

CHAPTER

8

Class 8 Science / Curiosity (NCERT)

Nature of Matter:
Elements, Compounds and Mixtures

Detailed handwritten notes + solved Q&As

Chapter Roadmap (kya kya padhenge?)

- 8.1 What are Mixtures? (uniform / non-uniform, alloys, air as a mixture, types of mixtures)
- 8.2 What are Pure Substances? (common meaning vs scientific meaning)
- 8.3 Types of Pure Substances → Elements and Compounds (Activities 8.3 to 8.5)
- 8.4 How do we use Elements, Compounds and Mixtures?
- 8.5 What are Minerals? + Dhokra art, matter vs not-matter
- Solved Q&As; in between ("Kuch Mazedaar Questions") + all 12 end-of-chapter questions solved ("Dekhe Kya Seekha Tumne?")

Probe and Ponder: Matter kya hai?

Look around: the staircase, air, water in your bottle, food, clothes, shoes, book, trees, ball, even the walking stick – everything is **MATTER**.

Matter (remember from earlier classes)

Matter = anything that has **mass** and **occupies space**.

- All matter is made of tiny particles.
- Most things around us are **NOT** a single substance – they are 2 or more substances mixed together.
- **NOT matter**: light, heat, electricity, sound, thoughts and emotions (they have no mass and take no space).

Kuch Mazedaar Questions

Q. Which entities in the chapter-opening picture are matter, and which are not?

Ans. Matter: steps/ramp, trees, bushes, grass, football, school bags, books, water bottle, tiffin boxes, clothes, walking stick, the students themselves, and the air around them. **Not matter:** sunlight (light), heat, sound of voices, and the thoughts/curiosity of the students.

Q. How can elements be combined to form a compound?

Ans. Elements combine **chemically** in a **fixed ratio** to form something entirely new. E.g. iron + sulfur (on heating) → iron sulfide; hydrogen + oxygen → water (details in 8.3.2).

Q. How could a compound that absorbs CO_2 from air help the environment?

Ans. CO_2 is a greenhouse gas. A compound that absorbs it can **reduce global warming and climate change**, clean the air near factories and power plants (carbon capture), and help keep the level of CO_2 in the air balanced.

8.1 What Are Mixtures?

Poha, sprout salad, sugar dissolved in water, soup, lemonade – all are made by mixing several ingredients. We see mixing of substances in everyday life.

Definition: Mixture and Components

When **two or more substances** are mixed and **each substance keeps its own properties**, it is called a **MIXTURE**.

- The individual substances that make a mixture = its **components**.
- Components do **NOT react chemically** with each other.
- Components can be mixed in **any proportion** and can be separated by **physical methods** (hand-picking, filtration, evaporation, magnet etc.).

Two kinds of mixtures

	NON-UNIFORM (heterogeneous)	UNIFORM (homogeneous)
Components	generally visible to naked eye or a magnifying lens	cannot be seen separately even under a microscope
Distribution	NOT evenly spread; composition differs from place to place	evenly distributed; same all through
Examples	sprout salad, poha, sand + water, oil + water, muddy water, soil	sugar/salt in water, lemonade, vinegar, soda water, air, alloys

A Step Further: Alloys are uniform mixtures too!

- **Stainless steel** = iron + nickel + chromium + a little carbon. So uniformly mixed that it looks same throughout.
- Such uniform mixtures of metals are called **ALLOYS**.
- **Brass** = copper + zinc; **Bronze** = copper + tin. (Utensils of steel, brass and bronze.)

Our Scientific Heritage: Mishraloha

- **Mishraloha** = mixture of 2 or more metals with properties **DIFFERENT** from its constituent metals.
- Ancient texts (*Charaka Samhita*, *Susruta Samhita*, *Rasaratna Samucchaya*, *Rasa Jala Nidhi*) mention alloys for medicinal purposes.
- **Bronze = Kamsya** = Copper (*Tamra*, 4 parts) + Tin (*Vanga*, 1 part). Used to improve digestion and boost immunity.

Kuch Mazedaar Questions

Q. Define a mixture. What are its components?

Ans. A mixture is formed when two or more substances are mixed without any chemical reaction and each keeps its own properties. The substances that make it are its components.

Q. Give 3 examples each of non-uniform and uniform mixtures from around you.

Ans. **Non-uniform:** sprout salad, muddy water, sand and water, oil and water, soil, concrete. **Uniform:** salt solution, lemonade, vinegar, soda water, air, brass.

Q. Why is stainless steel called a mixture?

Ans. It contains iron, nickel, chromium and carbon simply mixed together (no chemical reaction between them). Its components are mixed so uniformly that it looks the same throughout, so it is a **uniform mixture (alloy)**.

Q. Kamsya (bronze) in ancient India had copper and tin in 4 : 1 ratio by parts. How much copper and tin are there in 100 g of such bronze?

Ans. Total parts = $4 + 1 = 5$. Copper = $\frac{4}{5} \times 100 = 80$ g; Tin = $\frac{1}{5} \times 100 = 20$ g.

