FWC

வடமாகாணக் கல்வித் திணைக்களத்தின் அனுசரணையுடன்
தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்

Field Work Centre

தவணைப் பரீட்சை, நவம்பர் - 2017
Term Examination, November - 2017

இரசாயனவியல்	தரம் :- 12 (2019)	புள்ளித்திட்டம்

M.C.Q

(1) 5	(6) 1	(11) 3	(16) 5	(21) 4
(2) 3	(7) 1	(12) 1	(17) 4	(22) 1
(3) 5	(8) 5	(13) 1	(18) 4	(23) 2
(4) 5	(9) 4	(14) 5	(19) 2	(24) 4
(5) 3	(10) 4	(15) 3	(20) 3	(25) 3

PART I $25 \times 02 = 50$ marks

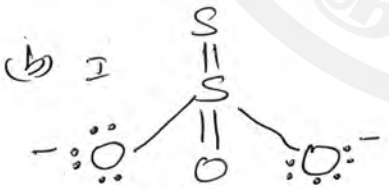
PART II $\frac{700}{14} = \frac{50 \text{ marks}}{100 \text{ marks}}$

PART II A.

(01) (a) (1) K (2) C (3) IKF (4) K (5) N

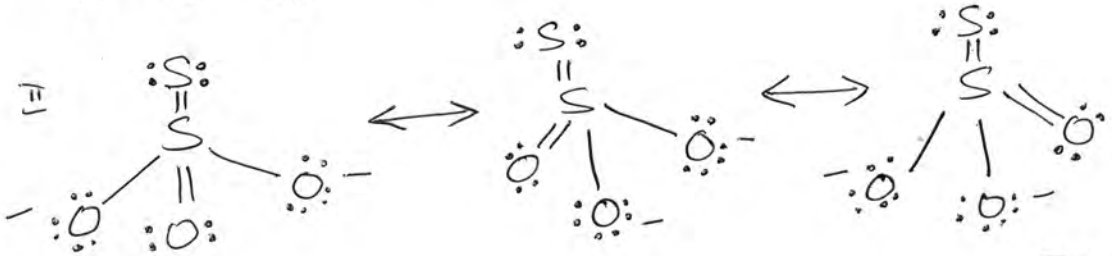
$05 \times 05 = 25$

(b) I



(10)

II



(15)

(III) No of electron pair = 6
No of bond pair = 4
No of lone pair = 0
Shape = tetrahedral
hybridization = sp^3

(IV) * sp^3 (ho) of S_2 and sp^2 (ho) / 2P (a.o) of S_1 (04)

(V) 109.5° (04)

(C) I $LiCl < BeCl_2 < BCl_3$

In all three compounds anion is same so its electronegativity also same but the electronegativity of cationic atom increases in the order of Li<Be<B. So in this order the electronegativity difference decreases and covalent character increases. (10)

II C-C < N-N < O-O (05)

In the order of O<N<C the atomic radious increases so the bond length also increases in the order of O-O < N-N < C-C so bond strength increases in the order of C-C < N-N < O-O (10)

100

(2) (a) (I) A = Si D = P E = S M = Cl 03×4 = (12)

(II) Si (03) (III) Cl < P < S < Si (05)

(IV) $D = PO_4^{3-}$ $E = SO_4^{2-}$ $M = ClO_4^-$ 03×3 = (09)

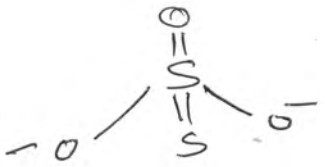
V $S_2O_3^{2-}$ ✓

Valancy = 2 ✓

Oxidation NO = 0 ✓

Valancy = 6 ✓

Oxidation NO = +4 ✓



(b)

Subshell	l	m_l	max no of electrons
3S	0	0	2
3P	1	-1, 0, +1	6
3d	2	-2, -1, 0, +1, +2	10

02×5 = (10)

12×03 = (36)

(C) (I) $NH_3(aq)$, $HF(g)$

(II) $NaCl(aq)$ (III) KI_3 (IV) $HF(g)$ (V) $HF_2^- = I_3^- > NO_2^-$

05×5 = (25)

100

3 (a) (i) Atomic nucleus was surrounded by electrons moving in orbit, like planets around the Sun. He postulated that the electrons in order to remain in orbit, the electro static attraction between the nucleus and electron must be equal to the centrifugal force. In other words, the electrons have to travel in a constant speed around the nucleus keeping the distance from the nucleus constant. (10)

(ii) Wrong

In the direction of decreasing wave length the space between successive lines in a serries should decrease, and the space between successive series should increase but here in the series B the space between successive lines increases. So the sketch is wrong. (10)

(iii) A = Lyman Series
B = Balmer series
C = Pashen series (15)

(iv) (a) The wave length of the last line of Lyman series. (05)

