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Class–9

SCIENCE

Chapter – 2

IS MATTER AROUND US PURE

Part – 4

Elements and Compounds

Deeksha Pahilajani

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OVERVIEW

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1. Mixture
2. True Solution
3. Suspension and Colloid
4. Elements and Compounds

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Ice
Water H_2O Water Vapour $\rightarrow H_2O$
State change
H_2O

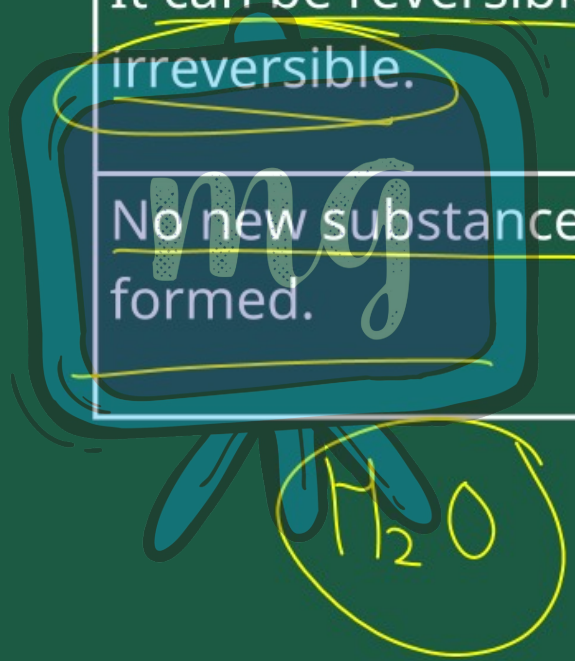
PHYSICAL & CHEMICAL CHANGES

Physical Change	Chemical Change
It brings about change in physical properties such as physical state, shape, size etc.	It brings about changes in chemical properties.
No changes in chemical composition are observed.	Changes in chemical composition are observed.

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Physical Change	Chemical Change
It can be reversible or irreversible.	It is irreversible that means permanent.
No new substance is formed.	New substance is formed.

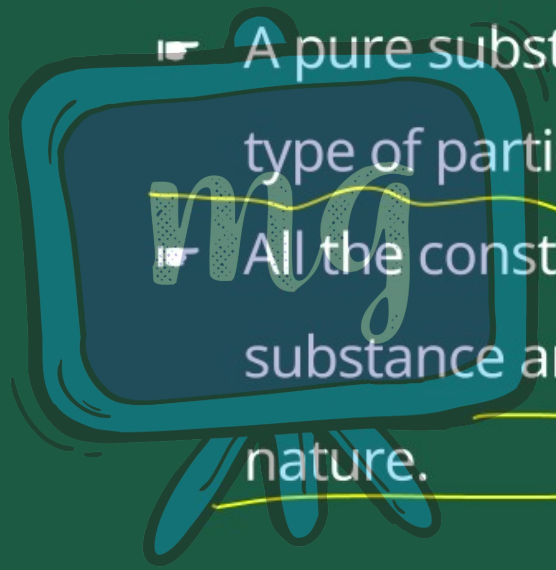


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PURE SUBSTANCES

- A pure substance consists of a single type of particles.
- All the constituent particles of a pure substance are same in their chemical nature.



