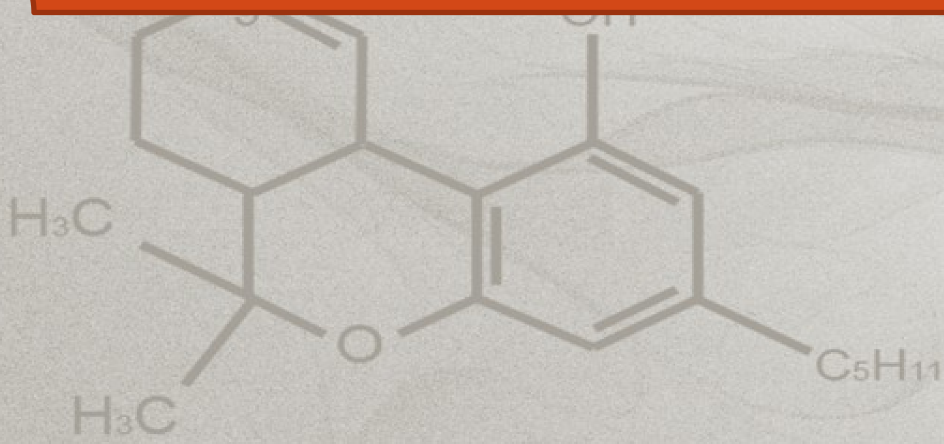
CHEMISTRY

Stoichiometry



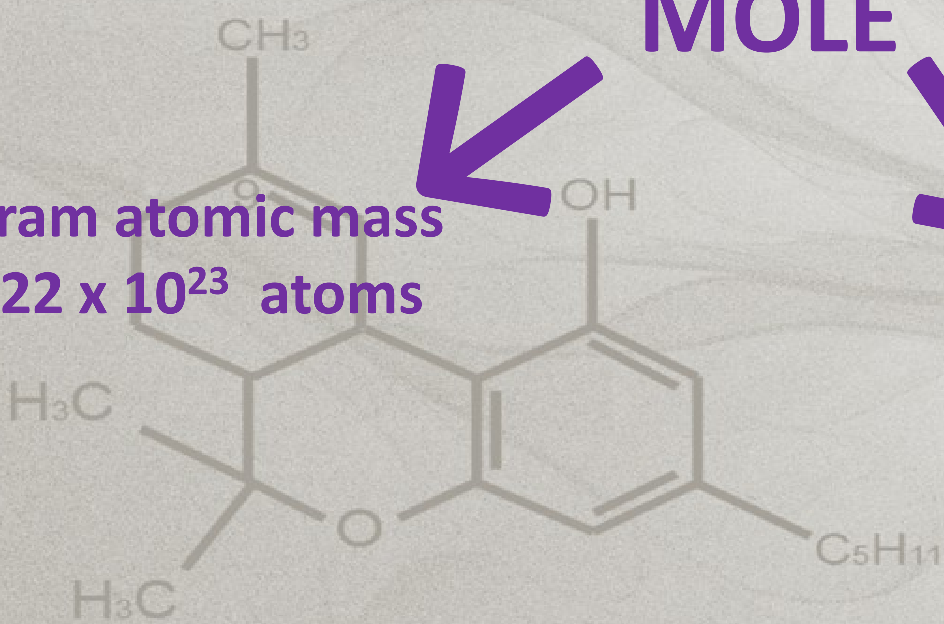
1gram molecular mass
6.022 x 10^{23} molecules

Avagadro No of particles
6.022 x 10^{23} particles

MOLE

1 gram atomic mass
6.022 x 10^{23} atoms

Molar volume
22.4dm^3 at STP



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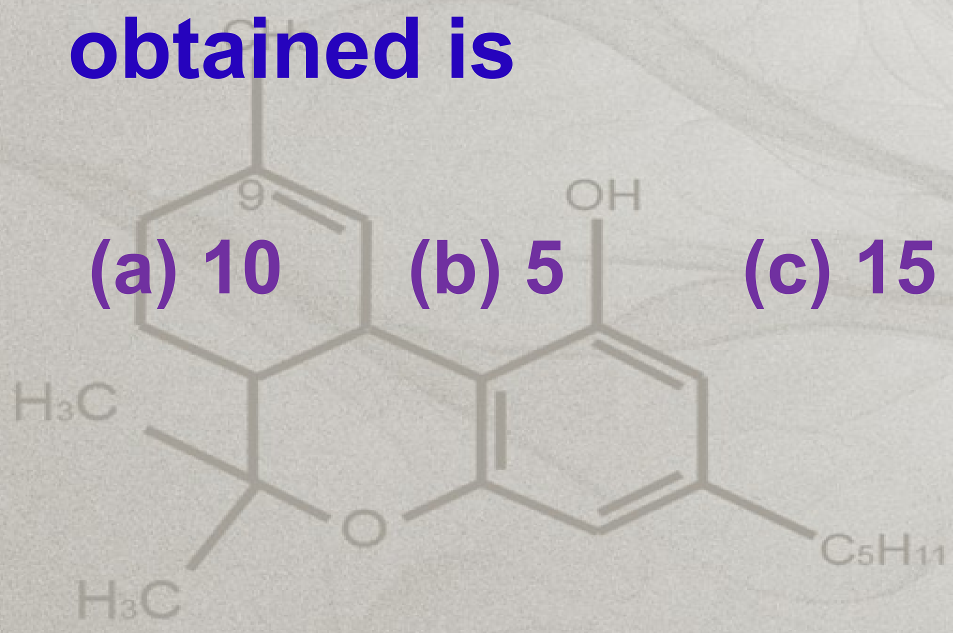
Equivalent mass of an element =	$\frac{\text{Atomic mass}}{\text{valency}}$
Equivalent mass of acids or bases =	$\frac{\text{Molecular mass}}{\text{Basicity or acidity}}$
Equivalent mass of a salt =	$\frac{\text{Molecular mass}}{\text{Total charge on cation or anion}}$
Equivalent mass of reducing or oxidising agent =	$\frac{\text{Molecular mass}}{\text{Change in oxidation number}}$

(1) 10 moles of H_2S is completely reacted with SO_2 to form sulphur and water. Number of moles of sulphur atom obtained is

(a) 10 (b) 5 (c) 15 (d) 50



working

Write balanced equation

$$2\ H_2S + SO_2 \longrightarrow 3S + 2\ H_2O$$

Mole ratio 2 1 3 2

Therefore 10 moles of H_2S reacts with 5 moles of SO_2 gives rise to 15 moles of sulphur atoms

