8.CHEMICAL REACTIONS
SOLUTIONS
TEACHING TASK
JEE MAIN LEVEL

1. $2A\ell(OH)_{3(s)} \xrightarrow{D} A\ell_2O_{3(s)} + 3H_2O_{(g)}$

Which of the following statements is true for the above reaction?

A) A compound decomposes to form two elements.
B) A compound decomposes to form two new compounds.
C) A compound decomposes to form two compounds and elements.
D) A compound decomposes to form another compound and an element.

Answer:B

Solution:Reactant: $Al(OH)_3$(a single compound).
Products: Al_2O_3(a compound) and H_2O (another compound).
No elements are formed in this reaction.

2. Which of the following reactions illustrates a chemical combination between an element and a compound?

A) $2HgO_{(s)} \xrightarrow{\Delta} 2Hg_{(\ell)} + O_2(g)$ B) $2KI + C\ell_{2(g)} \longrightarrow 2KC\ell_{(aq)} + I_{2(s)}$

C) $2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$ D) Both 2 and 3

Answer:C

Solution:C) $2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$ (Compound+Element $\rightarrow$ Compound)

3. When electric current is passed through molten sodium chloride, it decomposes to give sodium metal and chlorine gas:
Which of the following is true for the above reaction?

A) It is a electrolytic combination.
B) It is a chemical decomposition of a compound to form two compounds.
C) It is also called electrolysis of molten sodium chloride.
D) The above reaction is used to obtain molten sodium chloride.

Answer:C

Solution:This is a classic electrolytic decomposition reaction:
$2NaCl\ (l) \rightarrow 2Na\ (l) + Cl_2\ (g)$

4. Which chemical equation correctly represents the decomposition reaction that takes place when ammonia breaks down to form hydrogen gas and nitrogen gas?

A) $N_2 + H_2 \rightarrow NH_3$ B) $NH_3 \rightarrow N_2 + H_2$
C) $NH_3 + H_2 \rightarrow N_2$ D) $NH_3 \rightarrow N + H$

Answer:B

Solution:Balanced equation for ammonia decomposition.
$2NH_3 \rightarrow N_2 + 3H_2$

5. In a decomposition reaction:

A) the reactants are usually a metal and a nonmetal
B)the reactants are generally two ionic compounds in aqueous solution
C)one of the reactants is often water
D)energy in the form of heat or light is often produced

Answer:D

Solution:Decomposition reactions require energy input, usually as heat, light, or electricity.

6. A student writes a chemical equation of the reaction between carbon monoxide and hydrogen. $CO_2 + 2H_2 \rightarrow CH_3OH$.How can the reaction be classified?
   A) The reaction is an example of a combination reaction as a compound sepa rates into two compounds.
   B) The reaction is an example of a decomposition reaction as a compound dissociates into two compounds.
   C) The reaction is an example of a combination reaction as two compounds react to form a single compound.
   D) The reaction is an example of a decomposition reaction as two compounds react to form a single compound.

Answer:C

Solution:Two reactants combine to form one product: a classic combination reaction.

7. Sodium and chlorine are reacted and as a result, sodium chloride is formed which is also called table salt. What option gives the reactants and products of the reaction?
   A) reactants – sodium; products – chlorine
   B) reactants – sodium and table salt; products – chlorine
   C) reactants – tables salt; products – sodium and chlorine
   D) reactants – sodium and chlorine; products – sodium chloride

Answer:D

Solution: Reactants – sodium and chlorine; products – sodium chloride.

$2Na+Cl_2 \rightarrow 2NaCl$

8. Tajmahal is losing its shining due to effect of which of the following reactions?

   A) $SO_{3(g)}+H_2O_{(l)} \rightarrow H_2SO_{4(l)}$ B) $2Mg_{(s)}+O_{2(g)} \rightarrow 2MgO_{(s)}$
   C) $2HgO \rightarrow 2Hg+O_2$ D) $2C+O_2 \rightarrow 2CO$

Answer:A

Solution:Sulfuric acid formation from air pollution leads to marble corrosion.