(b) $E = hc/\lambda$

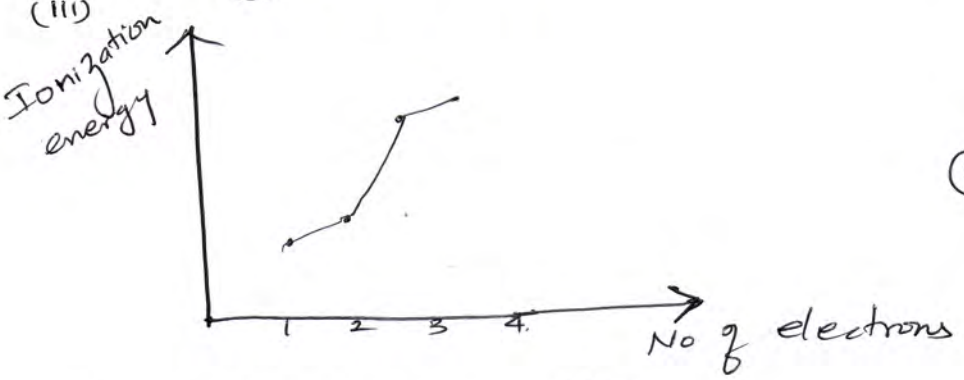
$$1317 \times 10^3 \text{ kJmol}^{-1} = \frac{6.626 \times 10^{-34} \text{ Js} \times 3 \times 10^8 \text{ ms}^{-1} \times 6.022 \times 10^{23} \text{ mol}^{-1}}{\lambda}$$

$$\lambda = 9.089 \times 10^{-8} \text{ m} = 90.89 \text{ nm} \quad (15)$$

(b) (i) Thomsan's plum pudding model (10)

(ii) Rutherford's Law (10)

(iii) Ans (10)



(10)

(iv) Explanation. (10)

(v) X^{2+} +2 charge.

(4) Take 100g of compound.

	Co	K	Cl.
Mass	21.2g	27.9g	50.9g ✓
mole	$\frac{21.2g}{59gmol^{-1}}$	$\frac{27.9g}{39gmol^{-1}}$	$\frac{50.9g}{35.5gmol^{-1}}$ ✓
	0.359 mol	0.715mol	1.434mol ✓
Mole ratio	$\frac{0.359}{0.359}$	$\frac{0.715}{0.359}$	$\frac{1.434}{0.359}$ ✓
	1	2	4

4 × 05 = (20)

Empirical formula K_2CoCl_4 (05)

molar mass of $K_2CoCl_4 = 2\times39 + 59 + 35.5\times4$
$= 279gmol^{-1}$ (05)

So molecular formula $K_2[CoCl_4]$ (05)

(b) (i) (1) +5 (2) +2 (3) −2 (4) 0 (5) +4. 04×5 = (20)

(ii) $SnCl_4$ = Tin(IV) chloride
$KMnO_4$ = potassium manganate (VII)
HCN = Hydrocyanic acid
NH_4ClO_4 = ammonium chlorate (VII)
H_2SO_3 = Sulphuric (IV) acid
Sulfurous acid 04 × 5 = (20)

(c) (i)

	C^1	C^2	C^3	C^4	C^5	C^6
Oxidation No	−3	−1	−2	−3	−2	−3

02 × 6 = (12)

(ii) $CH_3CH=CH_2$ = −6 $CH_3CH_2CH_3$ = −8

04 × 2 = (08)

(iii) −8 − (−6) = −2 (05)

Part II - B

Essay

(01)

(a) (i) Hydrogen bond is the intermolecular interaction when the considered molecules have N-H, O-H and F-H bonds. (10)

(ii) Density of ~~ice~~ is lesser than that of because of its intermolecular hydrogenbonds. The water has high surface tension high specific heat capacity good inorganic and organic solvent. High latent heat of Vapourization. (40)

(b) (i) London dispersion forces (10)

(ii) Non polar compounds (10)

(C) (i) NH_3 is a polar solute and water is a polar solvent and ccl_4 is a non polar solvent.

NH_3 dissolves more in water than ccl_4 by forming hydrogen bond (25)

(ii) I_2 is a non polar solute but water is a polar solvent and ccl_4 is a non polar solvent. Non polar solute dissolves well in non polar solvent than polar solvent (25)

(d) Molarmass of H_2S is greater than H_2O. But the boiling point of H_2O is greater than H_2S because Hydrogen bond is the intermolecular interaction between the H_2O molecules, but dipole-dipole interaction is found between the molecules of H_2S molecules. Hydrogen bond is stronger than dipole-dipole interaction. (30)

(02) a) (1) I_3^-

(2) SCl_4

(3) ICl_3

(4) SO_2, H_2O

(5) $HClO_4$

(6) SO_3

$6 \times 05 = (30)$

(b) (1) In these four compounds anion is same. but the cationic size increases in the order of $Mg^{2+} < Ca^{2+} < Sr^{2+} < Ba^{2+}$ The polariz ability of cation increases when size decreases with the decrease of polarize ability. ionic character increases. Thermal stability also increases.

