Chemical Reactions and Equations

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Q. 1. What is a balanced chemical equation? Why should chemical equations be balanced? (AS1)

Answer : Balanced chemical equation: A chemical equation in which the number of atoms of reactants and number of atoms of products is called a balanced equation.

Every chemical equation should be balanced because:

⇒According to the law of conservation of mass, atoms are neither created not destroyed in chemical reactions.

⇒It means the total mass of the products formed in chemical reaction must be equal to the mass of reactants consumed.

Q. 2 A. Balance the following chemical equations. (AS1)

$NaOH + H_2SO_4 \rightarrow Na_2SO_4 \rightarrow H_2O$

Answer : $NaOH + H_2SO_4 \rightarrow Na_2SO_4 \rightarrow H_2O$

Balanced equation: $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Explanation:

⇒Step 1: Write the given unbalanced equation

$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Na	1	2
O	5	5
H	3	2
S	1	1

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. Thus, let us consider sodium atom. If we multiply 2 in the reactant (in NaOH), we will get the equal number of atoms as in product (Na_2SO_4)

No. of atoms of sodium	Reactant (in NaOH)	Product (in Na_2SO_4)
Initially	1	2
To balance	$1 \times 2 = 2$	2

⇒**Step 4:** Write the resulting equation:

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Na	2	2
O	6	5
H	4	2
S	1	1

We find that the equation is not balanced yet. As the number of oxygen, hydrogen and Sulphur atoms are unequal on the two sides. First balance the hydrogen number.

⇒**Step 6:** Now, let us consider hydrogen atom. If we multiply 2 in the product (in H_2O), we will get the equal number of atoms as in reactants (in 2NaOH and H_2SO_4)

No. of atoms of hydrogen	Reactants (in 2NaOH and H_2SO_4)	Product (in H_2O)
Initially	4	2
To balance	4	2 × 2 = 4

⇒**Step 7:** Write the resulting equation:

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Na	2	2
O	6	6
H	4	4
S	1	1

We find that the equation is balanced now.

⇒**Step 9**: Write down the final balanced equation:

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Q. 2 B. Balance the following chemical equations. (AS1)

$Hg(NO_3)_2 + KI \rightarrow HgI_2 + KNO_3$

Answer : $Hg(NO_3)_2 + KI \rightarrow HgI_2 + KNO_3$

Balanced equation: $Hg(NO_3)_2 + 2KI \rightarrow HgI_2 + 2KNO_3$

Explanation:

⇒Step 1: Write the given unbalanced equation

$g(NO_3)_2 + KI \rightarrow HgI_2 + KNO_3$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Hg	1	1
N	2	1
O	6	3
K	1	1
I	1	2

⇒Step 3: Now, first we consider the element having unequal no. of atoms on both sides. First, let us consider iodine atom. If we multiply 2 in the reactant (in KI), we will get the equal number of atoms as in product (HgI_2)

No. of atoms of iodine	Reactant (in KI)	Product (in HgI_2)
Initially	1	2
To balance	$1 \times 2 = 2$	2

⇒Step 4: Write the resulting equation:

$Hg(NO_3)_2 + 2KI \rightarrow HgI_2 + KNO_3$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Hg	1	1
N	2	1
O	6	3
K	2	1
I	2	2

We find that the equation is not balanced yet. As the number of oxygen, nitrogen and potassium atoms are unequal on the two sides.

First balance the potassium number.

⇒**Step 6:** Now, let us consider potassium atom. If we multiply 2 in the product (KNO_3), we will get the equal number of atoms as in reactant (in KI)

No. of atoms of potassium	Reactant (in 2KI)	Product (in KNO_3)
Initially	2	1
To balance	2	$1 \times 2 = 2$

⇒**Step 7:** Write the resulting equation:

$Hg(NO_3)_2 + 2KI \rightarrow HgI_2 + 2KNO_3$

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Hg	1	1
N	2	2
O	6	6
K	2	2
I	2	2

We find that the equation is balanced now.

