Class:- VIII (Foundation)

7. Chemical Equations & laws

Teaching Task

Q1) Ans:- B

Solution:- According to law of conservation of mass

Mass of reactants = Mass of products

Mass of $AgNO_3$ + Mass of NaCL = Mass of $NaNO_3$ + Mass of AgCL.

$34g$ + Mass of NaCL = $17g + 28.70g$

Mass of NaCL = $17 + 28.7 - 34$.

$= 45.7 - 34 = 11.7$ gms.

Q2) Ans:- C

Solution:- According to law of conservation of mass,

Total mass of reactants = Total mass of products.

$BaCl_2 + Na_2SO_4 \longrightarrow BaSO_4 + 2NaCL$.

Q3) Ans:- A

Solution:- If wood burns into air, it releases CO_2, water vapour and other gases. So the mass of ash is less than the mass of wood.

Q4) Ans:- C

Solution:- Given, mass of Na = 46 gms

mass of H_2O = 36 gms.

mass of H_2 = 2 gms.

Mass of NaOH = ?

Mass of Na + Mass of H_2O = Mass of H_2 + Mass of NaOH.

$46+36 = 2 +$ Mass of NaOH.

Mass of NaOH = $82-2 = 80$ gms

Q5) Ans:- B

Solution:- $2NaOH + (NH_4)_2SO_4 \rightarrow Na_2SO_4 + 3NH_2 + H_2O$ is not a balanced equation becaus.

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.

Q6) Ans:- C

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

Q7) Ans:- C

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

Q8) Ans:- C

Solution:- $A + 2AL \rightarrow B + 2Fe$

$Fe_2O_3 + 2AL \rightarrow Al_2O_3 + 2Fe$.

Q9) Ans:- A

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

The above reaction is balanced only.

Element	L.H.S	R.H.S.
Ag	1	1
Cl	1	1
Na	4	4
S	4	4
O	6	6

Q10) Ans:- B..

Solution:-

$$Al + NaOH + H_2O \rightarrow NaALO_2 + 3H_2$$

	L.H.S	R.H.S.
AL	1	1
Na	1	1
O	2	2
H.	3	(6)

Multiply above equation with '2'

$$2AL + 2NaOH + 2H_2O \rightarrow 2NaALO_2 + 3H_2$$

2 atoms of 'Na' on right side.

Q11) Ans:- A

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

	L.H.S	R.H.S
Na	(1) 6.	(2) 6
O	(1) 6.	6.
H	(1) 6.	6.
Cl.	(2) x3 = 6.	(2) 6

Multiply NaOH with '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.

Q12) Ans:- C

Solution:- According to law of reciprocal proportions, the weights of two elements combining with a fixed amount of the third element will bear the same ratio in which they themselves react.

Q13) Ans:- 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) = 32g.

Mass of Oxygen (O) = 48g.

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

Q14) 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.

Q15) Ans:- C

Solution:-

	% C	% H	Ratio
i)	75	25	$\rightarrow \frac{3}{75} : \frac{1}{25} = 3:1$
ii)	80	20	$\rightarrow \frac{4}{80} : \frac{1}{20} = 4:1$
iii)	85.7	14.3	$\rightarrow 85.7 : 14.3 = 6:1$
iv)	91.3	8.7	$\rightarrow 91.3 : 8.7 = 10.5:1$

Taking H = 1 gms, So the Carbon ratio is

3 : 4 : 6 : 10.5

It follows Law of multiple proportions

Q16) Ans:- C

Solution: $CuO \rightarrow$ 1 cu and 1 oxygen.

$CuO_2 \rightarrow$ 1 Cu and 2 oxygen.

In these two compounds Cu combined with fixed masses of oxygen are in the ratio of 1:2

Balance the following

Q17) $Mg + HCLO_3 \rightarrow Mg(CLO_3)_2 + H_2O + HCL$

Balanced Equation

$3Mg + 7HCLO_3 \rightarrow 3Mg(CLO_3)_2 + 3H_2O + HCL$

Q18) $FeS_2 + O_2 \longrightarrow Fe_2O_3 + SO_2$.

	L.H.S	R.H.S.
Fe	(1) 4	(2) 4.
S.	(2) 8	(1) 8.
O.	(2) 22	(5) 22

Balanced equation

$4FeS_2 + 11O_2 \longrightarrow 2Fe_2O_3 + 8SO_2$.

