S.4 CHEMISTRY ASSESSMENT TEST

TIME: 110 MINUTES TOPIC: MOLE CONCEPT

INSTRUCTIONS: ***Attempt all questions***

SECTION A

1. Which one of the following substances contains the same number of moles as $10cm^3$ of a 0.5M nitric acid? *(1 mole of a gas occupies 22.4 dm^3 at s.t.p H=1, C=12, N=14)*

   A. 5.6 dm^3 of carbon dioxide at s.t.p. C. $112cm^3$ of oxygen at s.t.p.

   B. 17g of ammonia D. 12g of carbon

2. Sulphuric acid reacts with sodium hydroxide according to the following equation.

   $$H_2SO_4(aq) + 2NaOH(aq) \longrightarrow Na_2SO_4(aq) + 2H_2O(l)$$

   Which one of the following is the volume of a 2M sulphuric acid required to react completely with $10cm^3$ of a 2M sodium hydroxide solution?

   A. $5.0cm^3$ B. $10.0cm^3$ C. $20.0cm^3$ D. $40.0cm^3$

3. Ammonia burns in oxygen according to the following equation

   $$4NH_3(g) + 3O_2(g) \longrightarrow 2N_2(g) + 6H_2O(l)$$

   The maximum volume of oxygen required to burn $60cm^3$ of ammonia is?

   A. $45cm^3$ B. $80cm^3$ C. $90cm^3$ D. $180cm^3$

4. 0.4g of metal hydroxide MOH reacted completely with $20cm^3$ of a 0.5M hydrochloric acid. The relative formula mass of *MOH* is,

   A. $\left(\frac{0.5\ x\ 20}{0.4\ x\ 1000}\right)$ B. $\left(\frac{0.4\ x\ 20\ x\ 0.5}{1000}\right)$ C. $\left(\frac{1000\ x\ 0.5}{0.4\ x\ 20}\right)$ D. $\left(\frac{0.4\ x\ 1000}{0.5\ x\ 20}\right)$

5. Which one of the following is the concentration in grams per litre of a solution that contains 0.05 moles of sodium chloride in $50cm^3$? *(NaCl – 58.5)*

   A. $\left(\frac{0.05\ x\ 50}{1000\ x\ 58.5}\right)$ B. $\left(\frac{0.05\ x\ 1000\ x\ 58.5}{50}\right)$ C. $\left(\frac{0.05\ x\ 50\ x\ 58.5}{1000}\right)$ D. $\left(\frac{1000\ x\ 50}{58.5\ x\ 0.05}\right)$

6. The mass of oxalic acid $(H_2C_2O_4)$ required to prepare $250cm^3$ of a 4.5M solution of the acid is *(H=1; C=2; O=16)*

   A. $\left(\frac{1.5\ x\ 250}{1000\ x\ 90}\right) g$ B. $\left(\frac{1000\ x\ 250}{90\ x\ 1.5}\right) g$ C. $\left(\frac{90\ x\ 250}{1000\ x\ 1.5}\right) g$ D. $\left(\frac{1.5\ x\ 250\ x\ 90}{1000}\right) g$

7. Chlorine reacts with iron from iron(III) chloride according to the following equation.

   $$2Fe(s) + 3Cl_2(g) \longrightarrow 2FeCl_3(s)$$

   Which one of the following would be the volume of chlorine that would react with 5.6 g of iron to produce iron(III) chloride at s.t.p?

   (Fe=56; 1 mole of a gas occupies 22.4 litres at s.t.p)

   A. $\left(\frac{3\ x\ 5.6\ x\ 22.4}{56}\right) l$ B. $\left(\frac{3\ x\ 5.6\ x\ 22.4}{2\ x\ 56}\right) l$ C. $\left(\frac{3\ x\ 56\ x\ 22.4}{2\ x\ 5.6}\right) l$ D. $\left(\frac{2\ x\ 56\ x\ 224}{2\ x\ 5.6}\right) l$

8. Ammonia reacts with copper(II) oxide to form copper according to the following equation.

   $$3CuO(s) + 2NH_3(g) \longrightarrow 3Cu(s) + N_2(g) + 3H_2O(l)$$

   The mass of copper formed when 12 g of ammonia is reacted with copper(II) oxide is

   (Cu=64; N=16; H=1)