9. Which reaction is accompanied by the release of energy?

   A) $2Na_{(s)}+Cl_{2(g} \rightarrow 2NaCl$ B) $CaO+H_2O \rightarrow Ca(OH)_2$
   C) $2HgO \rightarrow 2Hg+O_2$ D) All the above

Answer:A,B

Solution:

A ($2Na_{(s)}+Cl_{2(g} \rightarrow 2NaCl$): Exothermic (ionic bond formation).

B ($CaO+H_2O \rightarrow Ca(OH)_2$): Exothermic (slaked lime formation).

C ($2HgO \rightarrow 2Hg+O_2$): Requires energy input (endothermic).

10. Which of the following reaction releases oxygen gas?
    A) Heating Sodium Nitrate B) Heating Lime stone
    C) Electrolysis of water D) All the above

Answer:A,C

Solution:Heating sodium nitrate $\rightarrow NaNO_2 + O_2$

Heating limestone ($CaCO_3$) $\rightarrow$ CaO + CO_2

Electrolysis of water $\rightarrow H_2 + O_2$

JEE ADVANCED LEVEL

MULTI CORRECT ANSWER TYPE:

11. Which of the following are chemical changes?
    A)Melting of ice B)Burning of sulphur power
    C)Burning of paper D) Burning of crackers.

Answer:B,C,D

Solution:B) Sulfur reacts with oxygen to form sulfur dioxide ($S+O_2 \rightarrow SO_2$), a new substance.

C)Paper combusts to produce ash, CO2, and water vapor, irreversibly changing its composition.

D)Crackers undergo explosive chemical reactions (e.g., oxidation of gunpowder), releasing gases and energy.

A) Melting of ice $\rightarrow$ Physical change (phase transition from solid to liquid; H_2O molecules remain unchanged).

12. Which of the following is an example for decomposition reaction?
    A)$C+O_2 \rightarrow CO_2$ B)$Fe+S \rightarrow FeS$
    C) $2HgO \rightarrow 2Hg+O_2$ D)$2C+O_2 \rightarrow 2CO$

Answer:C

Solution:

A single compound (HgO) breaks down into two simpler substances (Hg and O_2).

STATEMENT TYPE:

A) Statement-I, is True, Statement - II is True; Statement - II is a correct explanation for Statement-I

B) Statement - I is True, Statement is True; Statement -II is NOT a correct explanation for Statement - I

C) Statement - I is True, Statement - II , is False

D) Statement - I is False, Statement - II is True

13. **Statement-I:** $SO_{3(g)}+H_2O_{(l)} \rightarrow H_2SO_{4(l)}$ is decomposition reaction.
    Statement-II: It causes acid rains

Answer:D

Solution:

Statement-I:False.

The given reaction is a combination reaction (two reactants form one product), not decomposition.

Statement-II:True.

SO_3 reacting with water forms sulfuric acid (H_2SO_4), a major contributor to acid rain.

14. **Statement-I:** Acid base reactions are decomposition reactions.
    Statement-II: Acid reacts with base combine to form salt and water.

Answer:D

Solution:

Statement-I:False. Acid-base reactions are neutralization reactions, not decomposition.

Statement-II:True. Neutralization indeed produces salt and water, but this does not explain decomposition.

COMPREHENSION TYPE :

Paragraph-I:

The reaction in which a single product is formed from two or more reactants is called combination reaction. It is also called as synthesis reaction when two elements combined to give single product.

15. $2Mg_{(s)}+O_{2(g)} \rightarrow 2MgO$ The state of MgO is

A) Solid B) Liquid C) Gas D) All the above

Answer:A

Solution:Magnesium oxide (MgO) is an ionic solid at room temperature.

16. A teacher performed the following experiment. She took a samll quantity of Calium oxide in a beaker and pour water till it is wet and stirred with a glass-rod. The beaker turns warm due to the formation of

A) Quick lime B) Slaked Lime C) Lime stome D) Calcium

Answer:B

Solution:$CaO+H_2O \rightarrow Ca(OH)_2+Heat.$

$Ca(OH)_2$ is slaked lime (exothermic reaction).