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☛ Examples



Pure Water

Oxygen

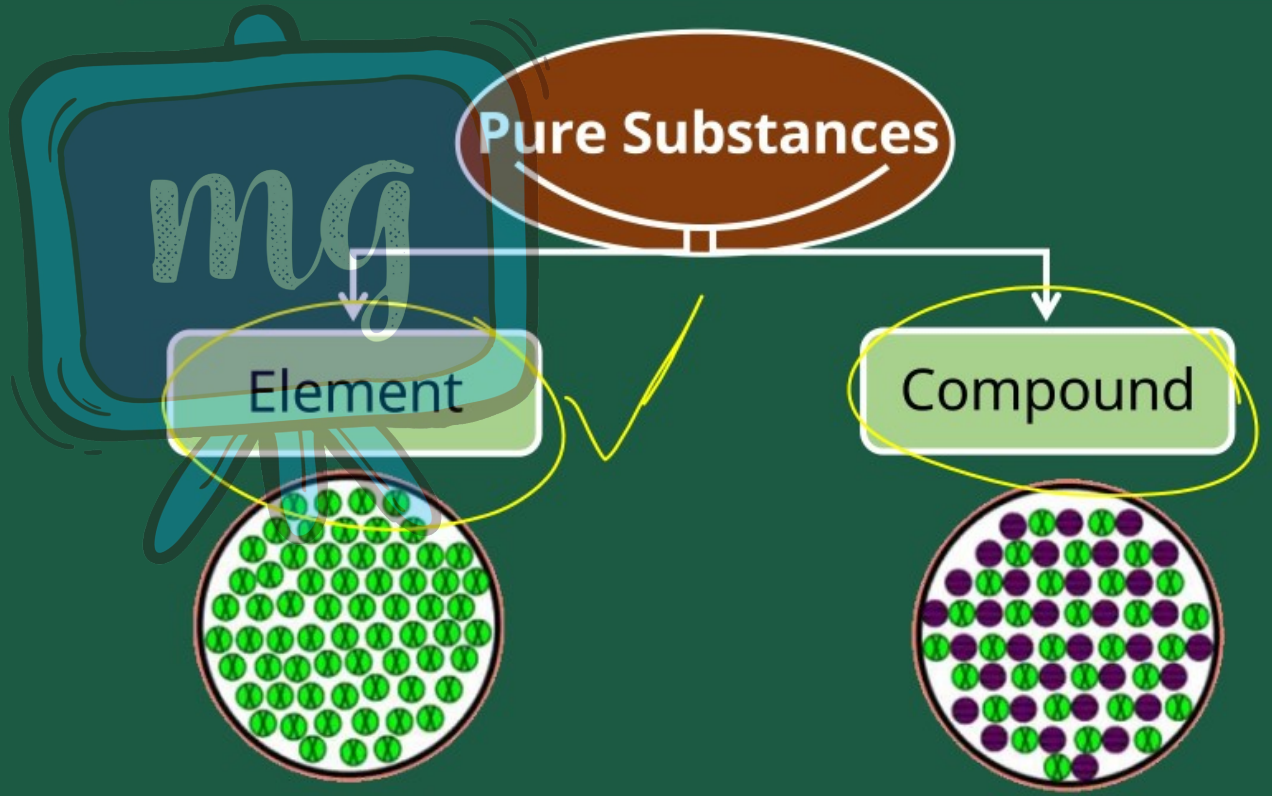


Salt

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TYPES OF PURE SUBSTANCES



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ELEMENTS

- Robert Boyle was the first scientist to use the term element in 1661.



Robert Boyle

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From

- Antoine Laurent Lavoisier, a French chemist, defined an element as a basic form of matter that cannot be broken down into simpler substances by chemical reactions.



Antoine Laurent Lavoisier

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- The number of elements = 100.
- Naturally occurring elements = 92.
- Rest are man-made.
- Majority of the elements are solid.
- Eleven elements are in gaseous state at room temperature.

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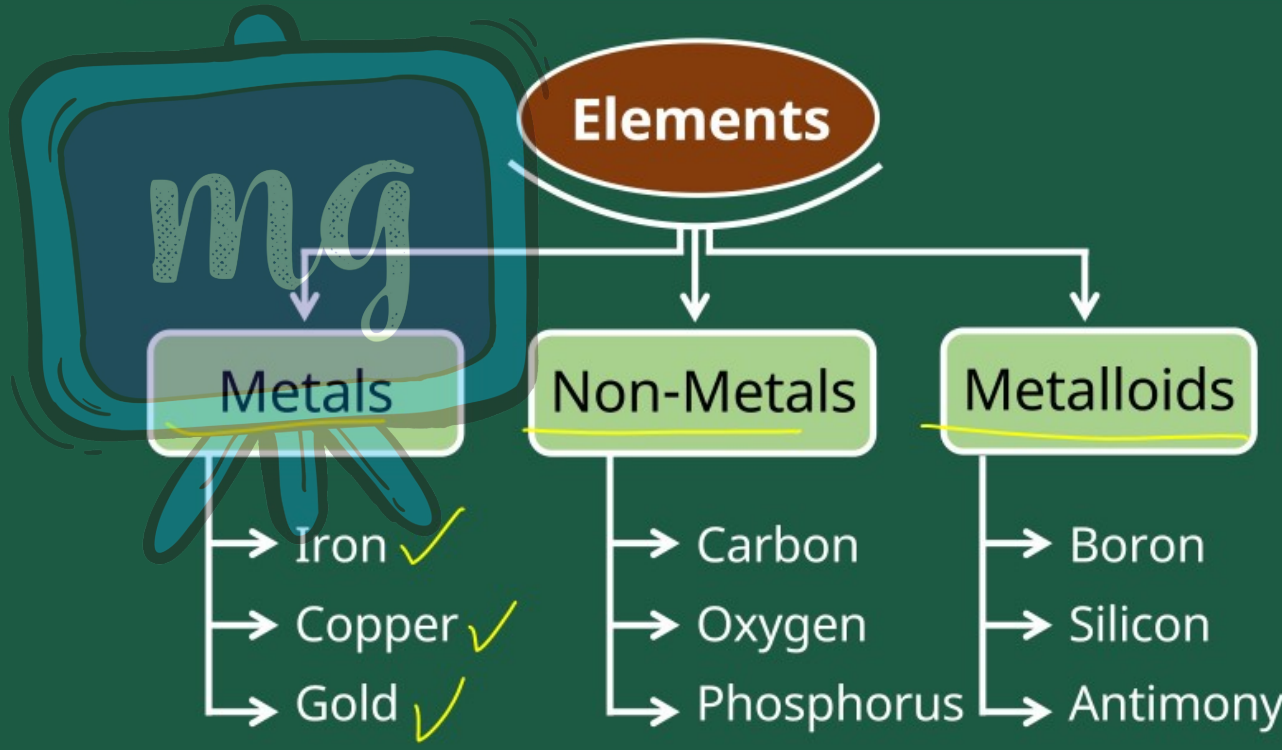
- Two elements are liquid at room temperature— mercury and bromine.
- Elements, gallium and cesium become liquid at a temperature slightly above room temperature (303 K).