⇒Step 9: Write down the final balanced equation:

$Hg(NO_3)_2 + 2KI \rightarrow HgI_2 + 2KNO_3$

Q. 2 C. Balance the following chemical equations. (AS1)

$H_2 + O_2 \rightarrow H_2O$

Answer : $H_2 + O_2 \rightarrow H_2O$

Balanced equation: $2H_2 + O_2 \rightarrow 2H_2O$

Explanation:

⇒Step 1: Write the given unbalanced equation

$H_2 + O_2 \rightarrow H_2O$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
H	2	2
O	2	1

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. First, let us consider oxygen atom. If we multiply 2 in the product (in H_2O), we will get the equal number of atoms as in reactant (O_2)

No. of atoms of oxygen	Reactant (in O_2)	Product (in H_2O)
Initially	2	1
To balance	2	$1 \times 2 = 2$

⇒**Step 4:** Write the resulting equation:

$H_2 + O_2 \rightarrow 2H_2O$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Product (right side)
Element	Number of atoms	Number of atoms
H	2	4
O	2	2

We find that the equation is not balanced yet. As the number of hydrogen atoms are unequal on the two sides.

⇒**Step 6:** Now, let us consider hydrogen atom. If we multiply 2 in the reactant (H_2), we will get the equal number of atoms as in product (in $2H_2O$)

No. of atoms of hydrogen	Reactant (in H_2)	Product (in $2H_2O$)
Initially	2	4
To balance	$2 \times 2 = 4$	4

⇒Step 7: Write the resulting equation:

$2H_2 + O_2 \rightarrow 2H_2O$

⇒Step 8: Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
H	4	4
O	2	2

We find that the equation is balanced now.

⇒Step 9: Write down the final balanced equation:

$2H_2 + O_2 \rightarrow 2H_2O$

Q. 2 D. Balance the following chemical equations. (AS1)

$KClO_3 \rightarrow KCl + O_2$

Answer : $KClO_3 \rightarrow KCl + O_2$

Balanced equation: $2KClO_3 \rightarrow 2KCl + 3O_2$

Explanation:

⇒Step 1: Write the given unbalanced equation

$KClO_3 \rightarrow KCl + O_2$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
K	1	1
O	3	2
Cl	1	1

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. Thus, let us consider oxygen atom. If we multiply 2 in the product (in $KClO_3$) and 3 in the reactant (in O_2) we will get the equal number of atoms in both sides.

No. of atoms of oxygen	Reactant (in $KClO_3$)	Product (in O_2)
Initially	3	2
To balance	$3 \times 2 = 6$	$2 \times 3 = 6$

⇒**Step 4:** Write the resulting equation:

$2KClO_3 \rightarrow KCl + 3O_2$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
K	2	1
O	6	6
Cl	2	1

We find that the equation is not balanced yet. As the number of potassium and chlorine atoms are unequal on the two sides. First balance the potassium atom.

⇒**Step 6:** If we multiply 2 in the product (in KCl), we will get the equal number of atoms as in reactant (in $2KClO_3$)

No. of atoms of potassium	Reactant (in $2KClO_3$)	Product (in KCl)
Initially	2	1
To balance	2	$1 \times 2 = 2$

⇒**Step 7:** Write the resulting equation:

$2KClO_3 \rightarrow 2KCl + 3O_2$

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
K	2	2
O	6	6
Cl	2	2

We find that the equation is balanced now.

⇒**Step 9:** Write down the final balanced equation:

$2KClO_3 \rightarrow 2KCl + 3O_2$

Q. 2 E. Balance the following chemical equations. (AS1)

$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

Answer : $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

Balanced equation: $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

Explanation:

⇒**Step 1:** Write the given unbalanced equation

$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

⇒**Step 2:** Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
C	3	1
H	8	2
O	2	3

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. Thus, first let us consider hydrogen atom. If we multiply 4 in the product (in H_2O), we will get the equal number of atoms as in reactant (in C_3H_8)

No. of atoms of hydrogen	Reactant (in C_3H_8)	Product (in H_2O)
Initially	8	2
To balance	8	$2 \times 4 = 8$

⇒**Step 4:** Write the resulting equation:

$C_3H_8 + O_2 \rightarrow CO_2 + 4H_2O$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
C	3	1
H	8	8
O	2	6

We find that the equation is not balanced yet. As the number of carbon and oxygen atoms are unequal on the two sides.

First balance the carbon atom.

⇒**Step 6:** If we multiply 3 in the product (in CO_2), we will get the equal number of atoms as in reactant (in C_3H_8)

No. of atoms of carbon	Reactant (in C_3H_8)	Product (in CO_2)
Initially	3	1
To balance	3	$1 \times 3 = 3$

⇒**Step 7:** Write the resulting equation:

$C_3H_8 + O_2 \rightarrow 3CO_2 + 4H_2O$

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
C	3	3
H	8	8
O	2	10

We find that the equation is not balanced yet. As the number of oxygen atoms are unequal on the two sides.

