Q-1 - 12224712

Two oxides of a metal contain $50\ \%$ and $40\ \%$ metal M respectively. If the formula of the first oxide is MO_2, the formula of the second oxide will be

(A) (a)MO_2

(B) (b)MO_3

(C) (c)M_2O

(D) (d)M_2O_5

CORRECT ANSWER: B

SOLUTION:

$\underset{50\,\%}{M}\ \underset{50\,\%}{O_2}\ 50g...$

$....1\text{metal}\underset{40}{M_x}\underset{60}{O_y}$

$1g.\ \frac{1}{50}\ \therefore\ 40g.\ \frac{4}{5}$ metal

and $50g.2$oxygen

$1g.\ \frac{2}{50}$ oxygen

For second oxide Atoms of metal

$(M) = \frac{1 \times 40}{50} = 0.8$ similarly

Atoms of oxygen

$= \frac{2 \times 60}{50} = \frac{12}{5}$

$= 2.4$

Hence, ratio of $M : O = 0.8 : 2.4$ or $1 : 3$

$\therefore$ Formula of the same metal oxide is MO_3

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Q-2 - 12224716

Two samples of lead oxide were separately reduced to metallic lead by heating in a current of hydrogen. The weight of lead from one oxide was half the weight of lead obtained from the other oxide. The data illustrates

(A) (a)Law of reciprocal proportions

(B) (b)Law of constant proportions

(C) (c)Law of multiple proportions

(D) (d)Law of equivalent proportions

CORRECT ANSWER: C

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Q-3 - 12224719

Two elements X and Y have atomic weight of 14 and 16. They from a series of compounds A, B, C, D and E in which the same

amount of element X, Y is present in the ratio $1:2:3:4:5$. If the compound A has 28 parts by weight of X and 16 parts by weight of Y, then the compound of C will have 28 parts weight of X and

(A) (a)32 parts by weight of Y

(B) (b)48 parts by weight of Y

(C) (c)64 parts by weight of Y

(D) (d)80 parts by weight of Y

CORRECT ANSWER: B

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Q-4 - 12224721

A sample of calcuium carbonate $(CaCO_3)$ has the following

percentage composition:

$Ca = 40\,\%\,, C = 12\,\%\,, O$
$= 48\,\%$

If the law of constant proportions is true. Then the weight of calcium in $4g$ of a sample of calcium carbonate obtained from another source will be

(A) (a)$0.016g$

(B) (b)$0.10g$

(C) (c)$1.6g$

(D) (d)$16g$

CORRECT ANSWER: C

Q-5 - 12224725

In compound A, $1.00g$ nitrogen units with $0.57g$ oxygen. In compound B, $2.00g$ nitrogen combines with $2.24g$ oxygen. In compound C, $3.00g$ nitrogen combines with $5.11g$ oxygen. These

results obey the following law

(A) (a)Law of constant proportion

(B) (b)Law of multiple proportion

(C) (c)Law of reciprocal proportion

(D) (d)Dalton's Law of partial pressure

CORRECT ANSWER: B

Q-6 - 12224726

Hydrogen combines with oxygen with oxygen to form H_2O in which $16g$ of oxygen combine with $2g$ of hydrogen. Hydrogen also combines with carbon to form CH_4 in which $2g$ of hydrogen combine with $6g$ of carbon. If carbon and oxygen combine togather then they will do show in the ratio of

(A) (a)$6:16$ or $12:32$

(B) (b)$6:18$

(C) (c)$1:2$

(D) (d)$12:24$

CORRECT ANSWER: A

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Q-7 - 11881001

Vapour density of a metal chloride is 6.6. Its oxide contains $53\ \%$ metal. The atomic weight of metal is:

(A) 21

(B) 54

(C) 26.72

(D) 2.086

CORRECT ANSWER: C

SOLUTION:

Eq. of metal $=$ Eq. of oxygen

$$\frac{53}{E}=\frac{47}{8}$$

$$\therefore E_{\text{metal}}=9.02 \text{ or}$$

$$\frac{a}{E}=n$$

Let MCl_n be metal chloride

$$a+35.5n=66\times 2$$

$$a+\frac{35.5a}{9.021}=132 \therefore a$$

$$=\frac{132}{4.94}=26.72$$

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Q-8 - 41501800

The empirical formula of an acid is CH_2O_2, the probable molecular

formula of acid may be :-

(A) CH_2O

(B) CH_2O_2

(C) $C_2H_4O_2$

(D) $C_3H_6O_4$

CORRECT ANSWER: A

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Q-9 - 60006848

74.5 g of a metallic chloride contain 35.5 g of chlorine. The equivalent weight of the metal is

(A) 19.5

(B) 35.5

(C) 39.0

(D) 78.0

CORRECT ANSWER: C

SOLUTION:

Wt. of metallic chloride =74.5

Wt. of chlorine $= 35.5$

$\therefore$ wt. of metal $= 74.5 - 35.5 = 39$

Equivalent weight of metal

$$= \frac{\text{weight of metal}}{\text{weight of chlorine}} \times 35.5$$

$$= \frac{39}{35.5} \times 35.5 = 39$$

Q-10 - 60006863

On reduction with hydrogen, 3.6 g of an oxide of metal left 3.2 g of metal. If the vapour density of metal is 32, the simplest formula of the oxide would be

(A) MO

(B) M_2O_3

(C) M_2O

(D) M_2O_5

CORRECT ANSWER: C

SOLUTION:

As we know that

Equivalent weight

$$= \frac{\text{weight of metal}}{\text{weight of oxygen}} \times 8$$

$$= \frac{3.2}{0.4} \times 8 = 64$$

Vapour density $= \frac{\text{mol. wt}}{2}$

Mol. Wt

$= 2 \times V.D = 2 \times 32$

$= 64$

As we know that

$$n = \frac{\text{mol. wt}}{\text{eq. wt}} = \frac{64}{64}$$

$= 1$

Suppose, the formula of metal oxide be M_2O_n. Hence the formula of metal oxide $= M_2O$.

