DPP –3 [Stoichiometry]

Chapter: Some Basic Concepts of Chemistry

"The difference between average and confident students is assignment completion"

TYPE I (i): Basic Stoichiometery
(Weight of species nikalna rehega from moles and weight of other species given)

Q.1 **The equation $2Al_{(s)} + \frac{3}{2}O_{2(g)} \longrightarrow Al_2O_{3(s)}$ shows that:**

(1) 2 mol of Al reacts with $\frac{3}{2}$ mol of O_2 to produce $\frac{7}{2}$ mol of Al_2O_3
(2) 2 g of Al reacts with $\frac{3}{2}$ g of O_2 to produce one mol of Al_2O_3
(3) 2 g of Al reacts with $\frac{3}{2}$ L of O_2 to produce 1 mol of Al_2O_3
(4) 2 mol of Al reacts with $\frac{3}{2}$ mol of O_2 to produce 1 mol of Al_2O_3

Q.2 **For the reaction $2P + Q \longrightarrow R$, 4 mol of P and excess of Q will produce:**

(1) 8 mol of R (2) 5 mol of R (3) 2 mol of R (4) 1 mol of R

Q.3 **If 1.5 moles of oxygen combine with Al to form Al_2O_3, the weight of Al used in the reaction is:**
$4Al + 3O_2 \longrightarrow 2Al_2O_3$

(1) 27 g (2) 40.5 g (3) 54 g (4) 81 g

Q.4 **In a given reaction, 9 g of Al will react with how much O_2?**
$2Al + \frac{3}{2}O_2 \longrightarrow Al_2O_3$

(1) 6 g O_2 (2) 8 g O_2 (3) 9 g O_2 (4) 4 g O_2

Q.5 **1.5 mol of O_2 combine with Mg to form oxide MgO. The mass of Mg (At. mass 24) that has combined is:**

(1) 72 g (2) 36 g (3) 24 g (4) 94 g

Q.6 **What quantity of lime stone on heating will give 56 kg of CaO?**

(1) 1000 kg (2) 56 kg (3) 44 kg (4) 100 kg

Q.7 **How much iron can be theoretically obtained in the reduction of 1 kg of Fe_2O_3?**
$Fe_2O_3 + 3H_2 \longrightarrow 2Fe + 3H_2O$

(1) 700 g (2) 350 g (3) 560 g (4) 875 g

Q.8 What amount of silver chloride is formed by the action of 5.850 g of sodium chloride on an excess of silver nitrate?
$NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$

(1) 14.35 g (2) 7.18 g (3) 28.70 g (4) 1.44 g

Q.9 For the following reaction, the mass of water produced from 445 g of $C_{57}H_{110}O_6$ is:
$2C_{57}H_{110}O_6(s) + 163\,O_2(g) \longrightarrow 114\,CO_2(g) + 110\,H_2O(l)$ **[JEE(Main)-2019(Jan)]**

(1) 490 g (2) 890 g (3) 445 g (4) 495 g

Q.10 The mass of carbon anode consumed (giving only carbon dioxide) in the production of 270 kg of aluminium metal from bauxite by the Hall's process is:
$2Al_2O_3 + 3C \longrightarrow 4Al + 3CO_2$

(1) 180 kg (2) 270 kg (3) 240 kg (4) 90 kg

TYPE I (ii) :Basic Stoichiometery
(Mass, Mole kisi ek species diye jayenge and Volume of gas puchega.)