⇒**Step 9:** Now, we consider oxygen atoms. If we multiply 5 in the reactant (in O_2), we will get the equal number of atoms as in products (in $3CO_2$ and $4H_2O$)

No. of atoms of oxygen	Reactant (O_2)	Products (in $3CO_2$ and $4H_2O$)
Initially	10	10
To balance	10	$2 \times 5 = 10$

⇒**Step 10:** Write the resulting equation:

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

We find that the equation is balanced now.

⇒**Step 11:** Write down the final balanced equation:

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

Q. 3 A Write the balanced chemical equations for the following reactions. (AS1)

Zinc +Silver nitrate → Zinc nitrate+ Silver.

Answer : $Zn + AgNO_3 \rightarrow Zn(NO_3)_2 + Ag$

Balanced equation: $Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

Explanation:

⇒**Step 1:** Write the given unbalanced equation

$Zn + AgNO_3 \rightarrow Zn(NO_3)_2 + Ag$

Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Zn	1	1
Ag	1	1
O	3	6
N	1	2

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. Thus, let us consider nitrogen atom first. If we multiply 2 in the reactant (in $AgNO_3$), we will get the equal number of atoms as in product ($Zn(NO_3)_2$)

No. of atoms of nitrogen	Reactant (in $AgNO_3$)	Product (in $Zn(NO_3)_2$)
Initially	1	2
To balance	$1 \times 2 = 2$	2

⇒**Step 4:** Write the resulting equation:

$Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + Ag$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Zn	1	1
Ag	2	1
O	6	6
N	2	2

We find that the equation is not balanced yet. As the number of silver atoms are unequal on the two sides.

⇒**Step 6:** Now, let us consider silver atom. If we multiply 2 in the product (inAg), we will get the equal number of atoms as in reactant (in $2AgNO_3$)

No. of atoms of silver	Reactant (in Ag)	Product (in $2AgNO_3$)
Initially	1	2
To balance	$1 \times 2 = 2$	2

⇒**Step 7:** Write the resulting equation:

$Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Zn	1	1
Ag	2	2
O	6	6
N	2	2

We find that the equation is balanced now.

⇒**Step 9:** Write down the final balanced equation:

$Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

Q. 3 B. Write the balanced chemical equations for the following reactions. (AS1)

Aluminum + copper chloride →Aluminum chloride+ Copper.

Answer : $Al + CuCl_2 \rightarrow AlCl_3 + Cu$

Balanced equation: $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

Explanation:

⇒**Step 1:** Write the given unbalanced equation

$Al + CuCl_2 \rightarrow AlCl_3 + Cu$

⇒**Step 2:** Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Al	1	1
Cu	1	1
Cl	2	3

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. Thus, let us consider chlorine atom first. If we multiply 2 in the product (in $AlCl_3$) and 3 in the reactant (in $CuCl_2$) we will get the equal number of atoms in both sides.

No. of atoms of chlorine	Reactant (in $CuCl_2$)	Product (in $AlCl_3$)
Initially	2	3
To balance	$2 \times 3 = 6$	$3 \times 2 = 6$

⇒**Step 4:** Write the resulting equation:

$Al + 3CuCl_2 \rightarrow 2AlCl_3 + Cu$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Al	1	2
Cu	3	1
Cl	6	6

We find that the equation is not balanced yet. As the number of aluminum and copper atoms are unequal on the two sides.

First balance the aluminum atom.

⇒**Step 6:** If we multiply 2 in the reactant (in Al), we will get the equal number of atoms as in product (in $2AlCl_3$)

No. of atoms of Al	Reactant (in Al)	Product (in $2AlCl_3$)
Initially	1	2
To balance	$1 \times 2 = 2$	2

⇒**Step 7:** Write the resulting equation:

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + Cu$

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Al	2	2
Cu	3	1
Cl	6	6

We find that the equation is not balanced yet. As the number of copper atoms are unequal on the two sides.

⇒**Step 9:** If we multiply 3 in the product (in Cu), we will get the equal number of atoms as in product (in $3CuCl_2$)

No. of atoms of copper	Reactant (in Cu)	Product (in $3CuCl_2$)
Initially	1	3
To balance	$1 \times 3 = 3$	3

⇒**Step 10:** Write the resulting equation:

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

⇒**Step 11:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Al	2	2
Cu	3	3
Cl	6	6

We find that the equation is now balanced.

