16.CHEMICAL EQUATIONS AND LAWS

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. If the law of conservation of mass holds true, how much sodium chloride will react with 34.0 g of silver nitrate to produce 17 g of sodium nitrate and 28.70 g of silver chloride?
    A) 12.35 g   B) 11.70 g   C) 9.32 g   D) 8.46 g

Answer:B

Solution:Conservation of mass:

Mass of reactants = Mass of products

Let x = mass of NaCl.

Reactants: x+34.0 g

Products: 17.0+28.70=45.70 g

x+34.0=45.70

x=11.70 g

2. Barium chloride reacts with sodium sulphate and forms Barium sulphate and sodium chloride. Which of the following statement is correct according to the law of conservation of mass?
    A) The total mass of reactants, barium chloride, and sodium sulphate taken is greater than the total mass of the products, barium sulphate, and sodium chloride.
    B) The total mass of reactants, barium chloride, and sodium sulphate taken is less than the total mass of the products, barium sulphate, and sodium chloride.
    C) The total mass of the reactants is equal to the total mass of the products.
   D) None of the above

Answer:C

Solution:

Law of conservation of mass: total mass of reactants = total mass of products.

3. A student asks why the ashes from a fire have a much lower mass than the wood that was burned. Which is the <u>correct </u>answer to the student's question?
    A) Gases are released into the air.
    B) Atoms in the wood are destroyed
    C) Heat causes molecules to lose density.
    D) Water inside the wood solidifies.

Answer:A

Solution:Ashes have lower mass because combustion releases gases (CO_2, H_2O vapor)

4. In the equation below, 46 grams of sodium (Na) reacted with 36 grams of water (H_2O).
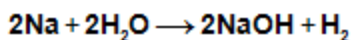
$$2Na + 2H_2O \longrightarrow 2NaOH + H_2$$

If 2 grams of hydrogen gas (H_2) is produced by this reaction, what is the mass of sodium hydroxide (NaOH) produced?

A) 10 grams   B) 44 grams   C) 80 grams   D) 82 grams

Answer:C

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

Given:

Na = 46 g, H_2O = 36 g, H_2 produced = 2 g.

Mass of reactants = 46+36=82 g

Mass of products = H_2+NaOH

82=2+NaOH mass

NaOH mass = 80 g

5. Which of the following equation is NOT balanced correcttly
A) $NaHSO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$
B) $2NaOH + (NH_4)_2 SO_4 \rightarrow Na_2SO_4 + 3NH_2 + H_2O$
C) $6NH_4OH + Al_2(SO_4)_3 \rightarrow 2Al(OH)_3 + 3(NH_4)_2 SO_4$
D) $MgSO_4 + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2SO_4$

Answer:B

Solution:- $2NaOH + (NH_4)_2 SO_4 \rightarrow Na_2SO_4 + 3NH_2 + H_2O$
is not a balanced equation because.

Element	L.H.S	R.H.S.
Na.	2	2
O	6	5
H.	10	8.
N.	2	3.
S	1	1.

According law of conservation of mass, mass of reactants = mass of products. In the above equation both are different. So it an unbalanced equation.

6. Decomposition of $2KNO_3$ gives
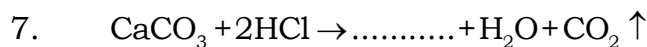A) $KNO + O_3$ B) $KNO_2 + O_2$ C) $2KNO_2 + O_2$ D) None

Answer:C

Solution: $2KNO_3 \rightarrow 2KNO_2 + O_2$

7. $CaCO_3 + 2HCl \rightarrow .... + H_2O + CO_2 \uparrow$
   A) Ca_2Cl B) CaH_2O C) $CaCl_2$ D) $CaCO_2$

Answer:C

Solution: $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

8. $A + 2Al \longrightarrow B + 2Fe$
   A) $A \longrightarrow 2Fe_3O_3$, $B \longrightarrow Al_2O_3$ B) $A \longrightarrow Fe_2O_3$, $B \longrightarrow 2Al_2O_3$
   C) $A \longrightarrow Fe_2O_3$, $B \longrightarrow Al_2O_3$ D) $A \longrightarrow 2Fe_2O_3$, $B \longrightarrow 2Al_2O_3$

Answer:C

Solution:

$Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$

$So, A = Fe_2O_3, B = Al_2O_3$

9. $AgCl + 2Na_2S_2O_3 \rightarrow Na_3[Ag(S_2O_3)_2] + NaCl$. After balancing the equation what number will come before NaCl
   A) 1   B) 2   C) 3   D) 4

Answer:A

Solution: $AgCl + 2Na_2S_2O_3 \rightarrow Na_3[Ag(S_2O_3)_2] + NaCl$

     Balance:

     Right side: Na = 3 + 1 = 4, Left: from $2Na_2S_2O_3$ = 4 Na.

     So NaCl coefficient = 1.

10. $Al + NaOH + H_2O \rightarrow NaAlO_2 + 3H_2$. After balancing the equation how many atoms of sodium is there on the right hand side
    A) 1   B) 2   C) 3   D) 4

Answer:B

Solution: $2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2$

     Right side: $2NaAlO_2 \rightarrow$ 2 Na atoms.

11. $NaOH + Cl_2 \rightarrow NaCl + NaClO_3 + 3H_2O$. After balancing the equation how many molecules of sodium chlorate is forme4)
    A) 1   B) 2   C) 3   D) 4

Answer:A

Solution:Reaction: $NaOH + Cl_2 \rightarrow NaCl + NaClO_3 + 3H_2O$

Solution:- $NaOH + Cl_2 \rightarrow NaCl + NaClO_3 + 3H_2O$.

Multiply NaOH with '6'

	LHS	RHS
Na	① 6.	②-6
O	① 6.	6.
H	① 6.	6.
Cl.	② x3	②-6

$6NaOH + Cl_2 \rightarrow NaCl + NaClO_3 + 3H_2O$

$6NaOH + Cl_2 \rightarrow 5NaCl + NaClO_3 + 3H_2O$.

$6NaOH + 3Cl_2 \rightarrow 5NaCl + NaClO_3 + 3H_2O$
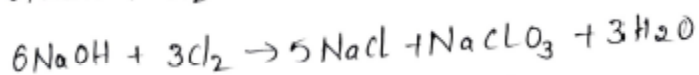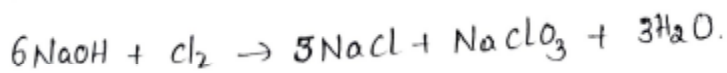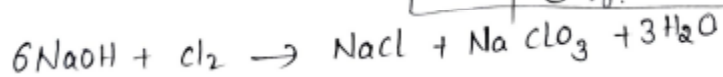
There are 1 molecule of sodium chlorate is present.

