

Lecture 1



CHEMICAL REACTION

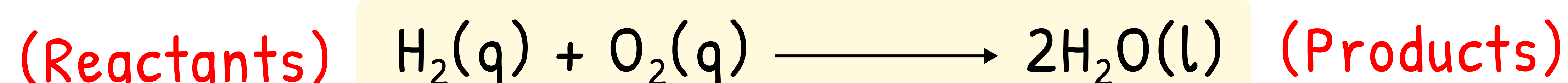
A process in which new chemicals are formed.

Example $\Rightarrow$ Hydrogen gas react with oxygen to produce water under some condition.



CHEMICAL EQUATION

A simple representation of chemical reaction with symbols and formula.

**NOTE :**

We also mention the state of chemical in bracket as, s(solid), l(liquid), g or $\uparrow$ (gas)

- aq(aqueous) $\Rightarrow$ soluble in water
- ppt(precipitate) $\Rightarrow$ insoluble in water

IMPORTANT TABLE TO BE REMEMBERED

VALENCY	IONS		NON-METALLIC ELEMENT		POLYATOMIC IONS	
	NAME	SYMBOL	NAME	SYMBOL	NAME	SYMBOL
1.	SODIUM	Na^+	HYDROGEN	H^+	AMMONIUM	NH_4^+
	POTASSIUM	K^+	HYDRIDE	H^-	HYDROXIDE	OH^-
	SILVER	Ag^+	CHLORIDE	Cl^-	NITRATE	NO_3^-
	COPPER(I)	Cu^+	BROMIDE	Br^-	HYDROGEN CARBONATE	HCO_3^-
2.			IODIDE	I^-		
	MAGNESIUM	Mg^{2+}	OXIDE	O^{2-}	CARBONATE	CO_3^{2-}
	CALCIUM	Ca^{2+}	SULPHIDE	S^{2-}	SULPHITE	SO_3^{2-}
	ZINC	Zn^{2+}			SULPHATE	SO_4^{2-}
	IRON(II)	Fe^{2+}				
3.	COPPER(II)	Cu^{2+}				
	ALUMINIUM	Al^{3+}	NITRIDE	N^{3-}	PHOSPHATE	PO_4^{3-}
	IRON(III)	Fe^{3+}				

STEPS TO WRITE A CHEMICAL FORMULA

STEP 1 : IDENTIFY THE ELEMENTS

- Determine the element present in the compound and their symbols.

STEP 2 : DETERMINE THE CHARGES (OXIDATION STATE)

- For ionic compounds, determine the charge of the each ion. For covalent compounds, determine the oxidation state of each element.

STEP 3 : BALANCE THE CHARGES/OXIDATION STATE

- Adjust the number of atoms of each element so that positive and negative charge balance out to zero.

STEP 4 : WRITE THE FORMULA

- Write the symbols of the elements, placing the less electro-negative element (or cationic compound) first.
- Add subscript to indicate the number of atoms of each elements needed to balance the charges.

STEP 5 : CHECK FOR POLYATOMIC IONS

- If polyatomic ions are present, enclose them in **parenthesis()** before adding subscripts.

Example $\Rightarrow$ Let us consider the compound magnesium chloride.

- Identifying elements** : Magnesium(Mg) and Chlorine(Cl).
- Determining the charges** : Magnesium typically has a +2 charge(Mg^{2+}) and Chlorine has -1 charge(Cl^-).
- Balancing the charges** : to balance the +2 charge of the magnesium, we need two chlorine atoms, each with -1 charge, resulting in a neutral compound.
- Writing the formula** : the chemical formula is MgCl_2 .

Q1

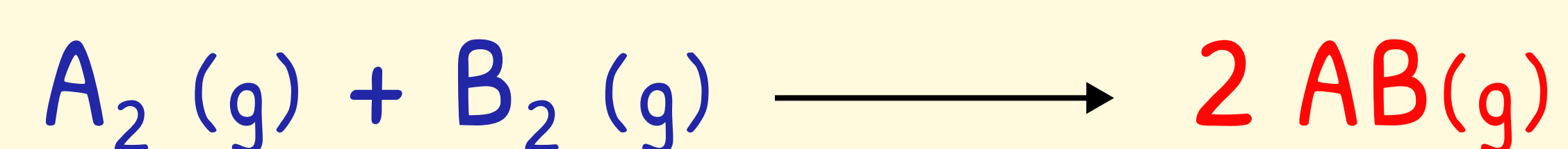
Write the chemical formula for,

- | | | |
|---------------------|----------------------|------------------------|
| (a) sodium chloride | (b) Ferrous sulphate | (c) Aluminium chloride |
| (d) Barium sulphate | (e) Lead nitrate | (f) Ferric oxide |

Answer (a) sodium chloride : sodium(Na) and Chlorine(Cl) $\text{Na}^{+1} \quad \text{Cl}^{-1}$ NaCl	(b) Ferrous sulphate : Iron(Fe) and Sulphate(SO_4) $\text{Fe}^{2+} \quad \text{SO}_4^{2-}$ FeSO_4	(c) Aluminium chloride : Aluminium(Al) and chloride(Cl) $\text{Al}^{3+} \quad \text{Cl}^{-1}$ AlCl_3
(d) Barium sulphate : Barium(Ba) and sulphate(SO_4) $\text{Ba}^{2+} \quad \text{SO}_4^{2-}$ BaSO_4	(e) Lead nitrate : Lead(Pb) and nitrate(NO_3) $\text{Pb}^{2+} \quad \text{NO}_3^{-}$ $\text{Pb}(\text{NO}_3)_2$	(f) Ferric oxide : Iron(Fe) and oxygen(O) $\text{Fe}^{3+} \quad \text{O}^{2-}$ Fe_2O_3

BALANCING CHEMICAL EQUATION

- Number of atoms of each element in a chemical equation should be same on LHS and RHS.



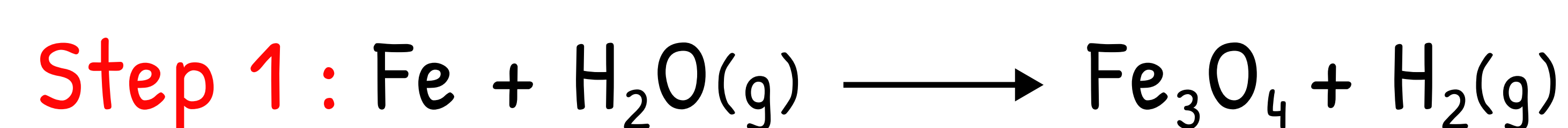
WHY SHOULD WE BALANCE A CHEMICAL EQUATION

- To ensure that the equation adheres to the **law of conservation of mass**, which states that mass can neither be created nor destroyed under ordinary conditions.
- (i.e., total mass of reactants should be equal to total mass of products)

STEPS TO BALANCE A CHEMICAL EQUATION

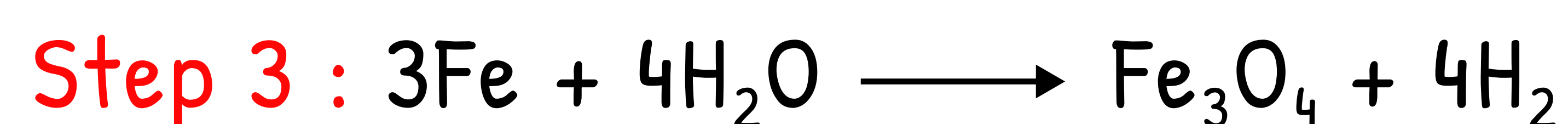
- Step 1:** Write the chemical symbols in the form of a skeletal chemical equation.
- Step 2:** List number of atoms of different elements present in the unbalanced equation & balance them.
- Step 3:** Write the balanced equation.

Example $\Rightarrow$ For balancing the following equation, **Iron + Steam $\longrightarrow$ Magnetite + Hydrogen gas**



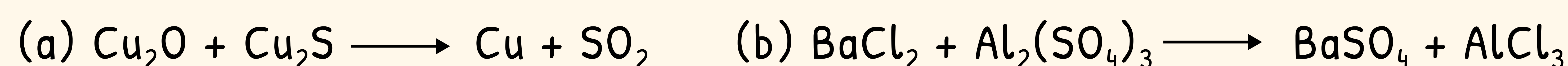
Step 2 :

ELEMENTS	NUMBER OF ATOMS(reactant)	NUMBER OF ATOMS(product)
Fe	$1 \times 3 = 3$	3
H	$2 \times 4 = 8$	$2 \times 4 = 8$
O	$1 \times 4 = 4$	4



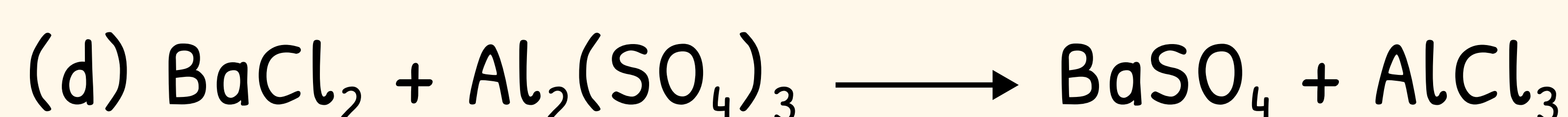
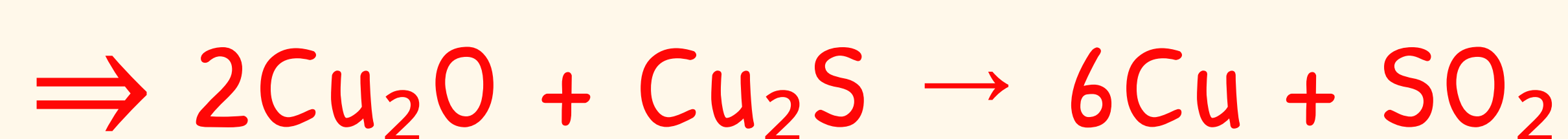
Q2

Balance the chemical equations,

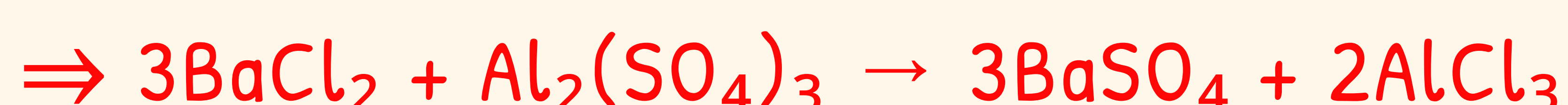


Answer (a) $Cu_2O + Cu_2S \longrightarrow Cu + SO_2$

ELEMENTS	NUMBER OF ATOMS(reactant)	NUMBER OF ATOMS(product)
Cu	$2 \times 2 = 4$, 2	$1 \times 6 = 6$
S	1	1
O	$1 \times 2 = 2$	2



ELEMENTS	NUMBER OF ATOMS(reactant)	NUMBER OF ATOMS(product)
Ba	$1 \times 3 = 3$	$1 \times 3 = 3$
Cl	$2 \times 3 = 6$	$3 \times 2 = 6$
Al	2	$1 \times 2 = 2$
S	3	$1 \times 3 = 3$
O	12	$4 \times 3 = 12$



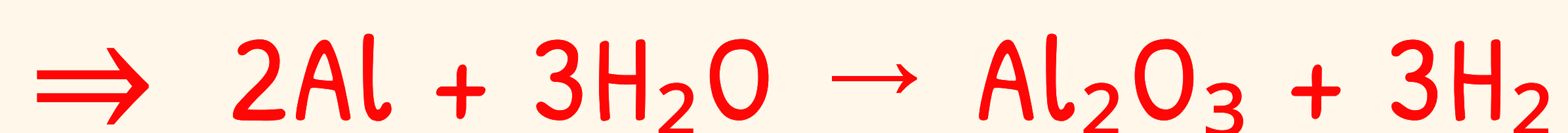
Q3

Consider the following chemical equation $\Rightarrow p \text{ Al} + q \text{ H}_2\text{O} \rightarrow r \text{ Al}_2\text{O}_3 + s \text{ H}_2$

To balance this chemical equation, the values of p, q, r and s must be respectively. [CBSE 2025]

Answer $p \text{ Al} + q \text{ H}_2\text{O} \rightarrow r \text{ Al}_2\text{O}_3 + s \text{ H}_2$

ELEMENTS	NUMBER OF ATOMS(reactant)	NUMBER OF ATOMS(product)
Al	$1 \times 2 = 2$	2
H	$2 \times 3 = 6$	$2 \times 3 = 6$
O	$1 \times 3 = 3$	3



Hence : $p = 2, q = 3, r = 1, s = 3$

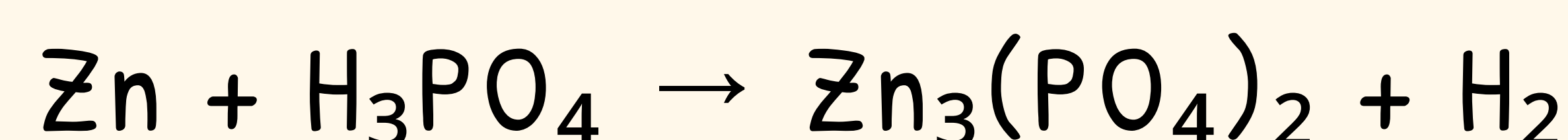
Q4

Why do we balance a chemical equation? Name & state the law that suggests the balancing of chemical equations and also balance the following chemical equation: $\text{Zn} + \text{H}_3\text{PO}_4 \rightarrow \text{Zn}_3(\text{PO}_4)_2 + \text{H}_2$

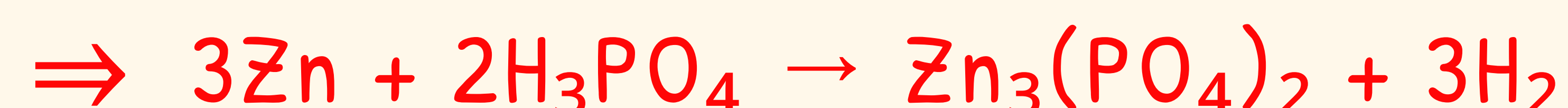
Answer

We balance the chemical equation, so that the total mass of the reactant should be equal to total mass of the product.

Law of conservation of mass: mass can neither be created nor be destroyed under ordinary conditions.