⇒**Step 12:** Write down the final balanced equation:

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

Q. 3 C. Write the balanced chemical equations for the following reactions. (AS1)

Hydrogen + Chlorine. →Hydrogen chloride

Answer : $H_2 + Cl_2 \rightarrow HCl$

Balanced equation: $H_2 + Cl_2 \rightarrow 2HCl$

Explanation:

⇒**Step 1:** Write the given unbalanced equation

$H_2 + Cl_2 \rightarrow HCl$

⇒**Step 2:** Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
H	2	1
Cl	2	1

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. First, let us consider hydrogen atom. If we multiply 2 in the product (in HCl), we will get the equal number of atoms as in reactant (H_2)

No. of atoms of hydrogen	Reactant (in H_2)	Product (in HCl)
Initially	2	1
To balance	2	$1 \times 2 = 2$

⇒**Step 4:** Write the resulting equation:

$H_2 + O_2 \rightarrow 2HCl$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Product (right side)
Element	Number of atoms	Number of atoms
H	2	2
Cl	2	2

We find that the equation is now balanced yet.

⇒Step 6: Write down the final balanced equation:

$2H_2 + Cl_2 \rightarrow 2HCl$

Q. 3 D. Write the balanced chemical equations for the following reactions. (AS1)

Ammonium nitrate→ Nitrous Oxide + water.

Answer : $NH_4NO_3 \rightarrow N_2O + H_2O$

Balanced equation: $NH_4NO_3 \rightarrow N_2O + 2H_2O$

Explanation:

⇒Step 1: Write the given unbalanced equation

$NH_4NO_3 \rightarrow N_2O + H_2O$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
N	2	2
H	4	2
O	3	2

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. Thus, let us consider hydrogen atom first. If we multiply 2 in the product (in H_2O), we will get the equal number of atoms as in the reactant (inNH_4NO_3)

No. of atoms of chlorine	Reactant (in NH_4NO_3)	Product (in H_2O)
Initially	4	2
To balance	4	2 × 2 = 4

⇒**Step 4:** Write the resulting equation:

$NH_4NO_3 \rightarrow N_2O + 2H_2O$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
N	2	2
H	4	4
O	3	3

We find that the equation is now balanced yet.

⇒**Step 6:** Write down the final balanced equation:

$NH_4NO_3 \rightarrow N_2O + 2H_2O$

Q. 4 A. Write the balanced chemical equation for the following and identity the type of reaction in each case. (AS1)

Calcium hydroxide$_{(aq)}$ + Nitric acid$_{(aq)}$ → Water$_{(1)}$+ Calcium nitrate$_{(aq)}$

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

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

Type of reaction: Double displacement reaction

Q. 4 B. Write the balanced chemical equation for the following and identity the type of reaction in each case. (AS1)

Magnesium$_{(s)}$+ Iodine$_{(g)}$→ Magnesium iodide$_{(g)}$

Answer : $Mg + I_2 \rightarrow MgI_2$

Balanced equation: $Mg + I_2 \rightarrow MgI_2$

Type of reaction: Decomposition reaction

Q. 4 C. Write the balanced chemical equation for the following and identity the type of reaction in each case. (AS1)

Magnesium$_{(s)}$+ Hydrochloric acid$_{(aq)}$→ Magnesium chloride$_{(aq)}$+ Hydrogen$_{(g)}$

Answer : $Mg + HCl \rightarrow MgCl_2 + H_2$

Balanced equation: $Mg + 2HCl \rightarrow MgCl_2 + H_2$

Type of reaction: Displacement reaction

Q. 4 D. Write the balanced chemical equation for the following and identity the type of reaction in each case. (AS1)

Zinc$_{(s)}$ + Calcium chloride$_{(aq)}$→ Zinc chloride$_{(aq)}$ + calcium$_{(s)}$

Answer : $Zn + CaCl_2 \rightarrow ZnCl_2 + Ca$

Balanced equation: $Zn + CaCl_2 \rightarrow ZnCl_2 + Ca$

Type of reaction: Displacement reaction

Q. 5. Write an equation for decomposition reaction where energy is supplied in the form of teat/ light/ electricity. (AS1)

Answer : On heating calcium carbonate, it decomposes to calcium oxide and carbon dioxide. The reaction is:

$CaCO_3 \rightarrow CaO + CO_2$

The above reaction is an example of thermal decomposition reaction in which decomposition take places in the presence of heat.

Note: Decomposition reaction is a reaction in which only one reactant decomposes into two or more products.

Q. 6. What do you mean by precipitation reaction? (AS1)

Answer : Precipitation reaction – When two reactants exchange their constituents chemically and form products in which one of them product is insoluble in water, the reaction takes place is called precipitation reaction.