12. One part of an element (A) combines with two parts of another element (2). 6 parts of element (C) combines with 4 parts of (2). If A and (C) combine together the ratio of their weights, will be governed by :
A) law of definite proportion
B) law of multiple proportion
C) law of reciprocal proportion
D) law of conservation of mass

Answer:C

Solution:A : B = 1 : 2
    C : B = 6 : 4 = 3 : 2
    B fixed at 2 parts with A → A = 1
    B fixed at 2 parts with C → C = 3
    So A : C = 1 : 3
    This is law of reciprocal proportions (two elements combining separately with a fixed mass of a third element).

13. Ferric sulphate on heating gives sulphur trioxide. The ratio between the weights of oxygen and sulphur present in SO_3 obtained by heating 1 kg of ferric sulphate is
A) 2 : 3   B) 1 : 3   C) 3 : 1   D) 3 : 2

Answer:D

Solution:

Ferric sulphate is $Fe_2(SO_4)_3$. On heating, it decomposes to give SO_3.

In SO_3:–

Mass of Sulphur (S) = 32 g.

Mass of Oxygen (O) = 48 g.

The ratio O : S = 48 : 32 = 3 : 2

14. 14 gm of an element 'X' combines with 16 gm of oxygen. On basis of this which of the following is correct ? (At.wt of oxygen = 16.
   A) The element X could have an atomic weight of 7 and its oxide formula is XO.
   B) The element X could have an atomic weight 14 and it's oxide formula X_2O_3.
   C) The element X could have an atomic weight 7 and it's oxide formula X_2O.
   D) The element X could have an atomic weight 14 and it's oxide formula XO_2

Answer:C

Ans:–C .

Solution:– If X has an atomic weight of 7,

$X_2O \rightarrow 2x + O = 14 + 16 = 30$.

The total mass of X & O is 30, the formula matches X = 14 gms, O = 16 gms).

15. The % composition of four hydro carbons is as follows:

| i.	ii.	iii.	iv.	% C
75	80	85.7	91.3	% H
25	20	14.3	8.7	The data illustrates the law of

   A) Constant proportion   B) Conservation of mass
   C) Multiple Proportions   D) Reciprocal Proportions.

Answer:C

Solution:Different hydrocarbons with different % C and H but all are in small whole number ratios of C:H when converted to fixed mass of C.

This illustrates law of multiple proportions (different compounds from same elements have masses in small whole number ratios).

16. Among the following pairs of compounds, The one that illustrates the law of multiple proportions is :

    A) NH_3 and NCl_3 B) H_2S and SO_2

    C) CuO and Cu_2O D) CS_2 and $FeSO_4$
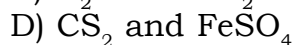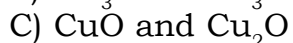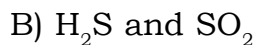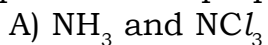
Answer:C

Solution:Law of multiple proportions: different masses of one element combining with fixed mass of another.
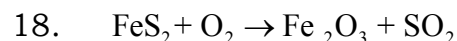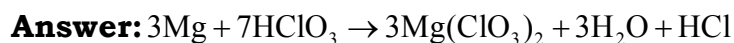
    CuO and Cu_2O:

    In CuO, 63.5 g Cu with 16 g O

    In Cu_2O, 127 g Cu with 16 g O

    Ratio of Cu masses for fixed O = 127 : 63.5 = 2 : 1 → whole number ratio →yes.

Balance the following
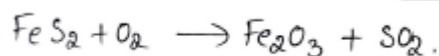
17. Mg + $HClO_3$ → $Mg(ClO_3)_2$ + H_2O + HCl

    Balanced Equation

Answer: $3Mg + 7HClO_3 \rightarrow 3Mg(ClO_3)_2 + 3H_2O + HCl$

18. $FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

    Balanced Equation

Answer:

19. $NaBrO$ + NH_2CONH_2 → $NaBr$ + CO_2 + H_2O + N_2

    Balanced Equation

Answer:

$Na\,BrO + NH_2CONH_2 \rightarrow Na\,Br + CO_2 + H_2O + N_2$

Balanced Equation.

$3Na\,BrO + NH_2CONH_2 \rightarrow 3NaBr + CO_2 + 2H_2O + N_2$
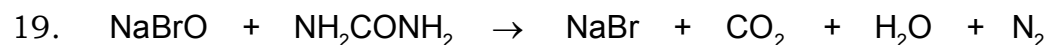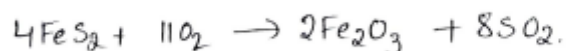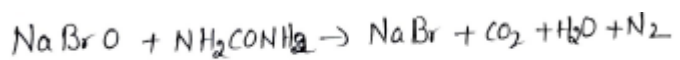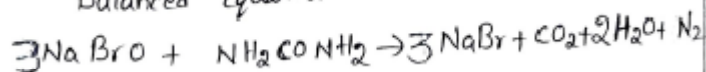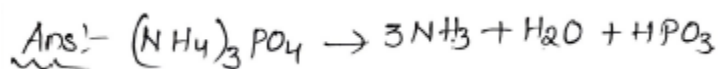
Reason :-

	L.H.S	R.H.S.
Na	3	3
Br	3	3
O	4	4
N	2	2
H	4	4
C	1	1

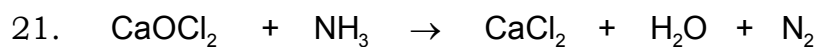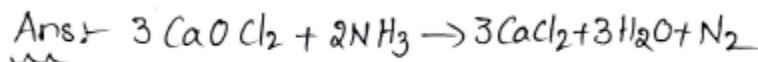20. $(NH_4)_3\,PO_4 \rightarrow NH_3 + H_2O + HPO_3$

Balanced Equation

Ans :- $(NH_4)_3\,PO_4 \rightarrow 3NH_3 + H_2O + HPO_3$

Reason :-

	L.H.S	R.H.S
N.	3	3
H.	12.	12.
P	1	1
O	4	4.