Q.11 In the following reaction, if 10 g of H_2 reacts with N_2, the volume of NH_3 at STP will be:
$N_2 + 3H_2 \longrightarrow 2NH_3$

(1) 74.67 L (2) 22.4 L (3) 44.8 L (4) 37.33 L

Q.12 Assuming 100% yield of the reaction, how many moles of $NaHCO_3$ will produce 448 mL of CO_2 gas at STP according to the reaction:
$NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2 + H_2O$ **(unbalanced)**

(1) 0.04 (2) 0.4 (3) 4 (4) 40

Q.13 In the reaction, $2KClO_3 \longrightarrow 2KCl + 3O_2$, when 36.75 g of $KClO_3$ is heated, the volume of oxygen evolved at N.T.P. will be: **[NSEC-2012]**

(1) 9.74 dm^3 (2) 8.92 dm^3 (3) 10.08 dm^3 (4) 22.4 dm^3

Q.14 Number of moles of $KClO_3$ that have to be heated to produce 1.0 L of O_2(g) at STP can be expressed as: **[NSEC-2018]**

(1) $\frac{1}{3}\left(\frac{1}{22.4}\right)$ (2) $\frac{1}{2}\left(\frac{1}{22.4}\right)$ (3) $\frac{2}{3}\left(\frac{1}{22.4}\right)$ (4) $\frac{3}{2}(22.4)$

Q.15 0.01 mol of iodoform (CHI_3) reacts with Ag to produce a gas whose volume at NTP is:
$2CHI_3 + 6Ag \longrightarrow C_2H_2 + 6AgI(s)$

(1) 224 mL (2) 112 mL (3) 336 mL (4) None of these

Q.16 **How many liters of CO_2 at STP will be formed when 0.01 mol of H_2SO_4 reacts with excess of Na_2CO_3?**
$Na_2CO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + CO_2 + H_2O$

(1) 22.7 L (2) 2.27 L (3) 0.227 L (4) 1.135 L

Q.17 **The volume of gas at NTP produced by 100 g of CaC_2 with water is:**
$CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2$

(1) 70 L (2) 35 L (3) 17.5 L (4) 22.4 L

Q.18 **Aluminum carbide (Al_4C_3) liberates methane on treatment with water. The grams of aluminum carbide required to produce 11.2 L of methane under STP conditions is: [Given: Al = 27]** **[NSEC-2014]**

(1) 48 (2) 72 (3) 144 (4) 24

Q.19 **The minimum quantity in grams of H_2S needed to precipitate 63.5 g of Cu^{2+} will be nearly:**
$Cu^{2+} + H_2S \longrightarrow CuS + H_2$

(1) 63.5 g (2) 31.75 g (3) 34 g (4) 20 g

Q.20 **2.76 g of silver carbonate on being strongly heated yields a residue weighing:**
$Ag_2CO_3 \longrightarrow 2Ag + CO_2 + \frac{1}{2}O_2$

(1) 2.16 g (2) 2.48 g (3) 2.32 g (4) 2.64 g

TYPE II (i): Limiting Reagent (agar mole ya fir weight diye jaye)

Q.21 **For reaction $A + 5B \longrightarrow C + 3D$, given 10 mol of A and 10 mol of B. Which is the limiting reagent?**

(1) A (2) B (3) Both equally (4) Neither

Q.22 **For reaction $A + 2B \longrightarrow C$. The amount of product formed by starting the reaction with 5 mol of A and 8 mol of B is:**

(1) 5 mol (2) 8 mol (3) 16 mol (4) 4 mol

Q.23 **If 0.5 mol of $BaCl_2$ is mixed with 0.2 mol of Na_3PO_4, the maximum number of moles of $Ba_3(PO_4)_2$ that can be formed is:**
$3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$

(1) 0.7 (2) 0.5 (3) 0.3 (4) 0.1

Q.24 Maximum number of moles of barium phosphate formed when 0.9 mole of barium chloride is mixed with 0.4 mole of sodium phosphate is: [NSEC-2010]

(1) 0.2 (2) 0.4 (3) 0.9 (4) 1.3

Q.25 0.5 mole of H_2SO_4 is mixed with 0.2 mole of $Ca(OH)_2$. The maximum number of moles of $CaSO_4$ formed is:

(1) 0.2 (2) 0.5 (3) 0.4 (4) 1.5

Q.26 4 g of hydrogen are ignited with 4 g of oxygen. The weight of water formed is:

(1) 0.5 g (2) 3.5 g (3) 4.5 g (4) 2.5 g

Q.27 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be:

(1) 1 mol (2) 2 mol (3) 3 mol (4) 4 mol

Q.28 $H_{2(g)} + \frac{1}{2}O_{2(g)} \longrightarrow H_2O_{(g)}$. Given 4 g of H_2 and 32 g of O_2, the volume of water vapour at STP is:

(1) 44.8 L (2) 22.4 L (3) 11.2 L (4) 89.6 L

Q.29 28 gm Lithium is mixed with 48 gm O_2 to react according to $4Li + O_2 \longrightarrow 2Li_2O$. The mass of Li_2O formed is:

(1) 60 g (2) 30 g (3) 90 g (4) 120 g

Q.30 The mass of Mg_3N_2 produced if 48 gm of Mg metal is reacted with 34 gm NH_3 gas is: $Mg + NH_3 \longrightarrow Mg_3N_2 + H_2$

(1) $\frac{200}{3}$ g (2) $\frac{100}{3}$ g (3) $\frac{400}{3}$ g (4) $\frac{150}{3}$ g

Q.31 If 10 g of Ag reacts with 1 g of sulphur, the amount of Ag_2S formed will be:

(1) 7.75 g (2) 0.775 g (3) 11 g (4) 10 g

Q.32 How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl? (Atomic wt. of Pb = 207)

(1) 0.011 (2) 0.029 (3) 0.044 (4) 0.333

Q.33 The maximum amount of CH_3Cl that can be prepared from 20 g of CH_4 and 10 g of Cl_2 by the following reaction is: $CH_4 + Cl_2 \longrightarrow CH_3Cl + HCl$ (presume no other reaction takes place) [NSEC-2012]

(1) 3.625 mole (2) 0.141 mole (3) 1.41 mole (4) 0.365 mole

Q.34 For a reaction $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$; identify dihydrogen ($H_2$) as a limiting reagent in the following reaction mixtures: [JEE(Main)-2019(April)]

(1) 28 g of N_2 + 6 g of H_2
(2) 56 g of N_2 + 10 g of H_2
(3) 14 g of N_2 + 4 g of H_2
(4) 35 g of N_2 + 8 g of H_2

Q.35 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and by how much? (At. wt. Mg = 24; O = 16)

(1) Mg, 0.16 g
(2) O_2, 0.16 g
(3) Mg, 0.44 g
(4) O_2, 0.28 g

Q.36 Lithium oxide (Li_2O; molar mass = 30 g mol^{-1}) is used in space shuttles to remove water vapour according to the following reaction:
$Li_2O_{(s)} + H_2O_{(g)} \longrightarrow 2LiOH_{(s)}$
If 60 kg of water and 45 kg of Li_2O are present in a shuttle, which of the following statements is/are correct? [NSEC-2017]

(1) I only (water will be removed completely)
(2) II and IV (Li_2O will be the limiting reagent; 27 kg of water will remain)
(3) III and IV (100 kg Li_2O required; 27 kg water remains)
(4) II and III (Li_2O will be the limiting reagent; 100 kg Li_2O required)

Q.37 If 1.6 g of SO_2 and 1.5×10^{22} molecules of H_2S are mixed and allowed to remain in contact in a closed vessel until the reaction $2H_2S + SO_2 \longrightarrow 3S + 2H_2O$ proceeds to completion. Which of the following statement is true?

(1) Only 'S' and 'H_2O' remain in the reaction vessel
(2) 'H_2S' will remain in excess
(3) 'SO_2' will remain in excess
(4) None

TYPE II (ii): Limiting Reagent (Agar gases ki volume puche jaye)

Q.38 When 22.4 L of H_2(g) is mixed with 11.2 L of Cl_2(g) at S.T.P., the moles of HCl(g) formed is equal to:

(1) 1 mol of HCl(g)
(2) 2 mol of HCl(g)
(3) 0.5 mol of HCl(g)
(4) 1.5 mol of HCl(g)

