Balanced Chemical Equations Chemistry Questions with Solutions

Q1. A balanced chemical equation is in accordance with-

a) Multiple proportion
b) Reciprocal proportion
c) Conservation of mass
d) Definite proportions

Correct Answer: (c) Law of Conservation of Mass

Q2. The correct balanced equation for the reaction $\_\_C_2H_6O + \_\_O_2 \rightarrow \_\_CO_2 + \_\_H_2O$ is-

a) $2C_2H_6O + O_2 \rightarrow CO_2 + H_2O$
b) $C_2H_6O + 3O_2 \rightarrow 2CO_2 + 3H_2O$
c) $C_2H_6O + 2O_2 \rightarrow 3CO_2 + 3H_2O$
d) $2C_2H_6O + O_2 \rightarrow 2CO_2 + H_2O$

Correct Answer: (b) $C_2H_6O + 3O_2 \rightarrow 2CO_2 + 3H_2O$

Q3. The correct balanced equation for the reaction $\_\_KNO_3 + \_\_H_2CO_3 \rightarrow \_\_K_2CO_3 + \_\_HNO_3$ is-

a) $2KNO_3 + H_2CO_3 \rightarrow K_2CO_3 + 2HNO_3$
b) $2KNO_3 + 2H_2CO_3 \rightarrow K_2CO_3 + 2HNO_3$
c) $KNO_3 + H_2CO_3 \rightarrow K_2CO_3 + 2HNO_3$
d) $2KNO_3 + 2H_2CO_3 \rightarrow K_2CO_3 + 3HNO_3$

Correct Answer: (a) $2KNO_3 + H_2CO_3 \rightarrow K_2CO_3 + 2HNO_3$

Q4. The correct balanced equation for the reaction $\_\_CaCl_2 + \_\_Na_3PO_4 \rightarrow \_\_ Ca_3(PO_4)_2 + \_\_ NaCl$ is-

a) $2CaCl_2 + 2Na_3PO_4 \rightarrow 2Ca_3(PO_4)_2 + NaCl$
b) $CaCl_2 + Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + NaCl$
c) $3CaCl_2 + 2Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6NaCl$
d) $3CaCl_2 + 2Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + 3NaCl$

Correct Answer- (c) $3CaCl_2 + 2Na_3PO_4 \rightarrow Ca3(PO_4)_2 + 6NaCl$

Q5. The correct balanced equation for the reaction $\_\_TiCl_4 + \_\_H_2O \rightarrow \_\_TiO_2 + \_\_HCl$ is-

a) $TiCl_4 + 2H_2O \rightarrow TiO_2 + 2HCl$
b) $TiCl_4 + 2H_2O \rightarrow TiO_2 + 4HCl$

c) $2TiCl_4 + H_2O \rightarrow 2TiO_2 + HCl$
d) $TiCl_4 + 4H_2O \rightarrow TiO_2 + 4HCl$

Correct Answer- (b) $TiCl_4 + 2H_2O \rightarrow TiO_2 + 4HCl$

Q6. Write a balanced equation for the reaction of molecular nitrogen (N_2) and oxygen (O_2) to form dinitrogen pentoxide.

Answer. The equation for the reaction is-
$N_2 + O_2 \rightarrow N_2O_5$ (unbalanced equation)
The balanced chemical equation is-
$2N_2 + 5O_2 \rightarrow 2N_2O_5$

Q7. On what basis is a chemical equation balanced?

Answer. A chemical equation is balanced using the law of conservation of mass, which states that "matter cannot be created nor destroyed."

Q8. What is the balanced equation for the reaction of photosynthesis?

Answer. The balanced chemical equation for the reaction of photosynthesis is-
$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$.

Q9. We must solve a skeletal chemical equation." Give a reason to justify the statement.

Answer. Skeletal chemical equations are unbalanced. Due to the law of conservation of mass, we must balance the chemical equation. It states that 'matter cannot be created or destroyed.' As a result, each chemical reaction must have a balanced chemical equation.

Q10. What does it mean to say an equation is balanced? Why is it important for an equation to be balanced?