   A. $\left(\frac{12\ x\ 64}{17\ x\ 3}\right) g$ *B.* $\left(\frac{12\ x\ 64}{2\ x\ 17}\right) g$ *C.* $\left(\frac{12\ x\ 2\ x\ 64}{3\ x\ 17}\right) g$ *D.* $\left(\frac{12\ x\ 3\ x\ 64}{2\ x\ 17}\right) g$

9. The mass of $2x10^{23}$ atoms of aluminium is
(*The atomic mass of aluminium =27, Avogadro's number =$6x10^{23}$ particles)*
A. $(2x10^{23}x27)g$ B. $\left(\frac{2x10^{23}x27}{6x10^{23}}\right)g$ C. $\left(\frac{27x\ 6.0\ x\ 10^{23}}{2\ x\ 10^{23}}\right)g$ D. $(2\ x\ 10^{23}x6.0\ 10^{23}x27)g$

10. Which one of the following gases diffuses faster? *(C=12, O=16, N=14: Cl=35.5: H=1)*
A. CO_2 B. CH_4 C. HCl D. NO

11. The volume of nitrogen dioxide produced at s.t.p when 2.2g of lead(II) nitrate is heated is
(N=14; O=16; Pb=207; 1 mole of a gas occupies 22.4 dm^3 at s.t.p)
A. $\left(\frac{2.2\ x\ 22.4}{331}\right)dm^3$ B. $\left(\frac{2.2\ x4x\ 22.4}{331}\right)dm^3$ C. $\left(\frac{2.2\ x4x\ 22.4}{331x2}\right)dm^3$ D. $\left(\frac{2.2\ x\ 22.4}{2x331x4}\right)dm^3$

12. 20 $cm^3$of an acid HX required 25 cm^3 of 0.05M sodium carbonate solution for complete neutralization. The concentration of the acid in moles per litre is
A. $\frac{25\ x\ 0.05}{2\ x\ 20}$ B. $\frac{20\ x\ 2}{25\ x\ 0.05}$ C. $\frac{2\ x\ 20\ x\ 0.05}{25}$ D. $\frac{2x\ 25\ x\ 0.05}{20}$

13. Hydrogen peroxide decomposes to give oxygen according to the following equation.
$2H_2O_2(ag) \longrightarrow 2H_2O(l) - O_2(g)$
The volume of oxygen produced at s.t.p when 50 cm^3 of a 3M hydrogen peroxide decomposes completely is *(1 mole of gas occupies 22.4 dm^3 at s.t.p)*
A. $\left(\frac{50\ x\ 2\ x\ 22.4}{1000\ x\ 3}\right)dm^3$ B. $\left(\frac{50\ x\ 3\ x\ 22.4}{1000\ x\ 2}\right)dm^3$ C. $\left(\frac{100\ x\ 3\ x\ 22.4}{50x2}\right)dm^3$ D. $\left(\frac{50\ x\ 2\ x\ 22.4x2}{1000}\right)$

14. Which one of the following has the same mass as 0.05 moles of sulphur?
(C=12; O=16; Na=23; Al=27; S=32)
A. 2 moles of carbon C.1.5 moles of sodium
B. 0.13 moles of aluminium D. 0.1 moles of oxygen atoms

15. The concentration of chloride ions in a litre of a solution which contains 22.2 g of calcium chloride is *(Ca=40; Cl=35.5)*
A. 0.20 mol l^{-1} B. 0.29 mol l^{-1} C. 0.40 mol l^{-1} D. 0.60 mol l^{-1}

16. Hydrogen reacts with nitrogen to form ammonia according to the following equation.
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
The volume of the gas that would remain unreacted at equilibrium when 30 litres of hydrogen is reacted with 20 litres of nitrogen is
A. 5l B. 10l C. 15l D. 30l

17. The number of sulphate ions in 3.0g of aluminium sulphate, $Al_2(SO_4)_3$ is
(Al=27; S=32; O=16)
A. $\frac{3.0}{342}$ B. $\frac{3.0\ x\ 3}{342}$ C. $\frac{3.0\ x\ 4}{342}$ D. $\frac{3.0}{342}$

18. 20 cm^3 of 0.30 M sodium hydroxide was neutralized by the same volume of 0.15M solution of an acid X. The basicity of the acid is
A. 1 B. 2 C. 3 D. 4

19. 20cm^3 of an acid HX was neutralized by 25cm^3 of a 0.05M sodium carbonate. Which one of the following is the molarity of the acid?
A. $\left(\frac{2.5\ x\ 0.05}{20}\right)M$ B. $\left(\frac{2\ x\ 25\ x\ 0.05}{20}\right)M$ C. $\left(\frac{2\ x\ 20\ x\ 0.05}{25}\right)M$ D. $\left(\frac{25\ x\ 0.05}{2\ x\ 20}\right)M$