21. $CaOCl_2 + NH_3 \rightarrow CaCl_2 + H_2O + N_2$

Balanced Equation

Ans :- $3CaOCl_2 + 2NH_3 \rightarrow 3CaCl_2 + 3H_2O + N_2$

Solution :-

	L.H.S	R.H.S.
Ca	3	3.
O	3	3.
Cl	6	6.
N	2	2.
H	6	6.

JEE ADVANCED LEVEL QUESTIONS

MULTICORRECT ANSWER TYPE

1. Which of the following is correct balanced equation?

    A) $Na_2CO_3 + 2HC\ell \longrightarrow 2NaC\ell + CO_2 + H_2O$
    B) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
    C) $2H_2S + SO_2 \longrightarrow 2H_2O + 3S$
    D) $2H_2 + Cl_2 \rightarrow 2HCl$

Answer:A,B,C

Solution: A) $Na_2CO_3 + 2HC\ell \longrightarrow 2NaC\ell + CO_2 + H_2O \rightarrow$ Balanced

    B) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O \rightarrow$ Balanced

    C) $2H_2S + SO_2 \longrightarrow 2H_2O + 3S \rightarrow$ Balanced

    D) $2H_2 + Cl_2 \rightarrow 2HCl \rightarrow$ Unbalanced

2. Which of the following is correct balanced equation?

    A) $Na_2CO_3 + 2HC\ell \longrightarrow 2NaC\ell + CO_2 + H_2O$
    B) $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$
    C) $2H_2S + SO_2 \longrightarrow 2H_2O + 3S$
    D) $4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$

Answer:A,B,C,D

Solution: A) $Na_2CO_3 + 2HC\ell \longrightarrow 2NaC\ell + CO_2 + H_2O \rightarrow$ Balanced

    B) $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O \rightarrow$ Balanced

    C) $2H_2S + SO_2 \longrightarrow 2H_2O + 3S \rightarrow$ Balanced

    D) $4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O \rightarrow$ Balanced

ASSERTION AND REASON TYPE

    A) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.

    B) Both Assertion and Reason are true, but Reason is NOT the correct explanation for Assertion.

    C) Assertion is true, but Reason is false.
    D) Assertion is false, but Reason is true.

3. **Assertion** : The volume ratio of $H_2, C\ell_2$ and $HC\ell$ in the reaction

        $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$ is 1 : 1 : 2

    Reason : Substances always react in such a way that their volume ratio is simple whole number

Answer:A

Solution: $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$

    Volume ratio is 1 : 1 : 2

COMPREHENSION TYPE

    According to the law of Multiple Proportions, if two elements combine to form more than one compound, then the different masses of one element which combine with a fixed mass of the other element, bear a simple ratio to one another.

4. The % of Hydrogen in water and Hydrogen peroxide is 11.2% and 5.94% respectively. This illustrates the law of
A) Constant Proportions B) Conservation of mass
C) Multiple Proportions D) Law of Gaseous volume.

Answer:C

Solution:% of H in

Water (H_2O) = 11.2%

Hydrogen peroxide (H_2O_2) = 5.94%

Here, the same elements (H and O) combine in different ratios to form different compounds → this illustrates the Law of Multiple Proportions

5. The composition of compound A is 40% X and 60% Y. The composition of compound B is 25% X and 75% Y. Accroding to the law of multiple Proportions the ratio of the weight of element Y in compounds A and B is:
A) 1:2 B) 2 : 1 C) 2 : 3 D) 3 :4

Answer:A

Solution:Compound A = 40% X and 60% Y

Compound B = 25% X and 75% Y

We take equal mass of X in both compounds and find the ratio of Y that combines with it.

Let's calculate the mass of Y that combines with 1 g of X:

In A:If X = 40 g → Y = 60 g

So, for 1 g X → Y = 60 / 40 = 1.5 g

In B:If X = 25 g → Y = 75 g

So, for 1 g X → Y = 75 / 25 = 3 g

Now ratio of masses of Y combining with same mass of X = 1.5 : 3 = 1 :2

INTEGER TYPE

6. Molecular weight of Calcium Carbonate is _____

Answer:100

Solution:Molecular weight of Calcium Carbonate($CaCO_3$):

Ca=40, C=12, O_3=16×3=48

Total=40+12+48=100

7. Atomic weight of Potassium is _____

Answer:39

Solution:Atomic weight of Potassium is **39**

MATRIX MATCHING TYPE

8.. **Column-I** **Column-II**

a) 2 N_2 + O_2 1) $2Fe_2O_3$ + 4 SO_2

b) H_2O_2 2) $2N_2O$

c) 4 FeS + 7O_2 3) H_2 +O_2

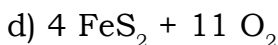d) 4 FeS_2 + 11 O_2 4) $2Fe_2O_3$ + 8SO_2

A) a-2,b-3, c-1,d-4 B) a-4,b-1, c-2,d-3

C) a-5,b-1, c-2,d-3　　　　　　D) a-3,b-4, c-1,d-2
Answer:A
Solution:

a) $2 N_2 + O_2$　　　　　　2) $2N_2O$

b) H_2O_2　　　　　　3) $H_2 + O_2$

c) $4 FeS + 7O_2$　　　　　　1) $2Fe_2O_3 + 4 SO_2$

d) $4 FeS_2 + 11 O_2$　　　　　　4) $2Fe_2O_3 + 8SO_2$
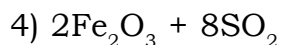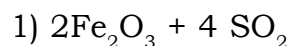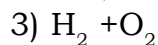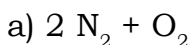
LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ'S)

1.　The correct molecular weight of $KClO_3$ is _____ amu.
　　A) 100　　　　　B) 112.5　　　　　C) 122.5　　　　　D) 134
Answer:C
Solution:K = 39, Cl = 35.5, O = 16
　　39+35.5+3×16=39+35.5+48=122.5 amu

2.　Balancing equations is necessary according to the
　　A) law of conservation of mass　　　B) law of definite proportion
　　C) law of multiple proportion　　　D) all the above
Answer:A
Solution:Balancing ensures mass conservation (atoms are conserved).

3.　If the atomic mass of H=1, S=32 and oxygen is 16, the molecular mass of H_2SO_4 is
　　A) 98　　　　　B) 49　　　　　C) 89　　　　　D) 76
Answer:A
Solution:22+32+64=98

4.　In a chemical reaction the atoms are neither created nor ....
　　A) invented　　　B) destroyed　　　C) both A & B　　　D) None
Answer:B
Solution:Law of conservation of mass: neither created nor destroyed.