ELEMENTS	NUMBER OF ATOMS(reactant)	NUMBER OF ATOMS(product)
Zn	$1 \times 3 = 3$	3
P	$1 \times 2 = 2$	2
H	$3 \times 2 = 6$	$2 \times 3 = 6$
O	$4 \times 2 = 8$	8

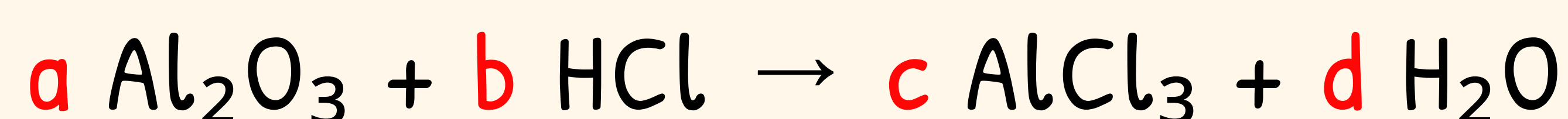


[CBSE 2015]

Q5

Consider the following chemical equation

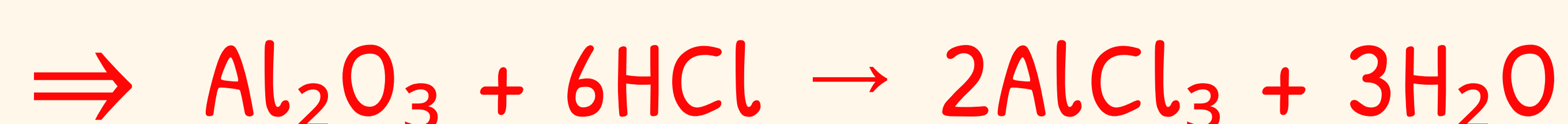
[CBSE 2024]



In order to balance this chemical equation, the values of a, b, c & d must be

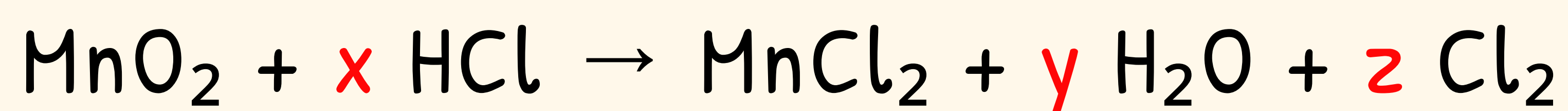
Answer $a \text{ Al}_2\text{O}_3 + b \text{ HCl} \rightarrow c \text{ AlCl}_3 + d \text{ H}_2\text{O}$

ELEMENTS	NUMBER OF ATOMS(reactant)	NUMBER OF ATOMS(product)
Al	2	$1 \times 2 = 2$
Cl	$1 \times 6 = 6$	$3 \times 2 = 6$
H	$1 \times 6 = 6$	$2 \times 3 = 6$
O	3	$1 \times 3 = 3$



Hence: $a = 1, b = 6, c = 2, d = 3$

In order to balance the below chemical equation, the value of x, y & z are respectively



[CBSE 2023]

Answer $\text{MnO}_2 + x \text{HCl} \rightarrow \text{MnCl}_2 + y \text{H}_2\text{O} + z \text{Cl}_2$

ELEMENTS	NUMBER OF ATOMS(reactant)	NUMBER OF ATOMS(product)
Mn	1	1
Cl	$1 \times 4 = 4$	2,2
H	$1 \times 4 = 4$	$2 \times 2 = 4$
O	2	$1 \times 2 = 2$



CHARACTERISTICS OF A CHEMICAL REACTION

- Change in colour [ex: CuSO_4 (blue) + $\text{Fe} \rightarrow \text{FeSO}_4$ (green) + Cu]
- Change in state [ex: $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightarrow \text{NH}_4\text{Cl}(\text{s})$]
- Change in temperature [ex: $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{Heat} \uparrow$]
 - Exothermic reaction (Energy is released) [Heat $\uparrow$]
 - Endothermic reaction (Energy is absorbed) [Heat $\downarrow$]
- Evolution of gas [ex: $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$]
- Formation of precipitate [ex: $\text{BaSO}_4 \downarrow$]

Lecture 2

TYPES OF CHEMICAL REACTION

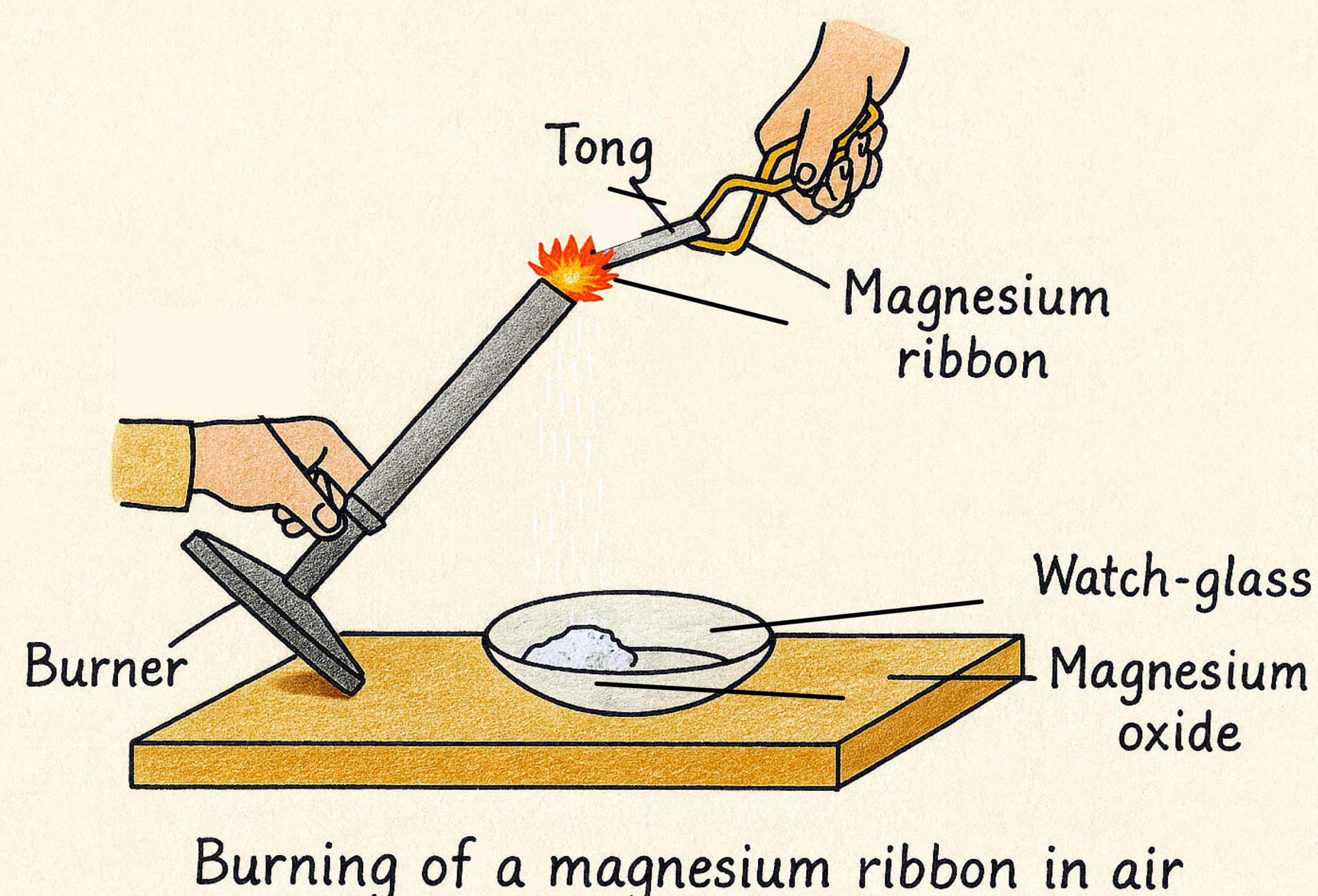
COMBINATION REACTION

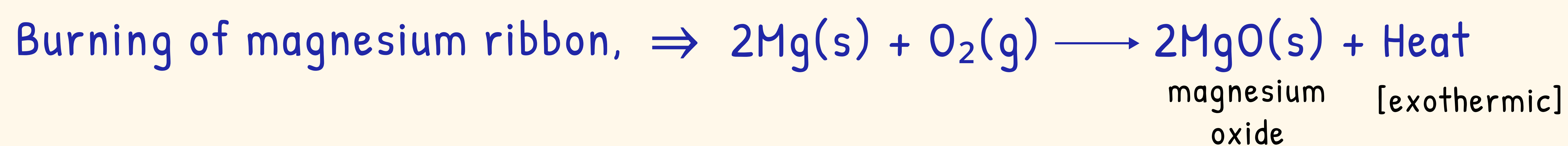
- Two or more reactants combine to form a single product. ($\text{A} + \text{B} \rightarrow \text{C}$)
- i) Burning of coal $\Rightarrow \text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
- ii) Formation of water from hydrogen gas & oxygen gas $\Rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$

Activity 1.1

CAUTION : This Activity needs the teacher's assistance. It would be better if students wear suitable eyeglasses.

- Clean a magnesium ribbon about 3-4 cm long by rubbing it with sandpaper.
- Hold it with a pair of tongs. Burn it using a spirit lamp or burner and collect the ash so formed in a watch-glass as shown in Figure. Burn the magnesium ribbon keeping it away as far as possible from your eyes.



**CONCLUSION :**

- Mg burns with dazzling white flame (very bright light).
- A white MgO powder is in watch glass.
- Heat energy releases so the temperature increases.
- It is Combination & Exothermic reaction.

Q. Why do we rub magnesium with sandpaper?

A : To remove any layer of magnesium oxide already present on magnesium ribbon

Q. Why to keep magnesium ribbon away from eyes?

A : Because the reaction is exothermic – it emits the dazzling white light so bright that you cannot see for a short time after looking at it.

Q. Select from the following statement which is not true about burning of magnesium ribbon in air?

- | | |
|---|---|
| a) It burns with a dazzling white flame | b) A white powder is formed on burning |
| c) It is an endothermic reaction | d) It is an example of combination reaction |

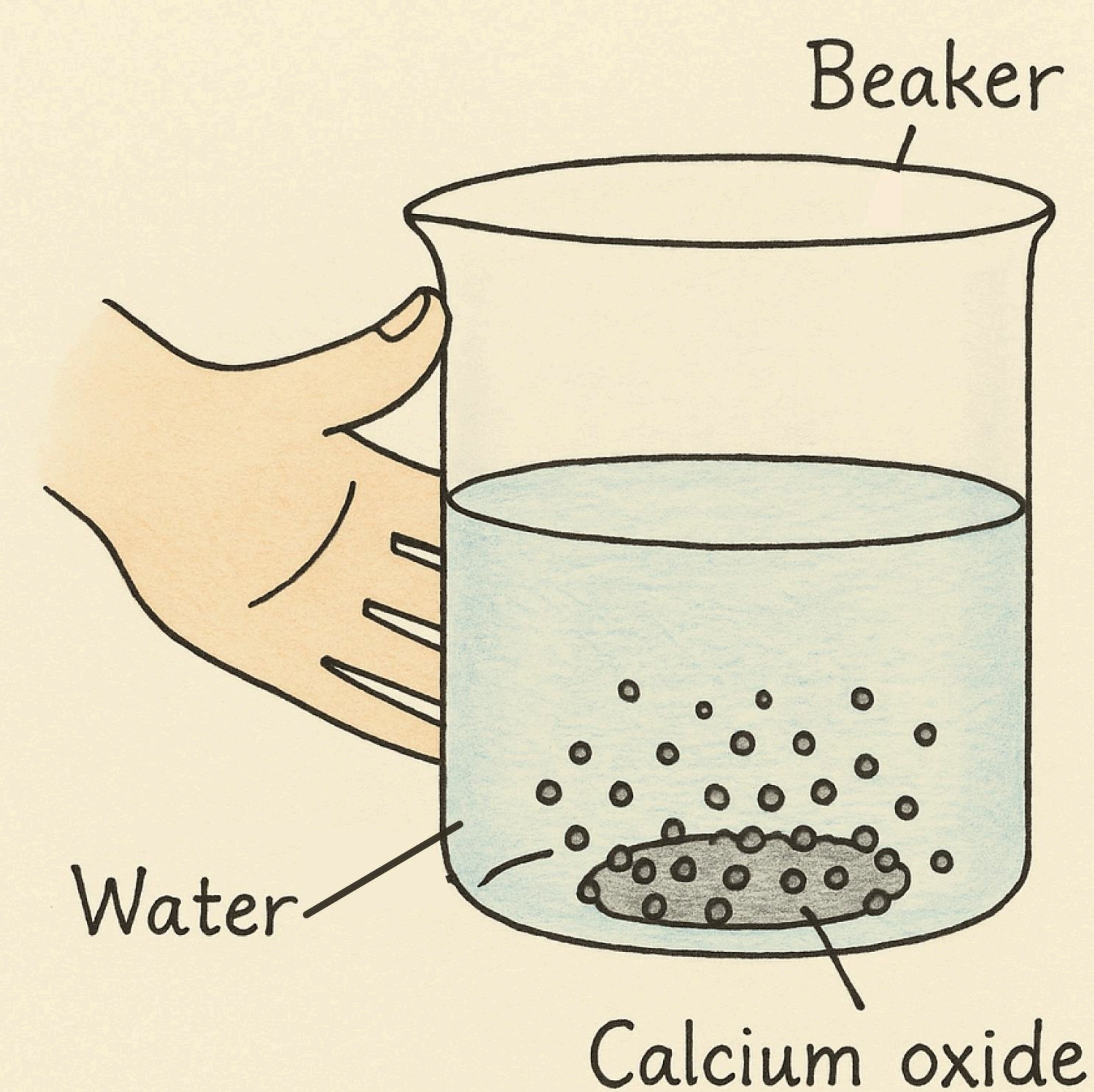
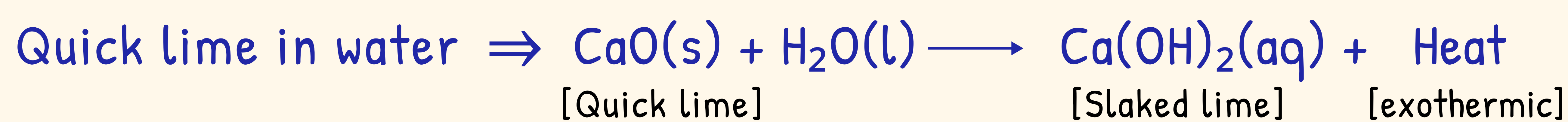
A : (c) It is an endothermic reaction.

[CBSE 2025]

**Activity 1.4**

- Take a small amount of calcium oxide or quick lime in a beaker.
- Slowly add water to this.
- Touch the beaker as shown in Figure.
- Do you feel any change in temperature?

⇒ Calcium oxide reacts vigorously with water to produce slaked lime (calcium hydroxide) releasing a large amount of heat.

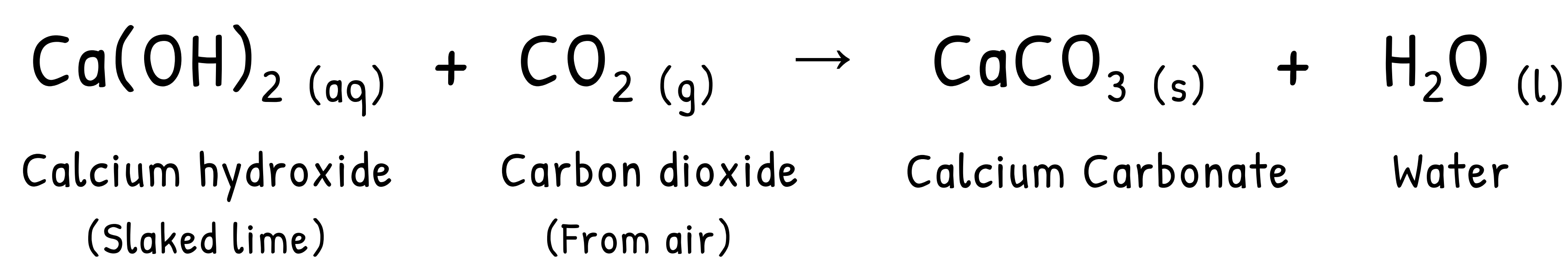


Formation of slaked lime by the reaction of calcium oxide with water

- In this reaction, calcium oxide and water combine to form a single product, calcium hydroxide. Such a reaction is known as a combination reaction.