20. Lead(II) ions react with iodide ions according to the following equation:
$Pb^{2-}{}_{(aq)} + 2l^{-}{}_{(aq)} \longrightarrow Pbl_{2(s)}$
Which one of the following is the volume of 1M potassium iodide solution that would react completely with 20cm^3 of a 0.5M lead(II) nitrate solution?
A. 5cm^3 B. 10cm^3 C. 20cm^3 D. 40cm^3

21. Which one of the following is the empirical formula of a hydrocarbon containing 88.88% carbon? *(H=1, C=12)*

    A. C_4H_6 B. C_2H_3 C. CH_2 D. CH

22. Sodium hydrogen carbonate decomposes according to the equation when heated:

$$2NaHCO_3 \longrightarrow Na_2CO_{3(s)} + CO_2 + H_2O_{(l)}.$$

    The mass of sodium hydrogen carbonate which must be heated to give off 200cm^3 of carbon dioxide at room temperature is

    (1mole of gas at room temperature occupies 24.000cm^3, Na=23; O=16; C=12; H=1)

    A. $\left(\frac{2\ x\ 84\ x\ 200}{24{,}000}\right) g$ B. $\left(\frac{24{,}000\ x\ 84}{2\ x\ 200}\right) g$ C. $\left(\frac{84\ x\ 200}{24{,}000}\right) g$ D. $\left(\frac{84\ x\ 200}{2\ x\ 24{,}000}\right) g$

23. Hydrogen peroxide decomposes according to the following equation:

$$2H_2O_{2(l)} \longrightarrow 2H_2O_{(l)} + O_{2(g)}$$

    Which one of the following is the volume of oxygen formed when 24.8g of hydrogen peroxide is completely decomposed at s.t.p?

    (H=1; O=16; one mole of a gas occupies 22.4 dm^3 at s.t.p)

    A. $\left(\frac{68\ x\ 22.4}{24.8}\right) dm^3$ B. $\left(\frac{34\ x\ 22.4}{24.8}\right) dm^3$ C. $\left(\frac{22.4\ x\ 24.8}{68}\right) dm^3$ D. $\left(\frac{22.4\ x\ 24.8}{34}\right) dm^3$

24. When heated, 0.25 moles of a hydrated salt lost 27g of water. Which one of the following is the number of moles of water of crystallisation in one mole of the salt? *(H=1; O=16)*

    A. 2 B. 5 C. 6 D. 10

25. 40g of zinc sulphide combined with 30g of water of crystallisation. If the formula of hydrated zinc sulphide is $ZnS.xH_2O$, find the value of x. *(Zn=65, S=32, O=16)*

    A. 2 B. 3 C. 4 D. 5

26. 5.72g of hydrated sodium carbonate, $Na_2CO_3.10H_2O$ was dissolved in water to make 500cm^3 of a solution. The molarity of the solution is *(Na=23, O=16, C=12, H=1)*

    A. 0.05M B. 0.02M C. 0.04M D. 0.11M

27. 25cm^3 of 0.12M sodium hydroxide was neutralized by 30.0cm^3 of a solution of a dibasic acid. The molarity of the acid is

    A. 0.05M B. 0.06M C. 0.01M D. 0.12M

28. Which one of the following samples of compounds contains the greatest mass of the compound? *(Na_2SO_4=142; Na_2CO_3=106; NaCl=58.5; NaOH=40)*

    A. 0.2 moles of Na_2SO_4
    B. 0.5 moles of $NaCl$
    C. 0.3 moles of Na_2CO_3
    D. 0.6 moles of $NaOH$

29. Which one of the following solution will neutralize 100cm^3 of a 0.8M hydrochloric acid?

    A. 10cm^3 of 0.08M sodium hydroxide
    B. 50cm^3 of 0.8M sodium hydroxide
    C. 50cm^3 of 0.4M sodium hydroxide
    D. 80cm^3 of 1M sodium hydroxide

30. Methane burns in oxygen according to the following equation;

$$CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O_{(l)}$$

    The volume of carbon dioxide formed when 20cm^3 of methane is burnt in 40cm^3 of oxygen is

    A. 10cm^3 B. 20cm^3 C. 40cm^3 D. 60cm^3

31. 6.48g of calcium hydrogen carbonate, $Ca(HCO_3)_2$was dissolved in water to make 500 cm^3 of the solution. Which one of the following is the molarity of the solution?