5.　The substance which take part in a chemical reaction are called
　　A) reactants　　　B) products　　　C) formula　　　D) compound
Answer:A
Solution:The substance which take part in a chemical reaction are called reactants

6.　The no. of places at which an element appears in a chemical reaction is called
　　A) repetition　　　B) periodicity　　　C) frequency　　　D) regularity
Answer:C
Solution: Number of places an element appears in a reaction is called frequency (in balancing chemical equations).

7. In a metal and non metal have same frequency then the element i.e. balanced first is
    A) non metal   B) metal
    C) metal if its atomic mass more   D) non metal if its atomic number more
Answer:B
Solution:Usually, metals are balanced first (common balancing rule).

8. The number of "Cr" after balacing the reaction

    $K_2Cr_2O_7 + H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + H_2O + O_2$

    A) 1   B)0   C)3   D)2
Answer:D
Solution: $2K_2Cr_2O_7 + 8H_2SO_4 \rightarrow 2K_2SO_4 + 2Cr_2(SO_4)_3 + 8H_2O + 3O_2$

    After bancing equation $2Cr_2$ are present on product side

9. The number of oxygen after balancing the reaction $H_2 + O_2 \rightarrow H_2O$
    A) 2   B)3   C)4   D)1
Answer:A
Solution:Balanced: $2H_2 + O_2 \rightarrow 2H_2O$

    O atoms: left = 2, right = 2.

10. A chemical equation is shown as $2H_2O \leftarrow 2H_2 + O_2$) Which substance is a reactant?
    A) Dihydrogen Monoxide   B) H_2O
    C) Hydrogen   D) Water
Answer:C
Solution:Reactants are oxygen & Hydrogen

JEE MAIN LEVEL QUESTIONS

11. In a balanced equation
    A) The number of molecules of both sides are equal.
    B) The number of atoms on both sides are same
    C) The diatomic molecules present on both sides are equal
    D) Reactants and products are same side.
Answer:B
Solution:Balanced means number of atoms of each element on both sides is same.

12. Students have two identical beakers with a mass of 20 grams each. The students pour a different liquid reactant into each beaker. The total mass of the two beakers with the reactants is 50 grams. Next, the students combine Reactant 1 and Reactant 2 into one of the beakers. A chemical reaction produces a product.
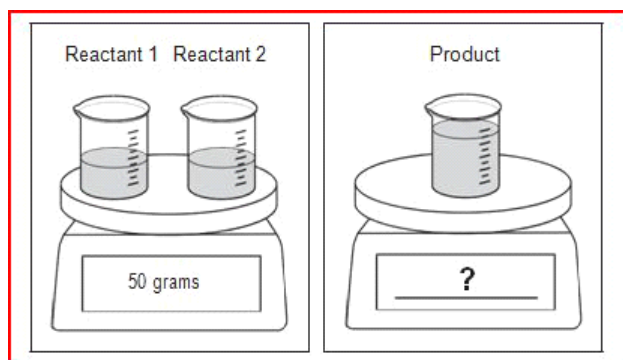
If all of the reactants are consumed and no gases are produced, what is the total mass of the product and one beaker?

A) 40 grams   B) 30 grams   C) 20 grams   D) 70 grams

Answer:B

Solution:Two beakers: each mass 20 g → total beakers mass = 40 g.
Total mass with reactants = 50 g → reactants mass = 10 g.
They combine reactants into one beaker →
 beaker (20 g) + reactants (10 g) = 30 g total.
Reaction: all reactants consumed, no gases → mass conserved.
Total mass of product + one beaker = 30 g.

13.   A chemical equation is shown as $2H_2O \longrightarrow 2H_2 + O_2$.Which of the following choices is the product of this chemical reaction?

A) Hydrogen   B) Water   C) H_2 D) Oxygen

Answer:A,C,D

Solution:Products are on right: H_2 and O_2

14.   Examine the following chemical reaction Iron (Fe) reacts with Oxygen (O) to form iron oxide (FeO) which is commonly called rust.

$$2Fe + 3O_2 \longrightarrow 2FeO_3$$

Which chemical formula shown below is the product of this reaction?

A) Iron (Fe)   B) Iron Oxide   C) $3O_2$ D) $2FeO_3$

Answer:D

Solution:
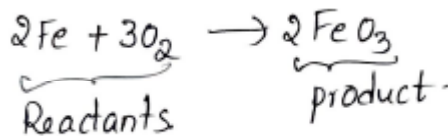
15.   Which of the following is correct?
A) Molecular weight of oxygen is 32.
B) Gram molecular mass of sulphur (S_8) is 256 g.
C) The weight of one molecule of O_3 is 48 amu.
D) All

Answer:D

Solution:A) Molecular weight of oxygen (O_2) = 32

B) S_8 molecular mass = 8 × 32 = 256 g → gram molecular mass = 256 g

C) O_3 molecular weight = 48 amu

16. Molecular weight of CH_4 is

A) 16 amu B)16 gr C)20 amu 4)20 gr

Answer:A

Solution:The molecular weight of CH_4(methane) is 16 amu.

17. Gram molecular weight of $Ca(OH)_2$ is

A) 74 amu B)74 gr C)78 amu D) 78gr

Answer:B

Solution:Ca = 40, O = 16×2=32, H = 1×2=2 → total = 74 g (gram molecular weight in grams)

18. In the formation of SO_2 and SO_3 the ratio of the weights of oxygen which combines with 10kg of sulphur is

A) 1 : 1 B) 3 : 2 C) 2 : 3 D) 3 : 4

Answer:C

Solution:For fixed S mass 10 kg:

O in SO_2 = 10 kg, O in SO_3 = 10 × (3/2) = 15 kg

Ratio O in SO_2 : O in SO_3 = 10 : 15 = 2 : 3

19. Among the following pairs of compounds, The one that illustrates the law of multiple proportions is :

A) NH_3 and NCl_3 　　　　　　　B) H_2S and SO_2

C) CuO and Cu_2O 　　　　　　　D) CS_2 and $FeSO_4$

Answer:C

Solution:

Solution:— In CuO, 1 Cu reacts with 1 oxygen

1:1

In Cu_2O, 2 Cu and 1 oxygen-

The ratio of Cu in CuO & Cu_2O is 1:2

20. Law of multiple proportions is illustrated by one of the following pairs.

A) H_2S and SO_2 　　　　　　　B) NH_3 and NO_2

C) Na_2S and Na_2O 　　　　　　D) N_2O and NO

Answer:D

Solution: N_2O and NO — N and O:

N_2O: O:N = 16:28 = 4:7, NO: O:N = 16:14 = 8:7 → ratio O masses for fixed
N = (4/7):(8/7) = 1:2

21. The ratio of weights of oxygen that combine with a fixed weight of sulphur in SO_2 and SO_3 is

A) 2 : 3   B) 1 : 1   C) 3 : 2   D) none of these

Answer:A

Solution:Oxygen ratio SO_2 : SO_3 =2:3

22. The different samples of CO_2 were found to contain the same ratio of carbon and oxygen. This illustrate

A) law of conservation of mass   B) law of definite proportion
C) law of multiple proportion   D) all the above

Answer:B

Solution:Different samples of CO2 have same C:O ratio Illustrates law of definite proportions.

23. Law of multiple proportions is illustrated by one of the following pairs.

A) H_2S and SO_2 B) NH_3 and NO_2
C) Na_2S and Na_2O D) N_2O and NO

Answer:D

Solution: N_2O and NO — N and O:

N_2O: O:N = 16:28 = 4:7, NO: O:N = 16:14 = 8:7 → ratio O masses for fixed
N = (4/7):(8/7) = 1:2

Balance the following

24. Skeleton Equation

$Fe + N_2O \rightarrow N_2 + Fe_3O_4$

Balanced Equation

Answer:

$3Fe + 4N_2O \rightarrow 4N_2 + Fe_3O_4$
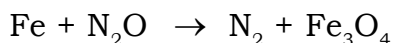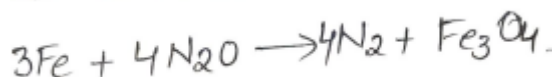
	L.H.S	R.H.S.
Fe	3	3
N₂	8	8.
O	4	4.

25. Skeleton Equation

Sn + HCl + NO $\rightarrow$ SnCl$_2$ + NH$_2$OH
Balanced Equation

Answer:

Ans:- $3Sn + 6HCl + 2NO \rightarrow 3SnCl_2 + 2NH_2OH$

Solution:- $Sn + HCl + NO \rightarrow SnCl_2 + NH_2OH$
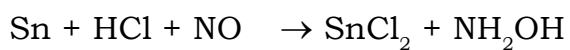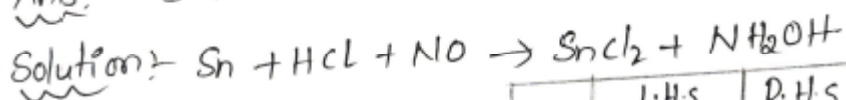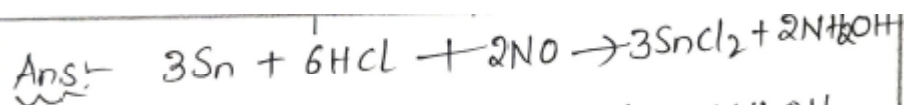
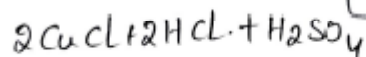|	L.H.S	R.H.S
Sn	① 3	① 3.
H	①②6	③ 6
cl	①②6	② 6
N	① 2	① 2
O	① 2	① 2

$Sn + 2HCl + NO \rightarrow SnCl_2 + NH_2OH.$

$Sn + 6HCl + NO \rightarrow SnCl_2 + 2NH_2OH.$

$3Sn + 6HCl + 2NO \rightarrow 3SnCl_2 + 2NH_2OH.$

26. Skeleton Equation

CuSO$_4$ +KI $\rightarrow$ CuI + I$_2$+K$_2$SO$_4$

Balanced Equation

Answer:

Ans:- $2CuSO_4 + 4KI \rightarrow 2CuI + I_2 + 2K_2SO_4$.

Solution:-

$CuSO_4 + KI \rightarrow CuI + I_2 + K_2SO_4$.

$CuSO_4 + 2KI \rightarrow CuI + I_2 + K_2SO_4$.
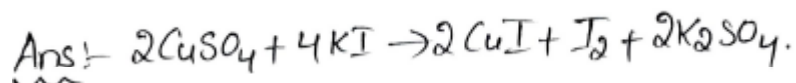
	L·H·S	R·H·S.
Cu	①2	① 2
S	①2	①2
O	④8	④8.
K	①②4	②4
I	①②4.	③4

$CuSO_4 + 4KI \rightarrow 2CuI + I_2 + K_2SO_4$

$2CuSO_4 + 4KI \rightarrow 2CuI + I_2 + 2K_2SO_4$.

27. Skeleton Equation
$CuCl_2 +$ $H_2O + SO_2 \rightarrow CuCl$ $+ HCl + H_2SO_4$
Balanced Equation

Answer:

Ans:- $2CuCl_2 + 2H_2O + SO_2 \rightarrow 2CuCl + 2HCl + H_2SO_4$.

Solution:-

$CuCl_2 + H_2O + SO_2 \rightarrow CuCl + HCl + H_2SO_4$

$CuCl_2 + 2H_2O + SO_2 \rightarrow CuCl + 2HCl + H_2SO_4$.
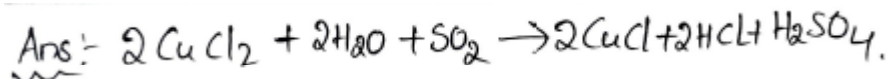
	LHS	RHS
Cu	①2	①2
Cl	②4	②③4
H	②4	③4.
O	③4.	4
S	1	1

$2CuCl_2 + 2H_2O + SO_2 \rightarrow$

$2CuCl + 2HCl + H_2SO_4$

28. $Al_2O_3 + C \rightarrow Al_4C_3 + CO$
Balanced Equation

Answer:

Ans:- $2Al_2O_3 + 9C \rightarrow Al_4C_3 + 6CO.$

Solution:-

$Al_2O_3 + C \rightarrow Al_4C_3 + CO.$

$2Al_2O_3 + C \rightarrow Al_4C_3 + 6CO$

$2Al_2O_3 + 9C \rightarrow Al_4C_3 + 6CO.$
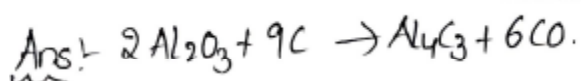
	L·H·S	R·H·S.
AL	②4	4
O	③6	①6
C	①9	④9.