CONCLUSION :

- Rise in temperature (Exothermic) & beaker becomes hot.
- Quick lime reacts vigorously with water.
- Water is added slowly to quicklime, because the reaction is exothermic.
- Combination & Exothermic reaction.
- Quick lime is used in making cement.



- Ca(OH)_2 solution is used for white washing walls.
- It reacts slowly with $\text{CO}_2(\text{g})$ from air.
- $\text{CaCO}_3(\text{s})$ is formed in 2-3 days on wall.
- This layer of $\text{CaCO}_3(\text{s})$ gives shiny wall.

EXOTHERMIC REACTIONS

- i) Burning of Natural gas (methane) $\Rightarrow \text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g}) + \text{Heat}$
- ii) Decomposition of vegetable into compost $\Rightarrow \text{Vegetable waste} \rightarrow \text{compost} + \text{Heat}$
- iii) Burning of magnesium ribbon $\Rightarrow 2\text{Mg}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{MgO}(\text{s}) + \text{Heat}$
- iv) Quick lime reacting with water $\Rightarrow \text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca(OH)}_2(\text{aq}) + \text{Heat}$
- v) Respiration $\Rightarrow \text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) + 6\text{O}_2(\text{aq}) \rightarrow 6\text{CO}_2(\text{aq}) + 6\text{H}_2\text{O}(\text{l}) + \text{Energy}$

ENDOTHERMIC REACTIONS

- i) Photosynthesis $\Rightarrow 6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l}) \rightarrow \text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) + 6\text{O}_2(\text{g})$
[In presence of sunlight & chlorophyll]
- ii) Some decomposition reactions.

Q7

- (a) Name the type of chemical reaction in which calcium oxide (quick lime) reacts with water.
- (b) Write the balanced chemical equation for the reaction.
- (c) Also, mention whether the reaction is exothermic or endothermic.

Answer

- (a) Combination Reaction
- (b) $\text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca(OH)}_2(\text{aq}) + \text{Heat}$
- (c) Exothermic reaction.

Q8

Select from the following process in which combination reaction is involved.

[CBSE 2023]

- | | |
|-------------------------------|-----------------------|
| a) Black & white photography. | c) Burning of coal. |
| b) Burning of methane. | d) Digestion of food. |

Answer

- (c) Burning of coal.

Q9

A metal ribbon X burns in oxygen with dazzling white flame, forming a white ash Y. The correct description of X, Y and the type of reaction is,

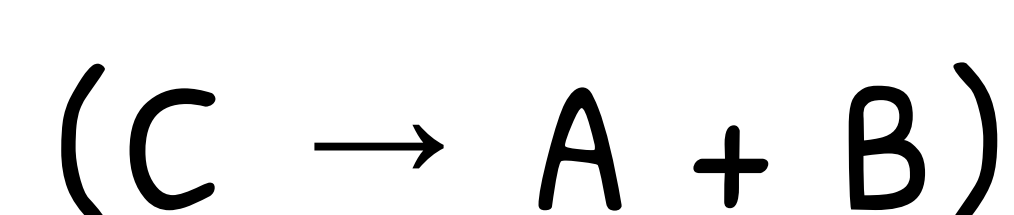
- a) $X = \text{Ca}$, $Y = \text{CaO}$, Type = Decomposition
 b) $X = \text{Mg}$, $Y = \text{MgO}$, Type = Combination
 c) $X = \text{Al}$, $Y = \text{Al}_2\text{O}_3$, Type = Thermal decomposition
 d) $X = \text{Zn}$, $Y = \text{ZnO}$, Type = Endothermic

Answer (b) $X = \text{Mg}$, $Y = \text{MgO}$, Type = Combination.

[CBSE 2023]

DECOMPOSITION REACTION

- One reactant breaks into two or more products (Reverse of combination).
- It happens when energy is supplied in the form of heat, electricity or sunlight.



TYPES OF DECOMPOSITION REACTION :

(i) Thermal decomposition (Heat)

(ii) Electrolytic decomposition (Electricity)

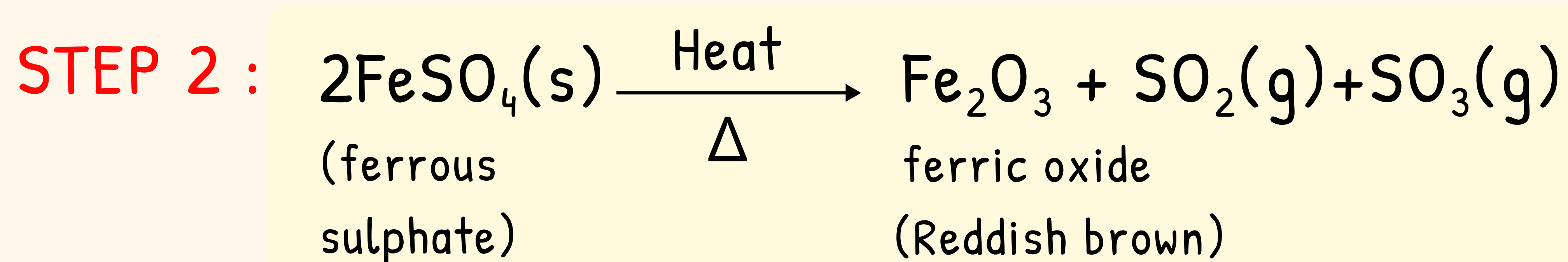
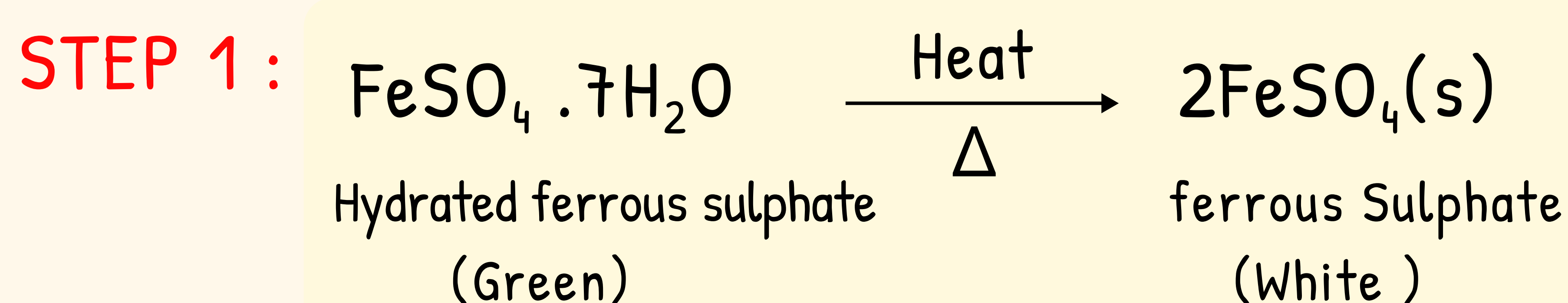
(iii) Photochemical decomposition (Light)

THERMAL DECOMPOSITION [THERMOLYSIS]

Activity 1.5

CAUTION : This Activity needs the teacher's assistance. It would be better if students wear suitable eyeglasses.

- Take about 2 g ferrous sulphate crystals in a dry boiling tube.
- Note the colour of the ferrous sulphate crystals.
- Heat the boiling tube over the flame of a burner or spirit lamp as shown in Figure.
- Observe the colour of the crystals after heating



Conclusion:

- Ferrous sulphate crystals are green in colour, on heating it loses water and changes to white colour. On further heating ferric oxide is formed which is reddish brown in color.
- Smell of burning sulphur (matchstick), smell of $\text{SO}_2(\text{g})$ (Suffocating odour); pungent smell.
- SO_2 and SO_3 are air pollutant and acidic in nature.
- This reaction is an endothermic reaction.



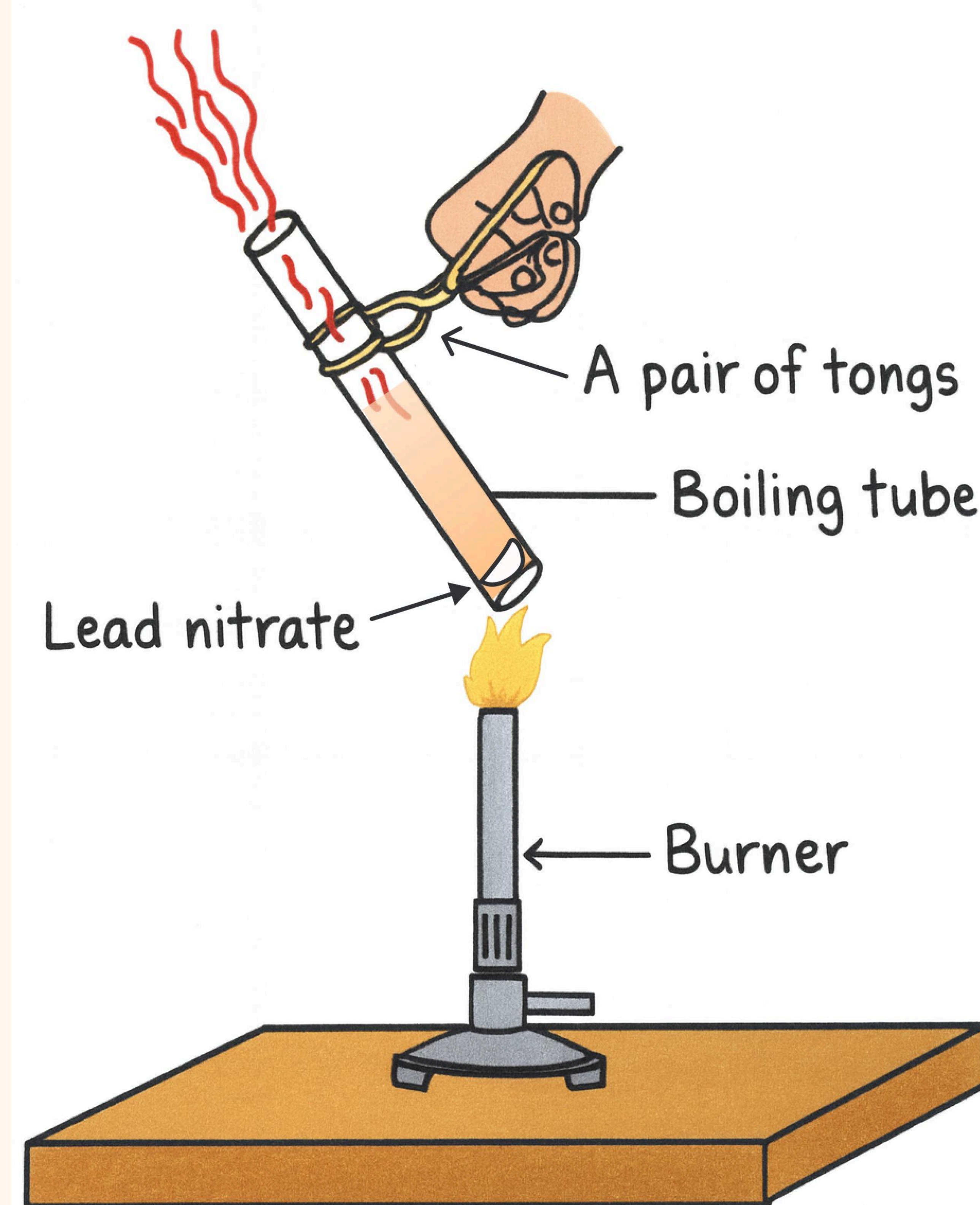
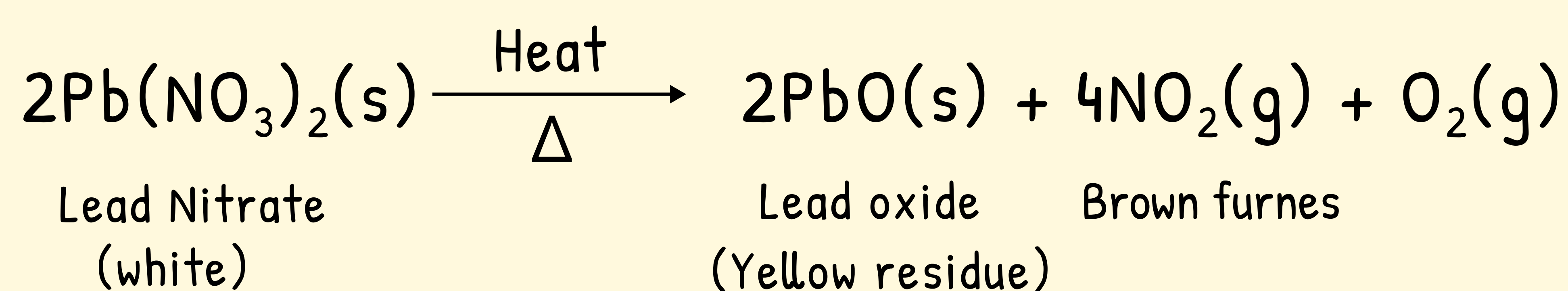


Activity 1.6

11

CAUTION : This Activity needs the teacher's assistance.

- Take about 2 g lead nitrate powder in a boiling tube.
- Hold the boiling tube with a pair of tongs and heat it over a flame, as shown in Figure.
- What do you observe? Note down the change, if any.