Paragraph -II:

The reactions where chemical change takes place is called chemical reaction. There are 4 types of chemical reactions. A decomposition reaction is a type of chemical reaction in which a single compound. These reactions often involve an energy source such as heat, light, or electricity that breaks apart the bonds of compounds.

17. 2HgO(red solid) on heating gives

A)Liquid mercury and Oxygen B)Solid mercury and Oxygen

C)Any of A & B D)None of the above

Answer:A

Solution:Mercury(II) oxide (HgO) decomposes into liquid mercury (Hg) and oxygen gas (O_2) when heated.

Mercury is a liquid metal at room temperature (and remains so even when heated moderately).

18. Which of the following is thermal decomposition reaction?

A) $CaCO_3(s) \xrightarrow[(Decomposition)]{Heat} CaO(s) + CO_2(g)$ B) $2NaNO_3 \rightarrow 2NaNO_2 + O_2\uparrow$

C) $O_3 \rightarrow O_2 + O^*$. D) All the above

Answer:A,B

Solution:A) $CaCO_3$ (s) $\rightarrow$ CaO (s) + CO_2 (g) (on heating)$\rightarrow$ This is a classic thermal decomposition reaction.

B) $2NaNO_3 \rightarrow 2NaNO_2 + O_2 \rightarrow$ This also requires heating $\rightarrow$a thermal decomposition reaction.

C) $O_3 \rightarrow O_2 + O \rightarrow$This reaction can occur by light (photochemical), not necessarily

by heat → Not typically classified under thermal decomposition.

INTEGER TYPE:

19. Number of reactants involved in decomposition reactions?

Answer:1

Solution:Decomposition reactions involve a single reactant breaking down into multiple products.

20. Number of products formed when lead nitrate is decomposed ?

Answer:3

Solution: $2Pb(NO_3)_2 \xrightarrow{heat} 2PbO + 4NO_2 + O_2$

Products:Lead(II) oxide (PbO),Nitrogen dioxide (NO_2),Oxygen gas (O_2).

MATRIX MATCH TYPE:

21.

COLUMN -I	**COLUMN-II**
A. Slaked lime	1. H_2CO_3
B. Quick lime	2. $Ca(OH)_2$
C. Lime stone	3. CaO
D. Carbonic acid	4. $CaCO_3$

Answer:A-2,B-3,C-4,D-1

Solution:

COLUMN -I	**COLUMN-II**
A. Slaked lime	2. $Ca(OH)_2$
B. Quick lime	3. CaO
C. Lime stone	4. $CaCO_3$
D. Carbonic acid	1. H_2CO_3

LEARNER'S TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1. The reaction in which two or more substances combined to form a single product is called …

A)Combination reaction B)Decomposition reaction

C) Displacement reaction D) Double displacement reaction.

Answer:A

Solution: A combination reaction involves two or more reactants forming a single product.

2. $2NaNO_3 \rightarrow 2NaNO_2 + O_2$ is an example for…

A)Combination reaction B)Decomposition reaction

C) Displacement reaction D) Double displacement reaction.

Answer:B

Solution:A single compound ($NaNO_3$) breaks down into two simpler substances ($NaNO_2$ and O_2).

3. A combination reaction in which a compound is formed from combination of its constituent element is called……..

A)Combination reaction B)Decomposition reaction
C) Synthesis reaction D) Double displacement reaction.

Answer:C

Solution:A combination reaction in which a compound is formed from combination **of** its constituent elements is called a Synthesis reaction. C

While "combination reaction" and "synthesis reaction" are the same thing, the question specifically asks about the term used to describe the formation of a compound from its elements, making "synthesis reaction" the more accurate answer.

4. The reaction in which single reactant gives two or more products is called...
A)Combination reaction B)Decomposition reaction
C) Displacement reaction D) Double displacement reaction.

Answer:B

Solution:Decomposition reactions involve breaking a single reactant into multiple products.

