger?
- Why did connecting many clips make them stronger?
- What would happen if the chain became even longer?

Guide students toward the idea that linking many small units creates stronger materials.

Concept

Explain:

Small molecules called **monomers** join together to form long chains called **polymers**.

Example:

Many **ethene** molecules join together to form **polythene**.

Examples of polymers:

- PVC pipes
- Nylon ropes
- Polyester clothes
- Plastic chairs
- Water bottles
- Food containers

Real-Life Connections

Ask students to look around the classroom and identify objects made from polymers.

Quick Assessment

Ask:“What is the difference between a monomer and a polymer?”

Expected answer:A monomer is a single small molecule.

A polymer is a long chain made of many monomers.

5. Concept Consolidation (10 mins)

Quick Review Ask students to complete the following:

Rusting occurs when iron reacts with __________ and __________.

Which nutrient helps root growth?

A polymer is made by joining many __________ together.

Exit Questions for students in end

Before leaving, every student answers one question on a slip of paper:

1. Name one method to prevent rusting.
2. What does NPK stand for?
3. Give one example of a polymer.
4. Write one new thing you learned today.

Collect the slips as students leave.

Homework (5 mins)

Observe Chemistry Around You

Find and write down:

- Two objects that may rust.
- Two painted iron objects.
- Three polymer products used at home.
- One fertilizer or plant nutrient used in your garden or nearby fields (if known).

Bonus Question:

Why do you think chemistry is important in everyday life?

Day 4

Matter and its Classification

1. Introduction (05 min)

Teacher begins with a simple discussion.

Everything we see around us—air, water, food, books, furniture, vehicles, and even our own body—is made of matter. Matter exists in different forms and can be classified based on its physical state and composition. Today, we will learn how to identify different types of matter through simple observations and activities.

2. Learning Outcomes

By the end of this session, students will be able to:
• Define matter and identify its characteristics.
• Differentiate between solids, liquids, and gases.
• Classify substances as elements, compounds, or mixtures.
• Distinguish between homogeneous and heterogeneous mixtures.
• Observe and perform simple activities related to mixtures.

3. Session Breakup (40 min)

3.1. Ice Breaker Activity (05 min)

Faculty should start by asking students:
• What are the objects around you made up of?
• Can you think of anything that has mass and occupies space?
• Is air also a form of matter? Why?

Today we will discover that everything around us is made of matter and learn how scientists classify it.

3.2. States of Matter (10 min)

Story-based Engagement (Teacher will start with this story)

Imagine your mother takes out ice cubes from the freezer to prepare lemonade (neembu paani) on a hot summer day. After some time, the ice melts into water. If the water is heated further, it changes into steam.

Teacher performs this activity in the laboratory or classroom:
Show ice cubes in a beaker and allow them to melt. If laboratory facilities are available, gently heat the water until steam is observed.

Teacher explains:
• Solids have a fixed shape and fixed volume (e.g. chair, table, chalk).
• Liquids have a fixed volume but take the shape of their container (e.g. water, milk, tea).
• Gases have neither fixed shape nor fixed volume (e.g. O_2, CO_2).

Discuss camphor, naphthalene balls and room fresheners as examples of sublimation.

3.3. Elements, Compounds and Mixtures (10 min)

Teacher discusses:
• Oxygen – Element
• Water – Compound
• Carbon dioxide – Compound
• Air – Mixture

Teacher explains the difference between elements, compounds and mixtures.

3.4.Types of Mixtures (15 min)

Activity 1: Prepare a homogeneous mixture using sugar and water.

Activity 2: Prepare a heterogeneous mixture using sand and water and separate it by filtration.

Discuss why sugar dissolves whereas sand does not.

4. Exit Questions for Students (10 min)

• What is matter?
• Name the three states of matter.
• Give one example each of an element, a compound and a mixture.
• What is the difference between a homogeneous and a heterogeneous mixture?
• Which method is used to separate sand from water?

5. Homework for Students (05 min)

Observe five materials available at your home and classify them as:
• Solid, liquid or gas.
• Element, compound or mixture.

Write your observations in a notebook. These observations will be discussed in the next class.