29. Skeleton Equation

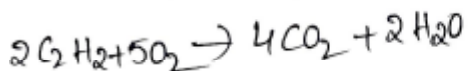$C_2H_4 \quad + \quad O_2 \quad \rightarrow \quad CO_2 + H_2O$

Balanced Equation

Answer:

Ans:- $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O.$

Solution:-

$C_2H_4 + O_2 \rightarrow CO_2 + H_2O$

$C_2H_4 + O_2 \rightarrow 2CO_2 + H_2O$

$C_2H_4 + O_2 \rightarrow 2CO_2 + 2H_2O$

$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$
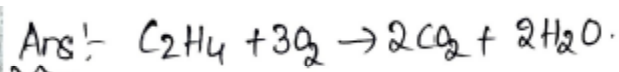
	L·HS	RHS
C	2	①2
H	4	②4
O	②6.	③6

30. Skeleton Equation

$C_2H_2 \quad + \quad O_2 \quad \rightarrow \quad CO_2 + H_2O$

Balanced Equation

Answer:

Ans:- $2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$

Solution:-

$C_2H_2 + O_2 \rightarrow CO_2 + H_2O$

$C_2H_2 + O_2 \rightarrow 2CO_2 + H_2O$

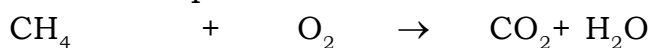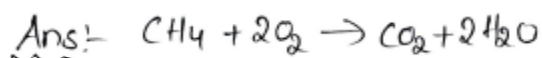$2C_2H_2 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$
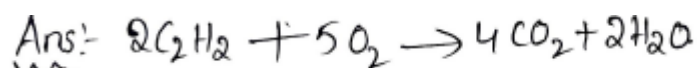
	L.H.S	R.H.S
C	②4	①②4
H	②4	②4
O	②⑥ 10	③⑤⑥ 10

31. Skeleton Equation
    $CH_4 \quad + \quad O_2 \quad \rightarrow \quad CO_2 + H_2O$
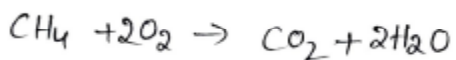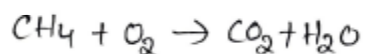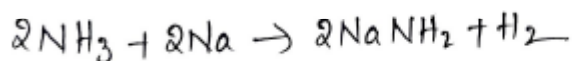   Balanced Equation

Answer:

Ans:- $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Solution:-

$CH_4 + O_2 \rightarrow CO_2 + H_2O$

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

	L.H.S	R.H.S
C	1	1
H	4	②4
O	②4	③4

32. Skeleton Equation
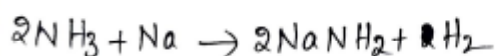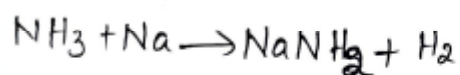 $NH_3 \quad + \quad Na \quad \rightarrow \quad NaNH_2 + H_2$
    Balanced Equation
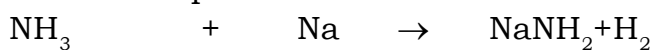
Answer:

Solution:-

$NH_3 + Na \longrightarrow NaNH_2 + H_2$

$2NH_3 + Na \rightarrow NaNH_2 + 2H_2$

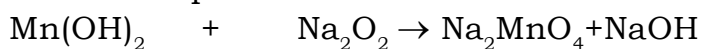$2NH_3 + Na \rightarrow 2NaNH_2 + 2H_2$

$2NH_3 + 2Na \rightarrow 2NaNH_2 + H_2$
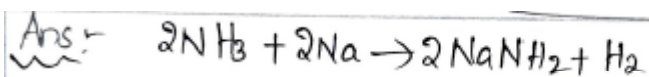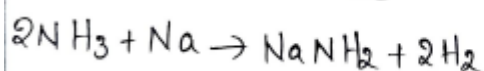
	L·H·S	R·H·S
N	① 2	① 2
H	③ 6	④ 6
Na	1	① 2

33. Skeleton Equation

$Mn(OH)_2 + Na_2O_2 \rightarrow Na_2MnO_4 + NaOH$

Balanced Equation

Answer:

Ans:- $Mn(OH)_2 + 2Na_2O_2 \rightarrow Na_2MnO_4 + 2NaOH$.

Solution:-

$Mn(OH)_2 + Na_2O_2 \longrightarrow Na_2MnO_4 + NaOH$.

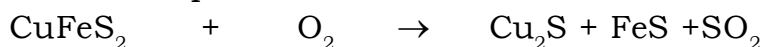$Mn(OH)_2 + Na_2O_2 \rightarrow Na_2MnO_4 + 2NaOH$.
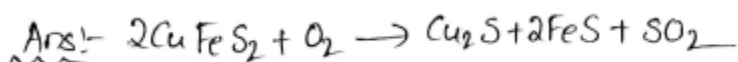
$Mn(OH)_2 + 2Na_2O_2 \rightarrow Na_2MnO_4 + 2NaOH$.

	L·H·S	R·H·S
Mn	①	1
O	④ 6	⑤ 6
H	②	① 2
Na	② 4	④ ③

34. Skeleton Equation

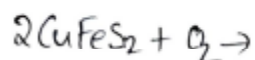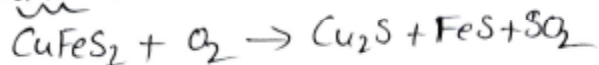$CuFeS_2 + O_2 \rightarrow Cu_2S + FeS + SO_2$

Balanced Equation

Answer:

Ans:- $2CuFeS_2 + O_2 \rightarrow Cu_2S + 2FeS + SO_2$

Solution:-

$CuFeS_2 + O_2 \rightarrow Cu_2S + FeS + SO_2$

$2CuFeS_2 + O_2 \rightarrow$

$Cu_2S + 2FeS + SO_2$
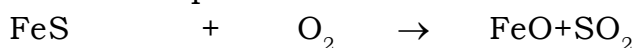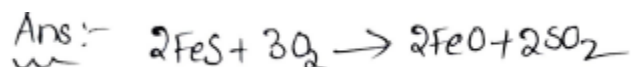
		L·H·S	R·H·S
Cu		① 2	2
Fe		① 2	① 2
S		② 4	③ 4
O		2	2