Conclusion:

- Cracking sound due to heating
- Irritating smell of brown fumes of $\text{NO}_2(\text{g})$
- Yellow solid residue (PbO) is formed
- NO_2 gas is acidic in nature and turns moist blue litmus red.
- This is also an endothermic reaction

Q10

Identify the product X obtained in the following chemical reaction $\text{CaCO}_3 \xrightarrow{\Delta} \text{X} + \text{CO}_2$

- (a) Quick lime (b) Gypsum (c) Limestone (d) Plaster of paris [CBSE 2025]

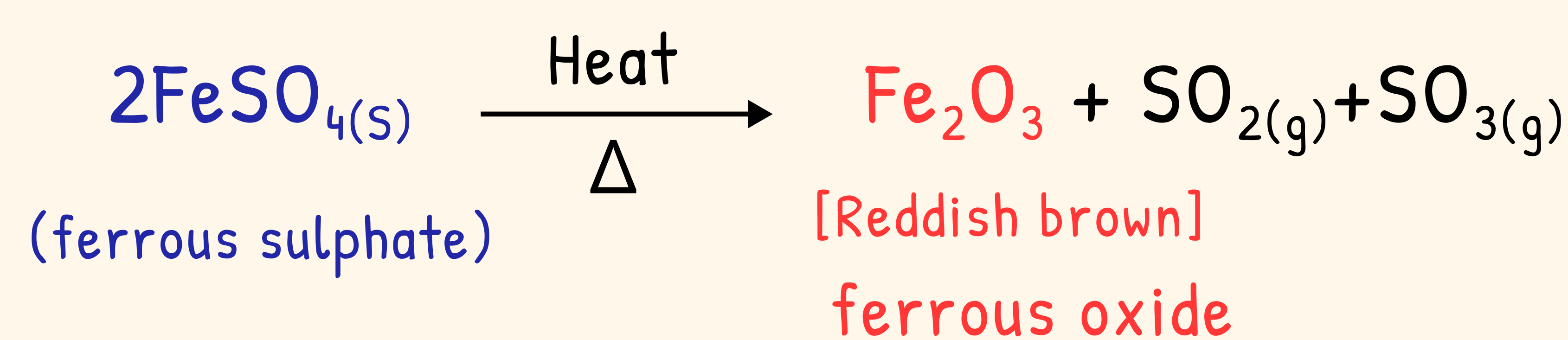
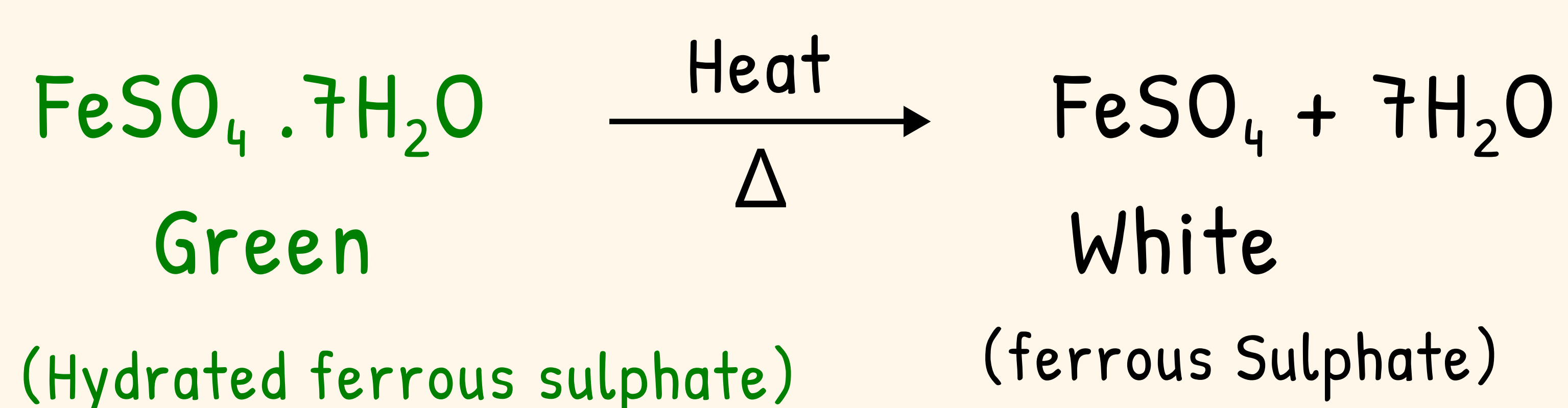
Answer (a) Quick lime (CaO)

Q11

What is observed when hydrated ferrous sulphate crystals are heated in a dry boiling tube? Give balanced chemical equations of the reaction that occurs?

Answer • Ferrous sulphate crystals are green in colour, on heating it loses water and changes to white colour. On further heating ferric oxide is formed which is reddish brown in color.

- Smell of burning sulphur (matchstick), smell of $\text{SO}_2(\text{g})$ (Suffocating odour); pungent smell.



[CBSE 2025]

Q12

The product obtained when lead nitrate is heated in a boiling tube are

- (a) PbO , N_2O and O_2 (b) NO , PbO and O_2 (c) $\text{Pb}(\text{NO}_2)_2$ and O_2 (d) NO_2 , PbO and O_2

Answer (d) NO_2 , PbO and O_2

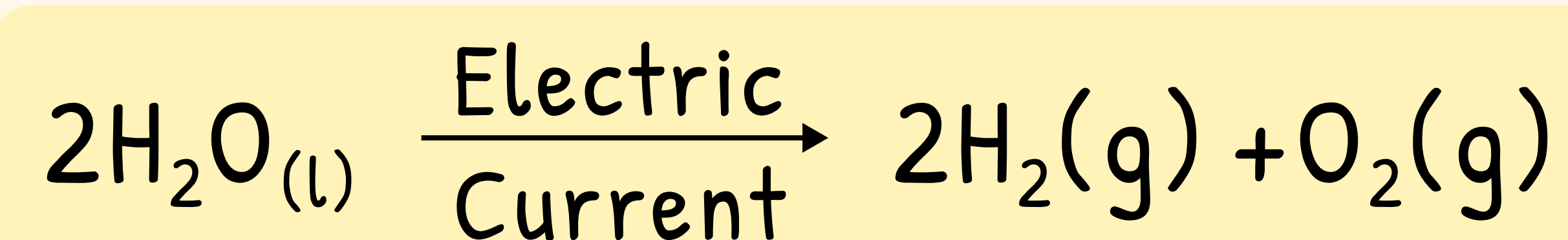
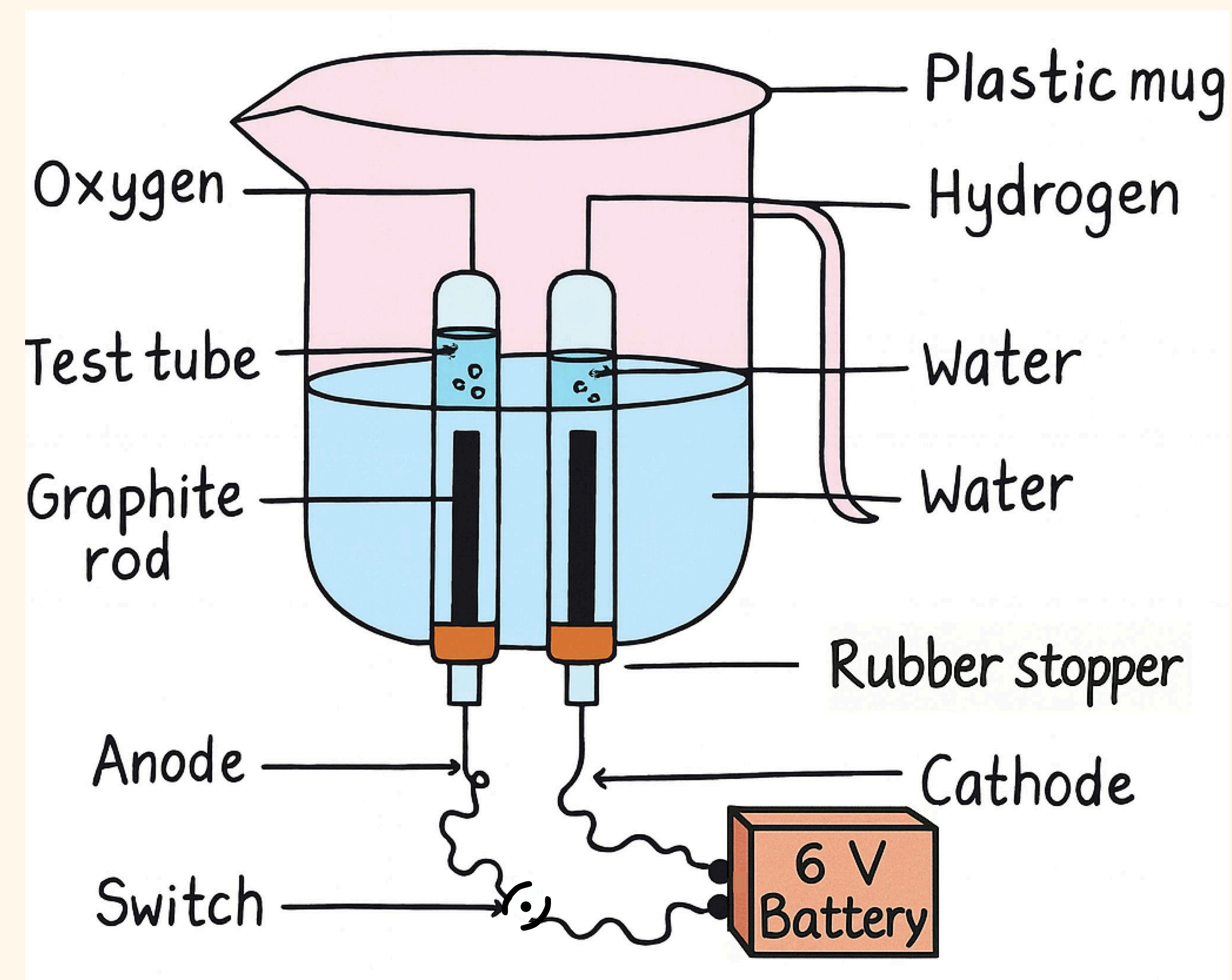
[CBSE 2025]



Activity 1.7

CAUTION : This Activity needs the teacher's assistance.

- Take a plastic mug. Drill two holes at its base and fit rubber stoppers in these holes. Insert carbon electrodes in these rubber stoppers as shown in figure.
- Connect these electrodes to a 6 volt battery.
- Fill the mug with water such that the electrodes are immersed. Add a few drops of dilute sulphuric acid to the water.
- Take two test tubes filled with water and invert them over the two carbon electrodes.
- Switch on the current and leave the apparatus undisturbed for some time.
- You will observe the formation of bubbles at both the electrodes. These bubbles displace water in the test tubes.
- Is the volume of the gas collected the same in both the test tubes?
- Once the test tubes are filled with the respective gases, remove them carefully.
- Test these gases one by one by bringing a burning candle close to the mouth of the test tubes.
- What happens in each case?
- Which gas is present in each test tube?



Conclusion:

- H_2 gas is obtained at cathode and O_2 gas is obtained at anode.
- The volume of the H_2 and O_2 gases are in the ratio 2:1
- The mass of the H_2 and O_2 gases are in the ratio 1:8
- If a burning candle is brought near then at

Cathode ($\text{H}_2(g)$):

- Pop sound is heard and candle extinguishes
- H_2 gas is combustible but not a supporter of combustion

Anode ($\text{O}_2(g)$):

- Candle burns more brightly / rekindles a glowing splinter.
- O_2 gas is not combustible but a supporter of combustion.

- Pure water is a poor conductor of electricity, so few drops of acid like (H_2SO_4) are added. The acid acts as an electrolyte and allows the solution to conduct electricity.

Q13

While electrolyzing water, before passing the current some drops of an acid are added why? Name the gases liberated at the cathode and anode. Write the relationship between the volume of gas collected at the anode and volume of gas collected at the cathode

Answer • We add few drops of acid to pure water to make it a good conductor, because it is a poor conductor of electricity.

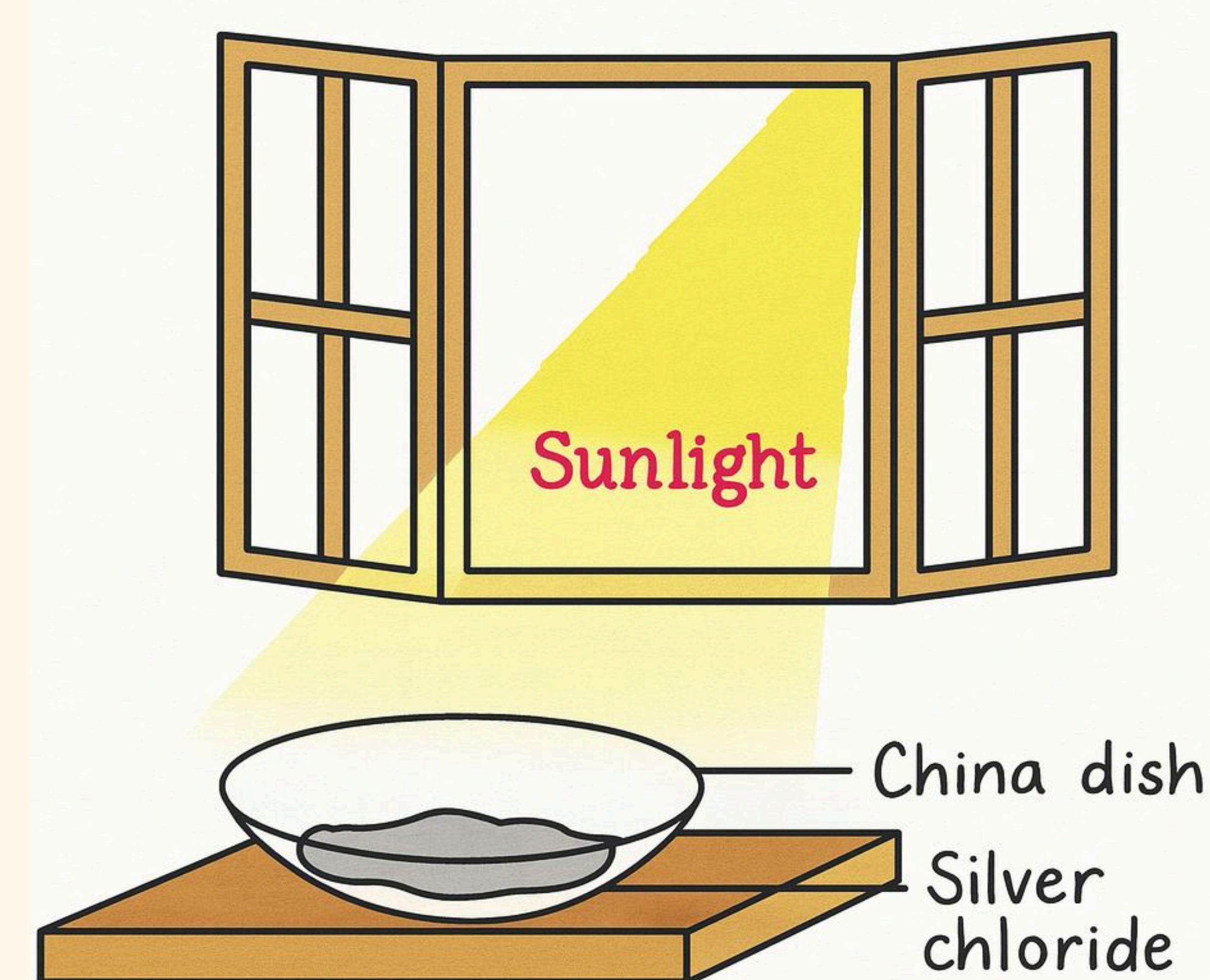
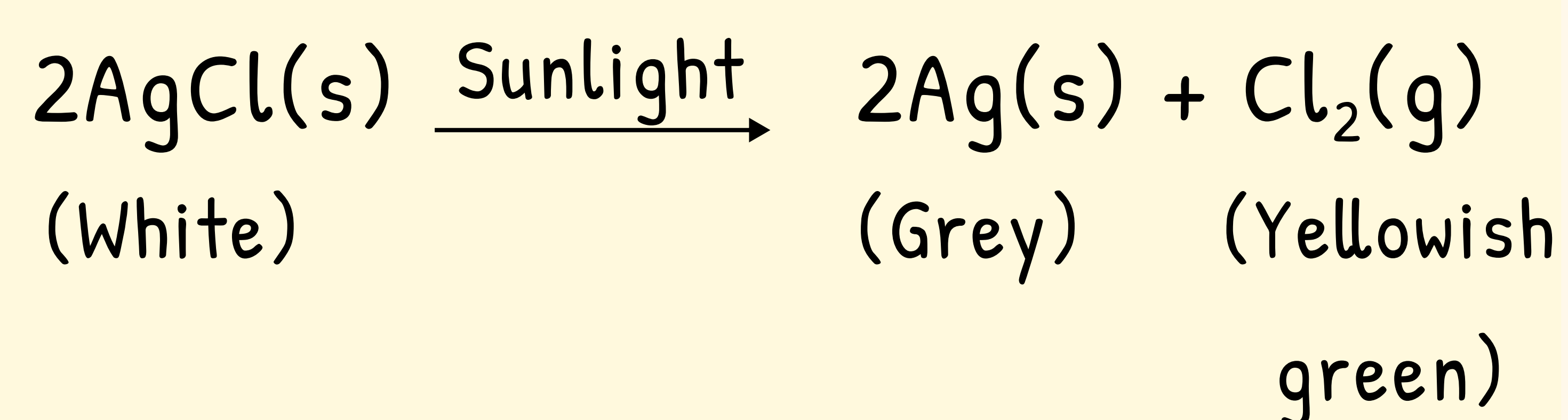
- The gas liberated at cathode is H_2 gas and the gas liberated at anode is O_2 gas
- The ratio of volume of H_2 and O_2 is 2:1

PHOTOCHEMICAL DECOMPOSITION [PHOTOLYSIS]

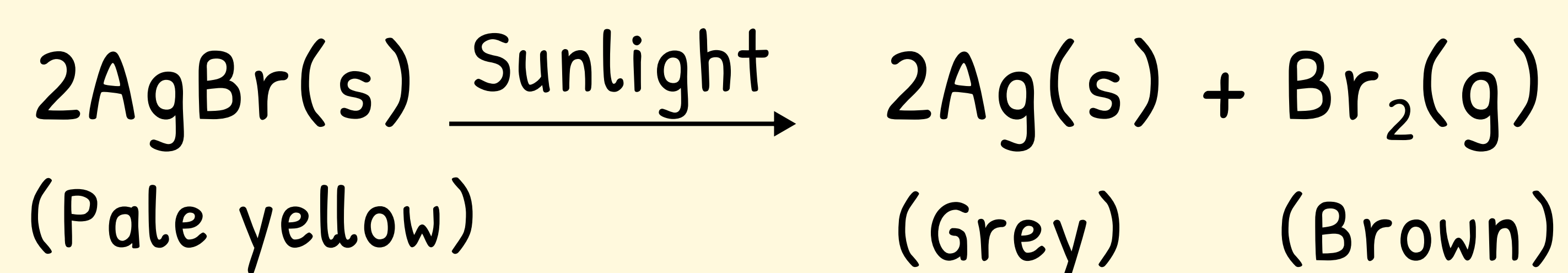


Activity 1.8

- Take about 2 g silver chloride in a china dish.
- What is its colour?
- Place this china dish in sunlight for some time as shown in figure.
- Observe the colour of the silver chloride after some time.