DAY 5

Atoms: The building blocks of molecules

Introduction **(05 minutes)**

Atoms and molecules are the fundamental building blocks of all matter in the universe. Everything you see, touch, and breathe is made up of these tiny particles.

Learning outcomes

By the end of this lesson, students will

* Have conceptual understanding about definition of an atom as the basic unit of matter and three main subatomic particles.

* Be able to describe the charge and location of the nucleus and subatomic particles.

* Be able to calculate atomic number and mass number using the number of protons, electrons and neutrons.

Session Breakup. **(40 min)**

Ice Breaker Activity **(05 min)**

Faculty should start with asking questions

* What is an atom?

* Do you know what an atom is made up of?

* What is the dense center of the atom called, and which particles live there?

* What is the smallest possible piece of matter you can imagine?
* Have you ever heard of words like electrons, protons or neutrons?

* Which parts of the atom do you think weigh the most?

Teacher will discuss the above questions with students. **(15 min)**

What is an atom?

An atom is the smallest particle of matter that takes part in chemical reactions and may or may not have an independent existence.

Do you know what an atom is made up of?

An atom is made up of:

1.Electrons (-vely charged)

2. Protons (+vely charged)

3. Neutrons (neutral or no charge)

What is the dense center of the atom called, and which particles live there?

Nucleus:

The nucleus is the central part of an atom that contains protons and neutrons. It carries most of the atom's mass and has a positive charge.
Example: In a carbon atom (^{12}C), the nucleus contains 6 protons and 6 neutrons.

What is electron?

Electron (e^-):

An electron is a negatively charged subatomic particle that moves around the nucleus in energy levels or shells. It has negligible mass compared to protons and neutrons.
Example: A hydrogen atom has 1 electron orbiting its nucleus.

What is proton?

Proton (p^+):

A proton is a positively charged subatomic particle found in the nucleus of an atom. Its mass is approximately 1 u. The number of protons determines the atomic number of an element.
Example: Oxygen has 8 protons in its nucleus, so its atomic number = 8.

What is neutron?

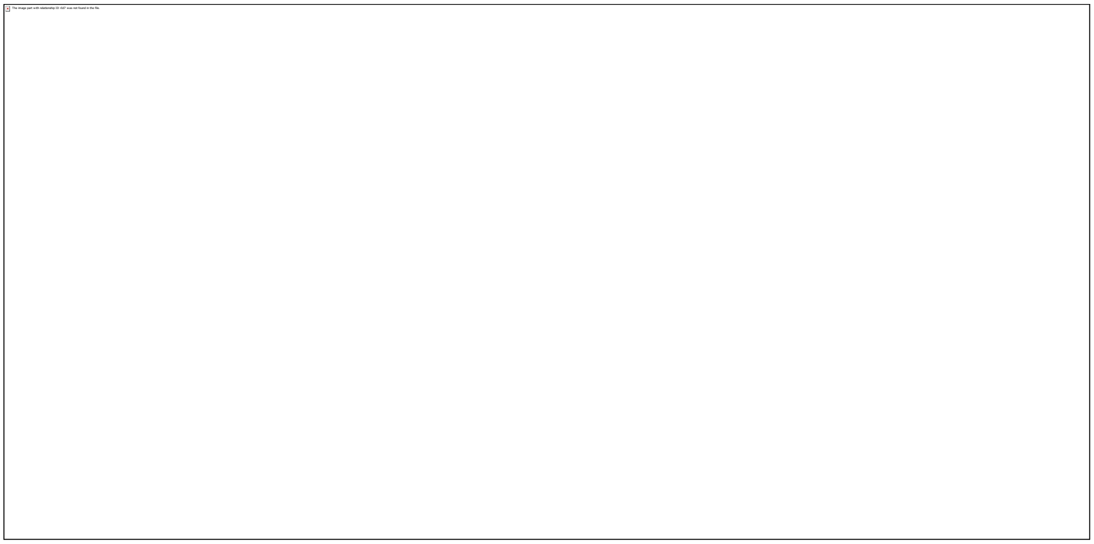
Neutron (n^0):

A neutron is a neutral subatomic particle (no charge) found in the nucleus of an atom. It has a mass similar to that of a proton and helps stabilize the nucleus.
Example: Carbon-12 has 6 neutrons in its nucleus.