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Q-11 - 12224754

Zinc sulphate contains $22.65\ \%$ of zinc and $43.9\ \%$ of water of crystallization. If the law of constant proportions is true, then the

the weight of zinc required to produce $20g$ of the crystals will be

(A) (a)$45.3g$

(B) (b)$4.53g$

(C) (c)$0.453g$

(D) (d)$453g$

CORRECT ANSWER: B

SOLUTION:

$100g$ of $ZnSO_4$ crystals are obtained from

$= 22.65gZn$

$1g$ of $ZnSO_4$ crystals will be obtained from

$= \frac{22.65}{100}gZn$

$20g$ of $ZnSO_4$ crystals obtained from

$= \frac{22.65}{100} \times 20$

$= 4.53g$

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Q-12 - 12224763

In a compound C, H, N atoms are present in $9:1:3.5$ by weight.

Molecular weight of compound is 108. Its molecular formula is:

(A) (a)$C_2H_6N_2$

(B) (b)C_3H_4N

(C) (c)$C_6H_8N_2$

(D) (d)$C_9H_{12}N_3$

CORRECT ANSWER: C

SOLUTION:

$9 + 1 + 3.5 = 13.5$

$\because 13.5g$ costains $\frac{9}{12}$ mole

$\therefore 108g$ contains $\frac{9 \times 108}{12 \times 13.5}$

$= 6$ mole carbon, i.e., $C_6H_8N_2$

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Q-13 - 12224766

Four one litre flaske are separately filled with the gases H_2, He, O_2 and O_3 at the same temperature and pressure. The ratio of total number of atoms of these gases present in different flask would be:

(A) (a) $1:1:1:1$

(B) (b) $1:2:2:3$

(C) (c) $2:1:2:3$

(D) (d) $3:2:2:1$

CORRECT ANSWER: C

SOLUTION:

$H_2 : He : O_2 : O_3$

$$\begin{array}{lllll} & H_2 & :He & :O_2 & :O \\ \text{Ratio of total no. of molecules} & = 1 & :1 & :1 & :1 \\ \text{So ratio of total no. of atoms} & = 2 & :1 & :2 & :3 \end{array}$$

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Q-14 - 23584359

A gaseous mixture contains oxygen and nitrogen in the ratio of $1:4$ by weight therefore the ratio of their number of molecules is

(A) $1:4$

(B) $1:8$

(C) $7:32$

(D) $3:16$

CORRECT ANSWER: C

SOLUTION:

By weight, the ratio of O_2 and N_2 is $1:4$, By molecules the ratio of $\frac{1}{32}:\frac{4}{28}$ i.e., $7:32$

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Q-15 - 69098718

A gaseous hydrocarbon gives upon combustion 0.72 g of water and 3.08 g of CO_2. The empirical formula of the hydrocarbon is

(A) C_7H_8

(B) C_2H_4

(C) C_3H_4

(D) C_6H_5

CORRECT ANSWER: A

SOLUTION:

Let the mass of gaseous hydrocarbon taken = w gm

$$\therefore \ \% C = \frac{12}{44} \times \frac{3.08}{w}$$

$$\times 100 = \frac{84}{w}$$

$$\% H = \frac{2}{18} \times \frac{0.72}{w}$$

$$\times 100 = \frac{8}{w}$$

Ratio of C : H atoms

$$= \frac{84}{w} \times \frac{1}{12} : \frac{8}{w} \times \frac{1}{1}$$

$$= 7 : 8$$

Thus, E.F. = C_7H_8.

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Q-16 - 12224782

How many gram ions of SO_4^{-2} are present in 1 gram molecule of

$K_2SO_4.\ Al_2(SO_4)_3.24H_2O$?

(A) (a)2

(B) (b)3

(C) (c)1

(D) (d)4

CORRECT ANSWER: D

SOLUTION:

1 g molecule is 1 mole

Mole of $SO_4^{2-}\ 4 \times 1 = 4g$ ion.

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Q-17 - 60006892

The atomic weights of two elements A and B are 40 and 80

respectively. If x g of A contains y atoms, how many atoms are present in 2x g of B

(A) $\frac{y}{2}$

(B) $\frac{y}{4}$

(C) y

(D) 2y

CORRECT ANSWER: C

SOLUTION:

Number of moles of $A = \frac{x}{40}$

Number of atoms of $A = \frac{x}{40} \times$ Avogadro no. $= y$ (say)

or $x = \frac{40y}{\text{Avogadro no.}}$

Number of moles of $B = \frac{2x}{80}$

Number of atoms of B

$$= \frac{2x}{80} \times \quad \text{a.v. no.}$$

$$= \frac{2}{80} \times \frac{40y}{\text{Av. No.}}$$

$$\times \quad \text{Av. no.} = y$$

Q-18 - 60006897

Caffeine has a molecular weight of 194. If it contains 28.9% by mass of nitrogen, number of atoms of nitrogen in one molecule of caffeine is

(A) 4

(B) 6

(C) 2

(D) 3

CORRECT ANSWER: A

SOLUTION:

100 gm caffeine has 28.9 gm Nittogen

194 gm caffeine has

$$= \frac{28.9}{100} \times 194$$

$$= 56.06$$

gm

$$\therefore \text{ No. of nitrogen atoms in caffeine } = \frac{56.06}{14} \approx 4$$

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Q-19 - 12224792

A 400 mg iron capsule contains 100 mg of ferrous fumarate, $(CHCOO)_2$Fe. The percentage of iron present in it is approximately

(A) (a)33%

(B) (b)25%

(C) (c)14%

(D) (d)8%

CORRECT ANSWER: D

SOLUTION:

Molecular weight of $(CHCOO)_2Fe = 170$

Fe present in $100mg$ of $(CHCOO)_2$ Fe

$$= \frac{56}{170} \times 100mg$$
$$= 32.9mg$$

This is present in $400mg$ of capsule

$$\% \text{ of Fe in capsule} = \frac{32.9}{400} \times 100 = 8.2.$$

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Q-20 - 12224798

Haemoglobin contains 0.33% of iron by weight. The molecular

weight of heamoglobin is approximately 67200. The number of iron atoms (At. Wt. of Fe=56) present in one molecule of haemoglobin is

(A) (a)6

(B) (b)1

(C) (c)4

(D) (d)2

CORRECT ANSWER: C

SOLUTION:

$\therefore 100gHb$ contains $= 0.33gFe$

$\therefore 67200gHb$

$= \frac{67200 \times 0.33}{100} gFe$

Gram atom of $Fe = \frac{672 \times 0.33}{56} = 4.$

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Q-21 - 12224800

A hydrocarbon contain 86% carbon, 488 ml of the hydrocarbon weight 1.68 g at STP. Then the hydrocarbon is an

(A) (a)Alkane

(B) (b)Alkene

(C) (c)Alkyne

(D) (d)Arene

CORRECT ANSWER: B

SOLUTION:

Element	At. wt.	Mole	Ratio	Empirical formul
$C = 86\,\%$	12	7.1	1	CH_2
$H = 14\,\%$	1	14	2	Belongs to alken

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Q-22 - 60007227

The simplest formula of a compound containing 50% of element X (atomic mass 10) and 50% of element Y (atomic mass 20) is

(A) XY

(B) X_2Y

(C) XY_3

(D) X_2Y_3

CORRECT ANSWER: B

SOLUTION:

Element	% (a)	At.wt(b)	a/b	Rate
X	50	10	5	2
Y	50	20	2.5	1

Simple formula $= X_2Y$

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Q-23 - 12224807

In the reaction,

$4NH_3(g) + 5O_2(g)$
$\rightarrow 4NO(g) + 6H_2O(g)$

, when 1 mole of ammonia and 1 mole of O_2 are made to react to

completion

(A) (a)1.0 mole of H_(2)O is produced

(B) (b)1.0 mole of NO will be produced

(C) (c)All the oxygen will be consumed

(D) (d)All the ammonia will be consumed

CORRECT ANSWER: C

SOLUTION:

$$4NH_{3(g)} + 5O_{2(g)}$$
$$\rightarrow 4NO_{(g)}$$
$$+ 6H_2O_{(g)}$$

$$t = 0 \quad 1 \quad 1 \quad 0 \quad 0$$
$$t = \quad t \quad 1 - 4x \quad 1$$
$$- 5x \quad 4x \quad 6x$$

Oxygen is limiting reagent

So, $X = \frac{1}{5} = 0.2$ all oxygen consumed

Left

$$NH_3 = 1 - 4 \times 0.2$$
$$= 0.2.$$

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Q-24 - 12224809

What quanitity of ammonium sulphate is necessary for the production of NH_3 gas sufficient to neutralize a solution containing 292 g of HC1?

$\left[HCl = 36.5, (NH_4)_2SO_4 = 132, NH_3 = 17 \right]$

(A) (a)272 g

(B) (b)403 g

(C) (c)528 g

(D) (d)1056 g

CORRECT ANSWER: C

SOLUTION:

$$(NH_4)_2SO_4 \equiv 2NH_3$$
$$\underset{134}{} \equiv \quad 2HCl$$
$$2\left(36.5\right) = 73g$$

$$73gHCl \equiv 132g(NH_4)_2SO_4$$

$$292gHCl \equiv 528g(NH_4)_2SO_4$$

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Q-25 - 12224811

Calculate the weight of lime (CaO) obtained by heating 200 kg of 95% pure lime stone $(CaCO_3)$.

(A) (a)104.4 kg

(B) (b)105.4 kg

(C) (c)212.8 kg

(D) (d)106.4 kg

CORRECT ANSWER: D

SOLUTION:

$$\begin{array}{lllll} CaCO_3 & \longrightarrow & CaO & + & CO_2 \\ 100g & & 56g & & 44g \end{array}$$

$100gCaCO_3$ give $= 56gCaO$

$1gCaCO_3$ give $= \dfrac{56}{100}$

$200 \times \dfrac{95}{100} gCaCo_3$ give

$= \dfrac{56}{100}$

$\times \dfrac{100}{200 \times 95} 106.4kg$

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Q-26 - 12224823

What will be the volume ofCO_2 at NTP obtained on heating 10 grams of (90% pure) limestone?