Therefore answer (c) 15

(2) How many H^+ ions are present in one ml of water at 25^oC

(a) 6.022×10^{13} (b) 6.022×10^{7}

(c) 6.022×10^{23} (d) 6.022×10^{10}

working

One litre of H_2O has H^+ ions = 10^{-7} moles

= 10^{-7} X 6.022X 10^{23} ions

1ml = 10^{-7} X 6.022 X 10^{23} X 10^{-3}

= (a) 6.022 x 10^{13}

Therefore answer (a) 6.022 x 10^{13}

(3) Which of the following contains maximum number of Nitrogen atoms

(a) 22.4 L N_2 gas at STP

(b) 500 ml of 2.0 M NH_3

(c) 1.00 mol NH_4Cl

(d) 6.02×10^{23} NH_4Cl

working

(a) 22.4 L = 1 mol of N_2 gas = 2 mol Nitrogen atom

(b) 500 ml of 2.0 M NH_3 = 1000ml of 1 M NH_3 = 1 mol of Nitrogen atom

(c) 1.00 mol NH_4Cl is one mol of Nitrogen atom

(d) 6.02×10^{23} NH_4Cl is nothing but one mol

Therefore answer (a) 22.4 L N_2 gas at STP

(4) An alloy of iron (55.8%), nickel (44%) & manganese (0.2%) has a density of 8.17g/c.c. Number of moles of iron present in a block of alloy measuring 10 cm x 10 cm x 10 cm are (at . mass of Fe= 55.8)

(a) 163.4 (b) 81.7

(c) 8.17 (d) 16.34

working

d =m/V mass of alloy = d x V

= 8.17x 10 x 10 x 10

= 8170g

Mass of pure Fe present = 8170 x 55.8/100

moles of Fe =mass/atomic mass

$$\frac{8170 \times 55.8}{100 \times 55.8} = 81.70$$

Therefore the Ans (b) 81.7

(5) $CH_4 + 2O_2 \xrightarrow{\text{burn}} CO_2 + 2\,H_2O$

One mole of methane is ignited in 48 g of oxygen gas. The amount of unreacted gas is

(a) 4g CH_4 (b) 8 g Oxygen

(c) 8g CH_4 (d) 4 g Oxygen

working

$CH_4 + 2O_2 \rightarrow CO_2 + 2\,H_2O$

16g	64g	44g	18 x 2 g

16 64 **Reacted methane is 12 g**

? 48 **Unreacted is 4g of methane**

Therefore answer (a) 4g CH_4

Note: Reagents consumed completely is called the limiting reagent.

(6) A gaseous mixture contains oxygen and sulphur dioxide in equimolar proportion. Mass of 2.24 dm^3 of this mixture at STP is

(a) 3.2 g (b) 4.8 g (c) 6.4 g (d) 9.6 g

working

Volume of SO_2 = Volume of O_2 = 2.24/2 = 1.12 dm^3

Mass of 1.12 dm^3 of O_2 at STP 32 g ⇨ 22.4

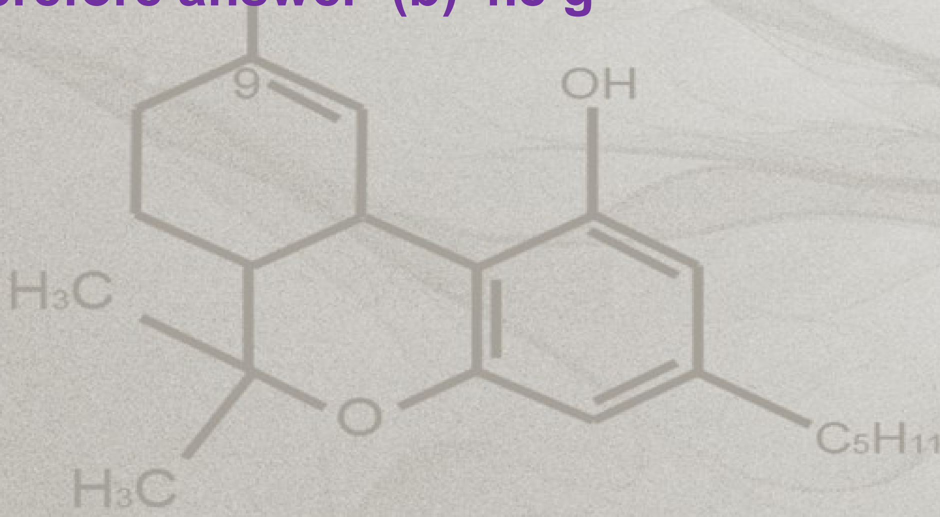
? 1.12 = 1.6g

Mass of 1.12 dm^3 of SO_2 64 22.4

? 1.12 = 3.2g

Total mass= 1.6 + 3.2 = 4.8 g

Therefore answer (b) 4.8 g



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(7) For which one of the following eq. mass is equal to 1/6th of molar mass

(a) $AlCl_3$

(b) $Al_2(SO_4)_3$

(c) $FeSO_4$

(d) $Fe(NO_3)_3$

working

Substances given are salts

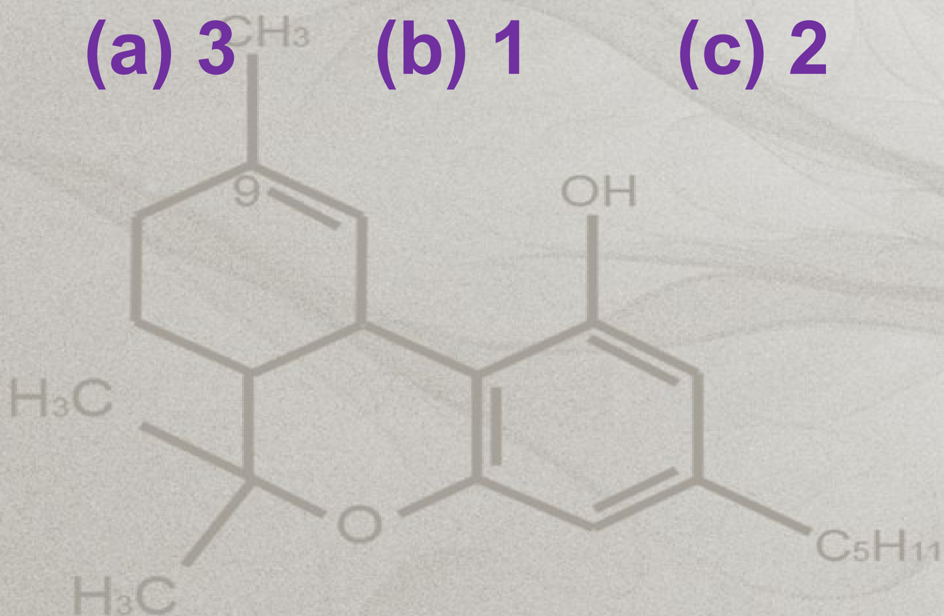
$$\text{For salts eq. mass} = \frac{\text{Molecular mass}}{\text{Total charge on cation or anion}}$$