(2) Cl_2 is having London forces among the molecules. But Na and Al have metallic bond between them. the strength of metallic bond in Na < Al. because the atomic size of Na > Al and the no of electrons contributing metalic bond in Na is one electron and Al is 3 electrons. So the melting point of Na < Al. Melting point of Si is greater than these three because Si is giant atomic lattice so its melting point of Si is greater than Cl_2, Na and Al.

(3) Atomic radius decreases in the order of Li > Be > B > C With the decrease of atomic size the distance between electron and nucleus decreases. So the attraction in creases so the energy to be supplied to remove electron from the atom increases. But the electron configuration of Be is stable than Li, B and C So the ionization enthalpy increases in the order of

Li < B < Be < C.

(4) In the order of Al, Na, Ne, N the P/e ratio decreases So the effective nuclear charge decreases so the ionic size increases in the above order

$30 \times 4 = 120$

(3) Let Volume of $3 mol dm^{-3}$ HCl required is V_1 and Volume of

a) $0.5 mol dm^{-3}$ HCl required is V_2 ✓

$$V_1 \times \frac{3 mol dm^{-3}}{1000} + V_2 \times \frac{0.5 mol dm^{-3}}{1000} = 0.25 mol$$ ✓

However $V_1 + V_2 = 250 cm^3$

$$V_1 \times \frac{3 mol dm^{-3}}{1000} + (250 - V_1) \times \frac{0.5 mol dm^{-3}}{1000} = 0.25 mol$$ ✓

$V_1 = 50 cm^3$ and $V_2 = 200 cm^3$ ✓

mix $50 cm^3$ of $3 mol dm^{-3}$ HCl and $200 cm^3$ of $0.5 mol dm^{-3}$ HCl ✓

$6 \times 06 = (36)$

(b) $2H_2O_2 \longrightarrow 2H_2O + O_2$ ✓

$$w_{H_2O_2} = 200g \times \frac{10}{100} = 20g$$ ✓

H_2O_2 ... = 2+32 = 34 g mol^{-1} ✓

$$n_{H_2O_2} = \frac{20g}{34 g mol^{-1}} = 0.588 mol$$ ✓

$n_{H_2O_2} : n_{O_2} = 2 : 1$ ✓

$$n_{O_2} = \frac{1}{2} \times 0.588 = 0.294 mol$$ ✓

$$V_{O_2} = 0.294 mol \times 22.4 dm^3 mol^{-1} = 6.588 dm^3$$ ✓

$11 \times 04 = (44)$

(c) a) $M_{CaCl_2} = 40 + 35.5 \times 2 = 111 g mol^{-1}$ ✓

$$n_{CaCl_2} = \frac{11g}{111 g mol^{-1}} = 0.1 mol$$ ✓

$$[CaCl_2(aq)] = \frac{0.1 mol}{0.5 dm^3} = 0.2 mol dm^{-3}$$ ✓

b) $n_{Cl^-} = 0.1 mol \times 2 = 0.2 mol$ ✓

$$w_{Cl^-} = 0.2 mol \times 35.5 g mol^{-1} = 7.1 g$$ ✓

$$w_{solution} = 500g + 11g = 511g$$ ✓

$[Cl^-_{(aq)}] = 0.4 \text{ mol dm}^{-3}$

$[Cl^-_{(aq)}] = 0.4 \text{ mol} \times 35.5 \text{ g mol}^{-1} \text{ dm}^{-3}$ ✓

$= 0.14 \times 35.5 \text{ g dm}^{-3} = 0.4 \times 35.5 \times 10^3 \text{ mg dm}^{-3}$

$= 14 \times 355 \times 10 \text{ mg dm}^{-3}$

$= 14200 \text{ ppm}$ ✓

$X_{CaCl_2} = \frac{n_{CaCl_2}}{n_{tot.}}$ ✓ $\quad n_{CaCl_2} = 0.1 \text{ mol}$

$n_{H_2O} = \frac{500 \text{ g}}{18 \text{ g mol}^{-1}} = 27.77 \text{ mol}$ ✓

$X_{CaCl_2} = \frac{0.1 \text{ mol}}{0.1 \text{ mol} + \frac{500}{18} \text{ mol}}$

$= \frac{0.1}{0.1 + 27.77} = \frac{0.1}{27.87} = \frac{10}{2787}$ ✓

$= 0.0036$ ✓

$X_{H_2O} = 1 - \frac{10}{2787} = 0.9964$ ✓

$8 \times 04 = 32$