For example: when aqueous lead nitrate and potassium iodide are mixed together, they form lead iodide which is insoluble in water. Lead iodide is called precipitate. The reaction is:

$Pb(NO_3)_2 + KI \rightarrow PbI_2 + 2KNO_3$

precipitate

Q. 7. How chemical displacement reactions differ from chemical decomposition reaction? Explain with an example for each. (AS1)

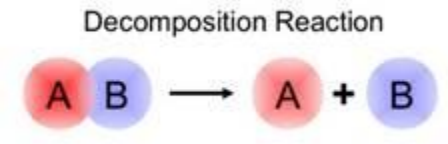
Answer : Difference between displacement and double displacement reaction:

Displacement reaction	Decomposition reaction
1. Displacement reaction is a reaction in which one element displaces another element from its compound and takes its place their in.	Decomposition reaction is a reaction in which only one reactant decomposes into two or more products.
2. For example: $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ In the reaction, zinc has displaced hydrogen from HCl.	For example: $2AgCl \rightarrow 2Ag + Cl_2$ In the given reaction, AgCl decomposes into Ag and Cl_2.

Note:

Displacement reaction –

Decomposition reaction –



Q. 8. Name the reactions taking place in the presence of sunlight? (AS1)

Answer : The decomposition reaction which occurs in the presence of sunlight is called photochemical reaction.

For example: $2AgBr \rightarrow 2Ag + Br_2$

⇒In the above reaction, silver bromide (AgBr) decomposes to silver and bromine in sunlight.

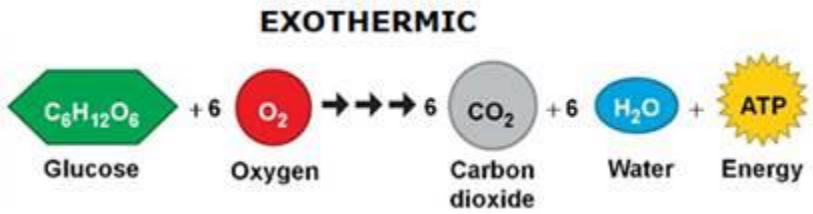
⇒Light colour of AgBr changes to gray due to sunlight.

Q. 9. Why does respiration considered as an exothermic reaction? Explain. (AS1)

Answer : Exothermic reaction: A reaction in which heat is released when reactants changes into products.

Respiration is considered as an exothermic reaction because:

⇒In respiration, a large amount of heat energy is released when oxidation of glucose takes place.



Q. 10. What is the difference between displacement and double displacement reaction? Write equations for these reactions? (AS1)

Answer : Difference between displacement and double displacement reaction:

Displacement reaction	Decomposition reaction
1. Displacement reaction is a reaction in which one element displaces another element from its compound and takes its place their in.	If two reactants exchange their constituents chemically and form tow products, then the reaction is called double displacement reaction.
2. <u>For example:</u> $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ In the reaction, zinc has displaced hydrogen from HCl.	2. <u>For example:</u> $BaCl_2 + ZnSO_4 \rightarrow BaSO_4 + ZnCl_2$ In this reaction, exchange of ions of Ba and Zn are taking place.

Note: Double displacement reaction –

A and C are Cations (Positive Ions)
B and D are Anions (Negative Ions)

Double Displacement Reaction

Q. 11. $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

In the above equation, name the compound which is oxidized and which is reduced? (A S1)

Answer : In the given reaction, $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

HCl is oxidized to Cl_2 and MnO_2 is reduced to $MnCl_2$

Explanation: As we know that oxidation is reaction that involves the removal of hydrogen and reduction is a reaction that involves the removal of oxygen.

Thus, HCl is oxidized and MnO_2 is reduced.

Q. 12. Give two examples for oxidation-reduction reaction. (AS1)

Answer : Oxidation – reduction reaction: When oxidation and reduction takes place at the same time, then the reaction is called oxidation-reduction reaction.

