

CHEMISTRY**Some Basic Concepts of Chemistry**

No. of Questions

30

Maximum Marks

120

Time

1 Hour*Speed***TEST****30**

Chapter-wise

GENERAL INSTRUCTIONS

- This test contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solutions provided at the end of this book.
- Each correct answer will get you 4 marks and 1 mark shall be deducted for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

1. In compound A, 1.00g of nitrogen unites with 0.57g of oxygen. In compound B, 2.00g of nitrogen combines with 2.24g of oxygen. In compound C, 3.00g of nitrogen combines with 5.11g of oxygen. These results obey the following law
 - (a) law of constant proportion
 - (b) law of multiple proportion
 - (c) law of reciprocal proportion
 - (d) Dalton's law of partial pressure
2. 10^{21} molecules are removed from 200 mg of CO_2 . The moles of CO_2 left are :
 - (a) 2.88×10^{-3}
 - (b) 28.8×10^{-3}
 - (c) 288×10^{-3}
 - (d) 28.8×10^3
3. What volume of hydrogen gas, at 273 K and 1 atm. pressure will be consumed in obtaining 21.6 g of elemental boron (atomic mass = 10.8) from the reduction of boron trichloride by hydrogen ?
 - (a) 67.2 L
 - (b) 44.8 L
 - (c) 22.4 L
 - (d) 89.6 L
4. Number of g of oxygen in 32.2 g $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ is
 - (a) 20.8
 - (b) 2.24
 - (c) 22.4
 - (d) 2.08

RESPONSE GRID

1. (a)(b)(c)(d) 2. (a)(b)(c)(d) 3. (a)(b)(c)(d) 4. (a)(b)(c)(d)

5. 6.02×10^{20} molecules of urea are present in 100 ml of its solution. The concentration of urea solution is
 (a) 0.02 M (b) 0.01 M
 (c) 0.001 M (d) 0.1 M
 (Avogadro constant, $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)
6. If we consider that $1/6$, in place of $1/12$, mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of the substance will
 (a) be a function of the molecular mass of the substance
 (b) remain unchanged
 (c) increase two fold
 (d) decrease twice
7. The weight of NaCl decomposed by 4.9g of H_2SO_4 , if 6 g of sodium hydrogen sulphate and 1.825 g of HCl, were produced in the reaction is:
 (a) 6.921 g (b) 4.65 g
 (c) 2.925 g (d) 1.4 g
8. Which one of the following is the lightest?
 (a) 0.2 mole of hydrogen gas
 (b) 6.023×10^{22} molecules of nitrogen
 (c) 0.1 g of silver
 (d) 0.1 mole of oxygen gas
9. How many moles of magnesium phosphate, $\text{Mg}_3(\text{PO}_4)_2$ will contain 0.25 mole of oxygen atoms?
 (a) 1.25×10^{-2} (b) 2.5×10^{-2}
 (c) 0.02 (d) 3.125×10^{-2}
10. The density (in g mL^{-1}) of a 3.60 M sulphuric acid solution that is 29% H_2SO_4 (molar mass = 98 g mol^{-1}) by mass will be
 (a) 1.45 (b) 1.64
 (c) 1.88 (d) 1.22
11. A gas occupies a volume of 300 cc at 27°C and 620 mm pressure. The volume of gas at 47°C and 640 mm pressure is:
 (a) 260 cc (b) 310 cc
 (c) 390 cc (d) 450 cc
12. Haemoglobin contains 0.33% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (at. wt. of Fe = 56) present in one molecule of haemoglobin is
 (a) 6 (b) 1
 (c) 2 (d) 4
13. The volume of 20 volume H_2O_2 required to get 5 litres of O_2 at STP is
 (a) 250 ml (b) 125 ml
 (c) 100 ml (d) 50 ml.
14. In the reaction,

$$2\text{Al(s)} + 6\text{HCl(aq)} \rightarrow 2\text{Al}^{3+}(\text{aq}) + 6\text{Cl}^{-}(\text{aq}) + 3\text{H}_2(\text{g})$$

 (a) 11.2 L $\text{H}_2(\text{g})$ at STP is produced for every mole HCl(aq) consumed
 (b) 6 L HCl(aq) is consumed for every 3 L $\text{H}_2(\text{g})$ produced
 (c) 33.6 L $\text{H}_2(\text{g})$ is produced regardless of temperature and pressure for every mole Al that reacts
 (d) 67.2 $\text{H}_2(\text{g})$ at STP is produced for every mole Al that reacts.