Q. Sugar is dissolved in water. Is it a chemical change? Is the result a mixture?

Ans. No chemical reaction happens – sugar particles keep their own (sweet) properties and can be got back by evaporating the water. So it is a **uniform mixture**.

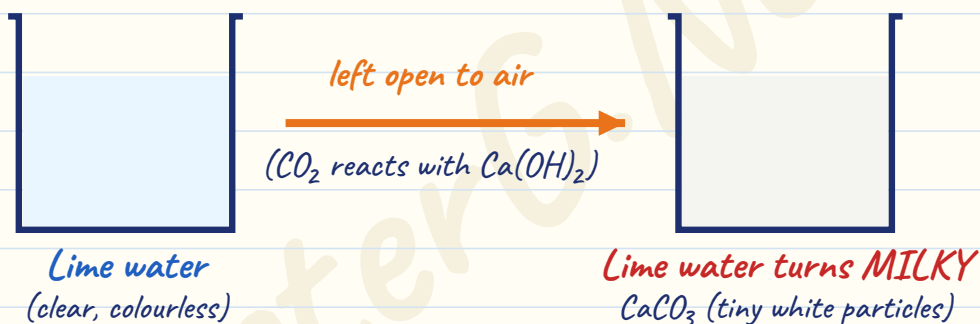
8.1.1 Is air a mixture? What kind?

Yes! Air is a **uniform mixture** of mainly nitrogen, oxygen, argon, carbon dioxide and water vapour.

- **Nitrogen** $\approx 78\%$ of air; does NOT take part in combustion.
- **Oxygen** is needed by most living beings to stay alive and it helps in combustion.
- **Air has water vapour:** when warm air touches a cool surface, vapour turns into tiny droplets of liquid water (condensation).

Activity 8.1: Is CO_2 present in air? (Lime water test)

- Half-fill a glass tumbler with water. Slowly add a little **calcium oxide (quick lime)** – **Safety first: do it carefully.**
- Observation: reaction is **vigorous and releases heat**: Calcium oxide + Water $\rightarrow$ Calcium hydroxide + heat.
- Stir continuously to make a solution of calcium hydroxide = **LIME WATER**. Filter it – it is colourless.
- Leave the clear lime water in a **petri dish** for a few hours, stirring at intervals. **It turns MILKY!**

**Why does lime water turn milky?**

CO_2 in air reacts with calcium hydroxide to form **calcium carbonate** (insoluble tiny white particles) and water:



So this activity **demonstrates the presence of carbon dioxide in air.**

Activity 8.2: Is anything else present in air? (Dust)

- Keep a clean **black sheet of paper** (free from dust) undisturbed near an open window or in a garden for a few hours.
- Result: tiny particles settle on it (use a magnifying glass) – **dust is suspended in air.**
- Dust is **NOT** an integral part of air; it is a **pollutant**. Its nature and amount change with time and place.

A Step Further: Air pollutants and AQI

- Major pollutants: particulate matter (dust, soot) and gases like carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide.
- Air Quality Index (AQI) = a tool used to describe the quality of air.

Kuch Mazedaar Questions

Q. Is air a mixture? Of which type?

Ans. Yes, air is a uniform mixture of nitrogen, oxygen, argon, carbon dioxide and water vapour (its gases are evenly mixed and keep their own properties).

Q. Why does lime water turn milky when left open in air?

Ans. CO_2 of the air reacts with calcium hydroxide giving insoluble calcium carbonate (white particles) which makes the water look milky.

Q. What shows that the reaction of quick lime with water is vigorous/chemical?

Ans. It happens vigorously and releases a lot of heat; a new substance (calcium hydroxide) is formed.

Q. Are dust particles a part of air? Why?

Ans. No. They are only suspended in air, vary from place to place and time to time, and are pollutants – not an integral part of air.

Q. Which gas forms 78% of air and does it support combustion?

Ans. Nitrogen – it does not take part in combustion. Oxygen supports combustion.

8.1.2 Types of mixtures

In daily language, components of a mixture may themselves be mixtures (poha, sprout salad) or pure substances (sugar/salt in water). But **in science, all components of a mixture must be pure substances only**. Mixtures are of several types depending on the physical state of components:

S.No.	Mixture type	Examples	Uniform / non-uniform
1.	Gas + gas	Air	Uniform
2.	Gas + liquid	Aerated (soda) water; oxygen dissolved in water	Uniform; Uniform
3.	Solid + gas	Carbon particles in air (smoke)	Non-uniform
4.	Liquid + liquid	Acetic acid in water (vinegar); oil and water	Uniform; Non-uniform
5.	Solid + liquid	Sand and water; seawater	Non-uniform; Uniform
6.	Solid + solid	Baking powder (baking soda + tartaric acid); alloys	Uniform (fine powders mixed evenly); Uniform

Why do we separate mixtures?

In daily life we separate a mixture to get the **component of interest** and discard the rest.

In **science**, the purpose of separating a mixture is to obtain **PURE SUBSTANCES**.