Oxidation: losing of electrons Reduction: gaining of electrons

For example:

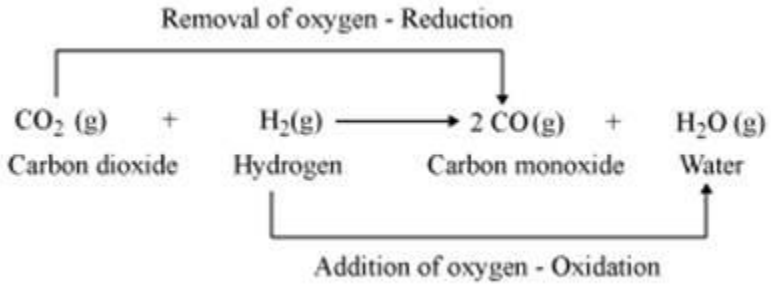
$CuO + H_2 \rightarrow Cu + H_2O$

⇒In the reaction, CuO loses oxygen atom which means that reduction of CuO (copper oxide) takes place.

⇒H_2 (hydrogen) takes up oxygen atom.

⇒As a result, formation of water takes place. This means hydrogen undergoes oxidation.

Another example:



Q. 13. In the refining of silver the recovery of silver from silver nitrate solution involved displacement by copper metal. Write the reaction involved. (AS1)

Answer : The reaction involved is:

$2AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + 2Ag$

In the above reaction, when copper is mixed with silver nitrate, copper displaces the silver from silver nitrate and form its own ions as $Cu(NO_3)_2$

Q. 14. What do you mean by corrosion? How can you prevent it? (AS1)

Answer : Corrosion – When some metals are exposed to moisture, air, acids etc. they tarnish due to the formation of metals oxide on their surface. This process is called corrosion.

Corrosion can be prevented by:

⇒Shielding the surface, the metal surface from oxygen and moisture.

⇒By painting, oiling, greasing, galvanizing, chrome plating or making alloys.

⇒Galvanizing is a method of protecting iron from rusting by coating them a thin layer of zinc.

Q. 15. Explain rancidity. (AS1)

Answer : When we use old, left over cooking oil for making foodstuff, it is found to have foul odour called rancidity.

⇒Rancidity is an oxidation reaction.

⇒If food is cooked in such oil, its taste also changes.

⇒When oils or fats are left aside for a long time, they undergo air oxidation and become rancid.

⇒Rancidity in the food stuff cooked in oil or ghee is prevented by using antioxidants.

Q. 16 A. Balance the following chemical equations including the physical states. (AS1)

$C_6H_{12}O_6 \rightarrow C_2H_5OH + CO_2$

Answer : Balanced equation: $C_6H_{12}O_{6(s)} \rightarrow 2C_2H_5OH_{(s)} + 2CO_{2(g)}$

Explanation:

⇒Step 1: Write the given unbalanced equation

$C_6H_{12}O_6 \rightarrow C_2H_5OH + CO_2$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
C	6	3
H	12	6
O	6	3

⇒Step 3: Now, first we consider the element having unequal no. of atoms on both sides. Thus, first let us consider hydrogen atom. If we multiply 2 in the product (in C_2H_5OH), we will get the equal number of atoms as in reactant (in$C_6H_{12}O_6$)

No. of atoms of hydrogen	Reactant (in $C_6H_{12}O_6$)	Product (in C_2H_5OH)
Initially	12	6
To balance	12	6 × 2 = 12

⇒**Step 4:** Write the resulting equation:

$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + CO_2$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
C	6	5
H	12	12
O	6	4

We find that the equation is not balanced yet. As the number of carbon and oxygen atoms are unequal on the two sides.

First balance the carbon atom.

⇒**Step 6:** If we multiply 2 in the product (in CO_2), we will get the equal number of atoms as in reactant (in $C_6H_{12}O_6$)

No. of atoms of carbon	Reactant (in $C_6H_{12}O_6$)	Products (in CO_2)
Initially	6	1
To balance	6	1 × 2 = 2

⇒**Step 7:** Write the resulting equation:

$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
C	6	6
H	12	12
O	6	6

We find that the equation is balanced now.

⇒**Step 9:** Write down the final balanced equation:

$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

Q. 16 B. Balance the following chemical equations including the physical states. (AS1)

$Fe + O_2 \rightarrow Fe_2O_2$

Answer : $Fe + O_2 \rightarrow Fe_2O_2$

Balanced equation: $2Fe_{(s)} + O_{2(g)} \rightarrow Fe_2O_{2(s)}$

Explanation:

⇒**Step 1:** Write the given unbalanced equation

$Fe + O_2 \rightarrow Fe_2O_2$

⇒**Step 2:** Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Fe	1	2
O	2	2

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. Thus, let us consider Fe atom. If we multiply 2 in the reactant (in Fe), we will get the equal number of atoms as in product (in Fe_2O_2)

No. of atoms of Fe	Reactant (in Fe)	Product (in Fe_2O_2)
Initially	1	2
To balance	$1 \times 2 = 2$	2

⇒**Step 4:** Write the resulting equation:

$2Fe + O_2 \rightarrow Fe_2O_2$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactant (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Fe	2	2
O	2	2

We find that the equation is balanced now.