Which part of the atom do you think weigh the most?

Ans: Nucleus, which is very small in size and present in the centre of the atom has mass almost equal to mass of the atom.

Teachers will how a simple diagram of an atom and explain the constituents of it.



After showing the diagram of atom and explaining the constituents of the atom, teacher will explain that the number of protons and number of electrons is related to atomic number.

Atomic Number (Z): (5 min)

The atomic number is the number of protons or electrons in an atom. It determines the identity of an element.

Atomic Number = Number of Electrons or Number of Protons

Example: Carbon has atomic number 6, which means it has 6 electrons and 6 protons.

Teacher will explain that the number of protons, the number of neutrons and atomic number is related to Mass number.

Mass Number (A): (5 min)

Mass number of an element is the sum of total number of protons and neutrons in an atom.

Mass Number = number of protons + number of neutrons

Mass Number = Atomic Number + Number of neutrons

For example: atomic number of Carbon is 6 and mass number is 12, which means it has 6 electrons, 6 protons, and 6 neutrons.

Activities

Teacher will ask the students to complete the table 1 and 2.

Activity 1: Complete the Table (5 min)

Element	**Protons**	**Neutrons**	**Atomic Number**	**Atomic Mass**
Hydrogen	1	0	____	____

Element	Protons	Neutrons	Atomic Number	Atomic Mass
Carbon	6	6	____	____
Oxygen	8	8	____	____

Activity 2: Complete the Table (5 min)

Element	Atomic Number (Z)	Atomic Mass (A)	Protons (p^+)	Neutrons (n^0)	Electrons (e^-)
Carbon	6	12			
Oxygen	8	16			
Sodium	11	23			

Exit Questions. **(10 min)**

Ask these questions from students for revision:

1. Which subatomic particle tells you the atomic number of an element?
2. Which two subatomic particles do you add together to find the mass number?
3. Where is almost all the mass of an atom located?
4. If an atom has 8 protons, 8 neutrons, and 8 electrons, what is its atomic number?
5. Can two different elements have the same atomic number?
6. Why doesn't the number of electrons affect the mass number of an atom?

Homework: **(5 min)**

Fill in the Blanks

1. The atomic number is always equal to the number of __________ in an atom.
2. The mass number is the total number of __________ and __________ combined.
3. Electrons are not counted in the mass number because they are too __________.
4. The identity of an element is determined solely by its number of __________.
5. Element X has 8 protons, 8 neutrons, and 8 electrons.

Atomic Number = _____Mass Number = _____

6. Element Y has an atomic number of 15 and a mass number of 31.

Number of Protons = _____Number of Neutrons = _____

7. Element Z has 7 protons and 8 neutrons.

Mass Number = _____

Day 6 Facilitator Module
Molecules: The Building Blocks of Matter

Duration: 60 Minutes

Learning Outcomes

- Explain what a molecule is.
- Differentiate between atoms and molecules.
- Identify the chemical formulae of common compounds.
- Calculate molecular mass of simple compounds.
- Relate molecules to substances used in everyday life.

1. Engage (Story-Based Introduction) (5 minutes)

Imagine you are extremely thirsty after playing cricket on a hot day. You drink a glass of water and immediately feel refreshed. Have you ever wondered what exactly you are drinking? Every drop of water contains billions of tiny particles called molecules.

Student Interaction:
• What is your favourite drink?
• Is milk made of molecules?
• Is oxygen made of molecules?
• Is sugar made of molecules?

Ice Breaking Activity

Faculty Talking Points

- Every object around us is made of tiny particles.
- Atoms rarely exist alone.
- Most atoms combine to become more stable.
- These combinations are called molecules.

2. Demonstration / Activity
(10 minutes)

Use coloured balloons, clay balls or thermocol balls to represent atoms. Build H_2O, CO_2 and NH_3 models with students to demonstrate that molecules are combinations of atoms.

Discussion Questions:
• Can one hydrogen atom make water?
• Why are two hydrogen atoms needed?
• Why is oxygen present only once?

3. Concept Explanation
(15 minutes)

A molecule is the smallest particle of a substance that can exist independently and retains the chemical properties of that substance. It is formed when two or more atoms chemically combine.