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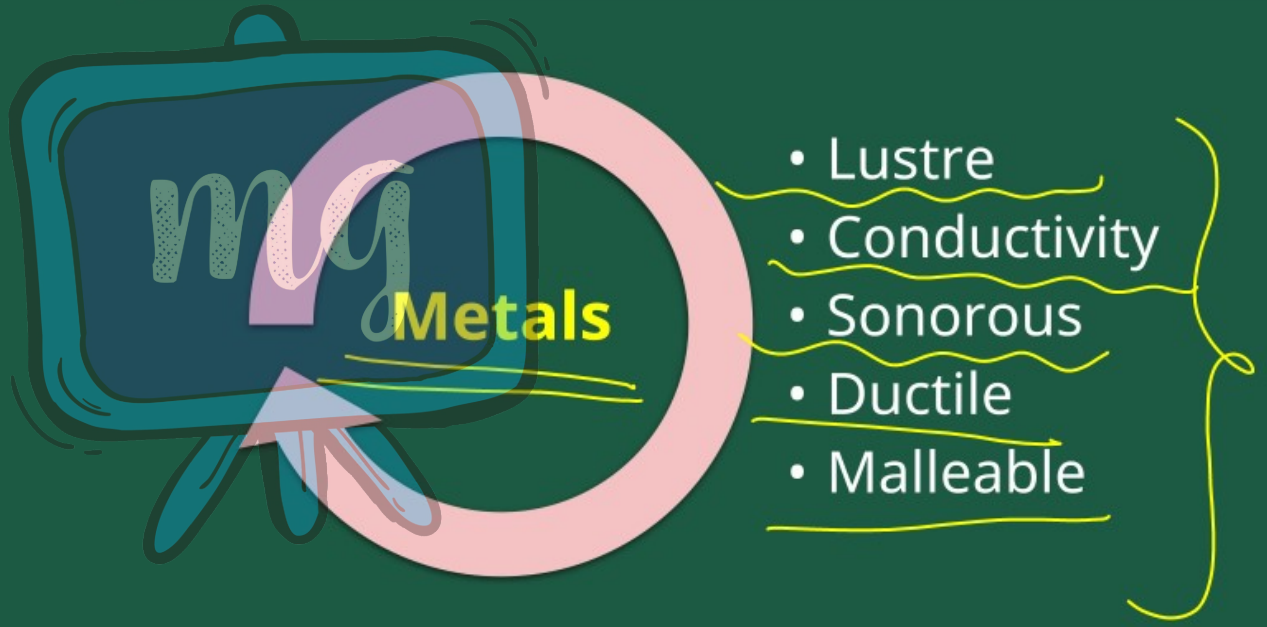
TYPES OF ELEMENTS



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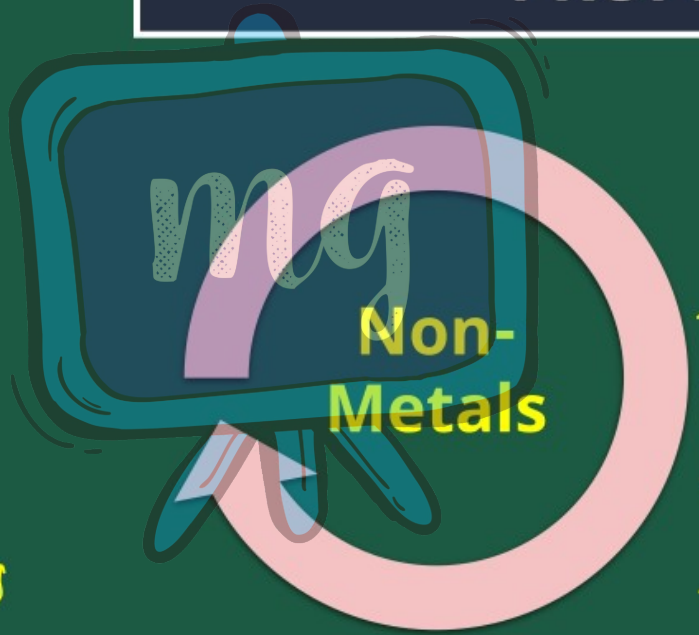
METALS AND THEIR PROPERTIES