⇒**Step 6:** Write down the final balanced equation:

$2Fe + O_2 \rightarrow Fe_2O_2$

Q. 16 C. Balance the following chemical equations including the physical states. (AS1)

$NH_3 + Cl_2 \rightarrow N_2 + NH_4Cl$

Answer : $NH_3 + Cl_2 \rightarrow N_2 + NH_4Cl$

Balanced equation: $8NH_{3(g)} + 3Cl_{2(g)} \rightarrow N_{2(g)} + 6NH_4Cl_{(s)}$

Explanation:

⇒Step 1: Write the given unbalanced equation

$NH_3 + Cl_2 \rightarrow N_2 + NH_4Cl$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
N	1	3
H	3	4
Cl	2	1

⇒Step 3: Now, first we consider the element having unequal no. of atoms on both sides. Thus, first let us consider hydrogen atom. If we multiply 4 in the reactant (in NH_3) and 3 in product (in NH_4Cl), we will get the equal number of atoms as in both the sides.

No. of atoms of hydrogen	Reactant (in NH_3)	Product (in NH_4Cl)
Initially	3	4
To balance	3 × 4 = 12	4 × 3 = 12

⇒Step 4: Write the resulting equation:

$4NH_3 + Cl_2 \rightarrow N_2 + 3NH_4Cl$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
N	4	5
H	12	12
Cl	2	3

We find that the equation is not balanced yet. As the number of chlorine and nitrogen atoms are unequal on the two sides.

First balance the chlorine atom.

⇒**Step 6:** If we multiply 3 in the reactant (in Cl_2) and 2 in the product (in $3NH_4Cl$), we will get the equal number of atoms as in both the sides.

No. of atoms of chlorine	Reactant (in Cl_2)	Products (in $3NH_4Cl$)
Initially	2	3
To balance	$2 \times 3 = 6$	$3 \times 2 = 6$

⇒**Step 7:** Write the resulting equation:

$4NH_3 + 3Cl_2 \rightarrow N_2 + 6NH_4Cl$

⇒Step 8: Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
N	4	8
H	12	12
Cl	6	6

We find that the equation is not balanced yet. As the number of nitrogen atoms are unequal on the two sides.

Balance the nitrogen atom.

⇒**Step 9:** If we multiply 2 in the reactant (in $4NH_3$) we will get the equal number of atoms as in products (in N_2 and $6NH_4Cl$)

No. of atoms of nitrogen	Reactant (in $4NH_3$)	Products (in N_2 and $6NH_4Cl$)
Initially	4	8
To balance	$4 \times 2 = 8$	8

⇒**Step 10:** Write the resulting equation:

$4NH_3 + 3Cl_2 \rightarrow N_2 + 6NH_4Cl$

⇒**Step 11:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
N	8	8
H	12	12
Cl	6	6

We find that the equation is balanced now.

⇒Step 12: Write down the final balanced equation:

$4NH_3 + 3Cl_2 \rightarrow N_2 + 6NH_4Cl$

Q. 16 D. Balance the following chemical equations including the physical states. (AS1)

$Na + H_2O \rightarrow NaOH + H_2$

Answer : $Na + H_2O \rightarrow NaOH + H_2$

Balanced equation: $2Na_{(s)} + 2H_2O_{(aq)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}\uparrow$

Explanation:

⇒Step 1: Write the given unbalanced equation.

$Na + H_2O \rightarrow NaOH + H_2$

⇒Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Na	1	1
H	2	3
O	1	1

⇒Step 3: Now, first we consider the element having unequal no. of atoms on both sides. Thus, first let us consider hydrogen atom. If we multiply 2 in the reactant (in H_2O) and 2 in product (in NaOH), we will get the equal number of atoms as in both the sides.

No. of atoms of hydrogen	Reactant (in H_2O)	Product (in NaOH)
Initially	2	1
To balance	$2 \times 2 = 4$	$1 \times 2 = 2$

⇒Step 4: Write the resulting equation:

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

⇒Step 5: Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Na	1	2
H	4	4
O	2	2

We find that the equation is not balanced yet. As the number of sodium atoms are unequal on the two sides.

Balance the sodium atom.

