Chemical Arithmetic

SET Self Evaluation Test - 1

1. A mixture of sand and iodine can be separated by **[Kerala CEE 2002]**

(a) Crystallisation (b) Sublimation

(c) Distillation (d) Fractional distillation

2. The element similar to carbon is

(a) Mg (b) Mn

(c) Sn (d) Po

2. The law of multiple proportions was proposed by **[IIT 1992]**

(a) Lavoisier (b) Dalton

(c) Proust (d) Gay-Lussac

4. 1 L of N_2 combines with 3 L of H_2 to form 2L of NH_3 under the same conditions. This illustrates the

(a) Law of constant composition

(b) Law of multiple proportions

(c) Law of reciprocal proportions

(d) Gay-Lussac's law of gaseous volumes

5. One sample of atmospheric air is found to have 0.03% of carbon dioxide and another sample 0.04%. This is evidence that

(a) The law of constant composition is not always true

(b) The law of multiple proportions is true

(c) Air is a compound

(d) Air is a mixture

6. One part of an element A combines with two parts of another B. Six parts of the element C combine with four parts of the element B. if A and C combine together the ratio of their weights will be governed by **[AMU 1984]**

(a) Law of definite proportion

(b) Law of multiple proportion

(c) Law of reciprocal proportion

(d) Law of conservation of mass

7. The maximum amount of $BaSO_4$ precipitated on mixing equal volumes of $BaCl_2$ (0.5 M) with H_2SO_4 (1M) will correspond to **[AIIMS 1997]**

(a) 0.5 M (b) 1.0 M

(c) 1.5 M (d) 2.0 M

8. Crystals of which pair are isomorphous **[MP PMT 1985]**

(a) $ZnSO_4, SnSO_4$ (b) $MgSO_4, CaSO_4$

(c) $ZnSO_4, MgSO_4$ (d) $PbSO_4, NiSO_4$

9. M is the molecular weight of $KMnO_4$. The equivalent weight of $KMnO_4$ when it is converted into K_2MnO_4 is

(a) M (b) $M/3$

(c) $M/5$ (d) $M/7$

10. An aqueous solution of 6.3 g of oxalic acid dihydrate is made up of to 250 ml. The volume of 0.1 N $NaOH$ required to completely neutralise 10 ml of this solution is **[IIT 2001]**

(a) 40 ml (b) 20 ml

(c) 10 ml (d) 4 ml

11. The normality of orthophosphoric acid having purity of 70% by weight and specific gravity 1.54 would be **[CPMT 1992]**

(a) 11N (b) 22N

(c) 33N (d) 44N

12. The equivalent weight of phosphoric acid (H_3PO_4) in the reaction, $NaOH + H_3PO_4 \rightarrow NaH_2PO_4 + H_2O$ is **[AIIMS 1999; BHU 2005]**

(a) 25 (b) 49

(c) 59 (d) 98

13. Volume of 0.6 M $NaOH$ required to neutralize 30 cm^3 of 0.4 M HCl is **[KCET 1995]**

(a) 30 cm^3 (b) 20 cm^3

(c) 50 cm^3 (d) 45 cm^3

14. One mole of potassium dichromate completely oxidises the following number of moles of ferrous sulphate in acidic medium **[MP PET 1998]**

(a) 1 (b) 3

(c) 5 (d) 6

15. The number of equivalents of $Na_2S_2O_3$ required for the volumetric estimation of one equivalent of Cu^{2+} is **[Kerala MEE 2000]**

(a) 1 (b) 2

(c) 3/2 (d) 3

AS Answers and Solutions

1. (b) Iodine shows sublimation and hence volatalizes on heating, the vapour condenses on cooling to give pure iodine.

2. (c) Carbon and tin both are same group elements so have similarities in properties.

3. (b) Law of multiple proportions was proposed by Dalton and verified by Berzelius.

4. (d) Gay-Lussac's law : The volumes of the reacting gases and those of the gaseous products bear the simple ratio (also called the law of gaseous volumes).

5. (d)

6. (c) The weights of two elements combining with a fixed amount of the third element will bear the same ratio(or simple multiple of it) in which they themselves react.

7. (a) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

One mole of $BaCl_2$ reacts with one mole of H_2SO_4.
Hence 0.5 mole will react with 0.5 mole of H_2SO_4
i.e. $BaCl_2$ is the limiting reagent.

8. (c) Isomorphous substance molecules contain the same number of atoms bonded in similar fashion.

9. (a) $\overset{+7}{K}\overset{+6}{M}nO_4 \rightarrow K_2\overset{+6}{M}nO_4$

Change in 0.5 per atom $= 7 - 6 = 1$

$\therefore$ Equivalent weight of $KMnO_4$

$= \frac{\text{Molecular weight of } KMnO_4}{\text{Change of 0.5 per atom}} = \frac{M}{1} = M$.

10. (a) Oxalic acid $NaOH$

$N_1V_1 = N_2V_2$

$\left[\frac{W}{E} \times \frac{1000}{V}\right] \times V_1 = N_2V_2$

$\frac{6.3}{63} \times \frac{1000}{250} \times 10 = 0.1 \times V \;\; V = 40ml.$

11. (a) 70% by weight $70gm\ H_3PO_4 \rightarrow 100gm$ solution/sample

$V = \frac{W}{d} = \frac{100}{1.54} \;\; N = \frac{70 \times 1000}{98 \times 100/1.54} = 11N$.

12. (d) $NaOH + \underset{(PO_4^{-3})}{H_3PO_4} \rightarrow \underset{(NaPO_4^{-2})}{NaH_2PO_4}$

$EW = \frac{MW}{\text{no. of ionisable } H^+} = \frac{98}{1}$.

13. (b) $NaOH \;\; HCl$

$N_1V_1 = N_2V_2$; $0.6 \times V_1 = 0.4 \times 30$; $V_1 = 20ml$.

14. (d) $\underset{n=6}{Cr_2O_7^{--}} \rightarrow Cr^{3+}$; $\underset{n=1}{Fe^{++}} \rightarrow Fe^{+++}$

eq. of $K_2Cr_2O_7$ = eq. of $FeSO_4$

$1 \times 6 = x \times 1$

15. (b) $Cu^{2+} + 2I^- \rightarrow CuI_2 \;\; 2CuI_2 \rightarrow Cu_2I_2 + I_2$

$I_2 + 2Na2S_2O_3 \rightarrow 2NaI + Na_2S_4O_6$

$Cu^{2+} \equiv 2Na_2S_2O_3$

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