Kuch Mazedaar Questions

Q. Complete the third column of Table 8.1.

Ans. Done above: air, soda water, dissolved oxygen, vinegar, seawater, baking powder, alloys = uniform; carbon particles in air, oil + water, sand + water = non-uniform.

Q. Why is oil + water non-uniform but vinegar uniform?

Ans. Oil does not dissolve in water, so two separate layers are visible. Acetic acid dissolves completely in water, so it is evenly spread and looks the same throughout.

Q. Is poha a mixture of pure substances (scientific sense)?

Ans. Poha is a mixture, but its ingredients (rice flakes, peanuts, vegetables, oil, spices) are themselves mixtures. In science, components of a mixture must be pure substances.

8.2 What Are Pure Substances?

The word 'pure' on milk, ghee and spice packets has a different meaning in daily life and in science.

	Common usage	Science
"Pure" means	unadulterated, nothing cheaper or poorer added	only ONE kind of substance, no other substance present
Milk, ghee, spices	pure (if not adulterated)	IMPURE – each is made of more than one substance

Definitions

Adulteration = illegal adding of cheaper / poor-quality substances to a product to increase quantity or cut cost. It lowers quality and can be hazardous to health.

Pure substance = a kind of matter that cannot be separated into other kinds of matter by any physical process. All its particles are of the same type and behave identically.

Kuch Mazedaar Questions

Q. A step further: classify milk, packed fruit juice, baking soda, sugar and soil as mixtures or pure substances.

Ans. **Mixtures:** milk, packed fruit juice, soil. **Pure substances:** baking soda (compound), sugar (compound).

Q. Is pure ghee (as sold in shops) scientifically pure?

Ans. No. Ghee is a mixture of many fats and other substances, so a scientist calls it impure even if it is not adulterated.

Q. Difference between a pure substance and a mixture?

Ans. A pure substance has only one kind of particle and cannot be separated by physical methods; a mixture has 2 or more pure substances which can be separated by physical methods.

8.3 Types of Pure Substances

Water cooled $\rightarrow$ ice; boiled $\rightarrow$ vapour; and we get water back on heating ice or cooling vapour. So the **particles of water stay the same** in these physical changes. Now let us pass **ELECTRICITY** through water.

Activity 8.3: Passing electricity through water (Demonstration)

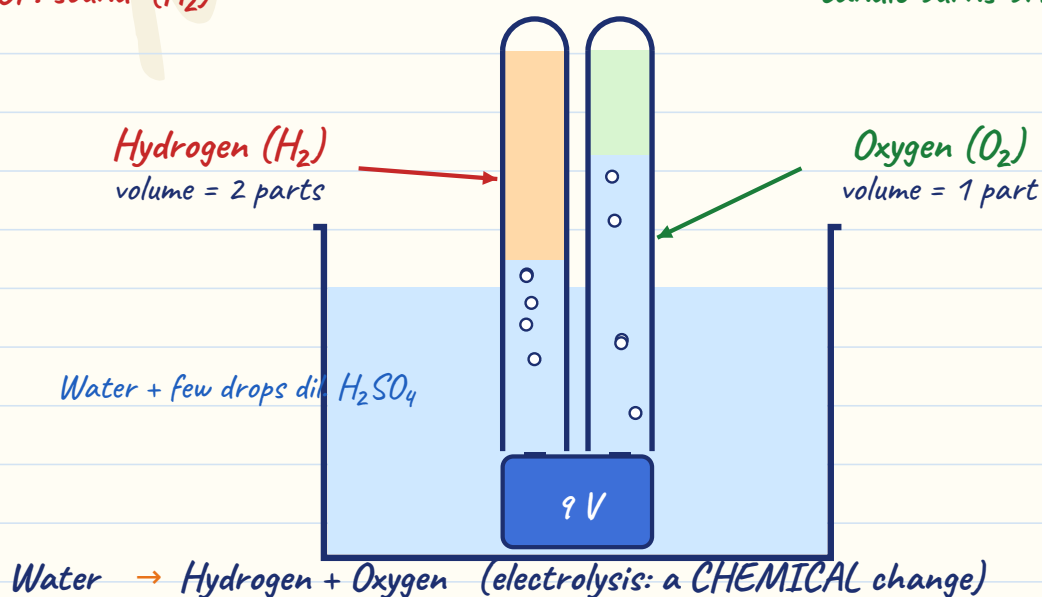
Safety first

Do it only under the teacher's supervision. Handle **sulfuric acid** carefully. **Do NOT** use a lithium-ion battery.

- Take 2 small test tubes, a beaker, a **9 V battery**. Fill $\frac{2}{3}$ of the beaker with water + a few drops of dilute sulfuric acid (makes water conduct).
- Fill both test tubes completely with this water; put the battery inside the beaker.
- Without spilling, place the water-filled test tubes upside-down over the two terminals of the battery.
- Wait 10–15 minutes. **Gas bubbles** form at both terminals and collect in the tubes. Volumes are **NOT** equal – one tube has about double.
- Remove tubes one by one carefully and bring a burning candle near the mouth of each.