Answer. The chemical equation must be balanced in order to obey the law of conservation of mass. A chemical equation is said to be balanced when the number of different atoms of elements in the reactants side equals the number of atoms in the products side. Balancing chemical equations is a trial-and-error process.

Q11. What is meant by the skeletal type chemical equation? What does it represent? Using the equation for electrolytic decomposition of water, differentiate between a skeletal chemical equation and a balanced chemical equation.

Answer. Skeletal equations are those in which formulas are used to indicate the chemicals involved in a chemical reaction.

The law of conservation of mass does not apply to skeletal equations.

The chemical formulas are represented by balanced chemical equations, which follow the law of conservation of mass, which states that the atoms on the reactant and product sides are the same.
$H_2O \rightarrow H_2 + O_2$: Skeletal equation
$2H_2O \rightarrow 2H_2 + O_2$: Balanced chemical equation

Q12. Write the balanced chemical equation for the following reaction:

a) Phosphorus burns in presence of chlorine to form phosphorus pentachloride.
b) Burning of natural gas.
c) The process of respiration.

Answer.

a) $P_4 + 10Cl_2 \rightarrow 4PCl_5$
b) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ + heat energy
c) $C_6H_{12}O_6 + 6O_2 + 6H_2O \rightarrow 6CO_2 + 12H_2O$ + energy

Q13. What Is the Distinction Between a Balanced Equation and a Skeleton Equation?

Answer. The primary distinction between a balanced equation and a skeleton equation is that the balanced equation provides the actual number of molecules of each reactant and product involved in the chemical reaction, whereas a skeleton equation only provides the reactants. Furthermore, a balanced equation may or may not contain stoichiometric coefficients, whereas a skeleton equation does not.

Q14. Balance the equations

a) $HNO + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
b) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
c) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

Answer. The balanced chemical equation for the reactions are as follows-

a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$
b) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
c) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Q15. Write a balanced molecular equation describing each of the following chemical reactions.

a) Solid calcium carbonate is heated and decomposes to solid calcium oxide and carbon dioxide gas.
b) Gaseous butane, C_4H_{10}, reacts with diatomic oxygen gas to yield gaseous carbon dioxide and water vapour.

c) Aqueous solutions of magnesium chloride and sodium hydroxide react to produce solid magnesium hydroxide and aqueous sodium chloride.
d) Water vapour reacts with sodium metal to produce solid sodium hydroxide and hydrogen gas.

Answer.

a) $CaCO_3 \rightarrow CaO + CO_2$
On heating, 1 mol of solid calcium carbonate yields 1 mol of calcium oxide and 1 mol of carbon dioxide gas.
b) $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$
When 2 moles of butane gas react with 13 moles of diatomic oxygen gas, 8 moles of carbon dioxide gas and 10 moles of water vapours are produced.
c) $MgCl_2 + 2NaOH \rightarrow 2NaCl + Mg(OH)_2$
1 mol magnesium Cordelia reacts with two moles of sodium hydroxide to produce two moles of aqueous sodium chloride solution and one mole of solid magnesium hydroxide.
d) $2H_2O + 2Na \rightarrow 2NaOH + H_2$
2 moles of water vapour react with 2 moles of sodium metal, yielding 2 moles of solid sodium hydroxide and 1 mol of hydrogen gas.

Practise Questions on Balanced Chemical Equations

Balance the following equations-

1. $(NH_4)_2Cr_2O_7(s) \rightarrow Cr_2O_3(s) + N_2(g) + H_2O(g)$

Solution:

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
N	2	2
H	8	2
Cr	2	2
O	7	4

Step 1: Put 4 in front of H_2O on the right side.
$(NH_4)_2Cr_2O_7(s) \rightarrow Cr_2O_3(s) + N_2(g) + 4H_2O(g)$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side

N	2	2
H	8	8
Cr	2	2
O	7	7

Since the number of atoms on both the sides are equal. Hence the equation os balanced.
Therefore, the balanced equation is $(NH_4)_2Cr_2O_7(s) \rightarrow Cr_2O_3(s) + N_2(g) + 4H_2O(g)$

2. $Ca(OH)_2 + H_3PO_4 \rightarrow Ca_3(PO_4)_2 + H_2O$

Solution:

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Ca	1	3
O	6	9
H	5	2
P	1	2

Step 1: Put a 3 in front of the $Ca(OH)_2$ on the left side.
$3Ca(OH)_2 + H_3PO_4 \rightarrow Ca_3(PO_4)_2 + H_2O$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Ca	3	3
O	10	9
H	9	2
P	1	2

Step 2: Put a 2 in front of the H_3PO_4 on the left side.
$3Ca(OH)_2 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + H_2O$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Ca	3	3
O	14	9
H	12	2
P	2	2

Step 3: Put a 6 in front of the H_2O on the right side.
$3Ca(OH)_2 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6H_2O$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Ca	3	3
O	14	14
H	12	12
P	2	2

Since the number of atoms on both the sides are equal. Hence the equation os balanced.
Therefore, the balanced equation is $3Ca(OH)_2 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6H_2O$.

3. $FeCl_3 + NH_4OH \rightarrow Fe(OH)_3 + NH_4Cl$

Solution:

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Fe	1	1
Cl	3	1
N	1	1
H	5	7
O	1	3

Step 1: Put a 3 in front of the NH_4Cl on the right side.

$FeCl_3 + NH_4OH \rightarrow Fe(OH)_3 + 3NH_4Cl$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Fe	1	1
Cl	3	3
N	1	3
H	5	15
O	1	3

Step 2: Put a 3 in front of the NH_4OH on the left.
$FeCl_3 + 3NH_4OH \rightarrow Fe(OH)_3 + 3NH_4Cl$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Fe	1	1
Cl	3	3
N	3	3
H	15	15
O	3	3

Since the number of atoms on both the sides are equal. Hence the equation os balanced.
Therefore, the balanced equation is $FeCl_3 + 3NH_4OH \rightarrow Fe(OH)_3 + 3NH_4Cl$.

4. $Al_2(CO_3)_3 + H_3PO_4 \rightarrow AlPO_4 + CO_2 + H_2O$

Solution:

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Al	2	1
C	3	1
O	13	7

H	3	2
P	1	1

Step 1: Put 2 in front of $AlPO_4$ on the left side.
$Al_2(CO_3)_3 + H_3PO_4 \rightarrow 2AlPO_4 + CO_2 + H_2O$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Al	2	2
C	3	1
O	13	11
H	3	2
P	1	2

Step 2: Put 2 in front of H_3PO_4 on the right side.
$Al_2(CO_3)_3 + 2H_3PO_4 \rightarrow 2AlPO_4 + CO_2 + H_2O$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Al	2	2
C	3	1
O	17	11
H	6	2
P	2	2

Step 3: Put 3 in front of CO_2 on the left.
$Al_2(CO_3)_3 + 2H_3PO_4 \rightarrow 2AlPO_4 + 3CO_2 + H_2O$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Al	2	2
C	3	3

O	17	15
H	6	2
P	2	2

Step 4: Put 3 in front of the H_2O on the right.
$Al_2(CO_3)_3 + 2H_3PO_4 \rightarrow 2AlPO_4 + 3CO_2 + 3H_2O$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
Al	2	2
C	3	3
O	17	17
H	6	6
P	2	2

Since the number of atoms on both the sides are equal. Hence the equation os balanced.
Therefore, the balanced equation is $Al_2(CO_3)_3 + 2H_3PO_4 \rightarrow 2AlPO_4 + 3CO_2 + 3H_2O$.

5. $S_8 + F_2 \rightarrow SF_6$

Solution:

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
S	8	1
F	2	6

Step 1: Put an 8 in front of the SF_6
$S_8 + F_2 \rightarrow 8SF_6$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
S	8	8

F	2	48

Step 2: Put a 24 in front of the F_2 on the left.
$S_8 + 24F_2 \rightarrow 8SF_6$

Elements	Number of atoms on Reactant Side	Number of atoms on Product Side
S	8	8
F	48	48

Since the number of atoms on both sides are equal. Hence the equation os balanced.
Therefore, the balanced equation is $S_8 + 24F_2 \rightarrow 8SF_6$.