Q18) $NaBrO + NH_2CONH_2 \rightarrow NaBr + CO_2 + H_2O + N_2$

Balanced Equation.

$3NaBrO + NH_2CONH_2 \rightarrow 3NaBr + CO_2 + 2H_2O + N_2$

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

Q19) Ans:- $(NH_4)_3PO_4 \rightarrow 3NH_3 + H_2O + HPO_3$

Reason:-

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

Q20) 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

Q21) Ans:- A, B, C

Solution:- In A, B, C equations, Reactants are equal to products.

Q22) Ans:- A, B, C, D.

Solution:- In all equations, reactants are equal to products.

Assertion Type

Q23) Ans:- A.

Solution:- $H_2 + Cl_2 \rightarrow 2HCl$ is 1:1:2 ratio

Comprehension Type

Q24) Ans:- C

Solution:- The % of hydrogen in H_2O is 11.2%.

and in H_2O_2 is 5.94%.

→ These consistent % of hydrogen in H_2O & H_2O_2 illustrate the Law of multiple proportions.

$$\text{Ratio} = \frac{\%\ H \text{ in } H_2O}{\%\ H \text{ in } H_2O_2} = \frac{11.1}{5.9} = \frac{2}{1}$$

Q25) Ans:- A.

Solution:- Compound A.

$X \rightarrow 40\%$, $Y \rightarrow 60\%$.

$X : Y = 40 : 60 = 2 : 3$.

$X \rightarrow 2$ moles , $Y \rightarrow 3$ moles.

Compound B.

$X : Y = 25 : 75 = 1 : 3$.

$X \rightarrow 1$ mole , $Y \rightarrow 3$ moles.

Y in Compound A & B is

In A, for 2 moles of X, y is 3 moles.

In B, for 2 moles of X, Y is 6 moles.

$3 : 6 = 1 : 2$

Integer Type

Q26) Ans:- 100 gms/mol.

Solution:- $CaCO_3 = 40 + 12 + 3(16)$

$= 40 + 12 + 48 = 100$ gms.

Q27) Ans:- 39.10 g/mol.

Solution:- Atomic weight of K is 39.10 g/mol.

Matrix Matching

Q28) Ans:- A (a-2, b-3, c-1, d-4)

Solution:-

a) $2N_2 + O_2 \longrightarrow 2) 2N_2O$.

b) $H_2O_2 \longrightarrow 3) H_2 + O_2$

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

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

Learner's Task

Q1) Ans:- C

Solution:- $KClO_3$.

$39 + 35.5 + 3(16) = 39 + 35.5 + 48 = 122.5$

Q2) Ans:- A

Solution:- Balacing equations is necessary according to law of conservation of mass.

Q3) Ans:- A

Solution:- H_2SO_4.

$2(1) + 32 + 4(16) = 2 + 32 + 64 = 98$.

Q4) Ans:- B

Solution:- According to law of conservation of mass in a chemical reaction the atoms are neither created nor destroyed

Q5) Ans:- A

Solution:- The substances which take part in a chemical reaction are called reactants

Q6) Ans:- C

Solution:- The number of places at which an element appears in a chemical reaction is called frequency & F-number

Q7) Ans:- B

Solution:- If the metal & non-metal have same frequency, first balance metal.

Q8) Ans:- D

Solution:- After balancing equation 2 Cr_2 are present on product side.

$$2K_2Cr_2O_7 + 8H_2SO_4 \rightarrow 2K_2SO_4 + 2Cr_2(SO_4)_3 + 8H_2O + 3O_2$$

Q9) Ans:- A

Solution:- $2H_2 + O_2 \rightarrow 2H_2O$.

'2' - oxygen atoms are present after balancing.

Q10) Ans:- B, D

Solution:- $2H_2O \longrightarrow 2H_2 + O_2$

Reactants → Products

JEE Main Level

Q11) Ans:- B

Solution:- In a balanced equation no of atoms on both sides are equal.

Q12) Ans:- B

Solution:- Mass of beaker A = 20 gms.

Mass of beaker B = 20 gms

Total mass of reactants & beakers = 50 gms.

Reactants + A + B = 50 gms.