POP! sound (H_2)

candle burns brighter (O_2)



Results of the gas test

- Tube 1: **POP sound** → **Hydrogen** gas (more volume).
- Tube 2: candle flame **glows brighter** → **Oxygen** gas.
- The gases are **NOT** water vapour – otherwise they would have condensed back into water.
- Inference: water is made of two different constituents. **Water** → **Hydrogen + Oxygen**

Kuch Mazedaar Questions

Q. Is the volume of gas collected in both tubes the same?

Ans. No. Hydrogen collected is about twice the volume of oxygen (matches the 2 : 1 ratio of H : O in water).

Q. Can the collected gases be water vapour?

Ans. No. If they were water vapour they would have condensed back to water droplets. Their burning-candle tests show they are hydrogen and oxygen.

Q. Ever heard of...: breaking of water by electric current – chemical or physical change?

Ans. **Chemical change** – entirely new substances (hydrogen and oxygen) with properties different from water are formed, and water cannot be got back by simply cooling them.

Q. Why are a few drops of dilute sulfuric acid added to the water?

Ans. Pure water conducts electricity very poorly; the acid makes it conduct so that electrolysis proceeds.

Q. How do we identify hydrogen and oxygen?

Ans. **Hydrogen**: burns with a pop sound near a burning candle. **Oxygen**: makes a burning candle burn more brightly (supports combustion).

8.3.1 Elements

Definition: Element

Hydrogen and oxygen (from Activity 8.3) are pure substances called **ELEMENTS**.

- Each element is made of **identical particles called ATOMS**; they differ from atoms of every other element.
- Elements **cannot be broken down into simpler substances** – they are the **building blocks of all matter**.
- Examples: hydrogen, oxygen, gold, silver, sulfur, carbon, iron, aluminium ...

A Step Further: Atoms vs Molecules

Atoms of most elements cannot exist alone. Two or more atoms combine to form a stable particle called a **MOLECULE**.

- 2 hydrogen atoms $\rightarrow$ 1 molecule of hydrogen (H_2). • 2 oxygen atoms $\rightarrow$ 1 molecule of oxygen (O_2).

Classification of elements

Type	Examples and notes
Metals	gold, silver, magnesium, iron, aluminium (copper, zinc, tin ...)
Non-metals	carbon, sulfur, hydrogen, oxygen (nitrogen, chlorine, bromine ...)
Metalloids	intermediate properties between metals and non-metals: silicon, boron (studied in higher classes)

A Step Further: Amazing facts about elements

- Known elements today = **118**; most are **solids** at room temperature.
- **Eleven** elements are gases at room temperature – all non-metals (oxygen, nitrogen, helium ...).
- Only **two** elements are liquids at room temperature: **mercury (a metal)** and **bromine (a non-metal)**.
- **Gallium and caesium** are solids but melt at about **30 °C (303 K)**.

- A mobile phone uses **more than 45 different elements** (aluminium, copper, silicon, cobalt, lithium, gold, silver ...).

Kuch Mazedaar Questions

Q. What is an element? Give 4 examples.

Ans. A pure substance made of identical atoms that cannot be broken down into simpler substances. E.g. gold, silver, sulfur, carbon, hydrogen, oxygen.

Q. Difference between an atom and a molecule?

Ans. An atom is the particle of an element. A molecule is a stable particle formed when two or more atoms combine (e.g. H_2 , O_2).

Q. Name the two elements that are liquids at room temperature. Metal or non-metal?

Ans. Mercury (metal) and bromine (non-metal).

Q. Gallium is solid, but a gallium piece placed on your palm melts. Why?

Ans. Its melting point is only about $30^\circ C$, lower than body temperature, so it turns liquid.

Q. Which type of elements is found in gaseous state at room temperature?

Ans. Only non-metals (11 elements, e.g. oxygen, nitrogen, helium).

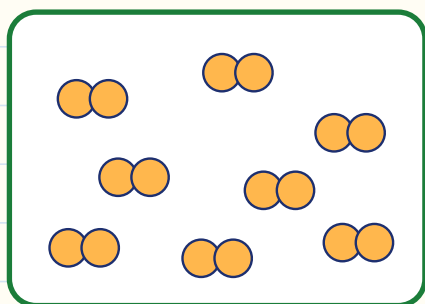
8.3.2 Compounds

Why can't hydrogen and oxygen in water be separated by physical means? Because their particles are **so tightly attached** to each other.

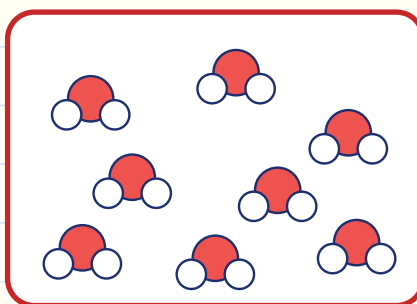
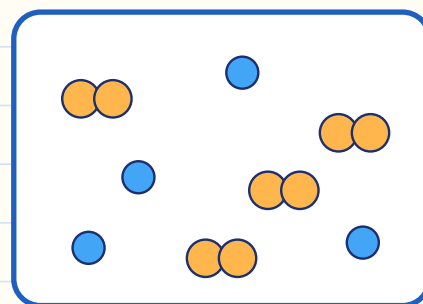
Definition: Compound

Compounds are formed when **different elements combine chemically in FIXED ratios** to give something **entirely new**.