Examples: Water (H_2O), Carbon dioxide (CO_2), Oxygen (O_2), Hydrogen (H_2), Methane (CH_4).

Real-Life Connections

Substance	Formula
Water	H_2O
Table Salt	NaCl
Carbon dioxide	CO_2
Ammonia	NH_3
Methane	CH_4
Hydrochloric acid	HCl
Sulfuric acid	H_2SO_4
Calcium carbonate	$CaCO_3$

Atom vs Molecule

Atom	Molecule
Smallest particle of an element	Two or more atoms joined together
Usually cannot exist independently	Can exist independently
Example: He, C, Li	Example: H_2O, CO_2

Molecular Mass (10 minutes)

Molecular mass is the sum of the atomic masses of all atoms present in a molecule.
Example: $H_2O = (2 \times 1) + 16 = 18$ u.

Hands-on Activity – Molecular Mass Relay

Divide students into groups. Provide formula cards (H_2O, CO_2, NH_3, $CaCO_3$, H_2SO_4, NaCl) and an atomic mass chart. Students calculate molecular masses as a relay activity.

Expected Answers

Compound	Molecular Mass
H_2O	18 u
CO_2	44 u
NH_3	17 u
$CaCO_3$	100 u
H_2SO_4	98 u
NaCl	58.5 u

Quick Assessment (5 minutes)

Oral Questions:
1. What is a molecule?
2. How is a molecule formed?
3. What is molecular mass?
4. Which has greater molecular mass—H_2O or CO_2?

Concept Consolidation (5 minutes)

- Molecules are formed by combining atoms.
- Every compound has a fixed chemical formula.
- Molecular mass is calculated by adding atomic masses.
- Molecules are present in everything around us.

Exit Ticket (5 minutes)

Answer the following :

- Write the formula of table salt.
- Calculate the molecular mass of NH_3.
- Name one molecule you use every day.

Homework (5 minutes)

Observe 10 substances at home and write their chemical formulae (where known). Also calculate the molecular masses of CH_4, HCl and SO_2 and explain the difference between an atom and a molecule.

DAY 7 – Acids and Bases

Lesson Plan (60 Minutes)

Learning Outcomes

- Define acids and bases.
- Identify acidic, basic, and neutral substances using the pH scale.
- Explain the neutralization reaction.
- Relate acids and bases to everyday life.
- Conduct simple experiments safely and interpret observations.

1. ENGAGE (5 Minutes)

- Story: Imagine you're helping your mother in the kitchen. While tasting lemonade, you notice it tastes sour. Later, you accidentally taste a little baking soda while preparing a cake—it tastes bitter. Why are these two everyday substances so different? Today we'll discover the science behind these tastes and learn how chemistry is all around us.
- Faculty Talking Points: Why is lemon sour? Why is soap slippery? Have you ever had acidity and taken an antacid?
- Student Interaction: Which foods taste sour? Have you touched soap and noticed it feels slippery? Can you name any acids or bases?

2. CONCEPT 1 – Acids and Bases (10 Minutes)

- Story: Our body needs stomach acid to digest food, but if too much acid forms, we experience acidity. Doctors give antacids, which are bases, to neutralize the extra acid.
- Acids: Produce H^+ ions in water; usually sour. Examples: Lemon juice, vinegar, orange juice.
- Bases: Produce OH^- ions in water; usually bitter and slippery. Examples: Soap, baking soda, toothpaste.
- Real-life examples: lemon juice, tamarind, vinegar, soap, toothpaste, shampoo, antacid tablets.
- Quick Check: Is lemon acidic or basic? Is soap acidic or basic?

3. ACTIVITY 1 – Identifying Acids and Bases (15 Minutes)

- Test lemon juice, soap solution, aerated soft drink and tap water using pH paper.
- Discuss: Which sample changed colour the most? Which had the lowest pH? Which was neutral?
- pH Scale: 0–6 Acidic, 7 Neutral, 8–14 Basic. Lower pH = stronger acid; Higher pH = stronger base.

4. CONCEPT 2 – Neutralization (10 Minutes)

- Story: Farmers add lime (a base) to acidic soil so crops grow better.

- Neutralization: Acid + Base → Salt + Water; $H^+ + OH^- \rightarrow H_2O$.
- Examples: Antacids, liming acidic soil, toothpaste, baking soda for acidic insect bites.