**RESPONSE
GRID**

5. (a)(b)(c)(d) 6. (a)(b)(c)(d) 7. (a)(b)(c)(d) 8. (a)(b)(c)(d) 9. (a)(b)(c)(d)
 10. (a)(b)(c)(d) 11. (a)(b)(c)(d) 12. (a)(b)(c)(d) 13. (a)(b)(c)(d) 14. (a)(b)(c)(d)

15. The concentrated sulphuric acid that is peddled commercial is 95% H_2SO_4 by weight. If the density of this commercial acid is 1.834 g cm^{-3} , the molarity of this solution is
 (a) 17.8 M (b) 12.0 M
 (c) 10.5 M (d) 15.7 M
16. What is the mass of precipitate formed when 50 mL of 16.9% solution of AgNO_3 is mixed with 50 mL of 5.8% NaCl solution ?
 (Ag = 107.8, N = 14, O = 16, Na = 23, Cl = 35.5)
 (a) 28 g (b) 3.5 g
 (c) 7 g (d) 14 g
17. Number of valence electrons in 4.2 gram of N_3^- ion is
 (a) $4.2 N_A$ (b) $0.1 N_A$
 (c) $1.6 N_A$ (d) $3.2 N_A$
18. A transition metal M forms a volatile chloride which has a vapour density of 94.8. If it contains 74.75% of chlorine the formula of the metal chloride will be
 (a) MCl_3 (b) MCl_2
 (c) MCl_4 (d) MCl_5
19. 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_2H_4 (b) C_3H_4
 (c) C_6H_5 (d) C_7H_8
20. Following is the composition of a washing soda sample :

Substance	Molecular Wt.	Mass percent
Na_2CO_3	106.0	84.8
NaHCO_3	84.0	8.4
NaCl	58.5	6.8

On complete reaction with excess HCl , one kilogram of the washing soda will evolve:

- (a) 9 mol of CO_2 (b) 16 mol of CO_2
 (c) 17 mol of CO_2 (d) 18 mol of CO_2
21. Arrange the numbers in increasing no. of significant figures.
 0.002600, 2.6000, 2.6, 0.260
 (a) $2.6 < 0.260 < 0.002600 < 2.6000$
 (b) $2.6000 < 2.6 < 0.002600 < 0.260$
 (c) $0.260 < 2.6 < 0.002600 < 2.6000$
 (d) $0.002600 < 0.260 < 2.6 < 2.6000$
22. Dissolving 120 g of a compound (mol. wt. 60) in 1000 g of water gave a solution of density 1.12 g/mL. The molarity of the solution is:
 (a) 1.00 M (b) 2.00 M
 (c) 2.50 M (d) 4.00 M
23. A gaseous compound of nitrogen and hydrogen contains 12.5% (by mass) of hydrogen. The density of the compound relative to hydrogen is 16. The molecular formula of the compound is:
 (a) NH_2 (b) N_3H
 (c) NH_3 (d) N_2H_4
24. The amount of BaSO_4 formed upon mixing 100 mL of 20.8% BaCl_2 solution with 50 mL of 9.8% H_2SO_4 solution with 50 mL of 9.8% H_2SO_4 solution will be:
 (Ba = 137, Cl = 35.5, S = 32, H = 1 and O = 16)
 (a) 23.3 g (b) 11.65 g
 (c) 30.6 g (d) 33.2 g

RESPONSE
GRID

15. (a)(b)(c)(d) 16. (a)(b)(c)(d) 17. (a)(b)(c)(d) 18. (a)(b)(c)(d) 19. (a)(b)(c)(d)
 20. (a)(b)(c)(d) 21. (a)(b)(c)(d) 22. (a)(b)(c)(d) 23. (a)(b)(c)(d) 24. (a)(b)(c)(d)