- Properties of a compound are **DIFFERENT** from the properties of its elements.
- Its elements **cannot be separated by any physical method** (only by chemical methods).
- **Water:** hydrogen : oxygen = **2 : 1** (ratio of atoms). **Sodium chloride:** sodium : chlorine = **1 : 1**.

**ELEMENT**

only one kind of atom

**COMPOUND**different atoms joined (H_2O)**MIXTURE**

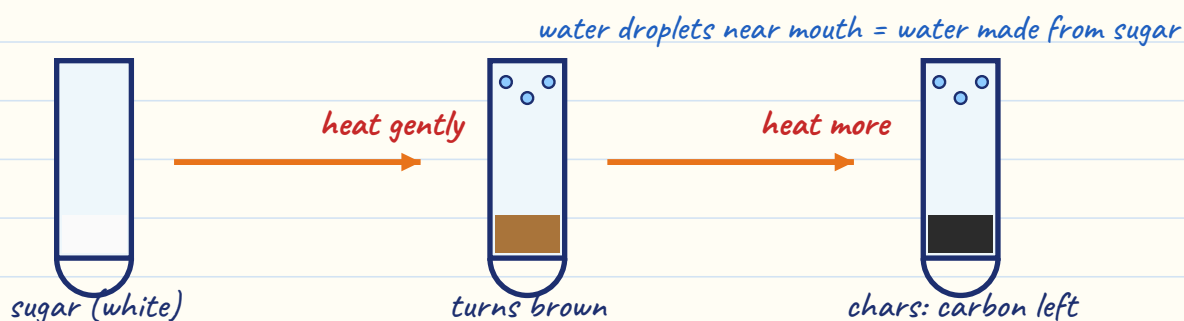
different particles, not joined

Compound vs its elements: wonderful change in properties!

- **Hydrogen** = a fuel (burns). **Oxygen** = supports combustion. **Water** = a liquid that **extinguishes fire!**
- **Sodium** = a soft, reactive metal. **Chlorine** = a hazardous gas. **Sodium chloride (common salt)** = harmless, tasty and essential for life.
- Salt dissolved in water can be recovered by **evaporation (physical)** – but $NaCl$ cannot be split into sodium and chlorine by any physical process.

Activity 8.4: Heating sugar (is sugar an element?)

- Put a teaspoon of sugar in a boiling tube and heat it gently (teacher present).
- Observation: sugar turns **brown**, then **chars (blackish)**. Small water droplets appear near the open end of the tube.
- Water came from the dry sugar itself (the tube is hot, so it cannot be condensation from air). **Charcoal (carbon)** is left behind.



Conclusion of Activity 8.4

Sugar → **Carbon + Water** (sugar decomposes on heating). Water = hydrogen + oxygen.

So sugar cannot be an element. **Sugar is a COMPOUND** of carbon, hydrogen and oxygen.

Activity 8.5: Iron + sulfur (mixture vs compound) Demonstration

Safety first

Demonstrate under teacher's supervision, preferably in a **fume hood / well-ventilated area**. **Do not inhale the gases**. Never smell a gas directly – waft it gently towards your nose. Be careful with dilute HCl.

- Take **5.6 g iron filings** and **3.2 g sulfur powder** on a watch glass. Mix thoroughly → label it **Sample A**. (Can you still see both? Yes – black and yellow → non-uniform mixture.)
- Heat half of Sample A in a china dish (tripod stand, wire gauze, burner) with continuous stirring until a **black mass** forms. Cool it, grind it in a mortar and pestle, put on another watch glass → **Sample B**.
- Compare A and B: (1) appearance, (2) magnet test, (3) gas test with dilute HCl (waft the gas; test with burning splinter).