Similarly,



Conclusion:

- $AgCl$ and $AgBr$ breaks down when sunlight falls on them.
- $AgCl$ and $AgBr$ are kept in Black coloured bottles to protect from sunlight.
- This is used in black and white photography.

Q14

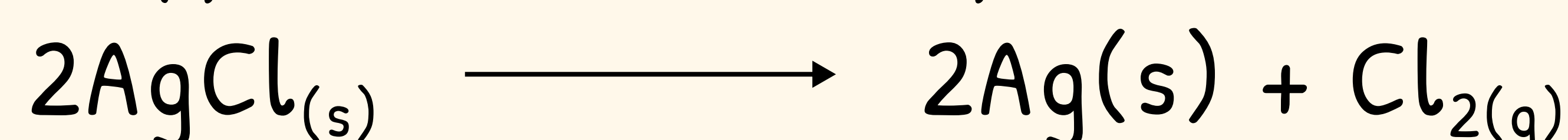
Silver chloride kept in a china dish turns grey in sunlight

[CBSE 2023]

- Write the colour of silver chloride when it was kept in the china dish
- Name the type of chemical reaction taking place and write the chemical equations for reaction
- State one use of the reaction. Name one more chemical which can be used the same purpose.

Answer A. Silver Chloride was white in colour when it was kept in china dish.

B. The type of reaction is photochemical decomposition and the equation is given by



C. The use of this reaction is in white and black photography

- Silver bromide ($AgBr$) can also be used for same

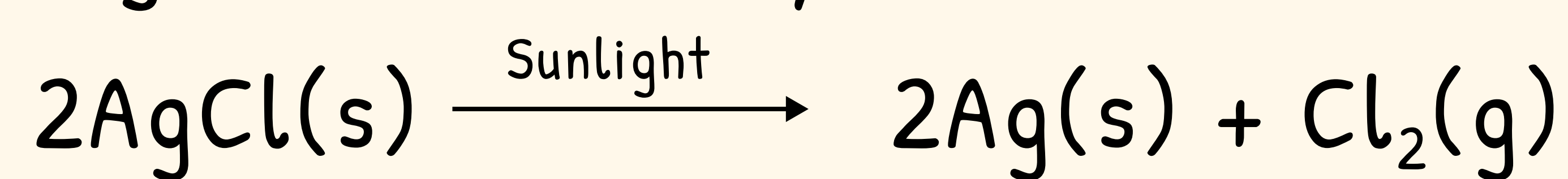
Q15

List the possible sources of energy required in decomposition reaction's Illustrate any one with a suitable example

[CBSE 2025]

Answer • Heat, Electricity and light

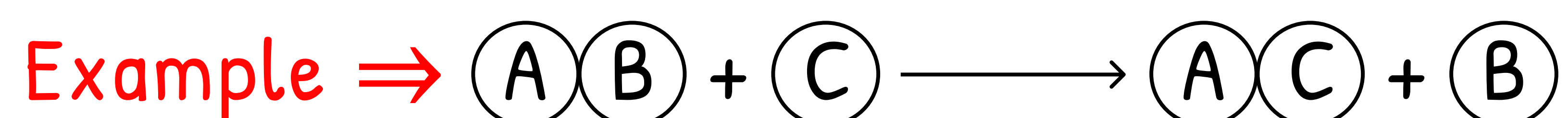
• Light $\longrightarrow$ Photolysis of silver chloride



NOTE : All decomposition reactions are endothermic reaction

DISPLACEMENT REACTION

More reactive element, replaces the less reactive element from its compound.



This shows that 'C' is more reactive than 'B', so it replaces 'B' and forms a compound with 'A'.

K Potassium

Na Sodium

Ca Calcium

Mg Magnesium

Al Aluminium

Zn Zinc

Fe Iron

Pb Lead

H Hydrogen

Cu Copper

Hg Mercury

Ag Silver

Au Gold

As we move from top to bottom
the reactivity decreases

• K is highly reactive whereas Au
is least reactive in this series

TRICK TO REMEMBER

Please Stop Calling Me A Zebra I Like Happy Clever Monkeys Selling Gold



Activity 1.9

CAUTION : This Activity needs the teacher's assistance.

- Take three iron nails and clean them by rubbing with sand paper.
- Take two test tubes marked as (A) and (B). In each test tube, take about 10 mL copper sulphate solution.
- Tie two iron nails with a thread and immerse them carefully in the copper sulphate solution in test tube B for about 20 minutes. Keep one iron nail aside for comparison.

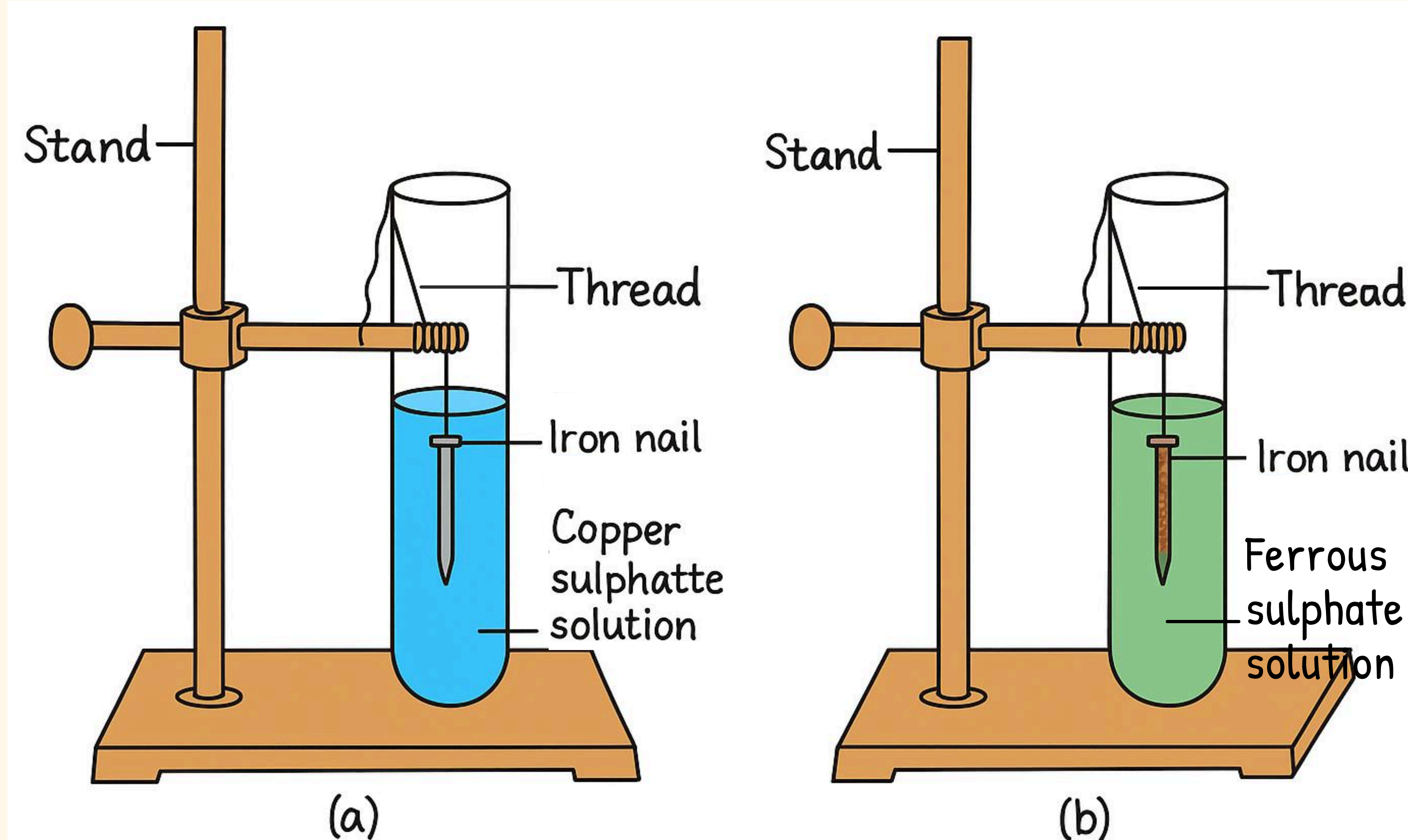
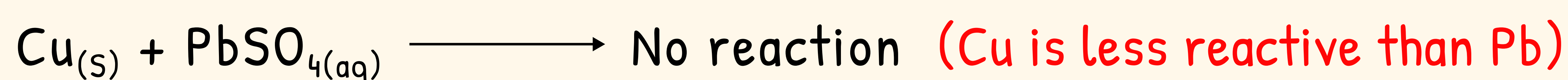
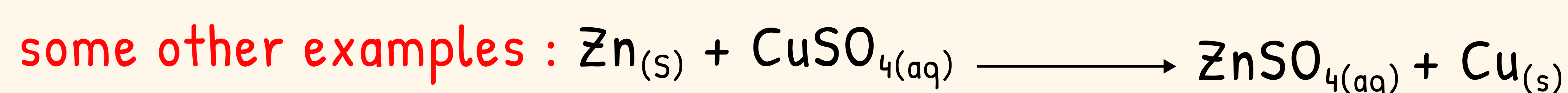
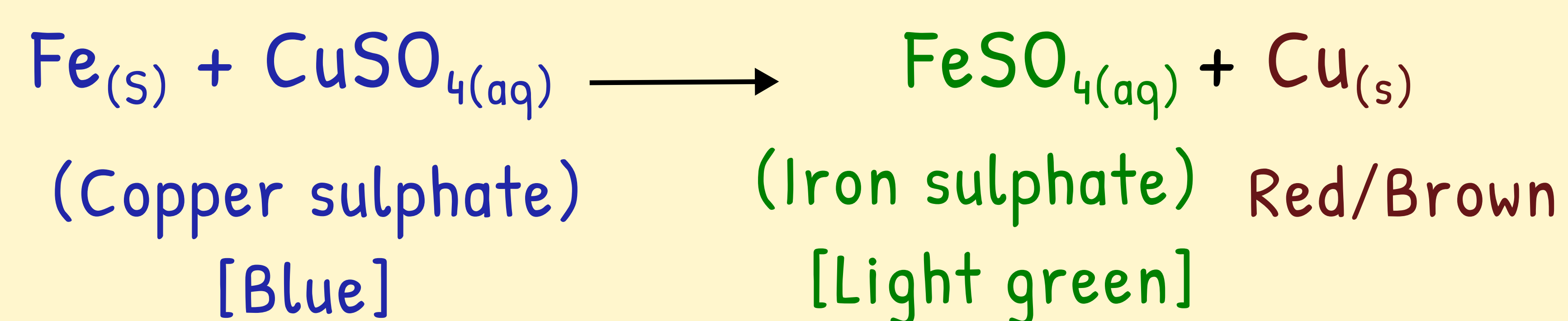


Figure (a) Iron nail dipped
in copper sulphate solution

Figure (b) Iron nail after
displacement reaction

- After 20 minutes, take out the iron nails from the copper sulphate solution.
- Compare the intensity of the blue colour of copper sulphate solutions in test tubes (A) and (B)
- Also, compare the colour of the iron nails dipped in the copper sulphate solution with the one kept aside

Example $\Rightarrow$ Iron nail in copper sulphate solution



Q16

A student has dipped some iron nails in an aqueous solution of copper sulphate, After about 25 minutes, he would observe that the colour of the solution has changed from

- (a) Blue to colourless (b) Blue to pale green (c) Pale green to blue (d) pale green to colourless

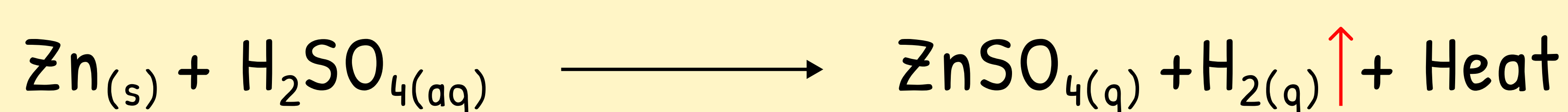
Answer (b) Blue to pale green because 'Fe' replaces 'Cu' in $\text{CuSO}_4(aq)$ and forms $\text{FeSO}_4(aq)$

