

1. Chemical Reactions and Equations

1. Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

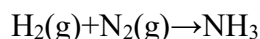
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

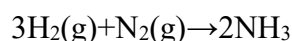
(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Solution:

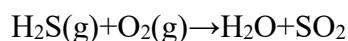
(a) Hydrogen gas combines with nitrogen to form ammonia.



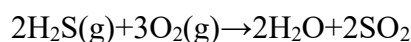
The balanced equation for this reaction can be written as:



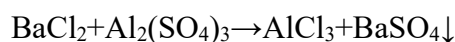
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.



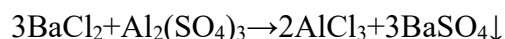
The balanced equation for this reaction can be written as:



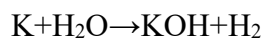
(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.



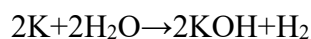
The balanced equation for this reaction can be written as:



(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.



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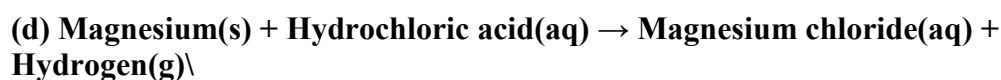


2. Write the balanced chemical equation for the following and identify the type of reaction in each case.

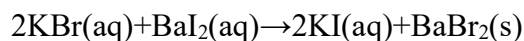
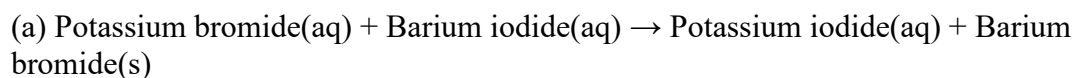
(a) Potassium bromide(aq) + Barium iodide(aq) $\rightarrow$ Potassium iodide(aq) + Barium bromide(s)

(b) Zinc carbonate(s) $\rightarrow$ Zinc oxide(s) + Carbon dioxide(g)

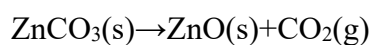
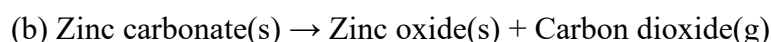
(c) Hydrogen(g) + Chlorine(g) $\rightarrow$ Hydrogen chloride(g)



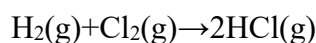
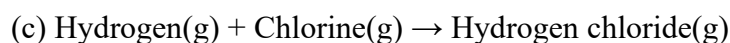
Solution:



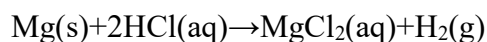
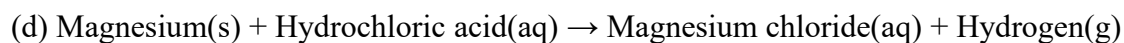
In this reaction, both the reactants exchange ions to form two new products. Hence, it is a double displacement reaction



In this reaction, a single substance yields two different products. Hence, it is a decomposition reaction.



In this reaction, two different reactants react with each other to form a single product. Hence, it is called a combination reaction.



In this reaction, more reactive Mg is replacing less reactive H. Hence, it is displacement reaction.

3. a) Rehmat classified the reaction between Methane and Chlorine in presence of sunlight as a substitution reaction. Support Rehmat's view with suitable justification and illustrate the reaction with the help of a balanced chemical equation.

b) Chlorine gas was prepared using electrolysis of brine solution. Write the chemical equation to represent the change. Identify the other products formed in the process and give one application of each.

Solution:



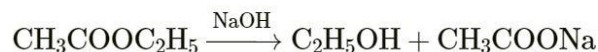


4. Raina while doing certain reactions observed that heating of substance 'X' with vinegar like smell with a substance 'Y' (which is used as an industrial solvent) in presence of conc. Sulphuric acid on a water bath gives a sweet-smelling liquid 'Z' having molecular formula $C_4H_8O_2$. When heated with caustic soda (NaOH), 'Z' gives back the sodium salt of and the compound 'Y'. Identify 'X', 'Y', and 'Z'. Illustrate the changes with the help of suitable chemical equations.

X is ethanoic acid whose molecular formula is CH_3COOH
Y is ethanol whose molecular formula is $\text{C}_2\text{H}_5\text{OH}$
Z is Ethyl ethanoate whose molecular formula is $\text{CH}_3\text{COOC}_2\text{H}_5$

$$\text{CH}_3\text{---COOH} + \text{CH}_3\text{---CH}_2\text{OH} \xrightleftharpoons{\text{Acid}} \text{CH}_3\text{---}\overset{\text{O}}{\underset{\text{O}}{\text{C}}}\text{---O---CH}_2\text{---CH}_3 + \text{H}_2\text{O}$$

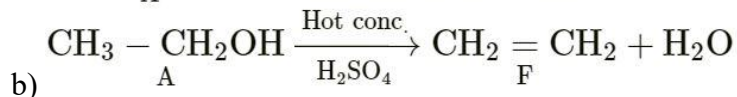
(Ethanoic acid) (Ethanol) (Ester)



S.NO	HINT
(i)	Substance 'C' is used as a preservative.
(ii)	'C' has two carbon atoms; 'C' is obtained by the reaction of 'A' in presence of alkaline Potassium permanganate followed by acidification.
(iii)	Misuse of 'A' in industries is prevented by adding Methanol, Benzene, and pyridine to 'A'.
(iv)	'F' is formed on heating 'A' in presence of conc Sulphuric acid.
(v)	'F' reacts with Hydrogen gas in presence of Nickel and Palladium catalyst.

a) Give the IUPAC names of A and F

Solutions:

$$\text{CH}_3\text{-CH}_2\text{OH} \xrightarrow[\text{Or acidified K}_2\text{Cr}_2\text{O}_7+\text{Heat}]{\text{Alkaline KMnO}_4+\text{Heat}} \text{CH}_3\text{COONa} \xrightarrow{\text{H}^+} \text{CH}_3\text{COOH}$$


b)