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NON- METALS AND THEIR PROPERTIES



- Non- lustrous
- Poor conductivity
- Non-Sonorous
- Non- ductile
- Non-malleable

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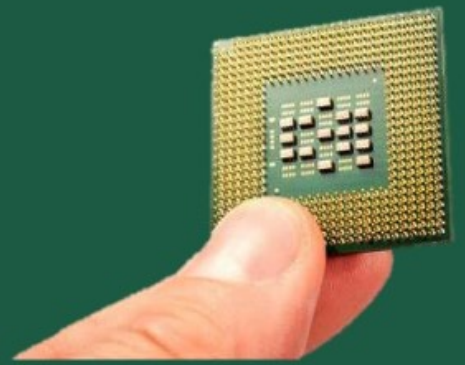
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METALLOIDS

- Elements which have intermediate properties between those of metals and non-metals.



Sample of Pure Silicon



Silicon Chip

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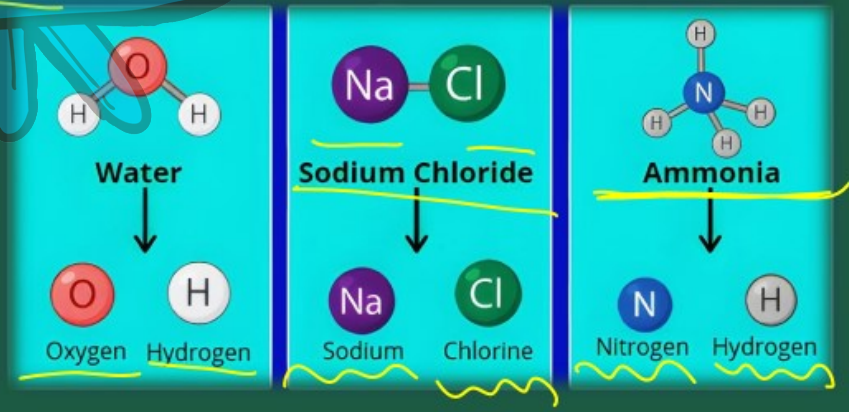
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CO_2 H_2O

2 : 1

COMPOUNDS

A compound is a substance composed of two or more elements, chemically combined with one another in a fixed proportion.