IMPORTANT DISPLACEMENT REACTION

Activity 1.3

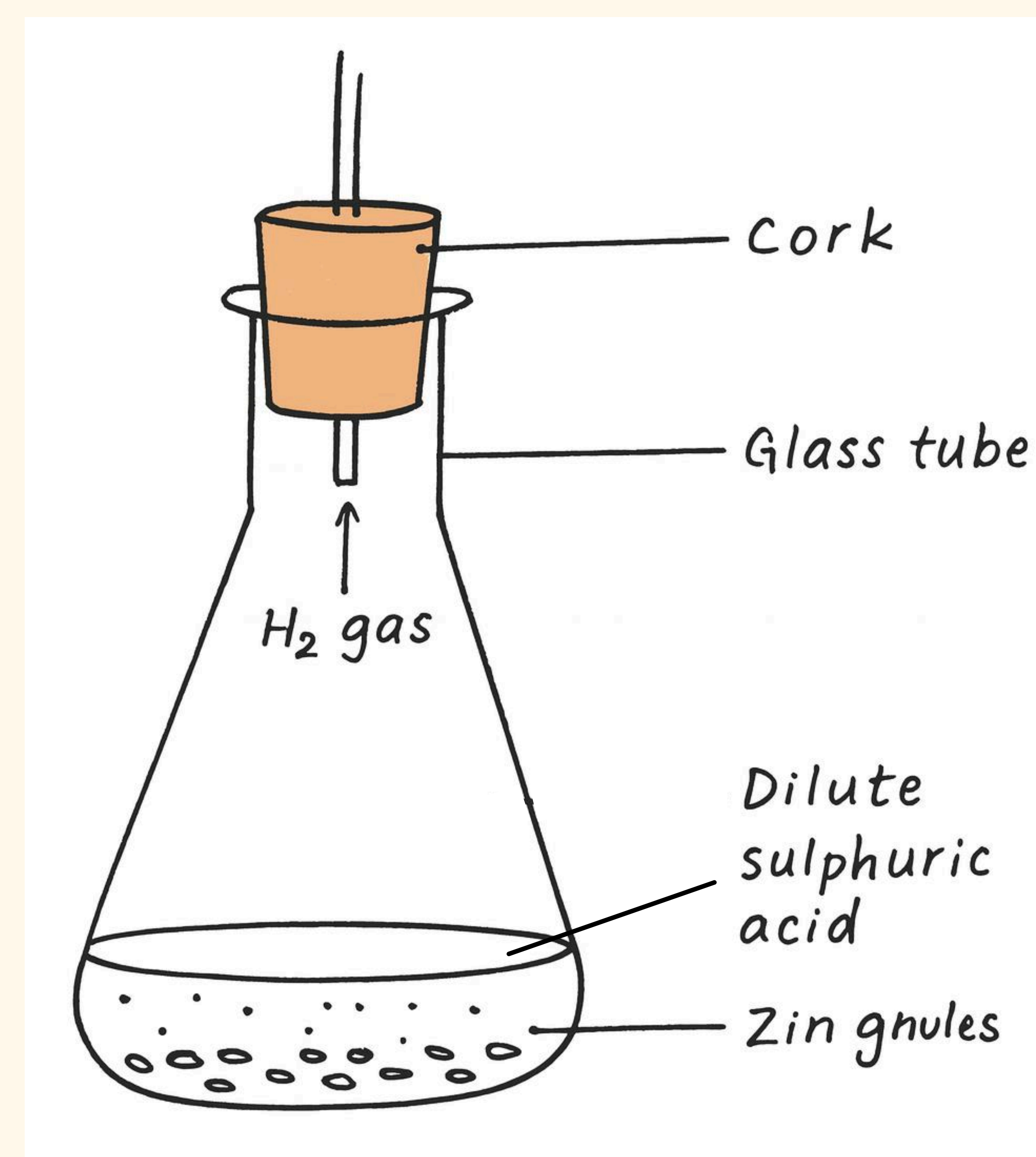
CAUTION : Handle the acid with care. This Activity needs the teacher's assistance.

- Take a few zinc granules in a conical flask or a test tube.
- Add dilute hydrochloric acid or sulphuric acid to this.
- Do you observe anything happening around the zinc granules?
- Touch the conical flask or test tube. Is there any change in its temperature?



Conclusion:

- H_2 gas is colourless, odourless and burns with a pop sound and extinguishes a burning candle.
- The reaction is highly exothermic as the temperature increases.
- Due to exothermic nature we use dilute acid, because concentrated acid would make it even more exothermic and dangerous reaction.

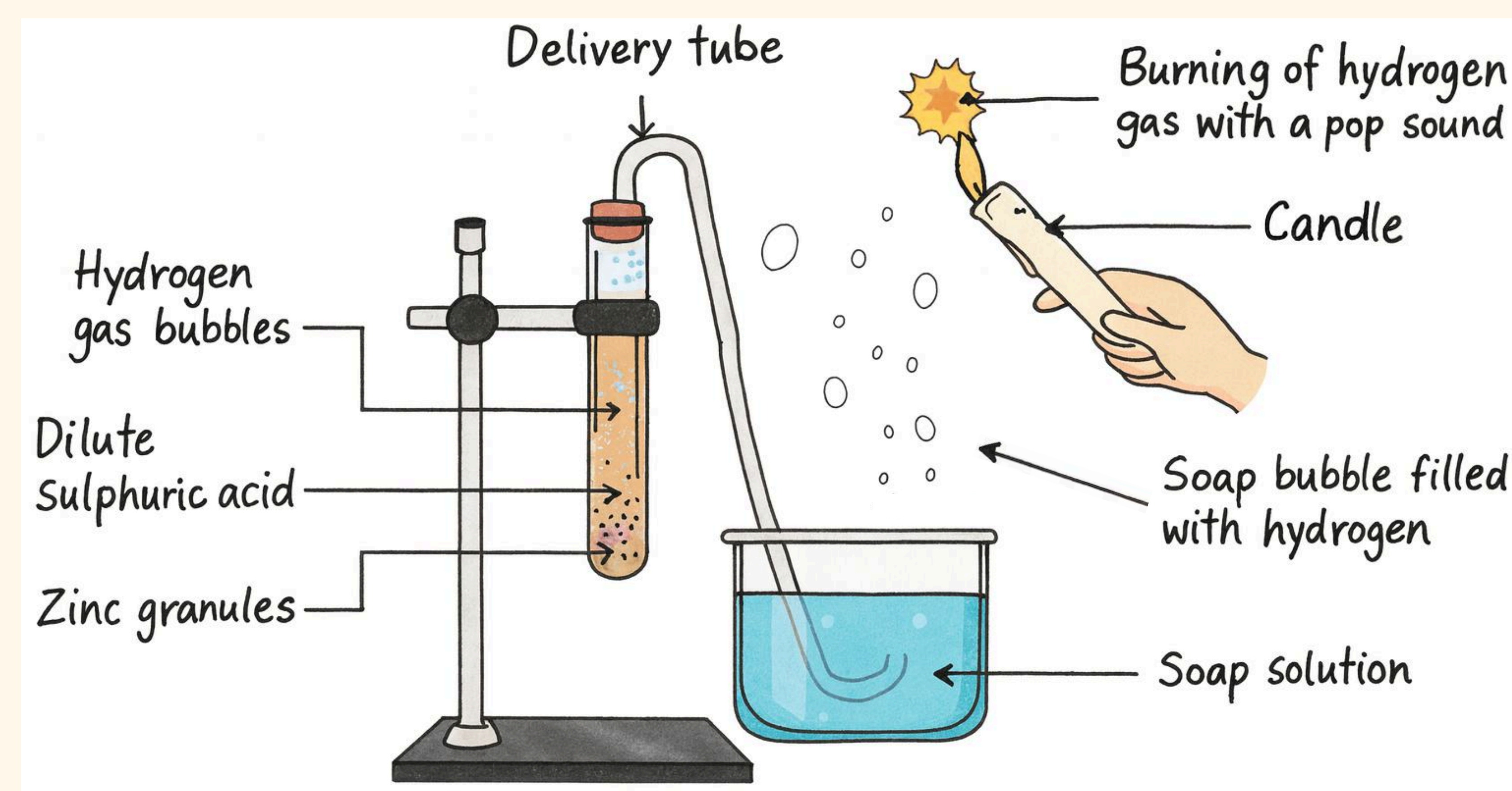


Study the diagram given below and identify the gas formed in the reaction

[CBSE 2022]

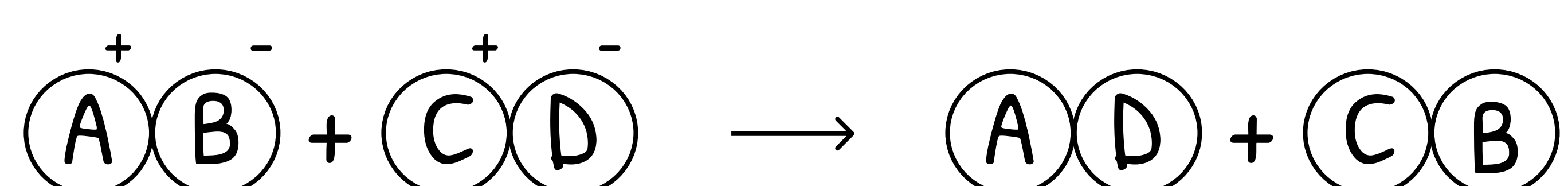
- (a) CO_2 , Which extinguishes a burning candle
- (b) O_2 , Due to which candle burns more brightly
- (c) SO_2 , Which produces a suffocating smell
- (d) H_2 , Which on burning produces a popping sound

Answer (d) H_2 , Which on burning produces a popping sound



DOUBLE DISPLACEMENT REACTION

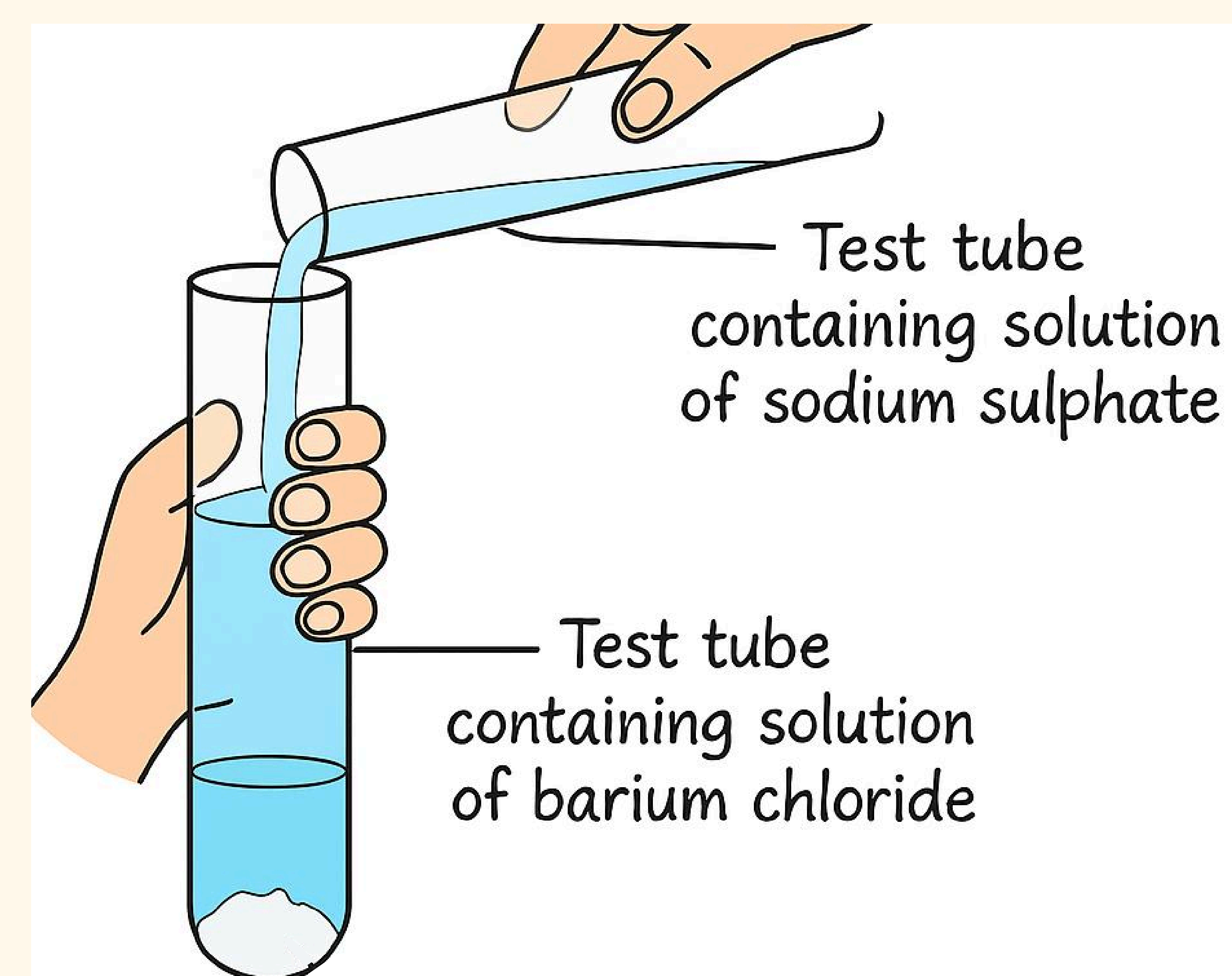
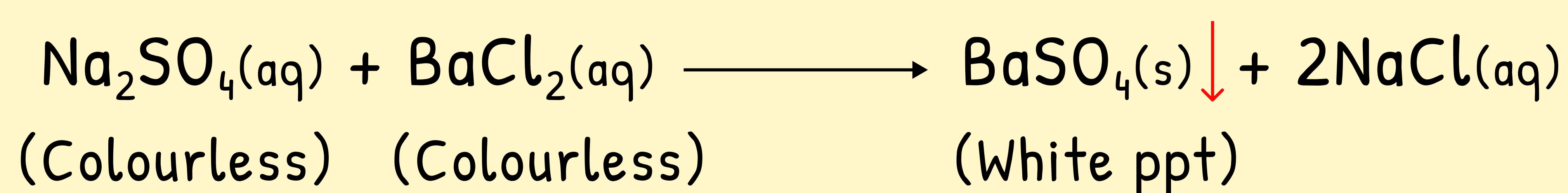
In this reaction exchange of ions takes place between reactants.



Example $\Rightarrow$ Sodium sulphate_(aq) + Barium chloride_(aq) $\longrightarrow$ Barium sulphate_(s) + Sodium chloride_(aq)

Activity 1.10

- Take about 3 mL of sodium sulphate solution in a test tube.
- In another test tube, take about 3 mL of barium chloride solution.
- Mix the two solutions as shown in figure.
- What do you observe?



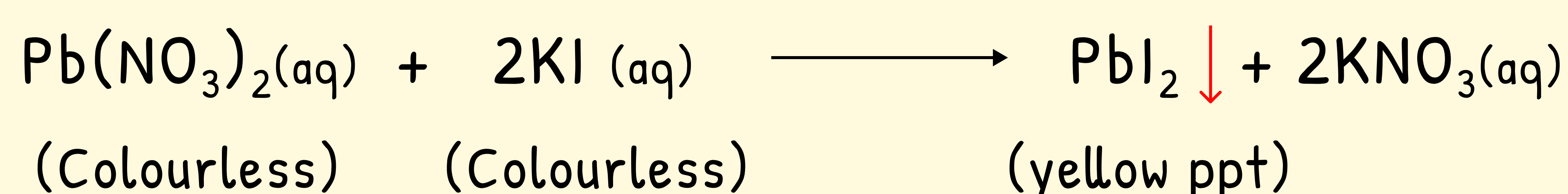
Conclusion:

- White insoluble substance (precipitate) of BaSO_4 , is formed.
- It is double displacement as well as a precipitation reaction
- Ion's in solution will be Na^+ and Cl^- as BaSO_4 , is ppt so it is insoluble.

PRECIPITATION REACTION

- when two aqueous soluble solutions react to form a semi soluble/ insoluble salt, the salt is called precipitate and the reaction is called precipitation reaction.

