STOICHIOMETRY, BALANCING OF REDOX REACTIONS

Single Correct Answer Type:

1. In an experiment, 50 ml of 0.1 M solution of a salt $\left(M^{+3}\right)$ reacted with 25 ml of 0.1 M solution of sodium sulphite completely. $M^{+3} + SO_3^{2-} \xrightarrow{H^+} SO_4^{2-} + M^{+x}$. Then x value is

   (A) 0 (B) 4 (C) 2 (D) 5

2. Calculate the % of free SO_3 in oleum (a solution of SO_3 in H_2SO_4) that is labelled 109 % H_2SO_4 by mass

   (A) 90 % (B) 109 % (C) 40 % (D) 80 %

3. Density of 2.05 M solution of acetic acid in water is 1.02 gr/ml. The molality of same solution is

   (A) 1.14 $molkg^{-1}$ (B) 3.28 $molkg^{-1}$ (C) 2.28 $molkg^{-1}$ (D) 0.44 $molkg^{-1}$

4. An athlete takes 20 breathes per minute at room temperature. The air inhaled in each breathe is 200 ml which contains 20% oxygen by volume, while exhaled air contains 10% oxygen by volume. Assuming that all the oxygen consumed is used for converting glucose into $CO_{2(g)}$ and $H_2O_{(\ell)}$, how many glucose will be burnt in the body in one hour? (Room temperature = $27°C$)

   (A) 25.29 g (B) 29.25 g (C) 50.00 g (D) 15.68 g

5. 4.14 g of pure lead was dissolved in nitric acid and was made to react with HCl, Cl_2 and NH_4Cl to convert lead completely into $(NH_4)_2PbCl_6$. However, only 2.28 g of $(NH_4)_2PbCl_6$ was actually produced. The percentage yield of the product is (At.wt of Pb = 207)

   (A) 75 (B) 37.5 (C) 50 (D) 25

6. 10 ml of $KMnO_4$ solution is mixed with excess of KI solution in acidic medium. The Iodine hence liberated required 20 ml of $Na_2S_2O_3$ solution for titration. If the molarity of $KMnO_4$ solution is 0.05M, find molarity of $Na_2S_2O_3$ solution

   (A) 1 (B) 1.25 (C) 5 (D) 4.5

7. 6 gm of Mg is burnt with insufficient amount of oxygen. The residue is treated with 100 ml of H_2SO_4 solution (30% by mass, 1.4 gm/ml density), resulting in an evolution of 3.36 lit of H_2 gas at STP. After the reaction density of H_2SO_4 solution is found to be 1.25 gm/ml. Assume no change in volume of H_2SO_4 solution. Percentage (Wt/Wt) of final H_2SO_4 solution is

   (A) 15 (B) 18 (C) 14 (D) 9

8. A $5.0\,cm^3$ solution of H_2O_2 liberates 0.508 g of Iodine from an acidified KI solution. Calculate the strength of H_2O_2 solution in term of volume strength at STP.

   (A) 2.24 (B) 4.48 (C) 1 (D) 0.2

9. The amount of nitric acid required to oxidise. 127 gms of I_2 to I_2O_5 will be _____. Assume that during the reaction HNO_3 gets converted to NO_2.

   (A) 12.7 (B) 3.15 (C) 315 (D) 31.5

10. 0.2 g of sample of H_2O_2 required 10 ml of 1 N $KMnO_4$ in a titration in the presence of H_2SO_4. Purity of H_2O_2 is

(A) 25% (B) 65% (C) 85% (D) None

11. A metal oxide is reduced by heating it in a steam of hydrogen. It is found that after complete reduction, 3.15 g of the oxide has yielded. 1.05 g of the metal. We may declare that

(A) The atomic weight of the metal is 8 (B) The atomic weight of the metal is 4

(C) The equivalent weight of the metal is 4 (D) The equivalent weight of the metal is 8