For $Al_2(SO_4)_3$, the total charge on cation or anion is 6

Therefore answer (b) $Al_2(SO_4)_3$

(8) One mole of H_3PO_3 completely neutralized 80 g of NaOH. The basicity of the acid is

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



working

80 g of NaOH ≡ 2 equivalents ≡ 2 equivalents of H_3PO_3

∴ 1 mole of H_3PO_3 ≡ 2 equivalents

∴ H_3PO_3 is dibasic has – 2 OH groups per molecule

Therefore answer (c) 2

(9) If 10^{21} molecules are removed from 200mg of CO_2 then number of moles of CO_2 left is

(a) 2.88×10^{-3}

(b) 28.8×10^{-3}

(c) 0.288×10^{-3}

(d) 1.66×10^{-2}

working

G.M.M of CO_2 = 44

0.2 g of CO_2 = 0.2/44 = 0.0045 mol

Number of molecules removed = 10^{21}

= 10^{21} / 6.022 x 10^{23} = 0.001666 mol

Number of moles left = 0.0045-0.00166

= 0.00284moles =2.88 x 10^{-3}

Therefore answer (a) 2.88 x 10^{-3}

(10) 0.7g of $Na_2CO_3 .xH_2O$ was dissolved in 100ml of water and the volume of 20 ml of this solution required 19.8 ml of N/10 HCl for complete neutralisation. The value of x is

(a) 7 (b) 53 (c) 2 (d) 5

working

$Na_2CO_3 .x\, H_2O$ dissolved in 1000 ml = 0.7 X 10 = 7 g/L

Normality equation $N_1V_1 = N_2V_2$

acid base

$N_1 \times 20 = 19.8 \times 0.1$ $N_1 = 0.099$

Mass of the substance dissolved in litre = N x Eq. Mass

$7 = 0.099 \times \frac{(106 + 18x)}{2}$ $18x = \frac{7 \times 2}{0.099} - 106 = 35.41$

X = 35.41/18 = Approx 2

Therefore answer (c) 2

CHEMISTRY

(11) Calcium carbonate reacts with aqueous HCl according to the reaction

$$CaCO_3 + 2\,HCl \longrightarrow CaCl_2 + CO_2 + H_2O$$

The mass of $CaCO_3$ required to react completely with 25ml of 0.75M HCl

(a) 1.875 g (b) 0.9375 g

(c) 1.00 g (d) 0.1875 g

working

No. of gram equivalent mass of $CaCO_3$ = X/50

(Since Eq mass of $CaCO_3$ = 50)

No. of gram equivalent mass of HCl $= \frac{25 \times 0.75}{1000} = \frac{18.75}{1000} = 0.01875$

Since the substances react in the ratio of their Eq. masses

equating X/50 = 0 .01875

X= 0.9375 g

Therefore answer (b) 0.9375 g

(12) Concentrated aqueous sulphuric acid is 98 % pure by mass. The density of the acid is 1.80 g/ml. The volume of this acid required to make one litre of 0.1 M H_2SO_4 is

(a) 5.55 ml (b) 11.10 ml

(c) 16.65 ml (d) 22.20 ml

CHEMISTRY

working

Density = 1.80 g/ml

⇒ 1 litre has 1800 g H_2SO_4 (impure)

⇒ $\frac{98}{100}$ x 1800 = 1764 g (pure)

⇒ 1 litre has 1764/98 moles H_2SO_4 =18 M

Dilution formula $M_1V_1 = M_2V_2$

$18 \times V_1 = 0.1 \times 1000$, $V_1 = 5.55$ ml

Therefore answer (a) 5.55ml

(13) 100 cm^3 of 2N HCl + 100 cm^3 of 2N HNO_3 + 200 cm^3 of 1 N NaOH is mixed. What is the pH of the resultant solution.

(a) 1 (b) 0 (c) 0.3010 (d) 0.6990

working

N x V cm^3 gives miliequivalants

$$\frac{N_1V_1 + N_2V_2 - N_3V_3}{V_1 + V_2 + V_3} = \text{N mixture}$$

$$\frac{2 \times 100 + 2 \times 100 - 1 \times 200}{100 + 100 + 200}$$

$$\frac{200 + 200 - 200}{400} = 1/2 \quad = 0.5\ \text{N ,Therefore pH} = 0.3010$$

Therefore answer (C) 0.3010

(14) The amount of $KMnO_4$ required to prepare 100 ml of 0.1 N solution in alkaline medium

(a) 3.16 g (b) 0.31 g (c) 0.52 g (d) 01.58 g

working

In alkaline medium $KMnO_4$ acts as

Oxidant as

$$2\ KMnO_4 + 2\ KOH \longrightarrow 2K_2Mn0_4 + H_20 + [0]$$

Hence its equivalent wt = Molecular wt

N = mass in grams in a litre/ Eq. mass

$$W = \frac{0.1 \times 158}{10} = 1.58\ g$$

Therefore answer (d) 1.58 g

States of matter

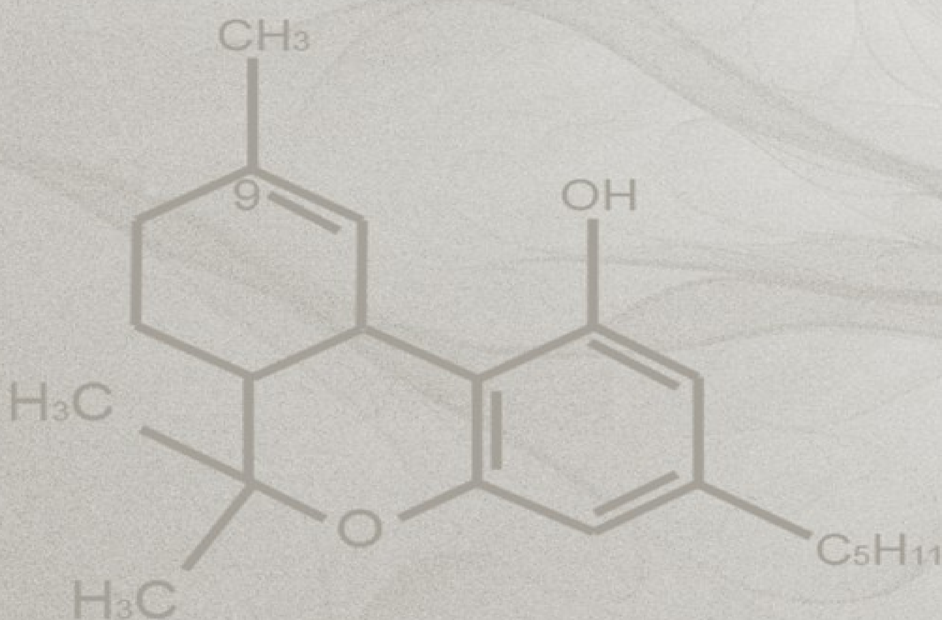
CHEMISTRY

15. Which of the following statement is correct

a) At constant temperature, the kinetic energy of all gas molecules is the same
b) At constant temperature, the kinetic energy of different molecules is different
c) At constant temperature, the kinetic energy greater for heavier gas molecules
d) At constant temperature, the kinetic energy is less for heavier gas molecules