Example $\Rightarrow$ Lead nitrate_(aq) + potassium iodide_(aq)



Conclusion:

- Yellow insoluble substance (ppt) of PbI_2 is formed.
- It is also a precipitation reaction.
- Ion's present in solution will be K^+ and NO_3^-

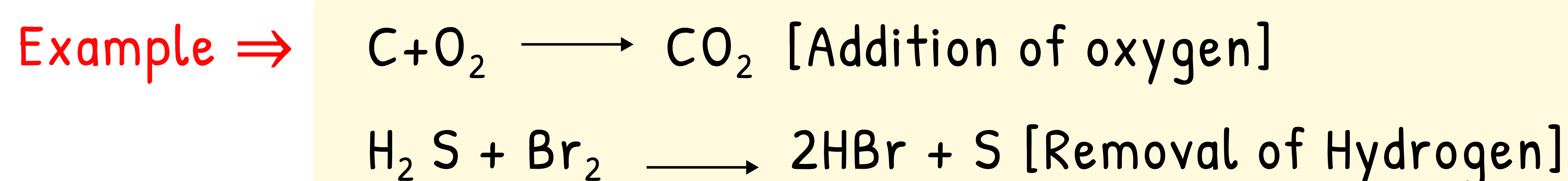
Q18

What is observed when an aqueous solution of sodium sulphate is added to an aqueous solution of Barium chloride taken in a test tube? Write the chemical equation for the reaction that occurs and name the type of reaction

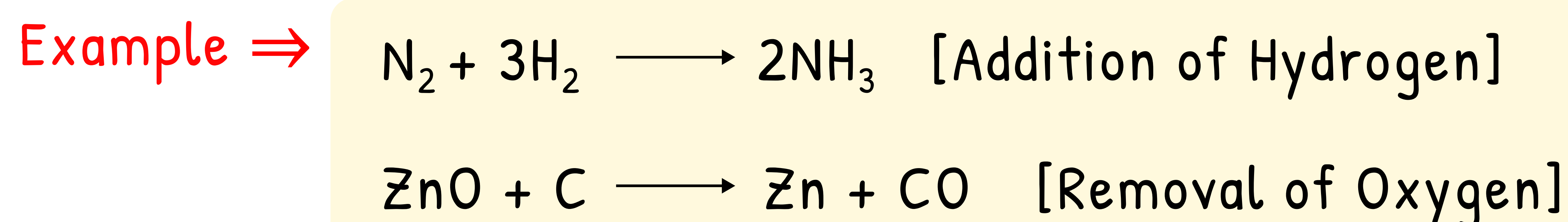
- Answer**
- White insoluble substance (ppt) of BaSO_4 is formed and Na^+ , Cl^- ions are present in solution
 - $\text{Na}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \longrightarrow \text{BaSO}_4(\text{s}) \downarrow + 2\text{NaCl}(\text{aq})$
 - The type of reaction is double displacement reaction.

[CBSE 2025]**Lecture 3****OXIDATION**

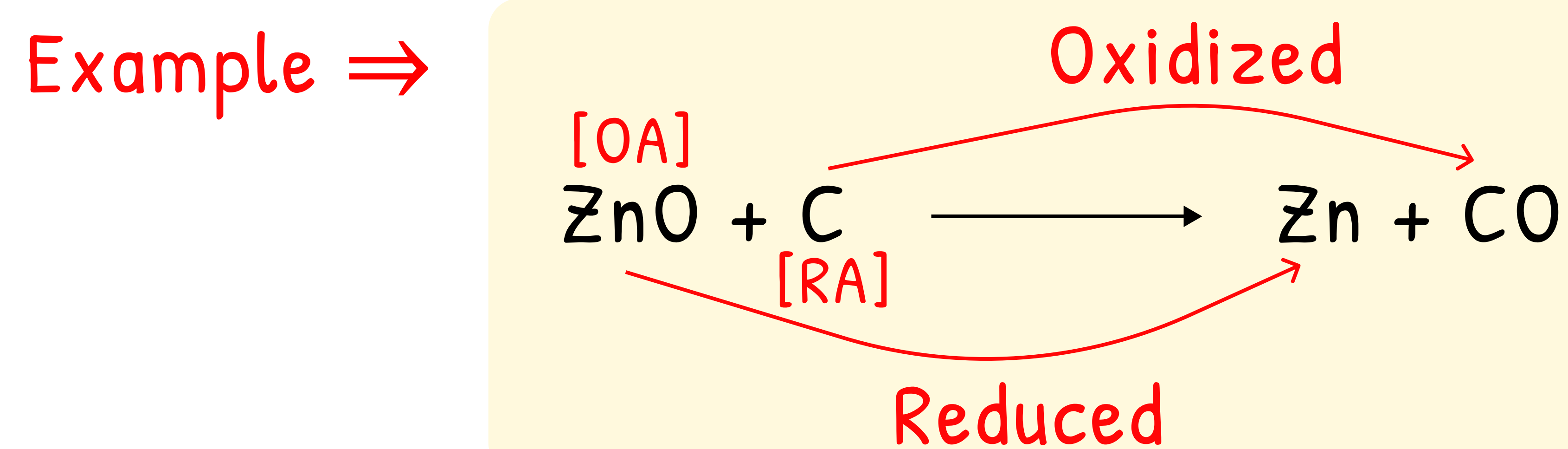
The process in which addition of oxygen or the removal of Hydrogen takes place

**REDUCTION**

The process in which addition of Hydrogen and removal of Oxygen takes place.

**REDOX REACTION**

A chemical reaction in which reduction and oxidation takes place simultaneously

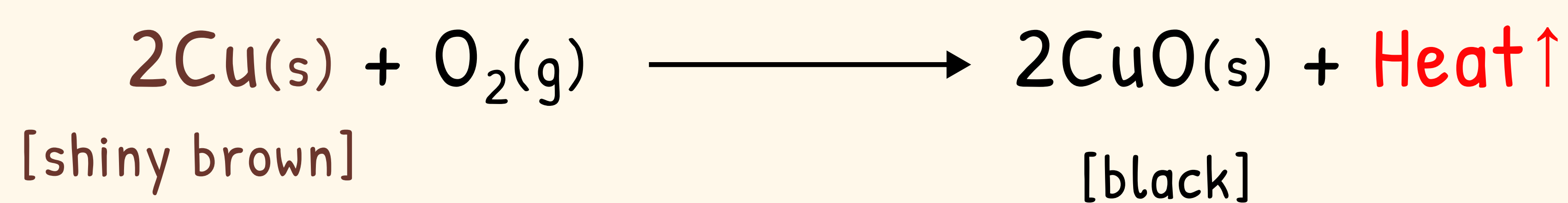


- The substance which is getting oxidized is called as Reducing agent (Reductant).
- The substance which is getting reduced is called as oxidizing agent (oxidant).

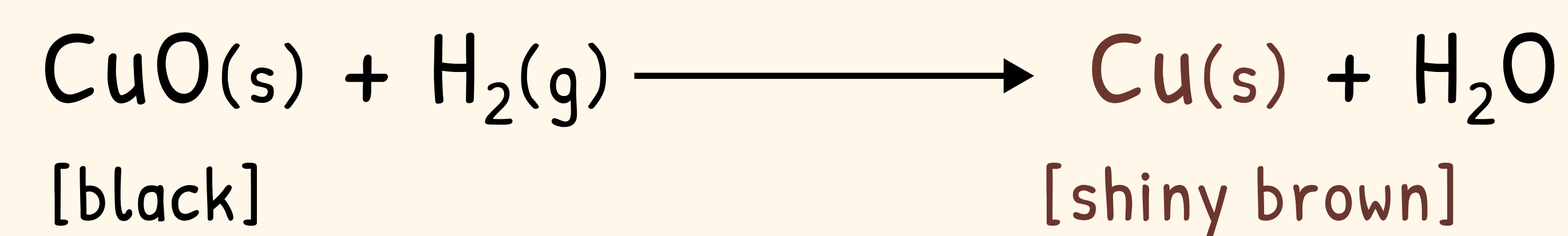
**Activity 1.11**

- Heat a china dish containing about 1 g copper powder as shown in figure.
- What do you observe?

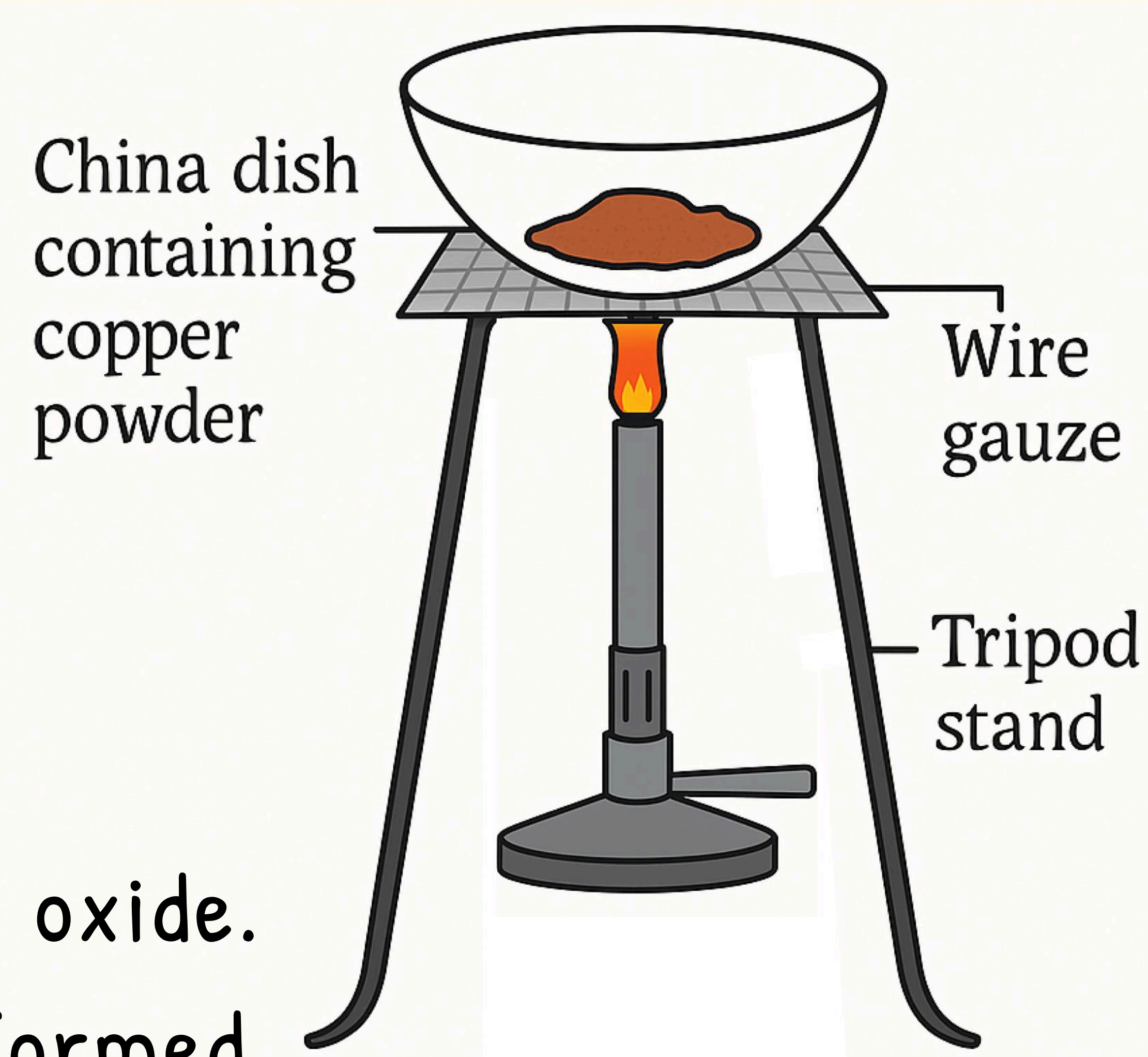
Oxidation of copper to copper oxide :



Reduction of copper oxide to copper :



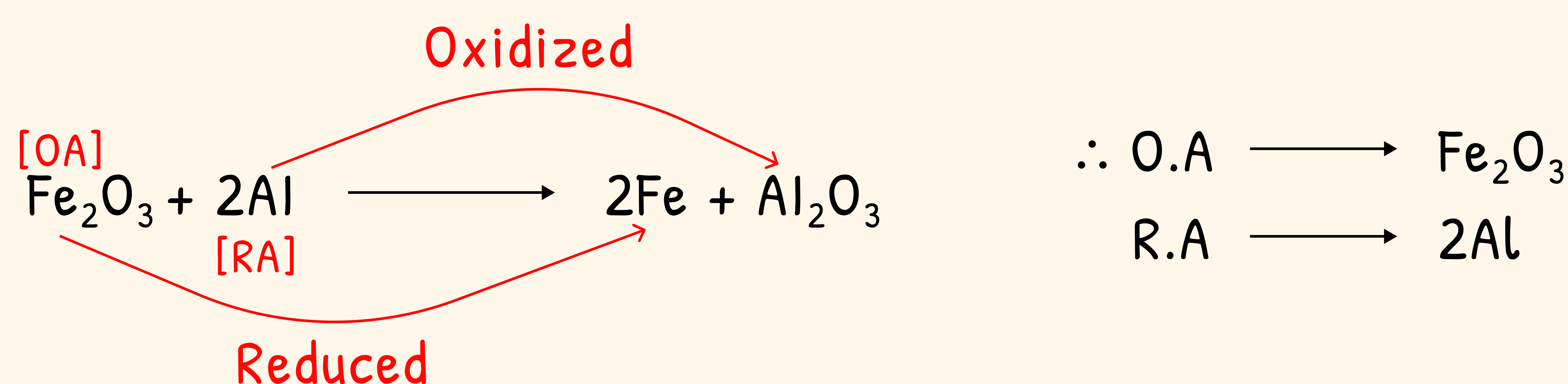
- The surface of Cu powder becomes coated with black copper(II) oxide.
- This is because oxygen is added to copper and copper oxide is formed.
- If hydrogen gas is passed over this heated material (CuO), the black coating on the surface turns brown as the reverse reaction takes place and copper is obtained.



Q19

Identify the oxidant and reductant in the following reaction $\text{Fe}_2\text{O}_3 + 2\text{Al} \longrightarrow 2\text{Fe} + \text{Al}_2\text{O}_3$

Answer



Q20

The reaction given is redox reaction because $\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$

- (a) MnO_2 is Oxidized and HCl is reduced
(b) HCl is Oxidized
(c) MnO_2 is reduced
(d) MnO_2 is reduced and HCl is Oxidized

Answer (d) MnO_2 is reduced and HCl is Oxidized

Q21

Which of the statements about the reaction are incorrect $2\text{PbO} + \text{C} \longrightarrow 2\text{Pb} + \text{CO}_2$

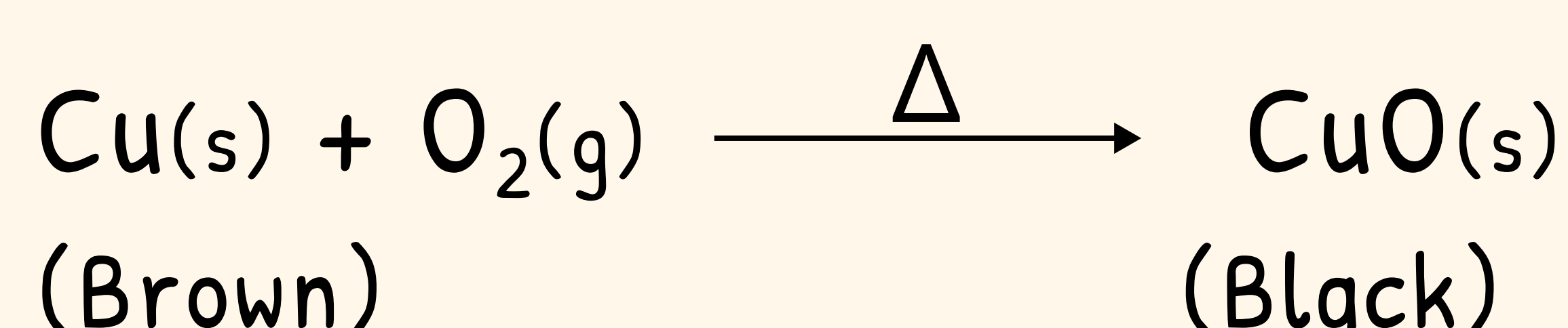
- (i) lead is getting reduced (iii) Carbon is getting oxidized
(ii) CO_2 is getting oxidized (iv) lead oxide is getting reduced
- (a) (i) and (ii) (b) (i) and (iii) (c) (i) , (ii) and (ii) (b) All

Answer (a) (i) and (ii) are incorrect, because PbO is getting reduced and Carbon is getting oxidized.