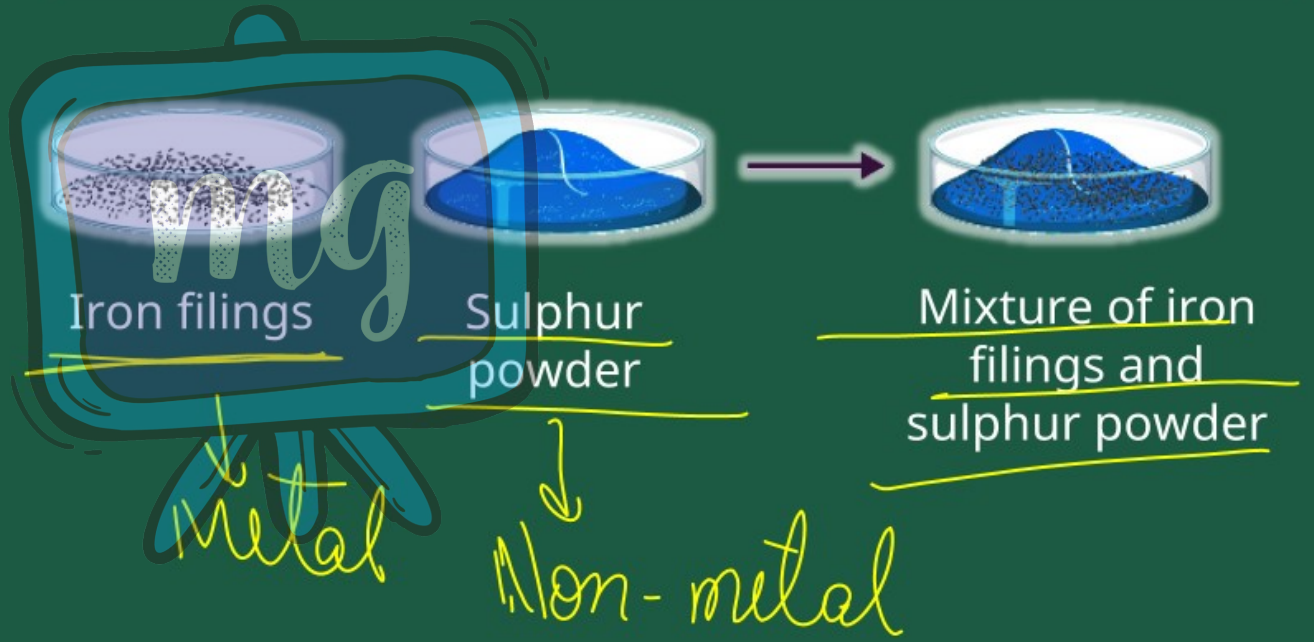


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Fe S

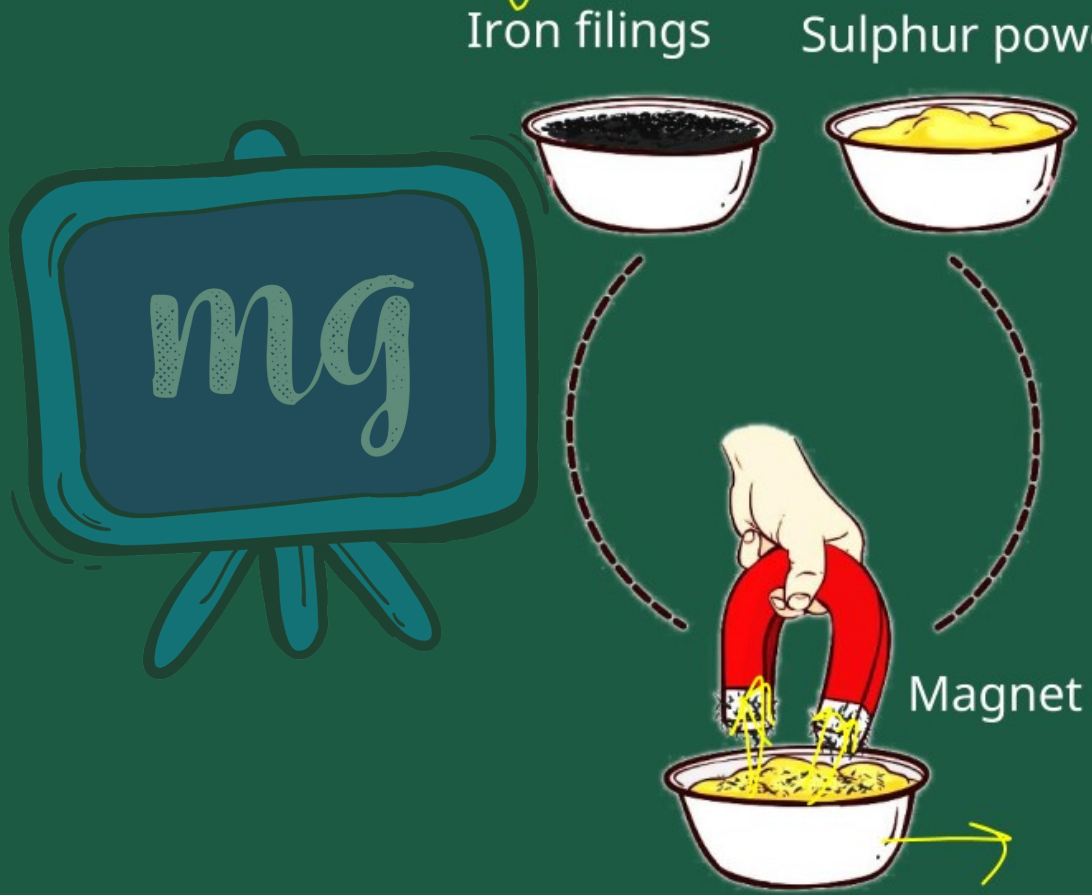
EXPERIMENT



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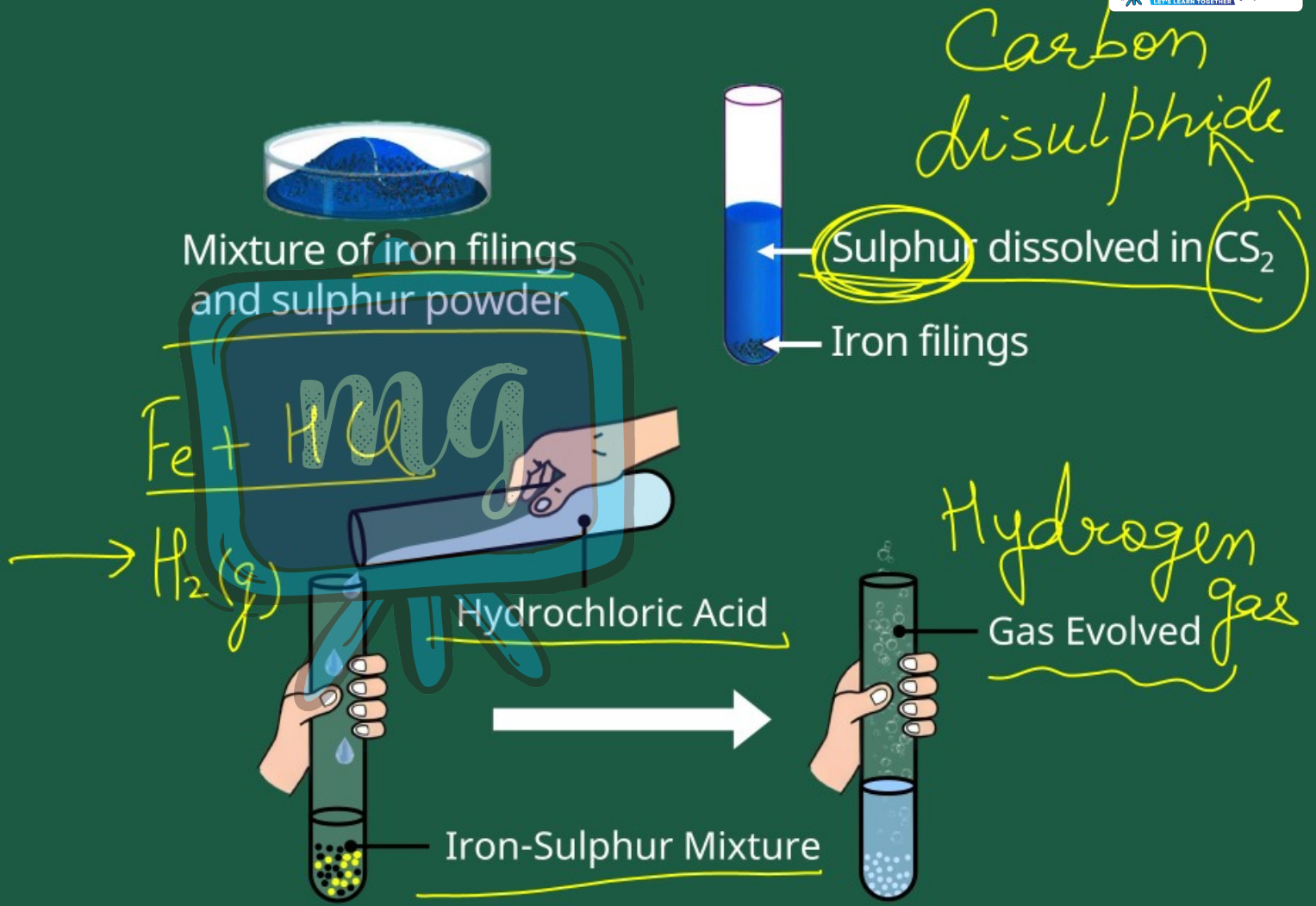
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Magnetic Separation



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Observations

- The material obtained is a mixture of the two substances. The substances are the elements—iron and sulphur.
- The properties of the mixture are the same as that of its constituents.

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$FeS + HCl \rightarrow H_2S$

CS_2 Rotten egg smell

HCl

EXPERIMENT

Iron sulphide

Magnetic separation



Heating of iron filings and sulphur powder

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Observation

- The material obtained is a compound.
- It has totally different properties compared to the combining elements.
- The composition, texture and the colour of a compound is the same throughout.