35. Skeleton Equation
   FeS   + O_2 →   FeO+SO_2
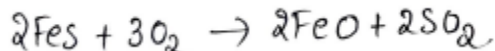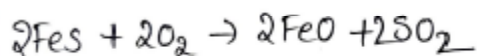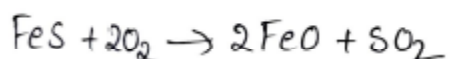   Balanced Equation

Answer:

Ans:- $2FeS + 3O_2 \rightarrow 2FeO + 2SO_2$

Solution:-

$FeS + O_2 \rightarrow FeO + SO_2$

$FeS + 2O_2 \rightarrow 2FeO + SO_2$

$2FeS + 2O_2 \rightarrow 2FeO + 2SO_2$

$2FeS + 3O_2 \rightarrow 2FeO + 2SO_2$
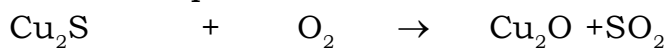
		LHS	RHS.
Fe		① 2	① 2
S		① 2	① 2
O		②④ 6	③④ 6

36. Skeleton Equation
   Cu_2S + O_2 → Cu_2O +SO_2
   Balanced Equation

Answer:

Ans:- $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

Solution:-

$Cu_2S + O_2 \rightarrow Cu_2O + SO_2$

$Cu_2S + O_2 \rightarrow 2Cu_2O + SO_2$

$2Cu_2S + O_2 \rightarrow 2Cu_2O + SO_2$

$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

	LHS	RHS.
Cu	②4	②4
S	①2	①2
O	④6	③④6

37. Skeleton Equation
$Cu_2S + CuSO_4 \rightarrow Cu + SO_2$
Balanced Equation

Answer:

Ans:- $Cu_2S + CuSO_4 \rightarrow 3Cu + 2SO_2$

Solution:-

$Cu_2S + CuSO_4 \rightarrow Cu + SO_2$

$Cu_2S + CuSO_4 \rightarrow 3Cu + 2SO_2$

	L·HS	RHS.
Cu	3	①3
S	2	①②
O	4	②4

38. Skeleton Equation
$Cu_2O + Cu_2S \rightarrow Cu + SO_2$
Balanced Equation

Answer:

Ans:- $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$

Solution:-

$Cu_2O + Cu_2S \rightarrow Cu + SO_2$.

$2Cu_2O + Cu_2S \rightarrow 4Cu + SO_2$

$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$
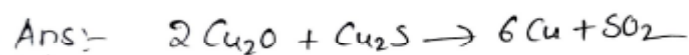
	LHS	RHS.
Cu	④6	①④6
O	①2	2
S	1	1

JEE ADVANCED LEVEL QUESTIONS

MULTICORRECT ANSWER TYPE
1.   Identify the balanced equation of the following

    A) $H_2 + C\ell_2 \rightarrow 2HC\ell$ B) $2Mg + O_2 \rightarrow 2MgO$

    C) $2CO + O_2 \rightarrow 2CO_2$ D) $Fe + S \rightarrow FeS$

Answer:A,B,C,D

Solution:All equations are balanced

2. $N_2 + 3H_2 \rightarrow 2NH_3$ The above reaction is a balanced one with corrected limitations.

    Identify the corrected limitations.

    A) Physical states of reactants

    B) Number of atoms and molecules

    C) Symbols and formulae of all the substances.

    D) Physical conditions of a reaction on the arrow.

Answer:A,D

Solution:

Solution'- The above reaction tells about the symbols and formulae. and also explains the no. of atoms and molecules. It doesn't tell the physical states and physical condition of a reaction on the arrow.

STATEMENT TYPE

    A) Both statement I and statement II are correct

    B) Both statement I and statement II are incorrect

    C) Statement I is correct andstatement II is incorrect.

    D) Statement I is incorrect and statement II is correct

3.   **Statement I :** A balanced chemical equation does not tell about the all physical
                    conditions of a reaction.

    Statement II : A balanced chemical equation tells about only some physical
                    conditions like light, heat energy and pressure but not of catalyst
                    of a reactions.

Answer:C

Solution:Statement I: True.

    A balanced equation alone (without additional notations) does not specify all
    physical conditions.

    Statement II: False.

     A balanced equation by default does not tell any conditions unless we add
    symbols (for heat, "light", "pressure", or catalyst above the arrow). So saying it

tells about some but not catalyst is misleading — it tells none unless we annotate it.

4.   **Statement I :** $Mg + 2HC\ell \rightarrow MgC\ell_2 + H_2$ is a balanced equation.
     Statement II : The number of atoms in the reactants is equal to the number of atoms in the products.
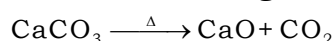**Answer:A**
Solution:Mg: 1 on left, 1 on right
     H: 2 on left (in 2HCl), 2 on right (in H_2)
     Cl: 2 on left, 2 on right

COMPREHENSION TYPE
A chemical equation in which number of atoms of each element is same on the side of reactants and products is called balanced equation.

5.   Which of the following is true regarding the amount of substances involved and formed in the following reaction?

$$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$$

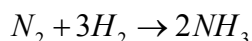|	$CaCO_3$	CaO	CO_2
1)	50g	20g	22g
2)	100g	28g	22g
3)	100g	56g	22g
4)	100g	56g	44g

Answer:D
Solution:Molar masses:$CaCO_3$ =40+12+48=100 g/mol
     CaO=40+16=56 g/mol
     CO_2=44 g/mol
     From 100 g $CaCO_3 \rightarrow$ 56 g CaO + 44 g CO_2g

6.   Which of the following is true about the following reaction?

$$N_2 + 3H_2 \rightarrow 2NH_3$$

A) 8 atoms of reactants react to give 8 atoms of products.
B) 4 molecules of reactants react to give two molecules of product.
C) 34 grams of reactants react to give 34 grams of products.
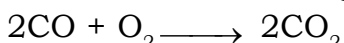D) All the above.
Answer:D
Solution:
     A) Atoms: Reactants: N_2 (2 N) + $3H_2$ (6 H) = 8 atoms; Products: $2NH_3$ (2 N + 6 H) = 8 atoms
     B) Molecules: 1 N_2 + 3 H_2 = 4 molecules react $\rightarrow$ 2 molecules of NH_3 formed
     C) Mass: N_2 = 28 g, $3H_2$ = 6 g $\rightarrow$ total 34 g reactants $\rightarrow$ $2NH_3$ = 34 g products

7.   Which of the following is practically incorrect about the following equation:
     $2CO + O_2 \longrightarrow 2CO_2$
     A) 2 molecules of CO react with 1 molecule of O_2 to form 2 molecules of CO_2.
     B) 1molecule of CO_2 is formed by the combination of 1 molecule of CO and 1/2

molecule of O_2.