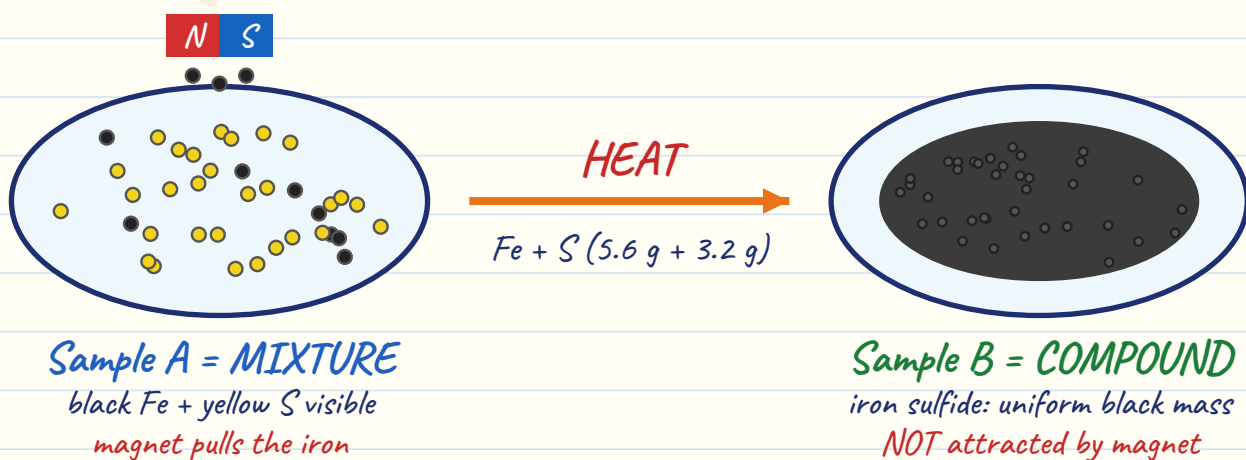


Table 8.2: Comparison of Samples A and B (filled)

Experiment	Sample A	Sample B
1. Appearance	Colour: black + yellow particles seen separately. Texture: uneven, grainy (non-uniform)	Colour: uniform dark/black. Texture: same throughout (uniform)
2. Magnet test	Iron filings are attracted to magnet	Not attracted – no free iron left
3. Gas test (i) Odour	Colourless gas, no smell ; yellow sulfur left behind	Colourless gas with rotten-egg smell (H_2S)
(ii) Burning	Gas burns with a pop sound = hydrogen	Gas is H_2S (rotten-egg smell) – it does not give the hydrogen 'pop'

Explanation (Sample A and Sample B)

Sample A = MIXTURE of two elements (iron + sulfur). Components keep their properties; the black and yellow particles are visible; the magnet separates iron. With dilute HCl the iron reacts but sulfur does not:



Sample B = COMPOUND (iron sulfide). Formed by heating the two elements; same colour and texture throughout; NOT attracted by magnet; iron and sulfur can no longer be separated; completely different properties. With dilute HCl:



Magnet has no effect on B because iron is no longer present as free iron – it is chemically combined with sulfur in a new substance. (Mass is conserved: $5.6 \text{ g} + 3.2 \text{ g} = 8.8 \text{ g}$ iron sulfide.)

Mixture vs Compound (must remember)

Point	MIXTURE (Sample A)	COMPOUND (Sample B)
Formation	only mixing, no chemical reaction	chemical reaction between elements
Composition	any proportion (not fixed)	FIXED ratio (e.g. $H : O = 2 : 1$)
Properties	components keep their own properties	new properties, different from elements
Separation	by physical methods (magnet, filtration ...)	only by chemical methods, never physical
Appearance	may be uniform or non-uniform	always uniform (homogeneous)
Examples	air, seawater, brass, salad	water, salt, sugar, iron sulfide

Kuch Mazedaar Questions

Q. Why cannot hydrogen and oxygen in water be separated by physical methods?

Ans. They are chemically combined and their particles are tightly attached. Only a chemical process (like electrolysis) can separate them.

Q. Sodium is a soft metal, chlorine a hazardous gas – yet table salt is harmless. Why?

Ans. Because a compound has properties entirely different from its elements. $NaCl$ is a new substance formed when sodium and chlorine combine in a 1 : 1 ratio.

Q. Heating sugar gives water droplets. Where did this water come from?

Ans. From the sugar itself, not the air, because the tube is hot. Sugar breaks into carbon and water, so sugar is a compound of C, H and O.

Q. Discussion: Do Samples A and B look the same? Which one is magnetic?

Ans. No. A shows black + yellow particles; B is uniformly dark. Sample A (because of free iron) is attracted by a magnet; B is not.

Q. Discussion: Can the components of A and B be separated?

Ans. A – yes, by a magnet (physical method). B – no, iron and sulfur cannot be separated by physical means.

Q. Discussion: Do gases evolve in both with dilute HCl? Same smell?

Ans. Yes, but different: A gives odourless hydrogen (pop sound); B gives hydrogen sulfide with rotten-egg smell.

Q. Discussion: Categorise iron, sulfur, Sample A, Sample B.

Ans. **Elements:** iron, sulfur. **Mixture:** Sample A. **Compound:** Sample B (iron sulfide).

Q. Why is sodium chloride a compound even though we can separate it from salt water?

Ans. Evaporation only separates NaCl from WATER (a mixture). It does not split NaCl into sodium and chlorine, which would need a chemical method.

8.4 Uses of Elements, Compounds, Mixtures

- Air = mixture of gases (oxygen, nitrogen, CO_2). Water = compound of hydrogen and oxygen.
- Elements like **iron** and **aluminium** are used to build bridges, buildings and vehicles.
- Chemists study how elements combine to make compounds → **life-saving medicines and vaccines**, and **fertilisers** that increase crop production to feed the growing population.
- Engineers and material scientists design **alloys** (e.g. stainless steel – stronger and more durable than pure iron). **Wood, steel and concrete** used in buildings are all **mixtures**.