12. The mass of P_4O_{10} produced if 440 gm of P_4S_3 is mixed with 384 gm of O_2 is

(A) 568 gm (B) 426 gm (C) 284 gm (D) 396 gm

13. The number of carbon atoms present in a signature, if a signature written by carbon pencil weights 1.2×10^{-3} g is

(A) 12.4×10^{20} (B) 6.02×10^{19} (C) 3.01×10^{19} (D) 6.02×10^{20}

14. In the following reaction (unbalanced), equivalent wt. of As_2S_3 is related to molecular wt. M by

$$As_2S_3 + HNO_3 \longrightarrow NO + H_2O + AsO_4^{3-} + SO_4^{2-}$$

(A) $\frac{M}{2}$ (B) $\frac{M}{4}$ (C) $\frac{M}{28}$ (D) $\frac{M}{24}$

15. When 0.75 gm of a substance was kjeldalised, it produced NH_3. Which neutralizes 30 ml of 0.25 N sulphuric acid. The percentage of nitrogen in the organic compound is

(A) 14 (B) 11 (C) 1 (D) None

16. A solution of specific gravity 1.6 is 67% by weight. What will be % by weight of the solution of same acid if it is diluted to specific gravity 1.2?

(A) 500 ml (B) 125 ml (C) 250 ml (D) 100 ml

17. An oleum sample is labelled as 118%. Calculate the mass of H_2SO_4 in 100 gm oleum sample

(A) 10 gm (B) 18 gm (C) 9 gm (D) 20 gm

18. Bay of Bengal has 1.9 ppm of lithium ions. What is the molality of Li^+ in this water?

(A) 2.7×10^{-4} (B) 8 (C) 3 (D) 2.7×10^{-3}

19. The number of moles of thiosulphate $\left(S_2O_3^{2-}\right)$ that will required to react completely with one mole. I_2 in alkaline medium (where it gets oxidised to SO_4^{2-}) is

(A) $\frac{1}{4}$ (B) 4 (C) 8 (D) $\frac{1}{8}$

20. 15 ml of gaseous hydrocarbon required for complete combustion 357 ml of air (21% of O_2 by volume) and the gaseous products occupied 327 ml (all volumes being measured at STP). What is the formula of hydrocarbon?

(A) CH_4 (B) C_2H_6 (C) C_3H_8 (D) C_4H_{10}

Numerical Based:

21. $KMnO_4 \xrightarrow{H^+ + R.A} Mn^x$

$KMnO_4 \xrightarrow{OH^- + R.A} Mn^y$

$K_2Cr_2O_7 \xrightarrow{OH^-} Cr^z$

$x + y + z$ is [here x, y and z are oxydation states]

22. A bottle of H_2O_2 is labelled as '10 V' H_2O_2. 336 mol of this solution of H_2O_2 is titrated against 0.04 M acidified solution of $KMnO_4$. The volume of $KMnO_4$ in litre is

23. If the sum of mole fraction of NaOH in its aqueous solution and the mole fraction of H_2O in an another aqueous solution of KOH is equal to one, find molality of KOH solution if the molality of NaOH solution is 'm'. Report your answer as "y" where

$y = \text{Molality of KOH solution} \div \text{Molality of NaOH solution}$

24. Due to partial corrosion of a piece of copper into cuprous sulphide Cu_2S, it gains weight. If the % of total copper that has undergone corrosion is 31.75%, then % gain in weight of piece of copper is

25. 50 gm of a sample of $Ca(OH)_2$ is dissolved in 50 ml of 0.5 N HCl solution. The excess of HCl was titrated with 0.3 N NaOH. The volume of NaOH used was 20 cc. Calculate % purity of $Ca(OH)_2$

KEY

1.	C	2.	C	3.	C	4.	B	5.	D
6.	B	7.	C	8.	B	9.	C	10.	C
11.	C	12.	B	13.	B	14.	C	15.	A
16.	B	17.	D	18.	A	19.	A	20.	C
21.	14	22.	3	23.	1	24.	8	25.	1.406

❇ *Wish You all the Best* ❇