    A. 0.04M B. 0.06M C. 0.08M D. 0.12M

32. Ammonia reacts with copper(II) oxide to form copper according to the following equation:

$$2NH_{3(g)} + 3CuO_{(s)} \longrightarrow 3H_2O_{(l)} + N_{2(g)} + 3Cu_{(s)}$$

The volume of ammonia that is required to react with 6.0g of copper(II) oxide at s.t.p. is

(H=1; Cu=64; O=16; N=14: one mole of a gas occupies 22400cm³ at s.t.p.is

A. $\frac{2 \times 22400 \times 6.0}{3 \times 80} cm^3$ B. $\frac{2 \times 22400 \times 6.0}{80} cm^3$ C. $\frac{2 \times 22400 \times 6.0}{2 \times 80} cm^3$ D. $\frac{3 \times 22400 \times 6.0}{80} cm^3$

33. Copper(II) sulphate reacts with sodium carbonate according to the following equation

$$CuSO_{4(aq)} + Na_2CO_{3(aq)} \longrightarrow CuCO_{3(s)} + Na_2SO_{4(aq)}$$

The mass of copper(II) carbonate that is formed when 200cm³ of a solution containing 5.3g of sodium carbonate per litre of solution was reacted completely with copper(II) sulphate is given by the expression: *(C=12; O=16; Na=23; Cu=64; S=32)*

A. $\frac{5.3 \times 200 \times 124}{106 \times 1000}$g B. $\frac{5.3 \times 124 \times 1000}{106 \times 200}$g C. $\frac{106 \times 200 \times 124}{5.3 \times 1000}$g D. $\frac{106 \times 124 \times 1000}{5.3 \times 200}$g

34. The mass of 4 atoms of phosphorus is

(Avogadro's constant=6.02 x 10²³, P=31)

A. $\frac{6.02 \times 10^{23}}{4 \times 31}$ B. $\frac{31 \times 4}{6.02 \times 10^{23}}$ C. $\frac{31 \times 6.02 \times 10^{23}}{4}$ D. $\frac{31}{4 \times 6.02 \times 10^{23}}$

35. Lead nitrate decomposes according to the equation:

$$2Pb(NO_3)_2 \longrightarrow 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$$

The mass of lead monoxide that is produced when 3.31g of lead nitrate is completely decomposed is; *(N=14, O=16, Pb=207)*

A. $\frac{3.31 \times 223}{331}$ B. $3.31 \times 223 \times 331$ C. $\frac{3.31 \times 223}{3.31}$ D. $\frac{3.31 \times 331}{223}$

36. Magnesium reacts with hydrochloric acid according to the following equation:

$$Mg_{(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$$

The volume of hydrogen formed at s.t.p. when 2.32g of magnesium reacts completely with dilute hydrochloric acid is *(Molar gas volume at s.t.p. is 22.4dm³, Mg=24)*

A. $\frac{22.4 \times 2.32}{24} dm^3$ B. $\frac{22.4 \times 24}{2.32} dm^3$ C. $\frac{2.32 \times 24}{22.4} dm^3$ D. $2.32 \times 24 \times 22.4 dm^3$

37. Zinc reacts with hydrochloric acid according to the following equation:

$$Zn_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$$

The number of moles of hydrochloric acid required to react completely with 7.0g of zinc is

A. $\frac{65 \times 2}{7.0}$ B. $\frac{7.0 \times 65}{2}$ C. $\frac{7.0 \times 2}{65}$ D. $7.0 \times 65 \times 2$

38. Which one of the following is the mass of lead(II) iodide formed when 33.2 g of potassium iodide is reacted with excess lead(II) nitrate? *(K=39; 1=127; pb = 207).*

A. 4.61 g B. 9.22g C. 46.10g D. 92.20g

39. 12.7 g of metal R reacts completely with 11.3 g of oxygen to form an oxide. Which one of the following is the formula of the oxide of R? *(O=16, R=27)*

A. RO_2 B. R_2O C. R_2O_3 D. R_3O_2

40. The percentages by mass of oxygen in a mole of carbon dioxide is *(C=12, O=16)*

A. 72.7% B. 57.1% C. 36.4% D. 32.0%

END!!!

"Don´t ask what the world needs. Ask what makes you come alive, and go do it."