25. 2 g of a mixture of CO and CO₂ on reaction with excess I₂O₅ produced 2.54 g of I₂. What will be the mass % of CO₂ in the original mixture ?
 (a) 35 (b) 70
 (c) 30 (d) 60
26. 7.5 grams of a gas occupy 5.6 litres of volume at STP. The gas is
 (a) N₂O (b) NO
 (c) CO (d) CO₂
27. Number of moles of KMnO₄ required to oxidize one mole of Fe(C₂O₄) in acidic medium is
 (a) 0.167 (b) 0.6
 (c) 0.2 (d) 0.4
28. What is the weight of oxygen required for the complete combustion of 2.8 kg of ethylene ?
 (a) 2.8 kg (b) 6.4 kg
 (c) 9.6 kg (d) 96 kg
29. A gas mixture of 3 litres of propane (C₃H₈) and butane (C₄H₁₀) on complete combustion at 25° C produced 10 litre CO₂. Find out the composition of gas mixture (Propane : Butane)
 (a) 2 : 1 (b) 1 : 2
 (c) 1.5 : 1.5 (d) 0.5 : 2.5
30. An organic compound contains 49.3% carbon, 6.84% hydrogen and its vapour density is 73. Molecular formula of the compound is :
 (a) C₃H₅O₂ (b) C₄H₁₀O₂
 (c) C₆H₁₀O₄ (d) C₃H₁₀O₂

**RESPONSE
GRID**

25. (a) (b) (c) (d) 26. (a) (b) (c) (d) 27. (a) (b) (c) (d) 28. (a) (b) (c) (d) 29. (a) (b) (c) (d)
 30. (a) (b) (c) (d)

CHEMISTRY CHAPTERWISE SPEED TEST-30

Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	37	Qualifying Score	52
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

HINTS & SOLUTIONS (CHEMISTRY – Chapter-wise Tests)

Speed Test-30

- (b)
- (a) No. of moles = $\frac{\text{Wt. in g}}{\text{Mol. wt}}$
 No. of moles in 200 mg = $\frac{200}{1000 \times 44}$
 $= 4.5 \times 10^{-3}$ moles
 No. of moles in 10^{21} molecules
 $= \frac{10^{21}}{6.02 \times 10^{23}} = 1.67 \times 10^{-3}$ moles
 No. of moles left = $(4.5 - 1.67) \times 10^{-3} = 2.88 \times 10^{-3}$
- (a) $2\text{BCl}_3 + 3\text{H}_2 \rightarrow 2\text{B} + 6\text{HCl}$
 or $\text{BCl}_3 + \frac{3}{2}\text{H}_2 \rightarrow \text{B} + 3\text{HCl}$
 Now, since 10.8 gm boron requires hydrogen
 $= \frac{3}{2} \times 22.4\text{L at N.T.P.}$
 hence 21.6 gm boron requires hydrogen
 $\frac{3}{2} \times \frac{22.4}{10.8} \times 21.6 = 67.2\text{L at N.T.P.}$
- (c) M. Wt of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ is 322 g which contains 224 g oxygen. $\therefore$ 32.2 g will contain 22.4 g oxygen.
- (b) Moles of urea present in 100 ml of sol. = $\frac{6.02 \times 10^{-20}}{6.02 \times 10^{23}}$
 $\therefore M = \frac{6.02 \times 10^{-20} \times 1000}{6.02 \times 10^{23} \times 100} = 0.01\text{M}$
 [$\therefore M = \text{Moles of solute present in 1L of solution}$]
- (d) Relative atomic mass = $\frac{\text{Mass of one atom of the element}}{1/12^{\text{th}} \text{ part of the mass of one atom of Carbon - 12}}$
 or $\frac{\text{Mass of one atom of the element}}{\text{mass of one atom of the C - 12}} \times 12$
 Now if we use $1/6$ in place of $1/12$ the formula becomes
 Relative atomic mass = $\frac{\text{Mass of one atom of element}}{\text{Mass of one atom of carbon}} \times 6$
 $\therefore$ Relative atomic mass decrease twice
- (c) $\text{NaCl} + \text{H}_2\text{SO}_4 \longrightarrow \text{NaHSO}_4 + \text{HCl}$
 $x\text{g} \quad 4.9\text{g} \quad 6\text{g} \quad 1.825\text{g}$
 According to law of conservation of mass "mass is neither created nor destroyed during a chemical change"
 $\therefore$ Mass of the reactants = Mass of products
 $x + 4.9 = 6 + 1.825$
 or $x = 2.925\text{g}$
- (c) (a) Weight of H_2
 $= 0.2 \times 2 =$
 (b) $6.023 \times 10^{23} = 1 \text{ mole}$
 Thus $6.023 \times 10^{22} = 0.1 \text{ mole}$
 Weight of $\text{N}_2 = 0.1 \times 28 = 2.8 \text{ g}$
 (c) Weight of silver = 0.1 g
 (d) Weight of oxygen = $32 \times 0.1 = 3.2 \text{ g}$
- (d) 1 Mole of $\text{Mg}_3(\text{PO}_4)_2$ contains 8 mole of oxygen atoms
 $\therefore$ 8 mole of oxygen atoms $\equiv$ 1 mole of $\text{Mg}_3(\text{PO}_4)_2$ mole of $\text{Mg}_3(\text{PO}_4)_2$
 $0.25 \text{ mole of oxygen atom} \equiv \frac{1}{8} \times 0.25 \text{ mole of } \text{Mg}_3(\text{PO}_4)_2$
 $= 3.125 \times 10^{-2} \text{ mole of } \text{Mg}_3(\text{PO}_4)_2$
- (d) Since molarity of solution is 3.60 M. It means 3.6 moles of H_2SO_4 is present in its 1 litre solution.
 Mass of 3.6 moles of H_2SO_4
 $= \text{Moles} \times \text{Molecular mass}$
 $= 3.6 \times 98 \text{ g} = 352.8 \text{ g}$
 $\therefore$ 1000 ml solution has 352.8 g of H_2SO_4
 Given that 29 g of H_2SO_4 is present in = 100 g of solution
 $\therefore$ 352.8 g of H_2SO_4 is present in
 $= \frac{100}{29} \times 352.8 \text{ g of solution}$
 $= 1216 \text{ g of solution}$
 Density = $\frac{\text{Mass}}{\text{Volume}} = \frac{1216}{1000} = 1.216 \text{ g/ml} = 1.22 \text{ g/ml}$
- (b) From $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$
 $\frac{V_1 \times 640}{(273 + 47)} = \frac{620 \times 300}{(273 + 27)}$
 $V_1 = \frac{620 \times 300 \times 320}{640 \times 300} = 310 \text{ cc}$
- (d) Weight of Iron in 67200 = $\frac{0.33}{100} \times 67200 = 221.76$
 Number of atoms of Iron = $\frac{221.76}{56} = 3.96 \approx 4$
- (a) 20 volume H_2O_2 means that 1 mL of this H_2O_2 solutions produces 20 mL of O_2 at N.T.P. on decomposition by heat.
 $\therefore$ For 20 mL of O_2 , the volume of 20 volume H_2O_2 required = 1 mL
 For 1 mL of O_2 , the volume of 20 volume H_2O_2 required = $\frac{1}{20} \text{ mL}$
 For 5000 mL or 5L of O_2 , the volume of 20 volume H_2O_2 required = $\frac{1}{20} \times 5000 \text{ mL} = 250 \text{ mL}$
- (a) $2\text{Al(s)} + 6\text{HCl(aq)} \rightarrow 2\text{Al}^{3+}(\text{aq}) + 6\text{Cl}^{-}(\text{aq}) + 3\text{H}_2(\text{g})$
 L of H_2 at S.T.P 2