Reactants + 20 + 20 = 50

Reactants = 50 - 40 = 10 gms.

The student pour total reactant in 1 beaker

Now weight = Reactants + Mass of beaker A.

= 10 + 20 = 30 gms.

Q3) Ans:- B

Solution:- $2H_2O \leftarrow 2H_2 + O_2$

Product — Reactants

Q4) Ans:- D

Solution:- $2Fe + 3O_2 \rightarrow 2FeO_3$

Reactants — product.

Q5) Ans:- D

Solution:- Molecular weight of oxygen is 32gms

G.M.M of $S_8 = 8 \times 32 = 256$ gms

Weight of $O_3 = 3 \times 16 = 48$ amu.

Q6) Ans:- A

Solution:- $CH_4 = 12 + 4(1) = 16$

Molecular weight of $CH_4 = 16$ amu.

Q7) Ans:- B

Solution:- $Ca(OH)_2 = 40 + 2[16+1]$

$= 40 + 2(17) = 40 + 34 = 74$ grams

GMW of $Ca(OH)_2 = 74$ gms

Q8) Ans:- C

Solution:- SO_2

32kg 32kg = 1 : 1 ratio

SO_3

32 48 = 32 : 48 = 2 : 3

Q19) Ans:- C

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

Q20) Ans:- D

Solution:- In the pair of N_2O & NO, Nitrogen ratio is 2:1.

Q21) Ans:- A

Solution:- SO_2,

$S \rightarrow 32$, $O \rightarrow 2 \times 16 = 32$

In SO_3

$S \rightarrow 32$, $O \rightarrow 3 \times 16 = 48$.

Oxygen ratio in SO_2 & SO_3 = $\cancel{32}:\cancel{48}$ → 2 : 3

= 2:3

Q22) Ans:- B.

Solution:- In different sample of CO_2, the ratio of C & O = 12 : 32 = 3 : 8.

i.e, called law of definite proportion

(Q23) Ans:- D.

Solution:- Nitrogen with oxygen in N_2O & NO.

2 : 1

Balance the following

(Q24) Ans:- $3Fe + 4N_2O \rightarrow 4N_2 + Fe_3O_4$.

Solution:-

	L.H.S	R.H.S.
Fe	3	3
N	8	8.
O	4	4.

(Q25) 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	① ② 6	③ 6.
Cl	① ② 6	② 6
N	① 2	① 2
O	① 2	① 2

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

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

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

(Q26) Ans:- $2CuSO_4 + 4KI \rightarrow 2CuI + I_2 + 2K_2SO_4$.

Solution:-

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

	L.H.S	R.H.S.
Cu	① 2	① 2
S	① 2	① 2
O	④ 8.	④ 8.
K	① ② 4	② 4
I	① ② 4.	③ 4

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

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

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

(Q27) Ans:- $2CuCl_2 + 2H_2O + SO_2 \rightarrow 2CuCl + 2HCl + H_2SO_4$.

Solution:-

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

	LHS	RHS
Cu	① 2	① 2
Cl	② 4	② ③ 4
H	② 4	③ 4.
O	③ 4.	4
S	1	1

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

$2CuCl_2 + 2H_2O + SO_2 \rightarrow$

$2CuCl + 2HCl + H_2SO_4$

Q28) 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

Q29) Ans:- $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$.

Solution:-

$C_2H_4 + O_2 \longrightarrow CO_2 + H_2O$

$C_2H_4 + O_2 \rightarrow 2CO_2 + H_2O$

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

$C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$

	L.HS	RHS
C	2	①2
H	4	②4
O	②6	③6

Q30) Ans:- $2C_2H_2 + 5O_2 \longrightarrow 4CO_2 + 2H_2O$

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

Q31) 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	(2) 4.
O	(2) 4.	(3) 4.

Q32) Ans:- $2NH_3 + 2Na \rightarrow 2NaNH_2 + H_2$

Solution:-

$NH_3 + Na \rightarrow NaNH_2 + H_2$

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

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

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

	L.H.S	R.H.S
N	(1) 2	(1) 2
H	(3) 6	(4) 6.
Na	1	(1) 2

Q33) Ans:- $Mn(OH)_2 + 2Na_2O_2 \rightarrow Na_2MnO_4 + 2NaOH$.