Q.39 At NTP, 100 mL N_2 and 100 mL of H_2 are mixed together. $N_2 + 3H_2 \longrightarrow 2NH_3$. The produced volume of NH_3 is:

(1) 66.6 mL (2) 100 mL (3) 33.3 mL (4) 200 mL

Q.40 **12 L of H_2 and 11.2 L of Cl_2 are mixed and exploded. The composition by volume of mixture is:**

(1) 24 L of HCl(g)
(2) 0.8 L Cl_2 and 20.8 L HCl(g)
(3) 0.8 L H_2 and 22.4 L HCl(g)
(4) 22.4 L HCl(g)

Q.41 **At constant T and P, 5.0 L of SO_2 are reacted with 3.0 L of O_2 according to the following equation: $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$. The volume of the reaction mixture at the completion of the reaction is:** [NSEC-2017]

(1) 0.5 L (2) 8.0 L (3) 5.5 L (4) 5 L

Q.42 **When a mixture of 10 mole of SO_2 and 15 mole of O_2 was passed over catalyst, 8 mole of SO_3 was formed. How many mole of SO_2 and O_2 did not enter into combination?**
$2SO_2 + O_2 \longrightarrow 2SO_3$

(1) 2 moles of SO_2, 11 moles of O_2
(2) 3 moles of SO_2, 11.5 moles of O_2
(3) 2 moles of SO_2, 4 moles of O_2
(4) 8 moles of SO_2, 4 moles of O_2

TYPE II (iii): Limiting Reagent (Agar 3 reactants diye jayein)

Q.43 **In the reaction $4A + 2B + 3C \longrightarrow A_4B_2C_3$, what will be the number of moles of product formed, starting from 2 moles of A, 1.2 moles of B and 1.44 moles of C?**

(1) 0.5 (2) 0.6 (3) 0.48 (4) 4.64

Q.44 **Calculate the mass of sucrose $C_{12}H_{22}O_{11}$(s) produced by mixing 78 g of C(s), 11 g of H_2(g) and 67.2 litre of O_2(g) at 0°C and 1 atm according to the (unbalanced) reaction:**
$12C(s) + 11H_2(g) + \frac{11}{2}O_2 \longrightarrow C_{12}H_{22}O_{11}(s)$

(1) 171 g (2) 342 g (3) 85.5 g (4) 256.5 g

Q.45 $2KI + I_2 + 22HNO_3 \longrightarrow 2HIO_3 + 2KIO_3 + 22NO_2 + 10H_2O$
If 3 mole of KI and 2 moles I_2 are reacted with excess of HNO_3, volume of NO_2 gas evolved at NTP is:

(1) 739.2 Lt (2) 1075.2 Lt (3) 44.8 Lt (4) 67.2 Lt

TYPE III (i) : Combustion of Gas (Basic)

Q.46 **For complete combustion of 3 g ethane, the produced volume of CO_2 at STP is**
$2C_2H_6 + 7O_2 \longrightarrow 4CO_2 + 6H_2O$

(1) 4.48 L (2) 2.24 L (3) 8.96 L (4) 7.84 L

Q.47 For complete combustion of 1.12 L of butane (C_4H_{10}) at STP, the produced volume of $H_2O_{(g)}$ at STP is:
$C_4H_{10} + \frac{13}{2}O_2 \longrightarrow 4CO_2 + 5H_2O$

(1) 5.6 L (2) 4.48 L (3) 2.24 L (4) 11.2 L

Q.48 For complete combustion of 3 g ethane, the required volume of O_2 at STP is

(1) 7.84 L (2) 3.92 L (3) 4.48 L (4) 15.68 L

Q.49 For complete combustion of 5 mol propane (C_3H_8), the required volume of O_2 at STP is:
$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

(1) 560 L (2) 112 L (3) 280 L (4) 448 L

Q.50 How many litres of oxygen at 1 atm and 273 K will be required to burn completely 2.2 g of propane (C_3H_8)?