Ans: a is correct

Kinetic energy depends only on temperature



(16) As the temperature is raised from 20^0C to 40^0C the average kinetic energy of Neon atoms changes by a factor of

(a) 1/2

(b) √313/293

(c) 313/293

(d) 2

working

$K.E \propto T$

$$\frac{K.E_{313K}}{K.E_{293K}} = \frac{313}{293}$$

Therefore answer is (c) 313/293

(17). The Vander Waal's constant 'a' for the gases O_2, N_2, NH_3 & CH_4 are 1.3, 1.39, 4.17 & 2.253 L^2 atm mol^{-2} respectively. The gas which can be most easily liquefied is

(a) O_2 (b) N_2

(c) NH_3 (d) CH_4

Explanation

Factor ‘a’ accounts for intermolecular forces of attraction, hence greater the value of ‘a’ more easily the gas is liquefied. Also there exists hydrogen bonding in NH_3 molecule.

Therefore the answer is c) NH_3

(18). A vessel has two equal components A & B containing H_2 and O_2 respectively each at one atmospheric pressure. If the wall separating the compartments is removed, the pressure

(a) will remain unchanged in A & B
(b) will increase in A and decrease in B
(c) will decrease in A and increase in B
(d) will increase in both A and B

Explanation

If V is the volume, initially the product PV in compartment A and B = 1 x V + 1 x V = 2V

Now PV = constant, at constant temperature. When the wall is removed then V becomes 2V, thus the pressure should be 1 atm to have PV constant.

Therefore the answer is a) will remain unchanged in A & B

(19) Two glass bulbs A and B are connected by a very small tube (of negligible volume) having stop cock. Bulb A has a volume of 100 ml and contains certain gas while bulb B is empty. On opening the stop cock, the pressure in A reduced by 60% . The volume of bulb B must be

(a) 200 ml (b) 150 ml

(c) 250 ml (d) 100 ml

working

Let the pressure in A be P

Final pressure = 40/100 x P

Let the volume of B be V ml

Total volume after opening the stop clock = 100 + V

According to Boyle's Law $P_1V_1 = P_2V_2$

$$100 \times P = (100 + V) \frac{40}{100} P$$

On solving V = 150

Therefore answer (b) 150 ml

(20) Equal masses of ethane and hydrogen are mixed in an empty container at 25^0C. The fraction of total pressure exerted by hydrogen is

(a) 1/ 2 (b) 1/ 1

(c) 1/16 (d) 15/16

working

Let the mass of each gas be W

$n_{C_2H_6} = W/30$ $\qquad$ $n_{H_2} = W/2$

P_{H_2} = **Mole fraction x Total pressure**

$$= \frac{W/2}{W/30 + W/2} \times P = \frac{15}{16} . P$$

Therefore answer (d) 15/16

(21) 3.2 g of oxygen (At. Mass =16) and 0.2 g of hydrogen (Atomic mass = 1) are placed in 1.12 L flask at 0^0C . The total pressure of the gaseous mixture will be

(a) 1 atm (b) 4 atm (c) 3.4 atm (d) 2 atm

working

From Combined Gas equation PV = nRT

$$P = nRT/V$$

$$P_{O_2} = \frac{3.2}{32} \times \frac{0.0821 \times 273}{1.12} = 2 \text{ atm}$$

$$P_{H_2} = \frac{0.2}{2} \times \frac{0.0821 \times 273}{1.12} = 2 \text{ atm}$$

$$\text{Total } P = P_{O_2} + P_{H_2} = 2+2 = 4$$

Therefore answer (b) 4 atm

(22) Two separate bulbs contains ideal gas A & B respectively. Density of the gas A is twice that of B while molecular mass of gas A is half that of gas B at the same temperature. The pressure ratio will be