Solution:-

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

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

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

	L.H.S	R.H.S
Mn	(1)	1
O	(4) 6	(5) 6
H	(2)	(1) 2
Na	(2) 4	(4) (3) 4

Q34) 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

Q35) 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	② ④ 6	③ ⑥ 6

Q37) 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	① 3
S	2	① ②
O	4	② 4

Q36) 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	4	4
S	2	2
O	6	6

Q38) 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	6	6
O	2	2
S	1	1

JEE Advanced Level

Q39) Ans:- A, B, C, D.

Solution:- $H_2 + Cl_2 \rightarrow 2HCl$

	L.HS	R.H.S
H	2	2
Cl	2	2

$2Mg + O_2 \rightarrow 2MgO$

	L	R.
Mg	2	2
O	2	2

$2CO + O_2 \rightarrow 2CO_2$

(2-C & 4-O on both sides)

$Fe + S \rightarrow FeS$ (1-Fe & 1-S on both sides)

Q40) Ans:- A,D

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.

Q41) Ans:- 3

Solution:- A balanced chemical equation typically shows the reactants and products & their stoichiometric ratios but does not always specify all physical conditions.

Q42) Ans:- 1

Solution:- $Mg + 2HCl \rightarrow MgCl_2 + H_2$ is a balanced equation because the no. of atoms in reactant is equal to the no of atoms in product.

Q43) Ans:- D

Solution:-

$$\underset{\substack{40+12+48 \\ =100g}}{CaCO_3} \xrightarrow{\Delta} \underset{\substack{40+16 \\ 56g}}{CaO} + \underset{\substack{12+32 \\ 44g}}{CO_2}$$

Q44) Ans:- D.

Solution:- $N_2 + 3H_2 \rightarrow 2NH_3$.

28 6 2[14+3]

28+6 = 34 gms = 34 gms.

→ 4 Molecules of reactants, 2 molecules of products.

→ 8 atoms of reactants & 8 atoms of products.

Q45) Ans:- B

Solution:- $2CO + O_2 \rightarrow 2CO_2$

For the given equation all information is correct. Option B is practically incorrect because of half molecule.

Q46) Ans:- A

Solution:- A balanced equation gives information about the no. of atoms of all substances involved in the reaction.

Q47) Ans:- C

Solution:- $N_2 + 3H_2 \rightarrow 2NH_3$

1 mol 3 mol 2 mol.

28 gms 6 gms 34 gms

1 gram of N_2 not able to react with 3 grams of H_2.

Q48) Ans:- D.

Solution:- $2Mg + O_2 \longrightarrow 2MgO$.

2×24 2×16 $2[24+16]$

48gms 32gms 80gms.

Integer type

Q49) Ans:- 2

Solution:-

$2Ca(OH)_2 + 2HCl \rightarrow 2CaCl_2 + 2H_2O$.

$Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$.

Matrix Matching

Q50) Ans:- a-4 , b-1 , c-2 , d-3. [B or C].

Solution:-

1) The substance which take part in chemical reaction → 4) Reactant

2). The substance which formed in chemical reaction → 1) Product.

3) A chemical equation in which no. of atoms on reactants & products are same → 2) Balanced chemical equation.

4) $Ca(OH)_2 + 2HCl$ → 3) $CaCl_2 + H_2O$.

Q51). Ans:- a - 4 , b - 1 , c - 2, d - 3.

Solution:-

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

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

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

d) $CaCO_3 + 2HCl \longrightarrow 3) CaCl_2 + H_2O + CO_3.$

7. CHEMICAL EQUATIONS & LAWS
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						
21	22	23	24	25	26	27	28		
A,B,C	A,B,C,D	A	C	A	100	39	a-2,b-3,c-1,d-4		
			LEARNERS TASK						
1	2	3	4	5	6	7	8	9	10
C	A	A	B	A	C	B	D	A	B,D
11	12	13	14	15	16	17	18	19	20
B	B	B	D	D	A	B	C	C	D
21	22	23							
A	B	D							
			JEE ADVANCED LEVEL QUESTIONS						
39	40	41	42	43	44	45	46	47	48
A,B,C,D	A,D	3	1	D	D	B	A	C	D
49	50		51						
2	a-4,b-1,c-2,d-3		a-4,b-1,c-2,d-3						