1. Tick (✓) the best answer

a. In which medium do sodium chloride and silver nitrate react with each other?
→ **iv. Aqueous solution** ✓

b. What kind of reaction occurs between sodium chloride and silver nitrate solutions?
→ **iii. Displacement** (double displacement actually) ✓

c. When sodium metal is dropped into chlorine gas, common salt is formed. Which equation represents this?
→ **iii. $2Na + Cl_2 \rightarrow 2NaCl$** ✓

d. Which of the following is an example of decomposition reaction?
→ **i. $CaCO_3 \rightarrow CaO + CO_2$** ✓

e. A chemical reaction is represented as:
$X + H_2SO_4 \rightarrow ZnSO_4 + H_2$.
X = ?
→ **ii. Zn** ✓

2. Answer these questions in one sentence

a. A piece of iron left in open area turns brown after some days. What kind of change is this?
→ It is a **chemical change** called **rusting of iron**.

b. What is neutralization reaction?
→ A reaction between an **acid and a base** to form **salt and water** is called neutralization reaction.

c. What kind of chemical reaction is affected by pressure?
→ **Gaseous reactions** are affected by pressure.

d. Give an example of synthesis reaction.
→ **$2H_2 + O_2 \rightarrow 2H_2O$**.

e. Give an example of a negative catalyst.
→ **Glycerine** acts as a negative catalyst in the decomposition of hydrogen peroxide.

f. An equation is given: $2KClO_3 \rightarrow 2KCl + 3O_2$. What kind of chemical reaction is it? Why?
→ It is a **decomposition reaction** because a single compound ($KClO_3$) breaks down into simpler substances (KCl and O_2).

g. Define single displacement reaction.
→ A reaction in which **a more reactive element displaces a less reactive element** from its compound is called a single displacement reaction.

h. Write an example of double displacement reaction.
→ **$NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl (\downarrow)$**.

3. Give reasons

a. The rate of reaction becomes faster if a bulk solid is finely powdered.
→ Because **powdering increases the surface area**, so more particles are exposed to react at the same time, which increases reaction rate.

b. Acid–base reaction is called neutralization reaction.
→ Because in this reaction, **the effect of acid and base is neutralized**, producing **salt and water**.

c. Heating increases the rate of chemical reaction
→ Heating increases the **kinetic energy** of the particles, causing them to move faster. This leads to **more frequent and more energetic collisions**, so more particles can overcome the **activation energy**, increasing the reaction rate.

d.Hydrogen peroxide is not stored in a transparent bottle
→ Hydrogen peroxide **decomposes on exposure to light** into water and oxygen. A transparent bottle allows light to pass through, so it is stored in a **dark or opaque bottle** to prevent decomposition.

Write down difference between:

Acid and base

Acid	Base
An acid tastes sour.	A base tastes bitter or slippery.
An acid has a pH less than 7.	A base has a pH greater than 7.
An acid turns blue litmus paper red.	A base turns red litmus paper blue.
An acid produces H^+ ions in water.	A base produces OH^- ions in water.
An example of an acid is hydrochloric acid (HCl).	An example of a base is sodium hydroxide (NaOH).

Combination and decomposition reaction

Combination (Synthesis)	Decomposition
In a combination reaction, two or more substances combine to form a single product.	In a decomposition reaction, one compound breaks down into two or more simpler substances.
An example of a combination reaction is $2H_2 + O_2 \rightarrow 2H_2O$.	An example of a decomposition reaction is $2KClO_3 \rightarrow 2KCl + 3O_2$.

Single and double displacement reaction

Single Displacement	Double Displacement
In a single displacement reaction, one element displaces another element from its compound.	In a double displacement reaction, two ions exchange their partners between two compounds.
An example of a single displacement reaction is $Zn + 2HCl \rightarrow ZnCl_2 + H_2$.	An example of a double displacement reaction is $AgNO_3 + NaCl \rightarrow AgCl\downarrow + NaNO_3$.

a. Define skeleton and balanced chemical equations with examples

Skeleton equation: A chemical equation showing reactants and products with their formulas but not balanced.

Example: $H_2 + O_2 \rightarrow H_2O$

Balanced equation: A chemical equation with coefficients added so that the number of atoms of each element is the same on both sides.
Example: $2H_2 + O_2 \rightarrow 2H_2O$

b. Why is it necessary to balance a chemical reaction?