(A) (a)22.4 litres

(B) (b)2.016 litres

(C) (c)2.24 litres

(D) (d)20.16 litres

CORRECT ANSWER: B

SOLUTION:

$$\underset{10g}{CaCO_3} \rightarrow CaO + CO_2$$

$$90\ \%\ pure 9g = \frac{9}{100} \text{mole}$$

$$CaCO_3 \equiv O_2 = 0.09 \text{ mole}$$

At NTP Vol. $CO_2 = 0.09 \times 2.016L.$

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Q-27 - 16007545

NX is produced by the following step of reactions

$$M + X_2 \rightarrow MX_2$$

$$3MX_2 + X_2 \rightarrow M_3X_8$$

$$M_3X_8 + N_2CO_3 \rightarrow NX + CO_2 + M_3O_4$$

How much M (metal) is consumed to produce 206 gm of NX?

(Take at. wt of M = 56, N=23, X = 80]

(A) 42gm

(B) 56gm

(C) 14/3 gm

(D) 7/4gm

CORRECT ANSWER: A

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Q-28 - 12224824

In a cartain operation 358 g of $TiCl_4$ is reacted with 96 g of Mg.

Calculate % yield of Ti if 32 g of Ti is actually obtained [At. Wt. Ti=48, Mg=24][Hint: $\frac{358}{190} = 1.88$]

(A) (a)35.38%

(B) (b)66.6%

(C) (c)100%

(D) (d)60%

CORRECT ANSWER: A

SOLUTION:

$$TiCl_4 + 2MTi$$
$$+ 2MgCl_2$$

Initial mole $\frac{358}{190} = 1.88\frac{96}{24} = 4$

final mole

$$04 - 2 \times 1.881.882$$
$$\times 1.88$$

Weight of Ti obtained $= \frac{358}{190} \times 48$

$$\% \text{ yield} = \frac{\frac{32 \times 100}{358 \times 48}}{190}$$

$$= 35.38\ \%$$

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Q-29 - 12224820

The following process has been used to obtain iodine from oil-field

drines in California.

$NaI + AgNO_3 \rightarrow AgI$
$+ NaNO_3$
(1)

$2AgI + Fe \rightarrow FeI_2$
$+ 2Ag(2)$

$2FeI_2 + 3Cl_2 \rightarrow 2FeCl_3$
$+ 2I_2$
(3)

How many grams of $AgNO_3$ are required in the first step for every

$254kgI_2$ produced in the third step?

(A) (a)340×10^3

(B) (b)240×10^3

(C) (c)440×10^3

(D) (d)540×10^3

CORRECT ANSWER: A

SOLUTION:

Balanced equation:

$$Nal + AgNO_3 \rightarrow Agl + NaNO_3(1)$$

$$AgI + Fe \rightarrow FeI_2 + 2Ag(2)$$

$$2FeI_2 + 3Cl_2 \rightarrow 2FeCl_2 + 2I_2(3)$$

From eq. (3), we get

$$\frac{\text{mole of} I_2}{2}$$

$$= \frac{\text{mole of} FeI_2}{2}$$

$$\frac{\text{mole of} FeI_2}{1}$$

$$= \frac{\text{mole of} AgI}{2}$$

$$\frac{\text{mole of} AgI}{1}$$

$$= \frac{\text{mole of} AgNO_3}{1}$$

$\therefore$ mole of $I_2 = (\text{mole of} FeI_2)$

$$\left(\frac{\text{mole of} AgI}{2}\right)$$

$$= \left(\frac{\text{mole of} AgNO_3}{2}\right)$$

$$\frac{254 \times 10^3}{254}$$

$$= \frac{\text{mole of} AgNO_3}{2}$$

2×10^3= mole of $AgNO_3$

$$= \frac{\text{mass of} AgNO_3}{\text{molar mass of} AgNO_3}$$

Mass of

$AgNO_3 = 170$

$\times \left(2 \times 10^3\right) g = 340$

$\times 10^3 g$

Q-30 - 12224819

An electric discharge is passed through a mixture containing 50 c.c. of O_2 and 50 c.c. of H_2. The volume of the gases formed (i) at room temperature and (ii) at 110C will be

(A) (a)(i) 25 c.c. (ii) 50 c.c.

(B) (b)(i) 50 c.c. (ii) 75 c.c.

(C) (c)(i) 25 c.c. (ii) 75 c.c.

(D) (d)(i) 75 c.c. (ii) 75 c.c.

CORRECT ANSWER: C

SOLUTION:

At room temperature

$2H_{2(g)} + O_{2(g)}$

$\rightarrow 2H_2O_{(l)}$

$t = 0 \quad 50ml$

50ml

0

$t = t \quad 50$

$-2x \quad 50 - x \quad 2x$

$= 0 \quad 25gases(50)$ liquid

In this case H_2 is limiting reagent $x = 25ml$

At

$$110C2H_{2(g)} + O_{2(g)}$$

$$\rightarrow 2H_2O_{(g)}V_{gas}$$

$$= 75ml$$

$$t = t \quad 0 \quad 25\text{ml} \quad 50ml$$

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Q-31 - 12224815

Calculate the amount of Ni needed in the Mond's process given below

$Ni + 4CO \rightarrow Ni(CO)_4$

If CO used in this process is obtained through a process, in which 6 g of carbon is mixed with 4 gCO_2.