(1) 11.2 L (2) 22.4 L (3) 5.6 L (4) 44.8 L

Q.51 What volume of oxygen gas (O_2) measured at 0°C and 1 atm is needed to burn completely 1 L of propane gas (C_3H_8) measured under the same conditions?

(1) 5 L (2) 10 L (3) 7 L (4) 6 L

Q.52 Assuming that petrol is octane (C_8H_{18}) and has density 0.8 g mL^{-1}, 1.425 L of petrol on complete combustion will consume:

(1) 50 mole of O_2 (2) 100 mole of O_2 (3) 125 mole of O_2 (4) 200 mole of O_2

Q.53 The number of litres of air required to burn 8 litres of C_2H_2 is approximately:

(1) 40 (2) 60 (3) 80 (4) 100

TYPE III (ii): Combustion of Gas (Uncombined gases problem)

Q.54 If 8 mL of uncombined O_2 remain after exploding O_2 with 4 mL of hydrogen, the number of mL of O_2 originally were:

(1) 12 (2) 2 (3) 10 (4) 4

Q.55 1 L of CO_2 is passed over hot coke. When the volume of reaction mixture becomes 1.4 L, the composition of reaction mixture is:

(1) 0.6 L CO
(2) 0.8 L CO_2
(3) 0.6 L CO_2 and 0.8 L CO
(4) None

Q.56 26 cc of CO_2 are passed over red hot coke. The volume of CO evolved is:

(1) 15 cc (2) 10 cc (3) 32 cc (4) 52 cc

TYPE III (iii): Combustion of Gas (Gas formula determination problems)

Q.57 10 mL of gaseous hydrocarbon on combustion give 40 mL of CO_2(g) and 50 mL of H_2O (vap.). The hydrocarbon is:

(1) C_4H_5 (2) C_8H_{10} (3) C_4H_8 (4) C_4H_{10}

Q.58 500 mL of a gaseous hydrocarbon when burnt in excess of O_2 gave 2.5 L of CO_2 and 3.0 L of water vapours under same conditions. Molecular formula of the hydrocarbon is:

(1) C_4H_8 (2) C_4H_{10} (3) C_5H_{10} (4) C_5H_{12}

Q.59 11.2 litre of a hydrocarbon at STP produces 44.8 litre of CO_2 at STP and 36 gm of H_2O during its combustion. The molecular formula of the hydrocarbon is:

(1) C_2H_4 (2) C_4H_8 (3) C_3H_6 (4) C_4H_6

TYPE IV : % Purity

Q.60 200 g impure $CaCO_3$ on heating gives 11.35 L CO_2 gas at STP. Find the percentage of calcium in the lime stone sample.

(1) 10% (2) 20% (3) 25% (4) 5%

Q.61 20.0 g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. What will be the percentage purity of magnesium carbonate in the sample? (Atomic weight of Mg = 24)

(1) 60 (2) 84 (3) 75 (4) 96

Q.62 $CaCO_3$ is 90% pure. Volume of CO_2 collected at STP when 10 g of $CaCO_3$ is decomposed is:

(1) 2.016 L (2) 1.008 L (3) 10.08 L (4) 20.16 L

Q.63 **How much amount of $CaCO_3$ in gram having percentage purity 50% produces 0.56 litre of CO_2 at STP on heating?**
$CaCO_3 \longrightarrow CaO + CO_2$

(1) 5 g (2) 2.5 g (3) 10 g (4) 1.25 g

Q.64 **10 g impure NaOH is completely neutralised by 1000 mL of $\frac{1}{10}$ N HCl. The percentage purity of the impure NaOH is:**

(1) 40% (2) 80% (3) 20% (4) 60%

Q.65 **50 g $CaCO_3$ will react with …g of 20% HCl by weight.**

(1) 36.5 g (2) 73 g (3) 109.5 g (4) 182.5 g

TYPE V : % Yield

Q.66 **Aluminium reacts with sulphur to form aluminium sulphide. If 5.4 gm of Aluminium reacts with 12.8 gm sulphur and gives 12 gm of aluminium sulphides, then the percent yield of the reaction is:**
$2Al + 3S \longrightarrow Al_2S_3$