5. Which of the following are chemical changes?
A)Rusting of iron B)Curdling of milk
C)Blackening of silverware D) All the above.

Answer:D

Solution:A) Rusting of iron: Forms iron oxide (irreversible).

B) Curdling of milk: Protein denaturation (irreversible).

C) Blackening of silverware: Tarnishing due to sulfide formation (irreversible).

6. $H_2 + Cl_2 \rightarrow$ A . What is A ?
A)HCl B)2HCl C)HO D)Cl

Answer:B

Solution:The balanced equation for hydrogen and chlorine combining is:

$H_2 + Cl_2 \rightarrow 2HCl$

7. $2Mg + O_2 \rightarrow 2MgO$ is ..... reaction
A) Decomposition B) Combination C)Synthesis D)Both B & C

Answer:D

Solution:Combination reaction: Two reactants form one product.

Synthesis reaction: Elements combine to form a compound.

8. The decomposition of ozone is using light energy is called
A) photo decomposition B) photoplytic decomposition
C)photochemical decomposition reaction. D) All the above

Answer:D

Solution:Terms like photo decomposition, photolytic decomposition, and photochemical decomposition are synonymous for light-driven breakdown.

9. electrolytic decomposition reaction generally involves
A) Solids B) Liquids C)Gases D) All the above

Answer:B

Solution:Electrolytic decomposition typically uses molten or aqueous ionic compounds (liquids) to conduct electricity.

10. Exothermic reactions involve
A) Release of energy B) Absorbtion of Energy
C) Both A & B D) None

Answer:A

Solution:Exothermic reactions release energy as heat/light.

JEE MAINS LEVEL QUESTIONS

11. Which of the following are decomposition reactions?

1)CH_4 (g) + O_2 (g) $\rightarrow$ CO_2 (g) + H_2O (l) 2)CaO (s) + CO_2 (g) $\rightarrow$ $CaCO_3$ (s)

3)Mg (s) + O_2 (g) $\rightarrow$ MgO (s) 4. $PbCO_3$ (s) $\rightarrow$ PbO (s) + CO_2 (g)

A) 4 only B)2, 3, and 4

C)All are decomposition reactions. D)2 and 3

Answer:A

Solution: 4. $PbCO_3$ (s) $\rightarrow$ PbO (s) + CO_2 (g)is a decomposition reaction (single compound breaks down).

12. One of the following processes does not involve a chemical reaction. That is:

A) Melting of candle wax when heated

B) Burning of candle wax when heated

C) Digestion of food in our stomach D) Ripening of banana

Answer:A

Solution:Melting is a physical change (state change, no new substance forms).

Others are chemical changes:

Burning (combustion), digestion (enzymatic reactions), ripening (biochemical changes).

13. The chemical equation, $KClO_3 \rightarrow KCl + O_2$, is an example of which type of reaction?

A)double-replacement B)combustion

C)decomposition D)single-replacement

Answer:C

Solution:A single compound ($KClO_3$) breaks into two simpler substances(KCl and $O_{2)}$

14. Rusting of iron is an example for

A)Combination B)Decomposition C)Displacement D)Double displacement

Answer:A

Solution:Iron + Oxygen $\rightarrow$Iron oxide (Fe_2O_3)

formation of a compound from elements

15. $2AgBr \rightarrow 2Ag + Br_2$ is an example for

A)Combination B)Decomposition C)Displacement D)Double displacement.

Answer:B

Solution: Silver bromide decomposes into silver and bromine (single reactant $\rightarrow$multiple products).

16. Combination reactions always

A)form only one product B)require oxygen gas

C)use only one reactant D)involve an element and an ionic compound.

Answer:A

Solution: Two or more reactants $\rightarrow$ one product.

17. If two or more substances are combined to form a new substance, the chemical

reaction is termed as

A)thermal decomposition B)combination

C)addition D)combustion

Answer:B

Solution:A combination reaction, also called synthesis reaction, is where two or more reactants come together to form a single product.