(A) (a)14.675 g

(B) (b)29 g

(C) (c)58 g

(D) (d)28 g

CORRECT ANSWER: A

SOLUTION:

$C + CO_2 \rightarrow 2CO$

Given moles

$\left(\frac{6}{12}\right) = 0.5 \quad \left(\frac{44}{44}\right)$

$= 1$

So C is limiting reagent

$\therefore CO$ formed =1 mole

Now moles of Ni need to react with 1 moles of CO are

$\frac{1}{4} \times 58.7 = 14.675g$

Q-32 - 30685366

The density (in g mL^{-1}) of a $3.60M$ sulphuric acid solution that is $29\ \%\ H_2SO_4$ (Molar mass $= 98gmol^{-1}$) by mass will be

(A) 1.45

(B) 1.04

(C) 1.88

(D) 1.22

CORRECT ANSWER: D

SOLUTION:

29% H_2SO_4 by mass means 29g H_2SO_4 are present in 100g of the solution

If $\mathrm{d\ g\ mL^{-1}}$ is the density of the solution,

Volume $= \frac{100}{d} mL = \frac{1}{10d} L$

Moles of $H_2SO_4 = \frac{29}{98}$ mole

Molarity $= \frac{29/98\text{mol}}{1/10d}$

$3.60 = \frac{29 \times 10d}{98}$

$d = \frac{3.60}{10} \times \frac{98}{29}$

$= 1.22\text{g mL}^{-1}$

.

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Q-33 - 12224832

How many millilitres of $0.1N H_2SO_4$ solution will be required for complete reaction with a solution containing 0.125 g of pure Na_2CO_3?

(A) (a)23.6 mL

(B) (b)25.6 mL

(C) (c)26.3 mL

(D) (d)32.6 mL

CORRECT ANSWER: A

SOLUTION:

Meq of H_2SO_4=Meq of Na_2CO_3

$$0.1 \times \frac{V}{1000} = \frac{0.125}{106} \times 2$$

$$V = 23.6mL$$

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Q-34 - 12224834

One litre of a solution contains 18 .9 g of HNO_3 and one litre of another solution contains 3.2 g of NaOH. In what volume ratio must these solution be mixed to obtain a neutral solution?

(A) (a)3:8

(B) (b)8:3

(C) (c)15:4

(D) (d)4:15

CORRECT ANSWER: D

SOLUTION:

$$eq_{HNO_3} = eq_{NaOH}$$

$$\frac{18.9}{63} \times 1 \times V_1 = \frac{3.2}{40} \times 1 \times V_2$$

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Q-35 - 12224837

The molarity of the solution containing 2.8% (mass/volume) solution of KOH is: (Given atomic mass of K=39) is:

(A) (a)0.1M

(B) (b)0.5M

(C) (c)0.2M

(D) (d)1 M

CORRECT ANSWER: B

SOLUTION:

Weight of $KOH = 2.8grams$

Volume of solution $= 100ml$

$$M = \frac{2.8 \times 1000}{56 \times 100}$$

$$= \frac{28}{56} = 0.5M$$

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Q-36 - 12224836

The amount of wet NaOH containing 15% water required to prepare

70 liters of 0.5 N solution is:

(A) (a)1.65 kg

(B) (b)1.4 kg

(C) (c)16.5 kg

(D) (d)140 kg

CORRECT ANSWER: A

SOLUTION:

Moles of pure NaOH required

$$= \frac{N \times V_L}{v.\ f}$$

$$= \frac{0.5 \times 70}{1} = 35$$

Mass of pure $NaOH$ required

$$= 35 \times 40 = 1400g$$

$$= 1.4kg$$

.

Mass of wet $NaOH$ required (containing 15 % water)

$$= 1.4 \times \frac{100}{85}$$

$$= 1.65kg$$

.

Q-37 - 60006937

250 ml of a sodium carbonate solution contains 2.65 grams of Na_2CO_3. If 10 ml of this solution is diluted to one litre, what is the concentration of the resultant solution (mol. Wt. of $Na_2CO_3 = 106$)

(A) 0.1 M

(B) 0.001 M

(C) 0.01 M

(D) 10^{-4} M

CORRECT ANSWER: B

SOLUTION:

Molarity

$$= \frac{W(gm) \times 1000}{\text{molecular wt.} \times V(ml.)}$$

$$= \frac{2.65 \times 1000}{106 \times 250}$$

$$= 0.1M$$

.

10 ml of this solution is diluted to 100 ml $M_1V_1 = M_2V_2$

$$10 \times 0.1 = 1000 \times x$$

$$x = \frac{0.1 \times 10}{1000}$$

$$= 0.001M$$

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Q-38 - 11881051

$25mL$ of a solution of barium hydroxide on titration with 0.1molar

solution of hydrochloric acid give a titre value of $35mL$. The molarity of barium hydroxide is:

(A) 0.28

(B) 0.35

(C) 0.07

(D) 0.14

CORRECT ANSWER: C

SOLUTION:

Meq.of

$Ba(OH)_2$

$=$ Meq.ofHCl

$$N \times 25 = 0.1 \times 35$$

$$\therefore N_{Ba(OH)_2} = \frac{3.5}{25}$$

$$\therefore M_{Ba(OH)_2} = \frac{3.5}{25}$$

$$\times \frac{1}{2} = 0.07$$

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Q-39 - 12224846

What is the molarity of H_2SO_4 solution that has a density 1.84 g/c

c at $35C$ and contains 98% by weight?