(a) 1/2 (b) 1/4 (c) 1/1 (d) 4/1

working

According to Boyle's Law

$P_1/P_2 = V_1/V_2$, $d = m/V$ or $V = m/d$

$P_1/P_2 = m_2d_1/d_2m_1$

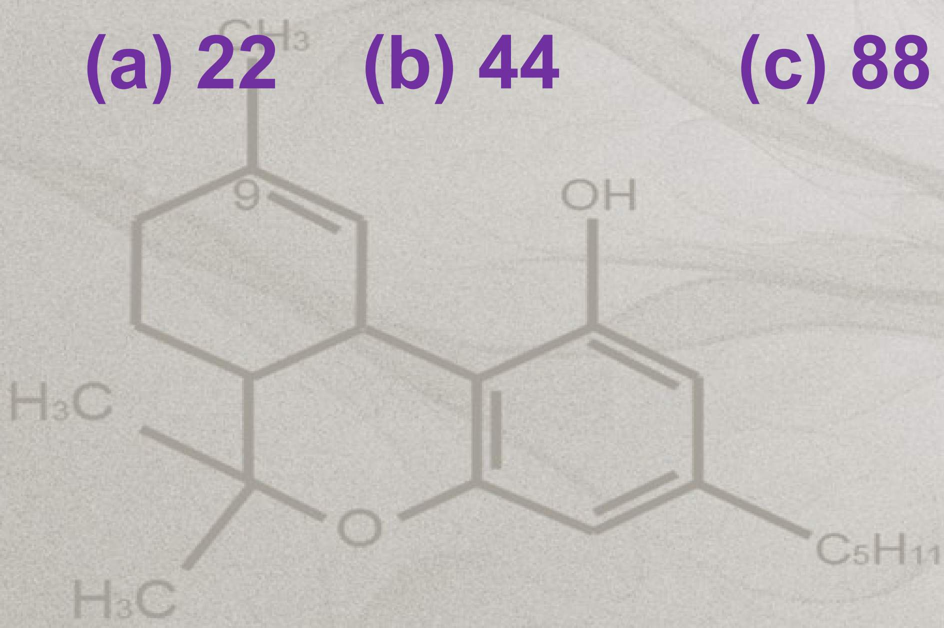
Given $m_2 = 2m_1$ and $d_1 = 2d_2$

$P_1/P_2 = 2m_1 \times 2d_2 / m_1 \times d_2 = 4/1$

Therefore answer is (d) 4 /1

(23) CO_2 diffuses 2 times faster than a gas. The molecular mass of the gas is

(a) 22 (b) 44 (c) 88 (d) 176



working

$r_1/r_2 = \sqrt{M_2/M_1}$ Given $r_1 = 2r_2$, $M_1 = 44$

$2r_2/r_2 = \sqrt{M_2/44}$

$2 = \sqrt{M_2/44}$

$(2)^2 = M_2/44$

$M_2 = 44 \times 4$

$M_2 = 176$

Therefore answer is (d) 176

(24) The molecules of which of the following has highest rms velocity

(a) Hydrogen at $-50^{O}C$ (b) Methane at 298 K

(c) Nitrogen at $1000^{O}C$ (d) Oxygen at $0^{O}C$

$$u_{rms} \text{ for } H_2 = \sqrt{\frac{3R \times 223}{2}} = \sqrt{111.5 \times 3R}$$

$$u_{rms} \text{ for } CH_4 = \sqrt{\frac{3R \times 298}{16}} = \sqrt{18.6 \times 3R}$$

$$u_{rms} \text{ for } N_2 = \sqrt{\frac{3R \times 1273}{28}} = \sqrt{45.4 \times 3R}$$

$$u_{rms} \text{ for } O_2 = \sqrt{\frac{3R \times 273}{32}} = \sqrt{8.5 \times 3R}$$

Therefore the Ans. (a) Hydrogen at $-50^{O}C$

(25) Two gases A and B having the same volume diffuses through a porous partition in 20 and 10 seconds respectively. The molecular mass of A is 49. The molecular mass of B will be

(a) 12.25 (b) 6.50 (c) 25 (d) 50

working

Rate of diffusion = $\frac{\text{Volume diffused}}{\text{Time}} = \frac{V}{t}$

Since $V_1 = V_2$

$$\frac{r_1}{r_2} = \frac{t_2}{t_1} = \sqrt{M_2/M_1}$$

$10/20 = \sqrt{B/49}$ $1/4 = B/49$ Therefore $B = 12.25$

Therefore answer is (a) 12.25

(26) In which of the following does the given amount of chlorine exert the <u>least</u> pressure in a vessel of capacity $1 dm^3$ at 273K

(a) 0.0355g
(b) 0.071g
(c) 6.023×10^{21} molecules
(d) 0.02 mole

working

Since R, T & V are constant

PV = nRT

P α n

(a) 0.0355g = 0.0355/71 = 0.0005 mol

(b) 0.071g = 0.071/71 0.001 mol

(c) $6.023 X 10^{21}$ = 0.01 mol

(d) 0.02 mol

Therefore answer is (a) 0.0355g

(27) An open vessel at 27^{0}c is heated until $3/5^{th}$ of the air has been expelled. Assuming that the volume of air is constant, the temperature at which the vessel has been heated is

(a) 750^{0}C
(b) 477^{0}C
(c) 120K
(d) 820K

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In this problem the volume of vessel is constant, as the vessel is open its pressure will also remains constant. According to ideal gas equation

$PV=nRT \quad PV=n_1RT_1 \quad PV= n_2RT_2$

$n_1RT_1= n_2RT_2$

$n_1 / n_2 = T_2/T_1$

$$\frac{1}{2/5} = \frac{T_2}{300}$$

$T_2 = 300 \times 5/2 = 750\ K$

$= 477^0C$

Therefore answer is (b) 477^0C

Let the initial no. of moles=1
Final no. of moles 1-3/5=2/5
Initial temperature=27+273=300

(28) To which of the following Dalton's law of partial pressure is not applicable

(a) SO_2 & CO_2 at room temp.

(b) N_2 & H_2 at room temp.

(c) SO_2 & O_2 at room temp.

(d) HCl & NH_3 at room temp.

working

Answer is (d) HCl & NH_3 at room temp

Note: ($NO + \frac{1}{2} O_2$), ($CO + N_2$), ($CO + Cl_2$), etc are the gaseous mixtures which do not obey Dalton's law

(29) 0.5 moles of each of H_2, SO_2 and CH_4 are kept in a container. A hole was made in the container. After 3 hours the order of partial pressure in the container

(a) $P_{SO_2} > P_{CH_4} > P_{H_2}$ (b) $P_{H_2} > P_{SO_2} > P_{CH_4}$

(c) $P_{CH_4} > P_{SO_2} > P_{H_2}$ (d) $P_{H_2} > P_{CH_4} > P_{SO_2}$

working

Diffusion of gases is inversely proportional to their molecular mass. Hence rate of diffusion is $H_2 > CH_4 > SO_2$

The no. of moles left will be $SO_2 > CH_4 > H_2$

Hence the amount left will be $P_{SO2} > P_{CH4} > P_{H2}$

Therefore answer is (a) $P_{SO_2} > P_{CH_4} > P_{H_2}$

(30) X ml of H_2 gas diffuse through a hole in a container in 5 seconds. The time taken for the diffusion from the container of the same volume of the gas specified below under identical condition

(a) 10 Seconds : He (b) 20 Seconds : O_2

(c) 25 Seconds : CO (d) 55 Seconds : CO_2

working

$r \propto 1/\sqrt{M}$ Since $M_{H_2}:M_{O_2}=2:32 = 1:16$

$\sqrt{M_{H2}} : \sqrt{M_{O2}} = 1:4$

Therefore time taken to diffuse same volume of oxygen is 4 times more = 5 x 4 = 20 seconds.