C) 56 grams of CO reacts with 32 grams of O_2 to form 88 grams of CO_2)

D) All of these.

Answer:B

Solution:B) is "practically incorrect" because ½ molecule O_2 is not possible practically (molecules in whole numbers only in real reactions).

8.   Which of the following is not true for a balanced chemical equation?

A) A balanced chemical equation gives information about physical states of all reacting substances.

B) A balanced equation gives information about the number of atoms of all substances involved in the reaction.

C) Both 1 and 2.

D) None of these.

Answer:A

Solution:A) Gives information about physical states → No, not unless we write (s), (l), (g) etc. So without states, it doesn't. So A is false.

B) Gives information about number of atoms of all substances ? Yes, that's what balancing does.

9. $N_2 + 3H_2 \rightarrow 2NH_3$

Which of the following statements is not true?

A) One molecule of nitrogen and three molecules of hydrogen combine to form two molecules of ammonia at same conditions of temperature and pressure.

B) 28 grams of nitrogen and 6 grams of hydrogen combine to form 34 gramsof ammonia

C) One gram of nitrogen and three grams of hydrogen combine to form two grams   of ammonia

D) Both 1 and 2.

Answer:C

Solution:A) 1 molecule N_2 + 3 molecules H_2 → 2 molecules NH_3 at same T & P

B) 28 g N_2 + 6 g H_2 → 34 g NH_3

C) 1 g N_2 + 3 g H_2 → 2 g NH_3 (mass conservation violated: 4 g total → 2 g product)

10.   2Mg + O_2 ⟶ 2MgO. Which of the following statements is not true?

A) One molecule of magnesium and two molecules of oxygen combine to form two molecules of magnesium oxide.

B) 28 grams of magnesium and 6 grams of oxygen combine to form 34 grams of magnesium oxide.

C) 48 grams of magnesium and 32 grams of oxygen combine to form 80 grams of magnesium oxide.
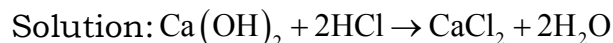
D) Both 1 and 2

Answer:D

Solution:A) 1 molecule Mg + 2 molecules O_2 → 2 molecules MgO → (coefficients: 2 Mg + 1 O_2 → 2 MgO, so A is wrong)

B) 28 g Mg + 6 g $O_2 \to$ 34 g MgO $\to$ (Check: Molar mass Mg = 24, 2Mg = 48 g needs 32 g $O_2 \to$ 80 g MgO; 28 g Mg is not stoichiometric with 6 g O_2)

C) 48 g Mg + 32 g $O_2 \to$ 80 g MgO

INTEGER TYPE

11. $Ca(OH)_2 + \_?\_HCl \longrightarrow CaCl_2 + 2H_2O$

Answer:2

Solution: $Ca(OH)_2 + 2HCl \to CaCl_2 + 2H_2O$

MATRIX MATCHING TYPE

12.

Column - I	Column - II
a) The substance which take part in chemical reaction	1) Products
b) The substance formed as a result of chemical reaction	2) Balanced equation
c) A chemical equation in which number of atoms of each element is same on the side of reactants and products	3) $CaCl_2 + H_2O$
	4) Reactants
d) $Ca(OH)_2 + 2HCl$	5) $CaCl_2 + H_2O + CO_2$

A) a-2,b-3, c-1,d-4   B) a-4,b-1, c-2,d-3
C) a-4,b-1, c-2,d-3   D) a-3,b-4, c-1,d-2
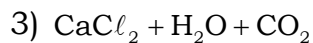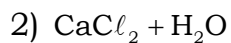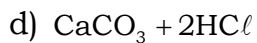
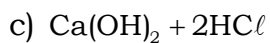**Answer:B of C) a-4,b-1, c-2,d-3**

Solution:

a) The substance which take part in chemical reaction	4) Reactants
b) The substance formed as a result of chemical reaction	1) Products
c) A chemical equation in which number of atoms of each element is same on the side of reactants and products	2) Balanced equation
d) $Ca(OH)_2 + 2HCl$	3) $CaCl_2 + H_2O$

13.

Column - I	Column - II
a) $Mg + 2HCl$	1) $MgO + C$
b) $2Mg + CO_2$	2) $CaCl_2 + H_2O$
c) $Ca(OH)_2 + 2HCl$	3) $CaCl_2 + H_2O + CO_2$
d) $CaCO_3 + 2HCl$	4) $MgCl_2 + H_2$
	5) MgO + HCl

A) a-2,b-3, c-1,d-4   B) a-4,b-1, c-3,d-2

C) a-5,b-1, c-2,d-3 D) a-3,b-4, c-1,d-2

Answer:a-4,b-1, c-2,d-3

Solution:

a) $Mg + 2HCl$ 4) $MgCl_2 + H_2$

b) $2Mg + CO_2$ 1) $MgO + C$

c) $Ca(OH)_2 + 2HCl$ 2) $CaCl_2 + H_2O$

d) $CaCO_3 + 2HCl$ 3) $CaCl_2 + H_2O + CO_2$
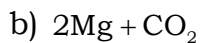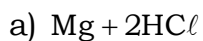
KEY

			TEACHING TASK						
1	2	3	4	5	6	7	8	9	10
B	C	A	C	B	C	C	C	A	B
11	12	13	14	15	16				
A	C	D	C	C	C				

			JEE ADVANCED LEVEL QUESTIONS						
1	2	3	4	5	6	7	8		
A,B,C	A,B,C,D	A	C	A	100	39 A			

			LEARNERS TASK						
1	2	3	4	5	6	7	8	9	10
C	A	A	B	A	C	B	D	A	C
11	12	13	14	15	16	17	18	19	20
B	B	A,C,D	D	D	A	B	C	C	D
21	22	23							
A	B	D							

			JEE ADVANCED LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
A,B,C,D	A,D	C	A	D	D	B	A	C	D
11	12	13	14						
2	a-4,b-1,c-2,d-3		a-4,b-1,c-2,d-3						