(A) (a)4.18 M

(B) (b)8.14 M

(C) (c)18.4 M

(D) (d)18 M

CORRECT ANSWER: C

SOLUTION:

$$(\%\, w/w) \times density$$

$$\text{Molarity} = \frac{\times 10}{\text{Molar mass of solute}}$$

$$= \frac{9.8 \times 1.84 \times 10}{98}$$

$$= 18.4M$$

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Q-40 - 11881039

Two solutions of a substance (non-electroyte) are mixed in the following manner $480mL$ of $1.5M$ of first solution with $520mL$ or $1.2M$ of second solution. The molarity of final solution is:

(A) $1.20M$

(B) $1.50M$

(C) $1.344M$

(D) $2.70M$

CORRECT ANSWER: C

SOLUTION:

For I

$$mM = 4480 \times 1.5$$
$$= 720$$

For II

$$mM = 520 \times 1.2$$
$$= 624$$

Total millie-mole $= 720 + 624 = 1344$

$$\therefore \text{Molarity}$$
$$= \frac{1344}{480 + 520}$$
$$= 1.344M$$

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Q-41 - 12654048

The molality of a urea solution in which $0.0100g$ of urea,

$\left[(NH_2)_2CO\right]$ is added to $0.3000dm^3$of water at STP is

(A) $0.555m$

(B) $5.55 \times 10^{-4}m$

(C) $33.3m$

(D) $3.33 \times 10^{-2}m$

CORRECT ANSWER: B

SOLUTION:

Molality

$$= \frac{\text{Mass of methyl alcohol}}{\text{Mass of solution}} \times 100$$

Moles of urea $= \frac{0.010}{60}mol$

water at STP

$\left(d = 1g/cm^3 = 1kg/dm^3\right) = 0.3dm^3$

$= 0.3kg$

$\therefore$ Molality

$= \dfrac{0.010}{60 \times 0.3} = 5.55$

$\times 10^{-4}m$

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Q-42 - 12224857

$H_3PO_4\left(98gmol^{-1}\right)$ is 98% by mass of solution. If the density is 1.8 g/ml, the molarity is:

(A) (a)18 M

(B) (b)36 M

(C) (c)54 M

(D) (d)0.18 M

CORRECT ANSWER: A

SOLUTION:

$$Molarity$$
$$= \frac{10 \times 1.8 \times 98}{98}$$
$$= 18M$$

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Q-43 - 11034938

At $100C$ and $1atm$, if the density of the liquid water is $1.0gcm^{-3}$ and that of water vapour is $0.0006gcm^{-3}$, then the volume occupied by water molecules in $1L$ of steam at this temperature is

(A) 6

(B) 60

(C) 0.6

(D) 0.06

SOLUTION:

For water vapours, $P = 0.0006 gcc^{-1}$

$$0.0006 = \frac{Mass}{Volume}$$

$$= \frac{Mass}{1000}$$

Mass

$$= 1000 \times 0.0006$$

$$= 0.6g$$

Density of liquid water $= 1 gcc^{-1}$

Volume occupied by water

$$= \frac{Mass}{Density} = \frac{0.6}{1}$$

$$= 0.6$$

Amount of oxalic acid present in a solution can be determined by its titration with $KMnO_4$ solution in the presence of H_2SO_4 . The titration gives unsatisfactory rasult when carried out the presence of HCl because HCl

(A) reducs permanganate to Mn^{2+}

(B) oxidises oxalic acid to carbon dioxide and water

(C) gets oxidized by oxalic acid to chlorine

(D) furnishes H^+ ions in addition to those from oxalic acid.

CORRECT ANSWER: A

SOLUTION:

In presence of H_2SO_4, $KMnO_4$ oxidises oxalic acid to CO_2 .In presence of HCl, $KMnO_4$ not only oxidises oxalic acid but also oxidises HCl to Cl_2 and itself it is

reduced to Mn^{2+}

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Q-45 - 20042053

An aqueous solution of $6.3g$ oxalic acid dihydrate is made up to 250 ml. The volume of $0.1NNaOH$ required to completely neutralize 10 ml of this solution is

(A) 40 ml

(B) 20 ml

(C) 10ml

(D) 4 ml

CORRECT ANSWER: A

SOLUTION:

$$N = \frac{w}{GEW} \times \frac{1000}{V(\text{in ml})}$$

$$N_1V_1 = N_2V_2$$

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Q-46 - 10488146

A mixture x containing 0.02 mol of $\left[Co(NH_3)_5SO_4\right]Br$ and 0.02 mol of $\left[Co(NH_3)_5Br\right]SO_4$ was prepared in $2L$ of solution.

$1L$ of mixture $X +$ excess $AgNO_3 \rightarrow Y$

$1L$ of mixture $X +$ excess $BaCl_2 \rightarrow Z$

The number of moles of Y and Z are

(A) 0.01,0.01

(B) 0.02,0.01

(C) 0.01,0.02

(D) 0.02,0.02

CORRECT ANSWER: A

SOLUTION:

A mixture X containing 0.02 mol of $\left[Co(NH_3)_5SO_4Br\right.$ and 0.02 mol of $\left[CO(NH_3)_5Br\right]SO_4$ was prepared in $2L$ of solution of $\left[Co(NH_3)_5SO_4Br0.01\right.$ mol of $\left[Co(NH_3)_5Br\right]SO_4$.

$1L$ of mixture $X+$ excess $AgNO_3$

$\rightarrow 0.01\mathrm{mol}AgBr$

$1L$ of mixture $X+$ excess $BaCl_2$

$\rightarrow 0.01\mathrm{mol}BaSO_4$

This is according to the following reactions taking place:

$\left[Co(NH_3)_5Br\right]SO_4$

$+AgNO_3\rightarrow$

$$\left[Co(NH_3)_5SO_4\right]NO_3$$
$$+ AgBr \downarrow$$

$$Co(NH_3)_5Br\right]SO_4$$
$$+ BaCl_3 \rightarrow$$

$$\left[Co(NH_3)_5Br\right]Cl_2$$
$$+ BaSO_4 \downarrow$$

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Q-47 - 20042125

$0.16g$ of dibasic acid required 25 ml of decinormal $NaOH$ solution for complete neutralisation. The molecular weight of the acid will be

(A) 32

(B) 64

(C) 128

(D) 256

CORRECT ANSWER: C

SOLUTION:

Ratio of molecules is equal to inverse ratio of their mol.