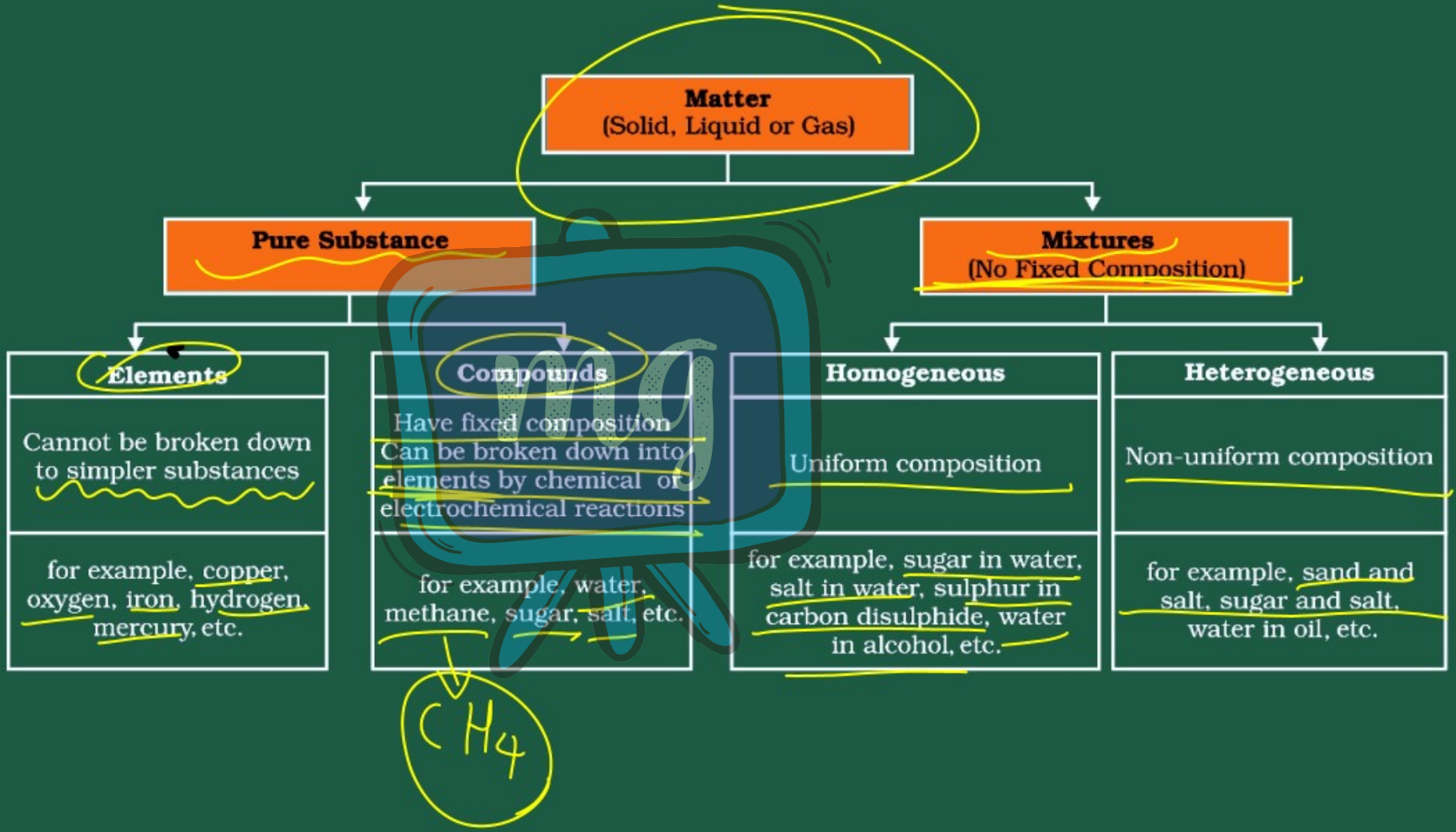
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Mixtures	Compounds
1. Elements or compounds just mix together to form a mixture and no new compound is formed.	1. Elements react to form new compounds.
2. A mixture has a variable composition.	2. The composition of each new substance is always fixed. H_2O
3. A mixture shows the properties of the constituent substances.	3. The new substance has totally different properties.
4. The constituents can be separated fairly easily by physical methods.	4. The constituents can be separated only by chemical or electrochemical reactions.

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LEARNING OUTCOMES





1. Elements
2. Compounds
3. Differences between Mixtures and Compounds

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ASSESSMENT



1 | Which of the following is/are chemical changes?

A. Rusting of iron

B. Freezing of water

C. Mixing of iron filings and sand

D. Digestion of food

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ASSESSMENT

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2 Which of the following materials fall under the category of a pure substance?

A Air

B Iron

C Milk

D Jelly

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ASSESSMENT



3 Which of the following is an element?

A Sugar solution

B Calcium carbonate $CaCO_3$

C Ice → H_2O

D Sodium Na

$NaCl$

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EXERCISE



Answer : Solubility of each salt at 293 K is

(i) Potassium nitrate → 32 g

(ii) Sodium chloride → 36 g

(iii) Potassium chloride → 35 g

(iv) Ammonium chloride → 37 g

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EXERCISE



d What is the effect of change of temperature on the solubility of a salt?

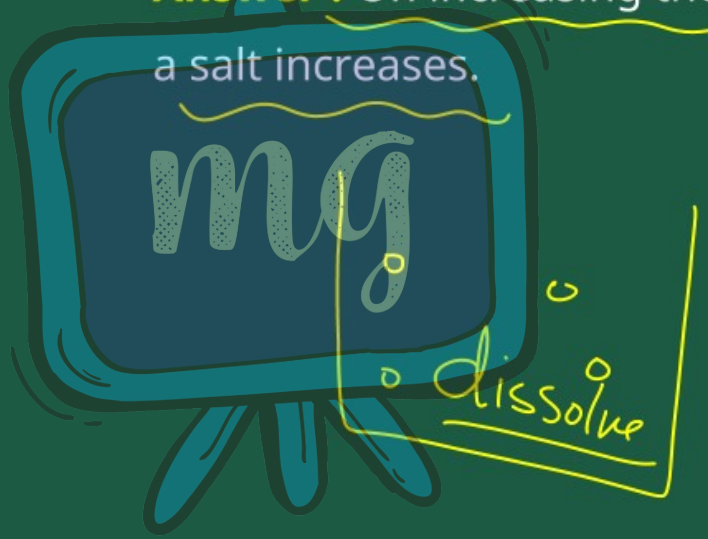
Substance Dissolved	Temperature in K				
	283	293	313	333	353
	Solubility				
Potassium nitrate	21	32	62	106	167
Sodium chloride	36	36	36	37	37
Potassium chloride	35	35	40	46	54
Ammonium chloride	24	37	41	55	66

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EXERCISE



Answer : On increasing the temperature, solubility of a salt increases.