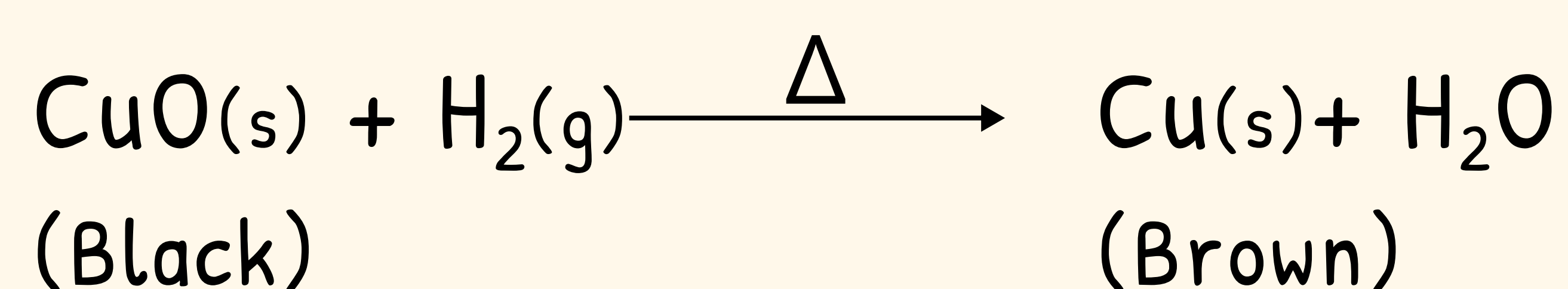
Q22

A copper wire on burning in flame, gets coated with a black substance. Write the chemical equation of the reaction that takes place. How can this chemical change be reversed [CBSE 2025]

Answer



This can be reversed by passing $\text{H}_{2(g)}$ over CuO

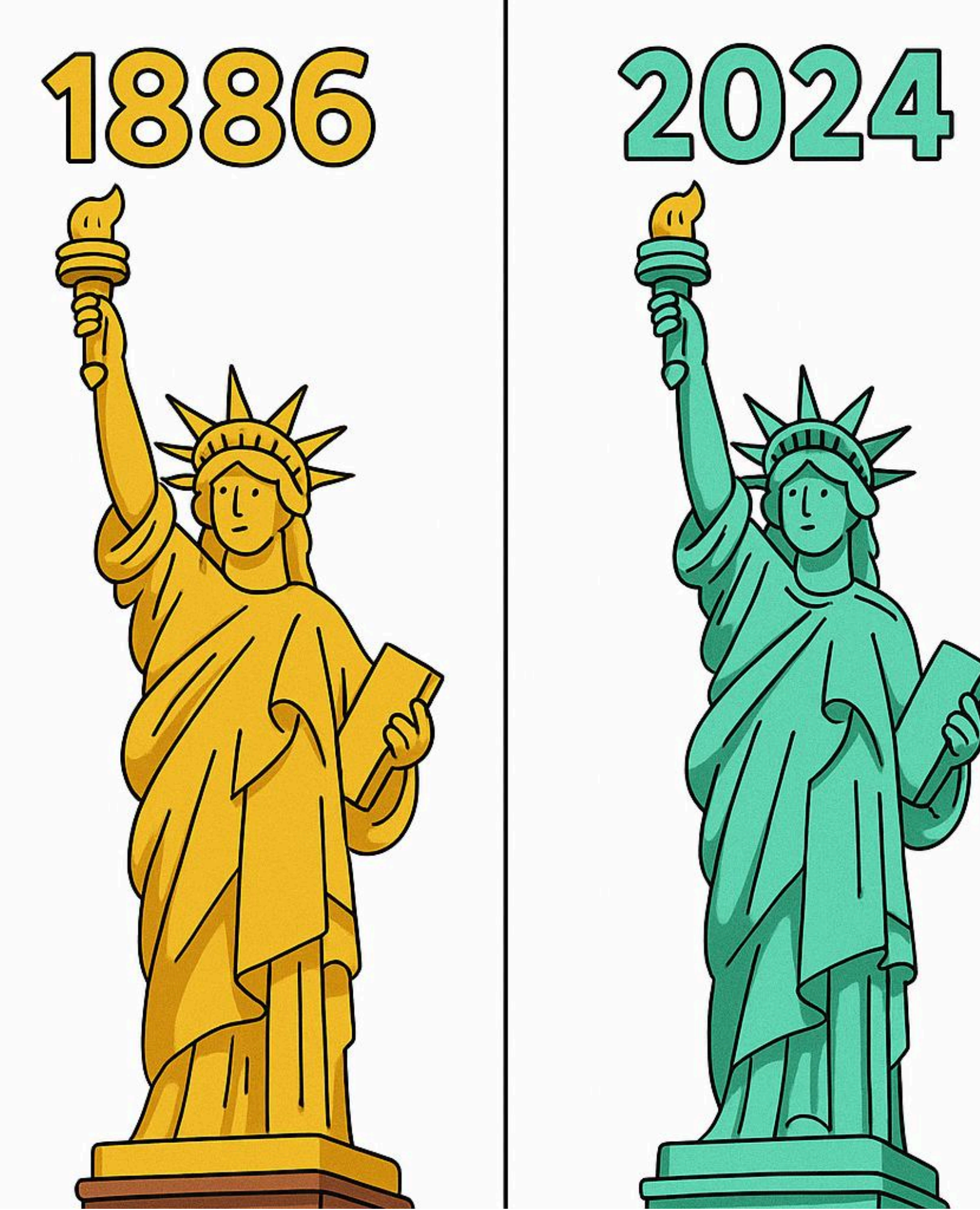
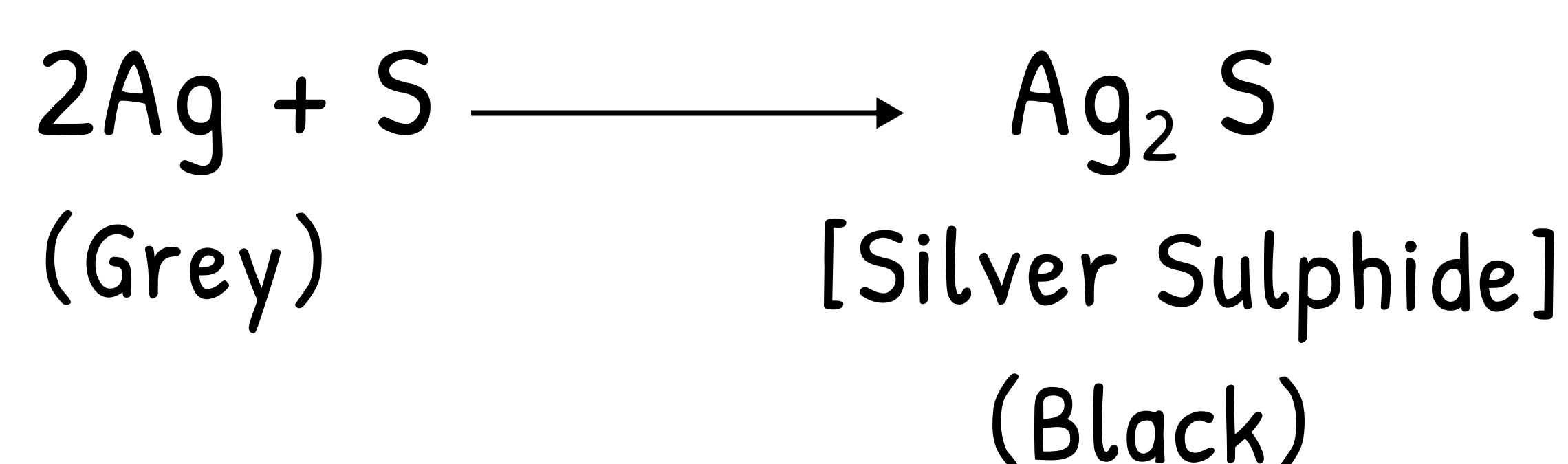
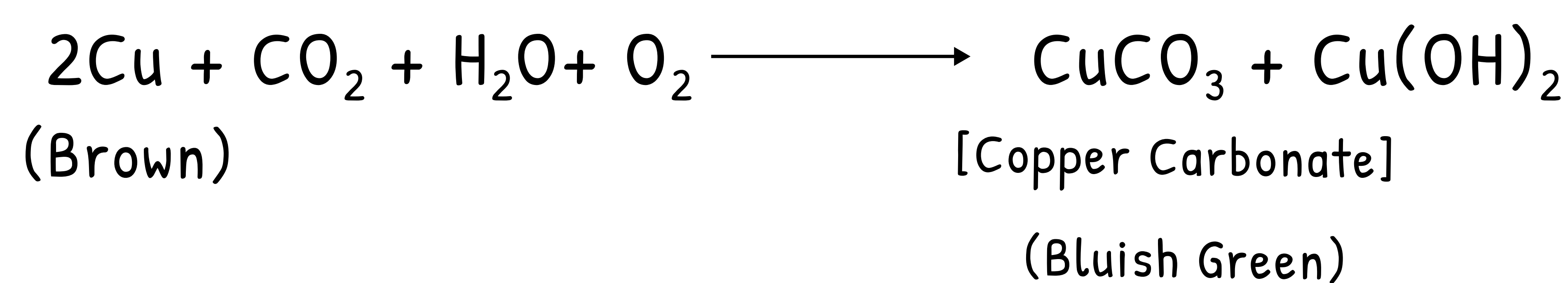
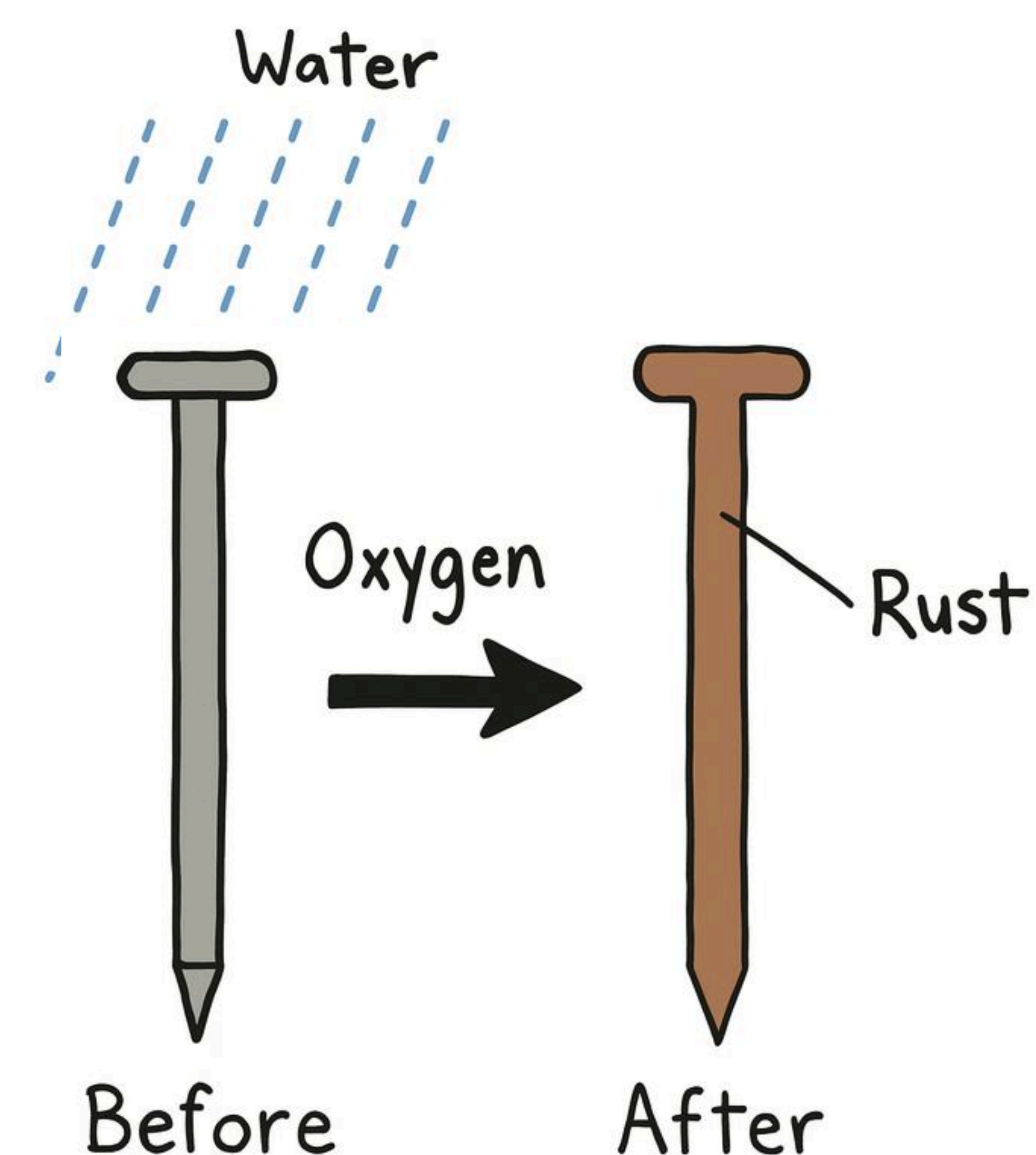
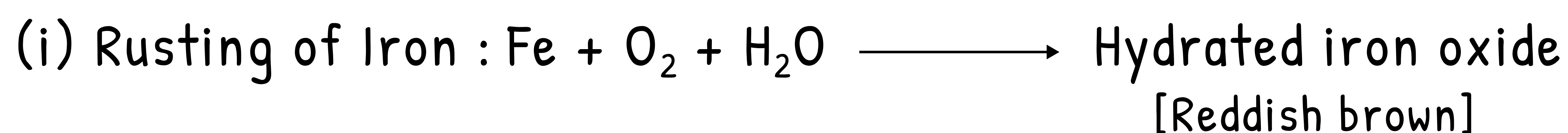


CORROSION

When a metal surfaces are attacked by the substances like oxygen, moisture or acids, the metal under go corrosion.

- This process is undesirable as it weakens the metal and diminishes its appearance.

Example $\Rightarrow$



Methods to prevent corrosion

- (i) Painting
- (ii) Greasing or oiling
- (iii) Alloying

RANCIDITY

If the food items which contain oil or fat are exposed to air for a long time, leads to oxidation. As a result the food develops an unpleasant odour and taste. This process is known as Rancidity.

Methods to prevent Rancidity

- (i) Addition of Antioxidants.
- (ii) Filling of nitrogen gas.
- (iii) Refrigeration of food items.
- (iv) Use of airtight container.