$$\therefore 1 \text{ mole of HCl produces} = \frac{3 \times 22.4}{6} \text{ L}$$

$$\text{of H}_2 \text{ at S.T.P}$$

$$= 11.2 \text{ L of H}_2 \text{ at STP}$$

15. (a) 95% H₂SO₄ by weight means 100g H₂SO₄ solution contains 95g H₂SO₄ by mass.

Molar mass of H₂SO₄ = 98g mol⁻¹

$$\text{Moles in 95g} = \frac{95}{98} = 0.969 \text{ mole}$$

Volume of 100g H₂SO₄

$$= \frac{\text{mass}}{\text{density}} = \frac{100\text{g}}{1.834\text{g cm}^{-3}}$$

$$= 54.52 \text{ cm}^3 = 54.52 \times 10^{-3} \text{ L}$$

$$\text{Molarity} = \frac{\text{Moles of solute}}{\text{Volume of solution in L}}$$

$$= \frac{0.969}{54.52 \times 10^{-3}} = 17.8 \text{ M}$$

16. (c) 50 ml of 16.9% solution of AgNO₃

$$\left(\frac{16.9}{100} \times 50 \right) = 8.45 \text{ g of AgNO}_3$$

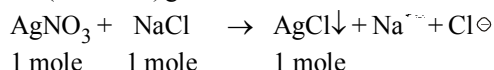
$$n_{\text{mole}} = \frac{8.45\text{g}}{(107.8 + 14 + 16 \times 3) \text{ g/mol}} = \left(\frac{8.45 \text{ g}}{169.8 \text{ g/mol}} \right)$$

$$= 0.0497 \text{ moles}$$

50 ml of 5.8% solution of NaCl contain

$$\text{NaCl} = \left(\frac{5.8}{100} \times 50 \right) = 2.9 \text{ g}$$

$$n_{\text{NaCl}} = \frac{2.9\text{g}}{(23 + 35.5) \text{ g/mol}} = 0.0495 \text{ moles}$$