⇒**Step 6:** If we multiply 2 in the reactant (in Na), we will get the equal number of atoms as in product (in 2NaOH).

No. of atoms of sodium	Reactant (in Na)	Products (in 2NaOH)
Initially	1	2
To balance	1 × 2 = 2	2

⇒**Step 7:** Write the resulting equation:

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

⇒**Step 8:** Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Na	2	2
H	4	4
O	2	2

We find that the equation is balanced now.

⇒**Step 9:** Write down the final balanced equation:

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

Q. 17 A. Balance the chemical equation by including the physical states of the substances for the following reactions. (AS1)

Barium chloride and sodium sulphate aqueous solutions react to give insoluble Barium sulphate and aqueous solution of sodium chloride.

Answer : $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + NaCl$

Balanced equation:

Explanation: $BaCl_{2(aq)} + Na_2SO_{4(aq)} \rightarrow BaSO_{4(s)}\downarrow + 2NaCl_{(aq)}$

⇒**Step 1**: Write the given unbalanced equation

$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + NaCl$

⇒**Step 2:** Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Ba	1	1
Cl	2	1
Na	2	1
S	1	1
O	4	4

⇒**Step 3:** Now, first we consider the element having unequal no. of atoms on both sides. First, let us consider sodium atom. If we multiply 2 in the product (in NaCl), we will get the equal number of atoms as in product (Na_2SO_4)

No. of atoms of sodium	Reactant (in NaCl)	Product (in Na_2SO_4)
Initially	1	2
To balance	1 × 2 = 2	2

⇒**Step 4:** Write the resulting equation:

$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Ba	1	1
Cl	2	2
Na	2	2
S	1	1
O	4	4

We find that the equation is balanced now.

⇒**Step 6:** Write down the final balanced equation:

$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

Q. 17 B. Balance the chemical equation by including the physical states of the substances for the following reactions. (AS1)

Sodium hydroxide reacts with hydrochloric acid to produce sodium chloride and water.

Answer : $NaOH + HCl \rightarrow NaCl + H_2O$

Balanced equation: $NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$

Explanation:

⇒**Step 1:** Write the given unbalanced equation

$NaOH + HCl \rightarrow NaCl + H_2O$

⇒**Step 2:** Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Na	1	1
O	1	1
H	2	2
Cl	1	1

We find that the equation is already balanced.

⇒**Step 3:** Write down the balanced equation:

$NaOH + HCl \rightarrow NaCl + H_2O$

Q. 17 C. Balance the chemical equation by including the physical states of the substances for the following reactions. (AS1)

Zinc pieces react with dilute hydrochloric acid to liberate hydrogen gas and forms zinc chloride.

Answer : $Zn + HCl \rightarrow ZnCl_2 + H_2$

Balanced equation: $Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}\uparrow$

Explanation:

⇒**Step 1:** Write the given unbalanced equation

$Zn + HCl \rightarrow ZnCl_2 + H_2$

⇒**Step 2:** Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Zn	1	1
H	1	2
Cl	1	2

⇒**Step 3:** Now, first we consider the element having uSnequal no. of atoms on both sides. Thus, first let us consider hydrogen atom. If we multiply 2 in the reactant (in HCl), we will get the equal number of atoms as in product (in H_2)

No. of atoms of hydrogen	Reactant (in HCl)	Product (in H_2)
Initially	1	2
To balance	$1 \times 2 = 2$	2

⇒**Step 4:** Write the resulting equation:

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

⇒**Step 5:** Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Zn	1	1
H	2	2
Cl	2	2

We find that the equation is balanced now.

⇒**Step 6:** Write down the final balanced equation:

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Q. 18. A shiny brown colored element 'X' on heating in air becomes black in colour. Can you predict the element ‘X’ and black colored substance filmed? How do you support your predictions? (AS2)

Answer : ⇒It is given that ‘X’ is a shiny brown colored element. This means ‘X’ is a copper metal.

⇒When copper (X) is heated in air, it becomes black in color due to the deposit of copper oxide on its surface.

⇒The reaction takes place:

$2Cu + O_2 \rightarrow 2CuO$

Brown Black

Q. 19. Why do we apply paint on iron articles? (AS7)

Answer : We apply paint on iron articles to prevent the corrosion and rusting of iron. It decreases the rate of the process of rusting of iron.

Q. 20. What is the use of keeping food in air tight containers? (AS7)

Answer : The use of keeping food in air tight containers is to prevent oxidation and to slow down the oxidation process, otherwise the food undergoes oxidation and becomes rancid.