To obey the **Law of Conservation of Mass** – the number of atoms of each element must be the same on both sides of the equation.

c. Example of a decomposition reaction caused by light:

Photodecomposition of silver bromide:

$2AgBr \rightarrow 2Ag + Br_2$ (sunlight)

d. Example of a decomposition reaction enhanced by a catalyst:
Decomposition of hydrogen peroxide using MnO_2 as catalyst:

$2H_2O_2 \rightarrow 2H_2O + O_2$ (MnO_2)

e. Balanced chemical equation of sulphuric acid reacting with ammonium hydroxide:

$H_2SO_4 + 2NH_4OH \rightarrow (NH_4)_2SO_4 + 2H_2O$

f. Balanced reaction between aluminium and dilute sulphuric acid & type:

$2Al + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$

Type: Single displacement reaction, because aluminium displaces hydrogen from sulphuric acid.

g. How does heat enhance reaction rate?
Heating increases the **kinetic energy** of particles, causing more frequent and energetic collisions, so more particles can overcome the **activation energy**, increasing the reaction rate.

h. Convert word equation to balanced formula:
Word: Nitric acid + calcium hydroxide → calcium nitrate + water
Balanced formula:

$2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

i. Two ways to increase the rate of a slow reaction:

Increase the **temperature**.

Increase **concentration** (or surface area for solids) or use a **catalyst**.

j. Two characteristics of a catalyst:

Increases the reaction rate without being consumed.

Lowers the activation energy and remains chemically unchanged at the end.

k. Balanced equation using a positive catalyst:
Decomposition of potassium chlorate with MnO_2:

$2KClO_3 \rightarrow 2KCl + 3O_2$ (MnO_2)

l. Define positive catalyst with example:
A **positive catalyst** is a substance that **increases the rate of a reaction**.

Example: MnO_2 in decomposition of H_2O_2: $2H_2O_2 \rightarrow 2H_2O + O_2$ (MnO_2)

m. What happens when lead nitrate is heated?
Lead nitrate decomposes into lead oxide, nitrogen dioxide, and oxygen:

$2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$

6. What happens when… (with balanced equations)

a. Potassium chlorate is heated:

$2KClO_3 \rightarrow 2KCl + 3O_2$

b. Silver nitrate solution + calcium chloride solution:

$2AgNO_3(aq) + CaCl_2(aq) \rightarrow 2AgCl \downarrow + Ca(NO_3)_2(aq)$

(AgCl is a white precipitate)

c. Calcium oxide reacts with water:

$CaO + H_2O \rightarrow Ca(OH)_2$

(Slaking of lime)

d. Iron reacts with oxygen:

$4Fe + 3O_2 \rightarrow 2Fe_2O_3$(Formation of iron(III) oxide / rust)

e. Mercuric oxide is heated:

$2HgO \rightarrow 2Hg + O_2$

f. Potassium bromide + chlorine gas:

$2KBr + Cl_2 \rightarrow 2KCl + Br_2$

(Chlorine displaces bromine)

g. Sodium metal + water:

$2Na + 2H_2O \rightarrow 2NaOH + H_2 \uparrow$

(Vigorous reaction; hydrogen may ignite)

h. Nitrogen + hydrogen (Haber process):

$N_2 + 3H_2 \rightarrow 2NH_3$

i. Silver bromide exposed to sunlight:

$2AgBr \rightarrow 2Ag + Br_2$ (sunlight)

Write down the balanced chemical equations for the following reaction.

a. Iron + Sulphur → Iron sulphide
$Fe + S \rightarrow FeS$

b. Copper carbonate → Copper oxide + Carbon dioxide
$CuCO_3 \rightarrow CuO + CO_2$

c. Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water
$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

d. Nitric acid + Magnesium hydroxide → Magnesium nitrate + Water
$2HNO_3 + Mg(OH)_2 \rightarrow Mg(NO_3)_2 + 2H_2O$

e. Calcium bicarbonate → Calcium carbonate + Water + Carbon dioxide
$Ca(HCO_3)_2 \rightarrow CaCO_3 + H_2O + CO_2$

f. Calcium chloride + Silver nitrate → Calcium nitrate + Silver chloride
$CaCl_2 + 2AgNO_3 \rightarrow Ca(NO_3)_2 + 2AgCl$

g. Sodium carbonate + Hydrochloric acid → Sodium chloride + Water + Carbon dioxide
$Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

h. Potassium chlorate → Potassium chloride + Oxygen
$2KClO_3 \rightarrow 2KCl + 3O_2$

i. Sodium hydroxide + Nitric acid → Sodium nitrate + Water
$NaOH + HNO_3 \rightarrow NaNO_3 + H_2O$

j. Lead nitrate + Potassium iodide → Potassium nitrate + Lead iodide
$Pb(NO_3)_2 + 2KI \rightarrow 2KNO_3 + PbI_2$