5. ACTIVITY 2 – Neutralization Experiment (15 Minutes)

- Materials: Vinegar, baking soda, cup, spoon.
- Mix vinegar and baking soda. Observe bubbling, gas formation and neutralization.
- Discuss: Why bubbles? Which was the acid? Which was the base? What products formed?

6. Concept Consolidation (5 Minutes)

- Key Points: Acid—Produces H^+; Base—Produces OH^-; Neutralization—Acid + Base → Salt + Water; pH measures acidity/basicity.
- Rapid Fire: Lemon juice is ____. Soap is ____. Neutral pH is ____. Acid + Base gives ____ and ____.

7. Assessment (5 Minutes)

- Exit Ticket: Name one acid used at home. Name one base used at home. What is the pH of pure water? Write the neutralization reaction. Why are antacids used?
- Homework: Find five acidic and five basic household substances. Draw a colourful pH scale (0–14). Explain one real-life use of neutralization in 4–5 lines. Identify whether household cleaning products are acidic or basic from their labels.

Day 8
Acid-base Indicators

1. Introduction

Teacher begins with a simple discussion. (5 min)
Many substances around us are acidic or basic. We use indicators to identify whether a solution is an acid or a base by observing colour changes.

2. Learning Outcomes

By the end of this session, students will be able to:
• Define indicators.
• Identify common indicators.
• Observe colour changes in acids and bases.
• Perform simple indicator activities.

3. Session Breakup (50 min)

3.1 Indicators (10 min)

Teacher explains:
• Indicators are substances that change colour in acidic and basic solutions.
Examples:
• Methyl orange
• Phenolphthalein
• Litmus paper

3.2 Activity 1: Testing with Visual Indicators (10 min)

Indicator	Acidic	Basic
Blue Litmus	Turns Red	No Change
Red Litmus	No Change	Turns Blue
Phenolphthalein	Colourless	Pink
Methyl Orange	Red/Pink	Yellow

3.3 Activity 2: Turmeric Test (10 min)

Turmeric remains yellow in acids and turns reddish-brown in bases such as soap solution.

3.4 Activity 3: Red Cabbage / Beetroot Juice (10 min)

Purple juice turns red/pink in acids and green/yellow in bases.

4. Exit Questions (10 min)

• What is an indicator?
• Name two common indicators.
• What colour does blue litmus show in acid?
• What colour does phenolphthalein show in base?

5. Homework (5 min)

Test safe household substances (lemon juice, soap solution) using natural indicators and record observations.

Day 9 Lesson Plan: Fuels

Duration: 60 Minutes

Learning Outcomes

Define fuel.
Classify fuels by occurrence and physical state.
Identify qualities of a good fuel.
Recognize petroleum products.
Explain soot formation and pollution.

Ice Breaker (5 min)

Show pictures of wood, LPG, petrol, candle and ask: What helps each one work or burn?

Story (5 min)

Ravi collected wet firewood after rain. It produced lots of smoke and cooked food slowly. A neighbour shared an LPG cylinder, which burned cleanly and cooked quickly. Ravi learned that different fuels have different qualities and cleaner fuels reduce pollution.

Teaching Plan

Time	Topic	Teaching/Activity
10 min	What is Fuel?	Definition with examples; ask where fuels are used.
10 min	Classification	Primary/secondary; solid/liquid/gaseous with examples.
10 min	Activity 1	Students sort fuel picture cards into solid, liquid and gaseous.
10 min	Qualities	High calorific value, moderate ignition temperature, low moisture, less pollution, easy transport/storage, easily available.
10 min	Activity 2	Identify products made from petroleum.
10 min	Activity 3	Hold beaker over candle flame, observe soot, discuss incomplete combustion and pollution.

Assessment Questions

1. What is a fuel?
2. Name two primary and two secondary fuels.
3. Give one example each of solid, liquid and gaseous fuel.
4. List any four qualities of a good fuel.

5. Why does soot form on the beaker?

Homework

1. Draw and colour one example each of a solid, liquid, and gaseous fuel.
2. Make a table of five petroleum products used at home.
3. Write five qualities of a good fuel.
4. Find out which fuel your family uses for cooking and explain why it is preferred.