(1) 80% (2) 40% (3) 60% (4) 90%

Q.67 **Calculate % yield of the reaction if 200 g $KHCO_3$ produces 22 g of CO_2 upon strong heating.**
$2KHCO_3 \xrightarrow{\Delta} K_2CO_3 + H_2O + CO_2$

(1) 50% (2) 25% (3) 75% (4) 100%

Q.68 **Ethyl propanoate has a pineapple like odour and is used as a flavoring agent in fruit syrups. It is prepared as follows:**
$C_2H_5OH_{(aq)} + C_2H_5COOH_{(aq)} \longrightarrow C_2H_5COOC_2H_{5(aq)} + H_2O(\ell)$
In an experiment, 349 grams of ethyl propanoate was obtained from 250 grams of ethanol, with propanoic acid in excess.
(M.W. of ethyl propanoate: 102, M.W. of ethanol: 46)
The percentage yield of the above reaction is: **[NSEC-2007]**

(1) 48.2 (2) 62.9 (3) 54.6 (4) 32.7

TYPE VI : Sequential Reactions

Q.69 **Minimum amount of $Ag_2CO_3(s)$ required to produce sufficient oxygen for the complete combustion of C_2H_2 which produces 11.2 L of CO_2 at 1 atm and 273 K after combustion is: [Ag = 108]**

$Ag_2CO_3(s) \longrightarrow 2Ag(s) + CO_2(g) + \frac{1}{2}O_2(g)$
$C_2H_2 + \frac{5}{2}O_2 \longrightarrow 2CO_2 + H_2O$

(1) 345 g (2) 172.5 g (3) 690 g (4) 276 g

Q.70 **What weight of $CaCO_3$ must be decomposed to produce the sufficient quantity of carbon dioxide to convert 21.2 kg of Na_2CO_3 completely into $NaHCO_3$? [Atomic mass: Na = 23, Ca = 40]**
$CaCO_3 \longrightarrow CaO + CO_2$
$Na_2CO_3 + CO_2 + H_2O \longrightarrow 2NaHCO_3$

(1) 100 kg (2) 20 kg (3) 120 kg (4) 30 kg

Q.71 **The following process has been used to obtain iodine from oil-field brines in California.**
$NaI + AgNO_3 \longrightarrow AgI + NaNO_3$
$2AgI + Fe \longrightarrow FeI_2 + 2Ag$
$2FeI_2 + 3Cl_2 \longrightarrow 2FeCl_3 + 2I_2$
How many grams of $AgNO_3$ are required in the first step for every 254 kg I_2 produced in the third step?

(1) 340 kg (2) 85 kg (3) 68 kg (4) 380 kg

TYPE VII : Parallel Reactions

Q.72 **A gas mixture of 3 L of propane and butane on complete combustion at 25°C produces 10 L of CO_2. The initial composition of propane and butane in the gas mixture is:**

(1) 66.67%, 33.33%
(2) 33.33%, 66.67%
(3) 50%, 50%
(4) 60%, 40%

Q.73 **When a 12 g mixture of carbon and sulphur is burnt in air, a mixture of CO_2 and SO_2 is produced, in which the number of moles of SO_2 is half that of CO_2. The mass of the carbon in the mixture is:**

(1) 4.08 g (2) 5.14 g (3) 8.74 g (4) 1.54 g

Q.74 **Find out moles of CO_2 and CO produced by combustion of 2 mol carbon with 1.25 O_2 leaving no residue:**
$C + O_2 \longrightarrow CO_2$ and $C + \frac{1}{2}O_2 \longrightarrow CO$

(1) CO_2 = 0.5 mol, CO = 1.5 mol
(2) CO_2 = 1.5 mol, CO = 0.5 mol
(3) CO_2 = 1 mol, CO = 1 mol
(4) CO_2 = 0.25 mol, CO = 1.75 mol

— End of DPP —