$\therefore$ 0.049 mole 0.049 mole 0.049 mole of AgCl

$$n = \frac{w}{M} \rightarrow w = (n_{\text{AgCl}}) \times \text{Molecular Mass}$$

$$= (0.049) \times (107.8 + 35.5)$$

$$= 7.02 \text{ g}$$

17. (b) Number of valence electrons in a N₃⁻ ion = 1

Now, 1 mol or 42 g of N₃⁻ has = 6.023 × 10²³ ions

So, 42 g of N₃⁻ has 6.023 × 4 × 10²³ valence e⁻

$$1 \text{ g of N}_3^- \text{ has } \frac{6.023 \times 1 \times 10^{23}}{42} \text{ valence e}^-$$

$$4.2 \text{ g of N}_3^- \text{ has } \frac{4.2 \times 6.023 \times 1 \times 10^{23}}{42} \text{ valence e}^- \text{ i.e.,}$$

0.1 N_A valence e⁻.

18. (c) 74.75% of chlorine means 74.75g chlorine is present in 100g of metal chloride.

$$\text{Weight of metal} = 100\text{g} - 74.75\text{g}$$

$$= 25.25\text{g}$$

Equivalent weight

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

$$= \frac{25.25}{74.75} \times 35.5 = 12$$

$$\text{Valency of metal} = \frac{2 \times \text{V.D.}}{\text{Equivalent wt. of metal} + 35.5}$$

$$= \frac{2 \times 94.8}{12 + 35.5} = 4$$

$\therefore$ Formula of compound = MCl₄

19. (d) $\therefore$ 18 gm, H₂O contains = 2 gm H

$\therefore$ 0.72 gm H₂O contains

$$= \frac{2}{18} \times 0.72 \text{ gm} = 0.08 \text{ gm H}$$

$\therefore$ 44 gm CO₂ contains = 12 gm C

$\therefore$ 3.08 gm CO₂ contains

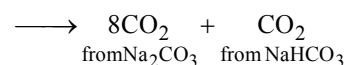
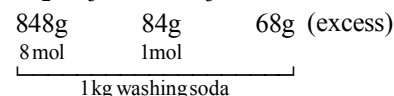
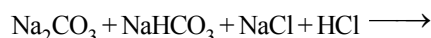
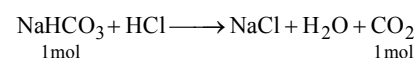
$$= \frac{12}{44} \times 3.08 = 0.84 \text{ gm C}$$

$$\therefore \text{C} : \text{H} = \frac{0.84}{12} : \frac{0.08}{1}$$

$$= 0.07 : 0.08 = 7 : 8$$

$\therefore$ Empirical formula = C₇H₈

20. (a) $\text{Na}_2\text{CO}_3 + 2\text{HCl} \longrightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$



Thus, on complete reaction with HCl, 1kg of washing soda will evolve 9 mol of CO₂.

21. (a) 2.6 has two significant figures.

0.260 has three significant figures.

0.002600 has four significant figures.

2.6000 has five significant figures.

22. (b) Given

mass of solute (w) = 120 g

mass of solvent (w) = 1000 g

Mol. mass of solute = 60 g

density of solution = 1.12 g/ml

From the given data,

Mass of solution = 1000 + 120 = 1120 g

$$\therefore d = \frac{\text{Mol. mass}}{V} \text{ or } V = \frac{\text{Mol. mass}}{d}$$

$$\text{Volume of solution } V = \frac{1120}{1.12} = 1000 \text{ ml or } = 1 \text{ litre}$$

$$\text{Now molarity (M)} = \frac{W}{\text{Mol. mass} \times V(\text{lit})} = \frac{120}{60 \times 1} = 2\text{M}$$