Wts. If the wts are equal

Q-48 - 30547628

5 mL of N HCl, 20 mL of $N/20 H_2SO_4$ and 30 mL of

$N/3 HNO_3$ are mixed together and volume made to one litre. The

normality of the resulting solution is :

(A) $N/5$

(B) $N/10$

(C) $N/20$

(D) $N/40$

CORRECT ANSWER: D

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Q-49 - 12224872

Hydrolic acid solution A and B have concentration of 0.5 N and 0.1N respectively. The volume of solutions A and B required to make 2 litres of 0.2 N hydrochloric are

(A) (a)$0.5LofA + 1.5LofB$

(B) (b)$1.5LofA + 0.5LofB$

(C) (c)$1.0LofA + 1.0LofB$

(D) (d)$0.75LofA + 1.25LofB$

CORRECT ANSWER: A

SOLUTION:

$$NV = N_1V_1 + N_2V_2$$
$$0.2 \times 2 = 0.5x$$
$$+ 0.1(2 - x)$$

$$0.4 = 0.5x = 0.2$$
$$- 0.1x$$

$$0.0 = 0.4x$$

$$x = \frac{1}{2}L = 0.5L$$

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Q-50 - 12224876

The amount of water that should be added to 500 ml of 0.5 N solution of NaOH to give a concentration of 10 mg per ml is

(A) (a)100

(B) (b)200

(C) (c)250

(D) (d)500

CORRECT ANSWER: D

SOLUTION:

$$N_1 = 0.5N$$
$$\rightarrow 10gperml$$

$$N_2 = \frac{10 \times 10^{-3}g}{40 \times 1}$$
$$\times 1000 = 0.25N$$

$$V_1 = 500ml, V_2 = \ ?$$
$$N_1V_1 = N_2V_2, 0.5$$
$$\times 500 = 0.25 \times V_2$$

$$V_2 = 1000ml$$

final volume water added

$= 1000 - 500$

$= 500mL$

.

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Q-51 - 12224908

How many grams of caustic potash required to completely neutralise $12.6gHNO_3$?

(A) (a)$22.4KOH$

(B) (b)$1.01KOH$

(C) (c)$6.02KOH$

(D) (d)$11.2KOH$

CORRECT ANSWER: D

SOLUTION:

$HNO_3 + KOH$

$\rightarrow KNO_3 + H_2O$

$\frac{12.6}{63} = 0.2\text{mole},$

$HNO_3 \equiv KOH$

$0.2\text{mole} \equiv 0.2\text{mole}$

$0.2 \times 56 = 11.2g.$

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Q-52 - 12224887

The valency factor of I_2 when, (i) it is formed by the reaction of potassium iodide and potassium iodate in acid medium and (ii) when it reacts with hypo, are respectively:

(A) (a)$2, 2$

(B) (b)$\frac{5}{3}, 2$

(C) (c) $\frac{3}{5}, 2$

(D) (d) $5, 2$

CORRECT ANSWER: B

SOLUTION:

$IO_3^- + I^- + H^+$

$\rightarrow I_2 + H_2O$

I_2 can be said to have undergone disproportionation.

:. V.f. of I_2 for oxidation, $n_1 = 2(5 - 0) = 10$

and v.f. of I_2 for reduction,

$n_2 = 2(0 - (-1))$

$= 2$

$\therefore V.f$

$. of I_2(overall) \frac{n_1 n_2}{n_1 + N_2}$

$= \frac{10 \times 2}{10 + 2} = \frac{5}{3}$

(ii)

$$I_2 + 2Na_2S_2O_3 \rightarrow Na_aS_4O_6 + 2Nal$$

$$I_2 + 2e^- \rightarrow 2I^- \Rightarrow v$$

$$. f. = 2$$

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Q-53 - 12224903

$KMnO_4$ reacts with ferrous ammonium sulphate according to the equation

$$MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

, here $10ml$ of $0.1MKMnO_4$ is equivalent to

(A) (a)20ml of $0.1MFeSO_4$

(B) (b)30 ml of$0.1MFeSO_4$

(C) (c)40 ml of $0.1MFeSO_4$

(D) (d)50 ml of $0.1MFeSO_4$

CORRECT ANSWER: D

SOLUTION:

$KMnO_4$= Mohr salt

$$\frac{M_1V_1}{n_1} = \frac{M_2V_2}{n_2},$$

$$\frac{0.1 \times 10}{1} = \frac{M_2V_2}{5},$$

$$M_2V_2 = 5$$

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Q-54 - 12224909

What should be the weight and moles of AgCl precipitate obtained on adding $500ml$ of $0.20MHCl$ in $30g$ of $AgNO_3$ solution? $(agNO_3 = 170)$