A Step Further: Graphene aerogel – a "wonder" material

- Made from **carbon**; said to be the **lightest material on earth** (even grass can hold it).
- Very **porous** → high absorbing capacity → can clean **oil spills** in sea and on land.
- Useful in energy-saving devices and special coatings for buildings.

8.5 What Are Minerals?

Minerals

- Most rocks are a **mixture of minerals** (seen by eye, magnifying glass or microscope).
- **Native minerals** = pure **ELEMENTS** found in nature: metals like gold, silver, copper; non-metals like sulfur and carbon.
- **Most minerals are compounds** of more than one element: quartz, calcite, mica, pyroxene, olivine, talc.
- Minerals = natural, solid substances on the Earth with a **fixed chemical composition**.
- Uses: cement is made from calcite, quartz, alumina and iron oxide; talcum powder is made from the mineral talc.

Our Scientific Heritage: Dhokra art (alloys in Indian craft)

Dhokra = old craft of Bihar and Odisha (lost-wax casting) making figures inspired by nature, animals and tribal life.

- Step 1: design shaped in beeswax. • Step 2: wax model covered with clay to make a mould.
- Step 3: clay hardens; wax is melted out leaving a hollow space. • Step 4: space filled with **molten brass or bronze (alloys)** → strong, shiny golden figure.

Matter vs Not-matter

Elements and compounds are the building blocks of **matter** (anything that has mass and takes up space). But **light, heat, electricity, thoughts and emotions are NOT matter** – important parts of our world, but not made of matter.

Kuch Mazedaar Questions

Q. What are minerals? What are native minerals?

Ans. Minerals are natural, solid substances of the Earth with fixed chemical composition. Native minerals are minerals that are pure elements (gold, silver, copper, sulfur, carbon).

Q. Why are wood, steel and concrete called mixtures?

Ans. Each is made of two or more substances mixed together without forming a new substance (e.g. steel = iron + carbon, concrete = cement + sand + gravel).

Q. Which minerals are used to make cement and talcum powder?

Ans. Cement: calcite, quartz, alumina, iron oxide. Talcum powder: the mineral talc.

Q. Why is graphene aerogel useful for cleaning oil spills?

Ans. It is extremely porous and so has a very high absorbing capacity.

Q. In Dhokra art, why is brass or bronze used?

Ans. These alloys make the figure strong and give it a shiny golden colour.

Snapshots: Quick Revision

Yaad rakhne wali baatein

- A **mixture** = 2 or more substances mixed; they keep their properties and do not react chemically. Parts = **components**.
- A **pure substance** = same type of particles; all particles behave identically. Pure substance = **element or compound**.
- **Elements** = simplest substances, cannot be broken down; building blocks of matter.
- **Compounds** = 2 or more elements chemically combined in a fixed ratio; properties differ from their elements.
- **Minerals** = natural solids with fixed chemical composition; mostly compounds, rarely pure elements.
- Air = uniform mixture; water, salt, sugar = compounds; iron sulfide = compound; iron + sulfur powder = mixture.

Keep the Curiosity Alive

All 12 end-of-chapter questions solved:

Dekhe Kya Seekha Tumne? (Q 1-5)

Q. 1. $A + B \rightarrow C$. A and B cannot be broken down into simpler substances by chemical reactions. Which statement is correct?

Ans. (iv) A and B are elements, C is a compound and has a fixed composition. (Because A and B cannot be broken down they are elements; combining two elements chemically gives a compound.)

Q. 2. Assertion: Air is a mixture. Reason: A mixture is formed when two or more substances are mixed, without undergoing any chemical change.

Ans. (i) Both are true and Reason is the correct explanation. Air is a mixture of gases which are simply mixed without a chemical change.

Q. 3. Water, a compound, has different properties from hydrogen and oxygen. Justify.

Ans. • Hydrogen is a combustible gas (fuel) and oxygen is a gas that supports combustion, but **water is a liquid that extinguishes fire**. • H_2 and O_2 are gases at room temperature, water is a liquid. • Water has fixed H : O ratio (2 : 1) and cannot be separated by physical methods. So a compound has properties entirely different from its elements.

Q. 4. In which case are all examples correctly matched? Give reasons. (i) Elements: water, nitrogen, iron, air (ii) Uniform mixtures: minerals, seawater, bronze, air (iii) Pure substances: CO_2 , iron, oxygen, sugar (iv) Non-uniform mixtures: air, sand, brass, muddy water

Ans. (iii) is correct. Carbon dioxide and sugar are compounds; iron and oxygen are elements – all pure substances. ✗ (i) water is a compound and air is a mixture. ✗ (ii) minerals are pure compounds/elements (rocks are mixtures of minerals). ✗ (iv) air and brass are uniform mixtures.

Q. 5. Iron reacts with moist air to form iron oxide; magnesium burns in oxygen to form magnesium oxide. Classify all substances.