Therefore answer is (b) 20 Seconds : O_2

(31) The root mean square velocity of one mole of mono atomic gas having molecular mass M IS u_{rms}. The relationship between the average K.E (E) of the gas and u_{rms} is

(a) $u_{rms} = \sqrt{3E/2M}$ (b) $u_{rms} = \sqrt{2E/3M}$

(c) $u_{rms} = \sqrt{2E/M}$ (d) $u_{rms} = \sqrt{E/3M}$

working

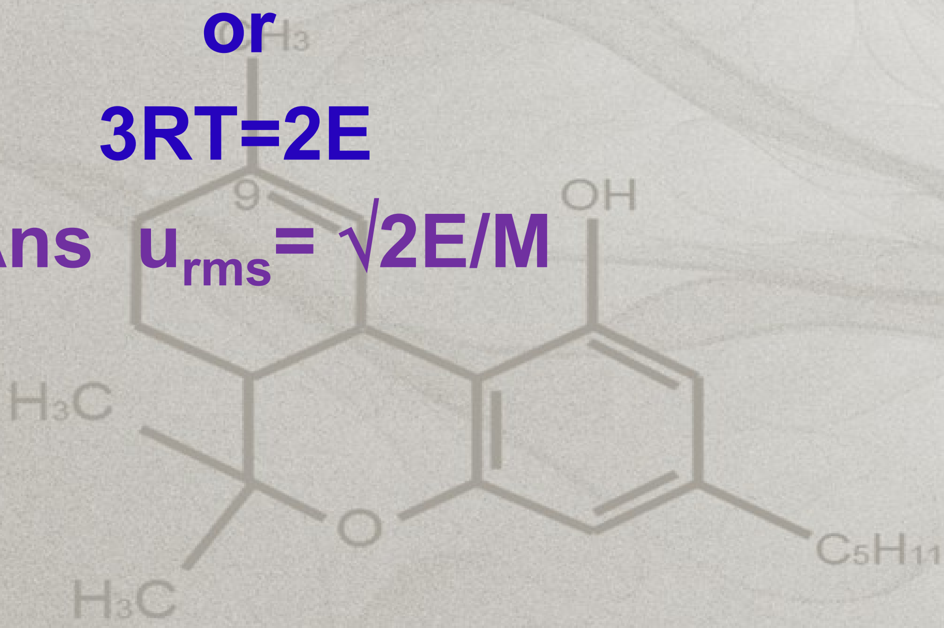
$u_{rms} = \sqrt{3RT/M}$

Average K.E= 3RT/2=E

or

3RT=2E

Ans $u_{rms} = \sqrt{2E/M}$



KEA

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(32) A weather balloon filled with hydrogen at 1 atm and 27^0C has volume equal to $1200 dm^3$. On ascending it reaches a place where the temperature is -23^0C and pressure 0.5 atm . The volume of the balloon is

(a) $2400\ dm^3$ (b) $2000\ dm^3$

(c) $1000\ dm^3$ (d) $1200\ dm^3$

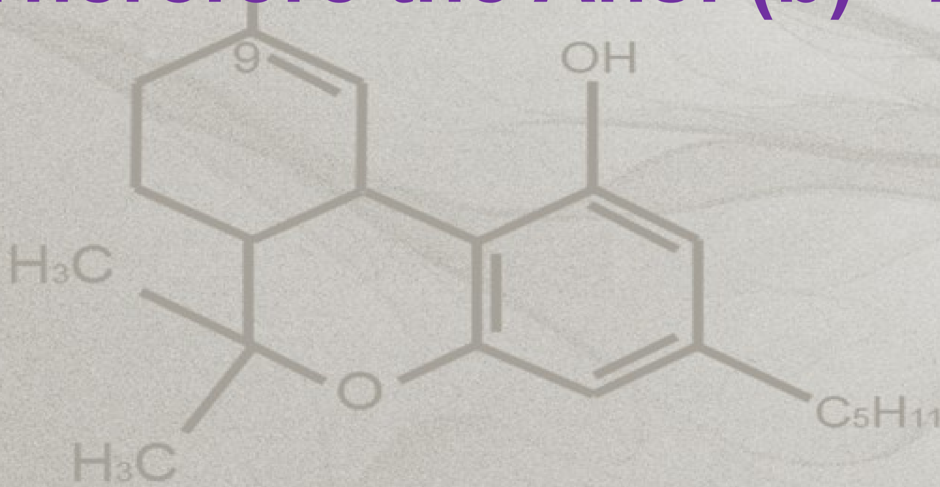
working

$P_1V_l/T_1 = P_2V_2/T_2$

Substituting $1 \times 1200/300 = 0.5 \times V_2/ 250$

$V_2 = 2000dm^3$

Therefore the Ans: (b) =2000dm3



(33) The kinetic energy of N molecules of O_2 is x joule at -123^{O}C. Another sample of O_2 at 27^{O}C has a kinetic energy of 2x joule. The latter sample contains

(a) N molecules of O_2
(b) 2N molecules of O_2
(c) N/2 molecules of O_2
(d) N/4 molecules of O_2

working

K.E α T

Let Y N be the no. of molecules of O_2 at $27^{O}C$

$$\frac{K.E_{300K}}{K.E_{150K}} = \frac{2x}{x} = \frac{YN}{N}\ \frac{300}{150} = 2Y = 2 \quad Y = 1$$

Therefore answer is (a) N molecules of O_2

(34) By what factor the root mean square velocity of gaseous molecule increased when the temperature (in kelvin) doubled

(a) 2.8 (b) 4.0 (c) 1.4 (d) 2.0

working

Here $T_2 = 2T_1$

$$U = \sqrt{\frac{3RT}{M}}$$

$$\frac{u_2}{u_1} = \sqrt{\frac{2T_1}{T_1}} = \frac{u_2}{u_1} = \sqrt{2} = 1.4$$

Therefore answer is (c) 1.4

(35) A football bladder contains equimolar proportions of hydrogen and oxygen gases. The composition by mass of the mixture effusing out of the punctured football is in the ratio of (Hydrogen: Oxygen)

(a) 1:4 (b) $2\sqrt{2}:1$ (c) $1:2\sqrt{2}$

(d) 4:1

working

$$\frac{r_{O_2}}{r_{H_2}} = \sqrt{\frac{M_{H_2}}{M_{O_2}}} = \sqrt{2/32} = 1/4$$

Therefore answer is (a) 1:4

(36) Zinc and aluminium metals produces hydrogen gas with dilute sulphuric acid. The ratio of moles of H_2 produced when 1 mole of each reacts with excess of dilute H_2SO_4 will be

(a) 1 : 1. 5 (b) 3:1

(c) 1 : 3 (d) 1:2

working

$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

1 mole 1 mole

$2Al + 3\ H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$

2 mole 3 mole

1 mole 1.5 mole

Therefore answer (a) 1:1.5

(37) The number of moles of $KMnO_4$ that will be required to react with one mole of sulphite ion in acidic medium is

(a) 1 (b) 3/5

(c) 4/5 (d) 2/5

working

Write the balanced equation

$$2\ MnO^{-}_{4} + 5\ SO_3^{2-} + H^{+} \rightarrow 5SO_4^{2-} + 2\ Mn^{2+}$$

Therefore, the number of moles of $KMnO_4$ that reacts with 1 mole of SO_3^{2-} will be 2/5