Day 10

Water: The medium of life

1. **Introduction (05mins)**

The teacher gives an introduction to the students

Water, “the liquid of life,” is unique to the planet Earth. It is the most abundant compound on the earth’s surface. It can exist in all three states, i.e. solid, liquid, and gaseous, over a relatively small range of temperature and pressure found on the Earth.

Water is an excellent solvent, often termed a universal solvent. It can dissolve a wide range of substances, including salts, minerals, colloidal particles, and biological impurities. We get the necessary minerals for our body in a dissolved state from the drinking water. Dissolved oxygen present in water is the source of life in aquatic habitats. However, the impurities dissolved in the water beyond a certain limit make it unfit for domestic consumption as well as in the industry.

2. **Learning outcomes**

By the end of this session, students:

- Will know the important properties of water and its importance on the planet.
- Will be able to know pure and impure water and reasons behind the same.
- Will the characteristics of drinking water
- Will be able to distinguish between hard and soft water.

3. **Session breakup (40mins)**

3.1. Water as a universal solvent(10mins)

Teacher asks the following questions

What are the various sources of water?

Oceans, seas, glaciers, rivers, lakes, groundwater, rainwater, spring water, etc.

Which is the purest form of water?

Rain water. It does not contain anything dissolved in it because it goes to the atmosphere by evaporation, and the dissolved impurities do not evaporate, thereby getting separated from the water.

What makes water impure, and why?

Dissolved impurities make it impure, and the capacity of water to dissolve almost everything in it is the underlying reason.

What are the impurities that are dissolved in water?

- Dissolved salts like bicarbonates, chlorides, sulphates, etc.
- Bacterial impurities: Bacteria, microorganisms
- Suspended Impurities: Clay and sand

3.2. Characteristics of drinking water (15mins)

Teacher asks the following questions

What qualities water should possess that we can use it for drinking? Or what are the qualities that qualify water to be used for the drinking purpose?

Teacher may enlist the following properties and elaborate each.

- It should be clear and free from any smell.
- It should not have any taste.
- It should be free from any suspended matter.
- Drinking water must be free from heavy metals such as arsenic, lead, cadmium, etc.
- The water's total dissolved solids (TDS) must be below 600 ppm.
- The pH level of the water must be around 8.
- It should be free from the disease-causing microorganisms.

3.3. Activity related to hard and soft nature of water (15mins)

Teacher asks the following questions

Have you ever noticed that while taking bath at some places, despite of using water in plenty, the soap remains on the body and you feel slippery? OR whilewashing clothes you may come across the phenomenon that the soap does not form lather easily with the soap and make it hard to wash the clothes.

What is the reason behind this phenomenon?

Teacher explains the following concept to the students

With the discovery of soap, it was found that the water from different sources behaves differently with the soap. Based on the behaviour with soap, it can be classified into soft water and hard water.

The water that does not contain any dissolved salts (e.g. rainwater) andeasily forms a soft and creamy lather with the soapis known as soft water.

Soft Water: The water that easily forms the lather with soap is known as soft water.

The water that contains dissolved salts of calcium and/ or magnesium, reacts with the soap and forms sticky white precipitates.It does not lather well with the soap and is known as hard water. It is named hard water because it makes the cleansing hard i.e. difficult.

Hard Water: The water containing dissolved salts of calcium and or magnesium, as a result of which it does not lather well with the soap is known as hard water.

Activity

1) Take two test tubes/beakers containing 5 ml (approx.) of pure water.
2) Add a small amount of any Calcium or magnesium salt in one test tube/beaker.
3) Add soap solution (made in distilled water) to both the test tubes/beakers and stir with a glass rod vigorously.
    a. Note the difference in lather formation

The test tube/ beaker containing pure water will form lather with soap, whereas the second test tube, having dissolved salts in water, will not form lather with soap solution.

4. Exit Questions for students in End (10mins)

1. Why earth in its present form would not have been possible without water?
2. What you will keep in mind while selecting water for drinking?
3. What is the difference between soft water and hard water?

5. Homework for students (05mins)

Note the TDS of tap water from municipal supply and ground water.

Try washing clothes by taking water from different sources.