23. (d) In an unknown compounds containing N and H

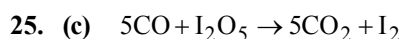
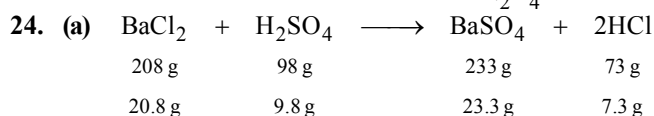
Element	Percentage	Atomic ratio	Simple ratio
H	12.5%	$\frac{12.5}{1} = 12.5$	$\frac{12.5}{6.25} = 2$
N	87.5	$\frac{87.5}{14} = 6.25$	$\frac{6.25}{6.25} = 1$

$2 \times \text{vapour density} = \text{Mol. wt} = \text{mol wt.} = 16 \times 2 = 32.$

Molecular formula = $n \times \text{empirical formula mass}$

$$n = \frac{32}{16} = 2$$

$\therefore$ Molecular formula of the compound will be $= (\text{NH}_2)_2$
 $= \text{N}_2\text{H}_4$



$$\text{Moles of } \text{I}_2\text{O}_5 = \frac{25.4}{254}$$

$$= 0.01 \equiv 0.05 \text{ moles of CO}$$

$$\text{Weight of CO} = 0.05 \times 28 = 1.4 \text{ g;}$$

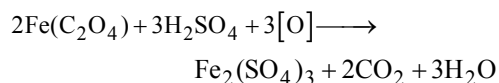
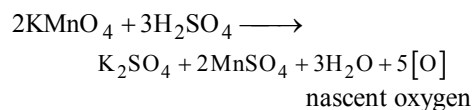
$$\text{Weight of CO}_2 = 2 - 1.4 = 0.6 \text{ g}$$

$$\text{Hence \% of CO}_2 = \frac{0.6}{2} \times 100 = 30\%$$

26. (b) $PV = nRT \quad \therefore 5.6 \times 1 = \frac{7.5}{\text{M. Wt.}} \times 0.0821 \times 273$

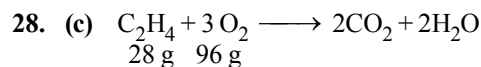
$$\text{M. Wt} = 30.12 \quad \text{Hence gas is NO.}$$

27. (b) The required equation is



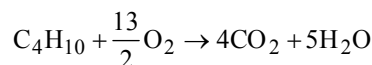
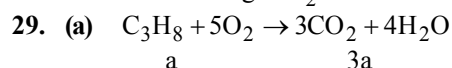
$[\text{O}]$ required for 1 mol. of $\text{Fe}(\text{C}_2\text{O}_4)$ is 1.5, 5 $[\text{O}]$ are obtained from 2 moles of KMnO_4
 $\therefore 1.5 [\text{O}]$ will be obtained from

$$= \frac{2}{5} \times 1.5 = 0.6 \text{ moles of KMnO}_4.$$



$\therefore 28 \text{ g of C}_2\text{H}_4$ undergo complete combustion by
 $= 96 \text{ g of O}_2$

$\therefore 2.8 \text{ kg of C}_2\text{H}_4$ undergo complete combustion by
 $= 9.6 \text{ kg of O}_2.$



$$(3 - a) \quad \quad \quad 4(3 - a)$$

$$\text{But, } 3a + 4(3 - a) = 10$$

$\therefore a = 2$ (Propane) and $3 - 2 = 1$ (Butane)

30. (c)

Element	%	Relative no. of atoms	Simplest ratio of atoms
C	49.3	$49.3/12 = 4.1$ $1.5 \times 2 = 3$	$4.1/2.74 = 1.5$
H	6.84	$6.84/1 = 6.84$ $= 2.5 \times 2$ $= 5$	$6.84/2.74 = 2.5$
O	43.86	$43.86/16 = 2.74$ $1 \times 2 = 2$	$2.74/2.74 = 1$

$\therefore$ Empirical formula $= \text{C}_3\text{H}_5\text{O}_2$

Empirical formula mass

$$= (3 \times 12) + (5 \times 1) + (2 \times 16) = 36 + 5 + 32 = 73$$

$$\text{Molecular mass} = 2 \times \text{Vapour density}$$

$$= 2 \times 73 = 146$$

$$n = \frac{\text{molecular mass}}{\text{empirical formula mass}} = 146/73 = 2$$

$$\text{Molecular formula} = \text{Empirical formula} \times 2$$

$$= (\text{C}_3\text{H}_5\text{O}_2) \times 2 = \text{C}_6\text{H}_{10}\text{O}_4$$