Therefore answer (d) 2/5

(38) Out of the following, the largest number of atoms are contained in

(a) 11 g of CO_2 **(b) 4 g of H_2**

(c) 8.5 g of NH_3 **(d) 8 g of SO_2**

working

(a) 11 g of CO_2 = 0.25 mol ≡ 3 x 0.25 x N atoms = 0.75N atoms

(b) 4 g of H_2 = 2 mol =2 x 2 x N = 4N atoms

(c) 8.5 g of NH_3= 0.5 mol = 0.5 x 4 x N atoms

= 2 N atoms

(d) 8 g of SO_2 = 8/64 = 0.125 moles

= 3 x 0.125 x N atom

Therefore answer (b) 4 g of H_2

(39) An aqueous solution of 6.3g of oxalic acid dihydrate is made upto 250ml. The volume of 0.1N NaOH required to completely neutralise 10ml of this solution is

(a) 40 ml (b) 20 ml

(c) 10 ml (d) 4 ml

working

Normality of Oxalic acid = 6.3 x 4 / 63

= 0.4 N

$N_1V_1 = N_2V_2$

(acid) (base)

$0.4 \times 10 = 0.1 \times V_2$

$V_2 = 4/0.1 = 40$ ml

Therefore answer (a) 40ml

(40) 500 ml of 4.0 molar aqueous solution of NaCl is electrolysed. This leads to the evolution of chlorine gas at one of the electrodes (atomic mass of Na =23, Hg =200, 1F =96500C)

The total number of moles of chlorine gas evolved is

(a) 0.5 (b) 1.0 (c) 2.0 (d) 3.0

working

$2\ NaCl \longrightarrow 2Na + Cl_2$

2Mol 1 Mol

500 ml of 4.0 molar = 2.0 mol

No. of moles = 2.0 mol

No. of moles of Cl_2 evolved =1 mol

Therefore answer (b) 1 mol

CHEMISTRY

(41) 0.5 M of H_2SO_4 is diluted from 1 litre to 10 litre, Normality of resulting solution is

(a) 0.1 N (b) 1 N (c) 10 N (d) 11 N

working

N of H_2SO_4 = M x basicity = 0.5 x 2 = 1N

N_1V_1 = N_2V_2

(before dilution) (after dilution)

1 x 1 = N_2 x 10

N_2 = 1/10 = 0.1

Therefore answer (a) 0.1 N

(42) The percentage of an element M is 53 in its oxide of molecular formula M_2O_3 . Its atomic mass is about

(a) 9 (b) 18 (c) 27 (d) 36

working

Let m is the atomic mass of element M

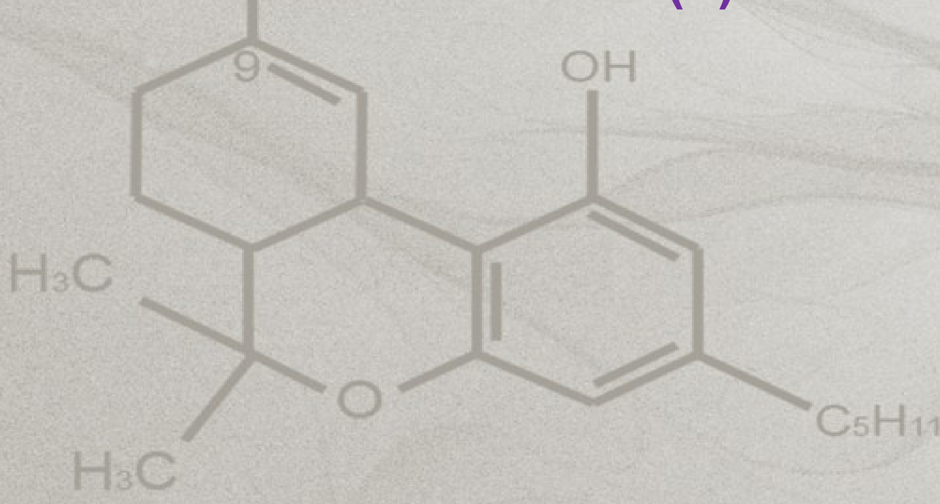
% of the metal in M_2O_3

$$= \frac{2m \times 100}{2m + 48} = 53$$

$$200m = (2m + 48)\,53$$

On solving m= 27

Therefore answer (c) 27



(43) A certain divalent metal salt solution is electrolysed in a series with silver. The weight of silver & the metal deposited are 0.52g and 0.27g respectively. Given that the equivalent mass of silver is 108, what is the atomic mass of the element.

(a) 212 (b) 56 (c) 217.2 (d) 112

working

According to Faraday Second Law when the same quantity of electricity flows thro' solution of different electrolytes, then

$$\frac{\text{Mass of X deposited}}{\text{Mass of Y deposited}} = \frac{\text{Eq mass of X}}{\text{Eq mass of Y}}$$

Therefore, eqi. Mass of the metal = $\frac{0.27}{0.52} \times 108 = 56$ **g**

At. Mass = Eq. Mass X Valency = 56 X 2 = 112

Therefore answer (d) 112

(44) The formula weight of an acid is 82.0. In a titration 100 cm^3 of a solution of this acid containing 39.0 g of the acid per litre were completely neutralised by 95 cm^3 of aqueous NaOH containing 40g of NaOH per litre. What is the basicity of the acid.

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

working

$$N_1V_1 = N_2V_2$$
(acid) (base)

Normality of NaOH = $\frac{40 \text{ g /lits}}{40}$ = 1N

$N_1 \times 100 = 1 \times 95$

N = 95/100= 0.95

$N = \frac{39/\text{liter}}{E}$ $E = \frac{39/\text{liter}}{N} = \frac{39}{0.95} = 41$ Basicity = 82/41

Therefore the answer (a) 2

(45) 1.520 g of certain metal hydroxide on ignition gave 0.995 g of metal oxide. The equivalent mass of the metal is