(A) (a)$14.35g$

(B) (b)$15g$

(C) (c)$18g$

(D) (d)$19g$

CORRECT ANSWER: A

SOLUTION:

$$AgNO_3 + HCl$$
$$\rightarrow AgCl + HNO_3$$

$$\frac{30}{170} \frac{500 \times 0.2}{1000}$$
$$t = 00.176\text{mole}$$
$$0.1\text{mole limiting}$$
$$= 14.345g$$

$$t$$
$$= t0.076\text{mole}00.1\text{mole}$$

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Q-55 - 12224912

$3.92g$ of ferrous ammonium sulphate crystals are dissolved in $100ml$ of water, $20ml$ of this solution requires $18ml$ of $KMnO_4$ during titration for complete oxidation. The weight of $KMnO_4$ present in one litre of the solution is

(A) (a)$3.476g$

(B) (b)$12.38g$

(C) (c)$34.76g$

(D) (d)$1.238g$

CORRECT ANSWER: A

SOLUTION:

$KMnO_4$= Mohr salt

$$\frac{M_1V_1}{1} = \frac{M_2V_2}{5}$$

$$= \left[\frac{W}{M \times V} \times 1000\right]$$

$$\times \frac{V_2}{5}$$

$$\left[\frac{W \times 1000}{58 \times 1000}\right] \times 18$$

$$= \frac{3.92 \times 1000}{392 \times 1000}$$

$$\times \frac{20}{5} W = 3.476 g / L$$

.

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Q-56 - 12224940

Assertion: $31.26 mL$ of $0.165 M$ solution of $Ba(OH)_2$ is exactly neutralised by $25 mL$ of citric acid $C_6H_8O_7$ of molarity 0.138.

Reason: The acid is tribasic in nature.

(A) (a)If both assertion and reason are true and the

reason is the correct explanation of the assertion.

(B) (b)If both assertion and reason are true and the reason is not the correct explanation of the assertion.

(C) (c)If assertion is true but reason is false.

(D) (d)If assertion is false but reason is true.

CORRECT ANSWER: A

SOLUTION:

Meq. Of $Ba(OH)_2$=Meq. Of acid

$31.26 \times 0.165 \times 2$

$= 25 \times M \times n = 25$

$\times 0.138 \times n$

$\therefore N = 3$

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Q-57 - 12224961

Percentage of Se in peroxidase anhydrase enzyme is $0.5\ \%$ by weight (at. Wt. $= 78.4$), then minimum molecular weight of peroxidase anhydrase enzyme is:

(A) (a)1.568×10^3

(B) (b)15.68

(C) (c)1.568×10^4

(D) (d)2.136×10^4

CORRECT ANSWER: C

SOLUTION:

Suppose the mol. Wt. of enzyme =x

Given $100g$ of enzyme wt of $Se = 0.5g$

$\therefore$ In x g of enzyme wt. of Se $= \dfrac{0.5}{100} \times x$

Hence $78.4 = \dfrac{0.5 \times x}{100}$

$\therefore X = 15680 = 1.568$

$\times 10^4$

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Q-58 - 12226163

In Haber process 30 litre of dihydrogen and 30 litres of dinitrogen were taken for reaction which yielded only50 % of the expected product. What will be the composition of gaseous mixture under the aforesaid condition in the end ?

(A) 20 litres ammonia, 25 litres nitrogen, 15 litres hydrogen

(B) 20 litres ammonia, 20 litres nitrogen, 15 litres hydrogen

(C) 10 litres ammonia, 25 litres nitrogen, 15 litrers hydrogen

(D) 20 litres ammoina, 10 litres nitrogen, 30 litres hydrogen

---

CORRECT ANSWER: C

SOLUTION:

$$N_2 + 3H_2 \quad \Longleftrightarrow \quad 2NH_3$$

$$\begin{array}{lll} 30 & 30 & 0 \\ 30-x & 30-x & 2x \end{array}$$

$2x = 10, x = \dfrac{10}{2} = 5$

$N_2 = 30 - 5 = 25L$

$H_2 = 30 - 3 \times 5$

$= 15L$

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Q-59 - 12224969

Concentrated aqueous sulphuric acid is $98\ \%\ H_2SO_4$ by mass and has a density of $1.80 gmL^{-1}$. Volume of acid required to make one

litre of $0.1MH_2SO_4$ solution is:

(A) (a)$16.65mL$

(B) (b)$22.20mL$

(C) (c)$5.55mL$

(D) (d)$11.10mL$

CORRECT ANSWER: C

SOLUTION:

Molarity of H_2SO_4 solution

$$= \frac{98 \times 1000}{98 \times 100} \times 1.802$$

$$= 18.02$$

Suppose V ml of this H_2SO_4 is used to prepare 1 litre of

0.1

MH_2SO_4. Using formula $M_1V_1 = M_2V_2$

$\therefore V \times 18.02 = 1000$

$\times 0.1$

or

$$V = \frac{1000 \times 0.1}{18.02}$$

$= 5.55ml$

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Q-60 - 52405141

What is the $\left[OH^{-}\right]$ in the final solution prepared by mixing

20.0ml of 0.50 M HCl with 30.0 ml of 0.10 M $Ba(OH)_2$

(A) 0.10 M

(B) 0.40 M

(C) 0.0050 M

(D) 0.12 M

CORRECT ANSWER: A

SOLUTION:

No. of milli equivalent of

$$HCl = 20 \times 0.05$$
$$= 1.0$$

No. of milli equivalent of

$$Ba(OH)_2 = 30 \times 0.10$$
$$\times 2 = 6.0$$

After neutralization, no. of milli equivalents in 50 ml. of

solution = (6-1) = 5

No. of milli equivalent of OH^- is 5 in 50 ml.

$$[OH^-] = \frac{5 \times 100}{50}$$
$$\times 10^{-3} = 0.1M$$