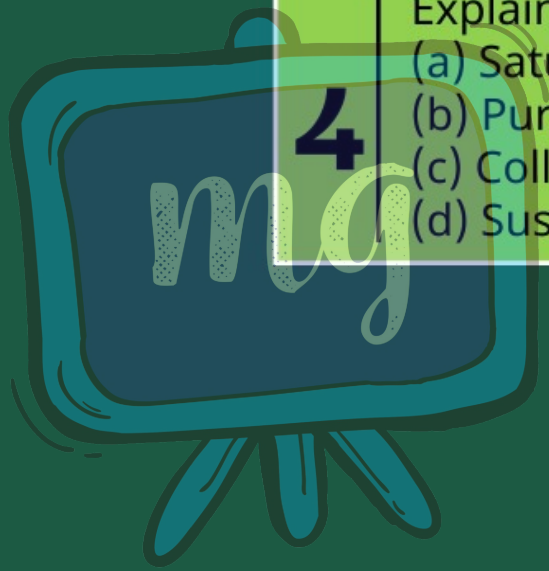


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EXERCISE

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4 Explain the following giving examples:
(a) Saturated solution
(b) Pure substance
(c) Colloid
(d) Suspension

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EXERCISE

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4 Explain the following giving examples:
(a) Saturated solution
(b) Pure substance
(c) Colloid
(d) Suspension

Answer :

(a) Saturated solution : In a given solution when no more solute can dissolve further at a given temperature is called saturated solution.

(b) Pure substance : A pure substance consists of a single type of particles. E.g., gold, silver.

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EXERCISE



(c) Colloid : A colloid is a solution in which the size of solute particles are bigger than that of true solution. These particles cannot be seen with our naked eyes, they are stable, e.g., milk, blood.

(d) Suspension : It is a heterogeneous mixture in which the solute particles are big enough to settle down, e.g., chalk-water, sand-water, etc.

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EXERCISE





5 Classify each of the following as a homogeneous or heterogeneous mixture:
soda water, wood, air. soil, vinegar, filtered tea.

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EXERCISE



5 Classify each of the following as a homogeneous or heterogeneous mixture:
soda water, wood, air, soil, vinegar, filtered tea.

Answer :

Homogeneous : Soda water, vinegar, filtered tea, air.

Heterogeneous : Wood, soil.

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EXERCISE

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6 How would, you confirm that a colourless liquid given to you is pure water?

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EXERCISE



6 How would, you confirm that a colourless liquid given to you is pure water?

Answer :

By finding the boiling point of a given colourless liquid. If the liquid boils at 100°C at atmospheric pressure, then it is pure water. This is because pure substances have fixed melting and boiling point.

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EXERCISE



7 Which of the following materials fall in the category of a "pure substance"?

(a) Ice → Pure (H_2O)
(b) Milk → Mixture
(c) Iron → Pure
(d) Hydrochloric acid (HCl – Pure)
(e) Calcium oxide → Pure (CaO)
(f) Mercury → Pure
(g) Brick
(h) Wood
(i) Air

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EXERCISE

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8 Identify the solutions among the following mixtures.

(a) Soil → Heterogeneous

(b) Sea water → Salt + H_2O → Solution

(c) Air

(d) Coal → Heterogeneous

(e) Soda water

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EXERCISE



9 Which of the following will show "Tyndall effect"?

(a) Salt solution

(b) Milk

(c) Copper sulphate solution

(d) Starch solution

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EXERCISE



10 Classify the following into elements, compounds and mixtures.

(a) Sodium → Element
(b) Soil → M
(c) Sugar solution → M
(d) Silver → E
(e) Calcium carbonate → C ($CaCO_3$)
(f) Tin → E
(g) Silicon → E
(h) Coal → M
(i) Air → M
(j) Soap → M
(k) Methane → C (CH_4)
(l) Carbon dioxide → C (CO_2)
(m) Blood → M

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EXERCISE



11 Which of the following are chemical changes?

(a) Growth of a plant

(b) Rusting of iron

(c) Mixing of iron filings and sand

(d) Cooking of food

(e) Digestion of food

(f) Freezing of water

(g) Burning of a candle

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EXERCISE



11 Which of the following are chemical changes?

Answer : Chemical changes are —

(a) Growth of a plant

(b) Rusting of iron

(c) Cooking of food

(d) Digestion of food

(e) Burning of a candle