(a) 3 (b) 18 (c) 12 (d) 9

CHEMISTRY

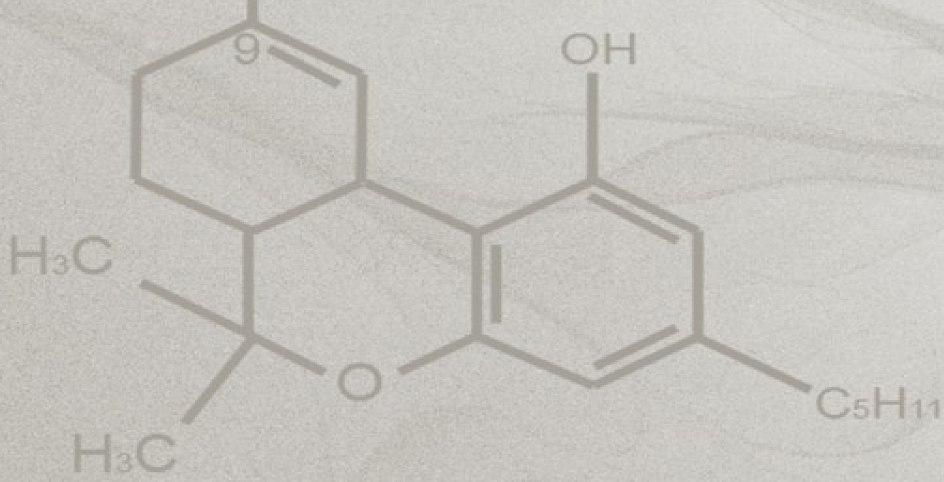
working

$$\frac{\text{mass of metal hydroxide}}{\text{mass of metal oxide}} = \frac{\text{Eq. Mass of (m + hydroxide)}}{\text{Eq. Mass of (m + oxygen)}}$$

$$= \frac{1.50}{0.995} = \frac{m + 17}{m+8}$$

On solving Eq. Mass of the metal = 9

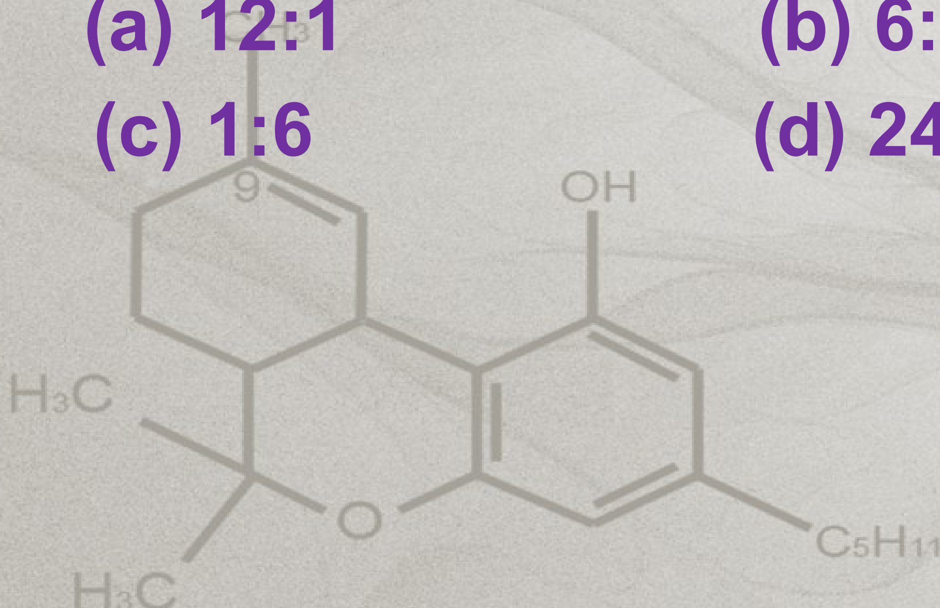
Therefore answer (d) 9



(46) The ratio of kinetic energy of 3g of hydrogen and 4g of oxygen at TK is

(a) 12:1 (b) 6:1

(c) 1:6 (d) 24:1



working

$$\frac{K.E\ H_2}{K.E\ O_2} = \frac{3/2 \times 3/2 \times RT}{3/2 \times 4/32 \times RT}$$

$$= 3/2 \times 32/4$$

$$= 12$$

Therefore answer is (a) 12:1

(47) Mole fraction of the solute in a 1.00 molal aqueous solution is

(a) 0.0177

(b) 0.0344

(c) 1.77 00

(d) 0.1770

working

$$1/X_B = 1 + \frac{1000}{m \times M_A}$$

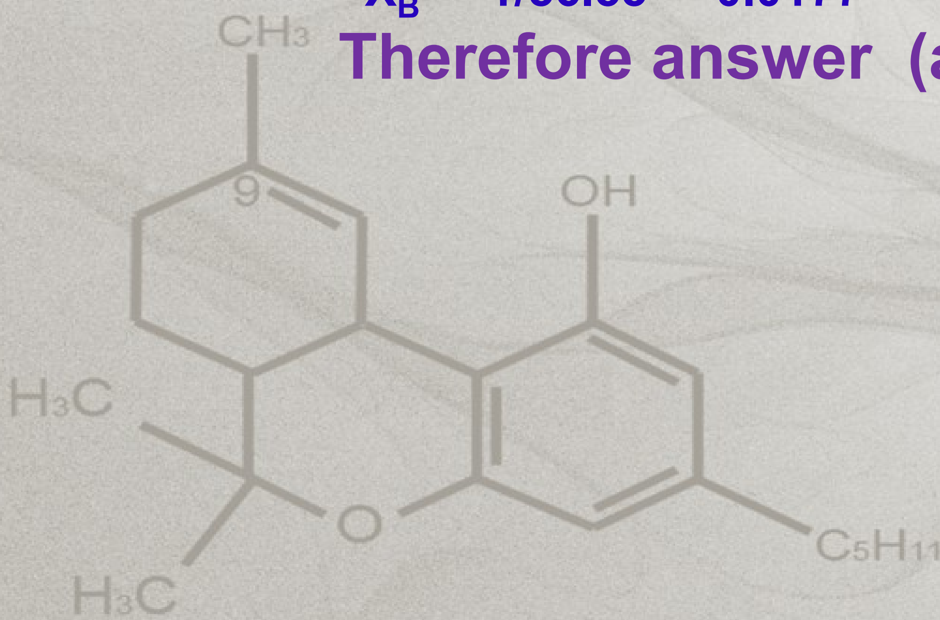
$1/X_B = 1 + 1000/\ 1 \times 18$

$= 1 + 55.55$

$= 56.55$

$X_B = 1/56.55 = 0.0177$

Therefore answer (a) 0.0177



(48) Ammonia reacts with copper Sulphate according to the following equation

$CuSO_4 + 4\,NH_3 \rightarrow Cu(NH_3)_4SO_4$

The number of moles of NH_3 required to produce 2.50 moles of $Cu(NH_3)_4SO_4$ is

(a) 3 mol (b) 6 mol

(c) 5 mol (d) 10 mol

working

As per the balanced equation

$4\ NH_3 \equiv Cu(NH_3)_4SO_4$

Therefore, Moles of NH_3 required

$2.5 \times 4 = 10$ mol

Therefore answer (d) 10 mol

ALL THE BEST