Ans. **Elements:** iron, magnesium, oxygen (one kind of atom). **Compounds:** iron oxide, magnesium oxide, water (in moist air) – chemically combined elements in fixed ratio.

Mixture: moist air (gases + water vapour mixed together).

Q6. Table 8.3 – classify the given substances:

Elements	Compounds	Mixtures
aluminium, gold, oxygen, nitrogen, sulfur, hydrogen	carbon dioxide, magnesium oxide, rust, iron sulfide, glucose, water, sodium chloride, baking soda	sand, seawater, muddy water, air, fruit juice

Pure substances = all elements + all compounds in the above list (aluminium, gold, oxygen, nitrogen, sulfur, hydrogen, carbon dioxide, magnesium oxide, rust, iron sulfide, glucose, water, sodium chloride, baking soda).

Dekhe Kya Seekha Tumne? (Q 7–12)

Q. 7. What new substance forms when iron filings + sulfur powder are heated? How is it different? Write the word equation.

Ans. **Iron sulfide** (black). It is a uniform compound, NOT attracted by a magnet, and its iron and sulfur cannot be separated physically; it gives rotten-egg smelling H_2S with dilute HCl . The original mixture shows black + yellow particles, is attracted by magnet and can be separated. **Iron + Sulfur $\rightarrow$ Iron sulfide** (on heating).

Q. 8. Can a substance be classified as both an element and a compound?

Ans. **No.** An element is made of only one kind of atom and cannot be broken down; a compound is made of two or more different elements chemically combined and can be broken down. So the two categories are mutually exclusive.

Q. 9. How would our daily lives change if water were a mixture of hydrogen and oxygen instead of a compound?

Ans. Water would be a mixture of two gases, so there would be no liquid water to drink, cook or farm with, no rivers or oceans. Hydrogen burns and oxygen supports burning, so it would be dangerous and could not put out fires. Its gases could be separated easily by physical methods. Life as we know it would be impossible.

Q. 10. Analyse Fig. 8.24 (iron filings + dilute HCl). Identify gas A and write the word equation.

Ans. Gas A = **hydrogen** (colourless, odourless, burns with a pop sound). **Iron + Dilute hydrochloric acid** → **Iron chloride + Hydrogen gas**.

Q. 11. Name two compounds made only from non-metals and mention two uses of each.

Ans. **Water (H_2O)**: (i) drinking, cooking and washing, (ii) irrigation of crops / solvent in industries. **Carbon dioxide (CO_2)**: (i) aerated drinks, (ii) fire extinguishers (also used by plants in photosynthesis). [Also: ammonia – fertilisers and cleaning agents.]

Q. 12. How can gold be classified as both a mineral and a metal?

Ans. Gold is found naturally in the earth as a solid with fixed composition, as a pure element (native mineral). Chemically, as an element it is shiny, malleable, ductile and a good conductor, so it is also a **metal**.

Extra Practice (MasterG.Net special)

Kuch Mazedaar Questions: Fill in the blanks / True-False

Q. Fill: Components of a _____ do not react chemically. Elements are made of identical _____.

Ans. mixture; atoms.

Q. Fill: Compounds have a _____ ratio of elements; the H : O ratio in water is _____.

Ans. fixed; 2 : 1.

Q. True/False: Milk is a pure substance (scientific meaning).

Ans. False – it is a mixture.

Q. True/False: A compound can be separated into its elements by physical methods.

Ans. False – only chemical methods.

Q. True/False: Rocks are mixtures of minerals.

Ans. True.

Q. True/False: Mercury is the only liquid element at room temperature.

Ans. False – bromine is also liquid.

Q. Odd one out: brass, bronze, steel, iron.

Ans. Iron – it is an element; the rest are alloys (mixtures).

Q. Why are alloys such as brass called mixtures and not compounds?

Ans. Their metals are simply mixed in varying proportions without chemical reaction, and each metal keeps its properties.

Q. What differences would you observe on adding dilute HCl to iron filings and to iron sulfide?

Ans. Iron: odourless gas that burns with a pop (H_2). Iron sulfide: gas with a rotten-egg smell (H_2S).

Discover, Design and Debate (project ideas)

- Make comic strips of real-life examples showing elements, compounds and mixtures (with diagrams, properties and uses).
- Research discoveries of elements (phosphorus, sodium), a compound (penicillin) and mixtures (brass, bronze, stainless steel); present in class.
- Read labels on detergents or snacks and list the mixtures and compounds they contain.
- Group role-play: each group is an element, a compound or a mixture – debate which is most important!

Yaad karne ka trick (memory tips)

- **MECCH**: Mixtures – Easily separated, Components keep properties, Can be any ratio, Hmm no reaction!
- **Compound = Chemically Combined, fixed ratio. Element = One kind of atom.**
- Hydrogen → POP. Oxygen → brighter flame. Lime water → milky = CO_2 .
- Metalloids: Si, B (in-between). Liquid elements: Hg, Br. Elements known: 118.

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