While sometimes used interchangeably with combination, "addition" can refer to the process of adding atoms to a molecule, not necessarily the formation of a new compound from separate substances.

JEE ADVANCED LEVEL QUESTIONS

MULTICORRECT TYPE:

18. A + B $\rightarrow$ AB represents:

A) Chemical combination B) Synthesis reaction.

C) Chemical double decomposition reaction. D) Analysis reaction.

Answer:A,B

Solution: A + B $\rightarrow$ AB represents:

Chemical combination - Two or more substances combine to form a single product.

Synthesis reaction - This is a specific type of combination reaction where simpler substances combine to form a more complex compound.

STATEMENT TYPE:

A) Statement-I, is True, Statement - II is True; Statement - II is a correct explanation for Statement-I

B) Statement - I is True, Statement is True; Statement -II is NOT a correct explanation for Statement - I

C) Statement - I is True, Statement - II , is False

D) Statement - I is False, Statement - II is True

19. **Statement I :**Lead nitrate on thermal decomposition gives lead oxide ,brown coloured gas called nitrogen dioxide and oxygen gas

Statement II :lead nitrate reacts with potassium iodide to form yellow ppt of lead iodide and the reaction is double displacement as well as precipitation reaction.

Answer:B

Solution: Statement I:True.

The decomposition reaction is: $2Pb(NO_3)_2 \xrightarrow{heat} 2PbO + 4NO_2 + O_2$

Statement II:True.

The reaction is: $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$

20. **Statement -**I: A single product is formed in combination reaction.

Statement -II: A single reactant is involved in decomposition reaction.

Answer:B

Solution: Statement I:True.

Combination reactions always produce one product from two or more reactants.

Statement II:True.

Decomposition reactions involve one reactant breaking into multiple products.

COMPREHENSION TYPE:

The reactions where chemical change takes place is called chemical reaction. There are 4 types of chemical reactions.

21. $N_2 + O_2 + \text{heat} \rightarrow 2NO$ is an example for

A)Combination reaction B)Endothermic reaction

C)Displacement reaction D) Both A&B

Answer:D

Solution: Option A: Combination Reaction

Correct. Two reactants ($N_2$and O_2) combine to form a single product (NO).

Option B: Endothermic Reaction

Correct. The reaction absorbs heat (as indicated by "+ heat") to proceed.

Option C: Displacement Reaction

Incorrect. No element is being displaced; it's a direct combination.

Option D: Both A & B

Correct. The reaction is both combination and endothermic.

INTEGER TYPE:

22. How many products are formed during combination reaction?

Answer:1

Solution:A combination reaction is defined as a reaction where two or more reactants combine to form a single product.

MATRIX MATCH TYPE:

23.

COLUMN -I	**COLUMN-II**
A) $AB \rightarrow A + B$	1) electrolytic decomposition reaction
B) Acidified water	2) Decomposition
C) Ozone depletion	3) Combination
D) $A+B \rightarrow AB$	4) Photo decomposition

Answer:A-2,B-1,C-4,D-3

Solution:

COLUMN -I	**COLUMN-II**
A) $AB \rightarrow A + B$	2) Decomposition
B) Acidified water	1) electrolytic decomposition reaction
C) Ozone depletion	4) Photo decomposition
D) $A+B \rightarrow AB$	3) Combination

KEY

			TEACHING TASK						
			JEE MAIN LEVEL						
1	2	3	4	5	6	7	8	9	10
B	C	C	B	D	C	D	A	A,B	A,C
			JEE ADVANCED LEVEL						
11	12	13	14	15	16	17	18	19	20
B,C,D	C	D	D	A	B	A	A,B	1	3
21									
A-2,B-3,C-4,D-1									
			LEARNER'S TASK						
			CUQ'S						
1	2	3	4	5	6	7	8	9	10
A	B	C	B	D	B	D	D	B	A
			JEE MAINS&ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	20
A	A	C	A	B	A	B	A,B	B	B
21	22	23							
D	1	A-2,B-1,C-4,D-3							

EdOS
Educational Operating System