G.C.E A/L Examination November - 2018

Filed Work Centre

FWC

Grade - 12 (2020) **CHEMISTRY** **Marking Scheme**

PART - I

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

$25 \times 02 = 50$ marks

PART - II

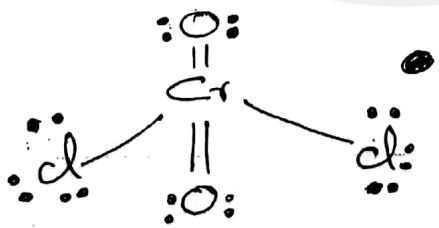
A - PART

(1) (a)

(i) False
(ii) False
(iii) True
(iv) True
(v) False
(vi) True

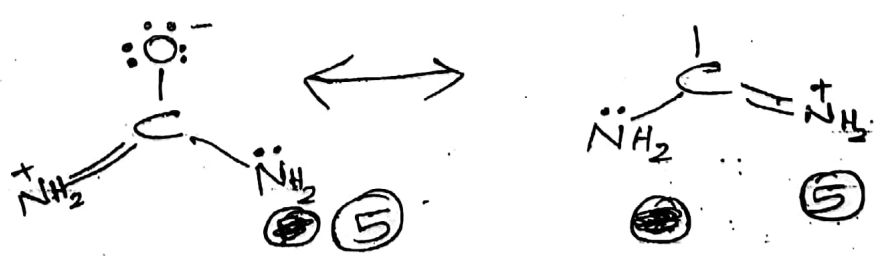
$6 \times 05 = 30$

(b) (i)



09

(ii)



5 5

(iii)

(iii)

	O_1	N_2	C_4	N_5
VSEPR PAIRS	4	4	2	2
Geometry	Tetrahedral	Tetrahedral	linear	linear
Shape	Angular	Trigonal pyramid	linear	linear
Hybridization	sp^3	sp^3	sp	sp

$16 \times 01 = (16)$

(iv)

$N_2 = sp^3$ $\quad O_3 = 2p \mid sp^3$

$C_4 = sp$ $\quad N_5 = sp$

$O_1 = 2p \mid sp^3$ $\quad N_2 = sp^3$

$N_2 = sp^3$ $\quad C_4 = sp$

$8 \times 02 = (16)$

(v) $N_5 = 2p$ $\quad C_4 = 2p$

$O_3 = 2p$ $\quad N_2 = 2p$

$4 \times 01 = (4)$

(c) (i) $Ba^{2+} < Sr^{2+} < Ca^{2+} < Mg^{2+}$ (5)

(ii) $N_2O < NO < N_2O_3 < NO_2 < NO_3^-$ (5)

(iii) $O_2 < O_3 < H_2O < H_2O_2$ (5)

100

(2) (a) (i) $1s^2 2s^2 2p^6 3s^2 3p^3$ (10)

(ii) H_2S (10)

(iii)
- Electronic configuration of A is $3s^2 3p^3$
- that is half filled state and stable
- Electronic configuration of B is $3s^2 3p^4$
- Therefore loosing an electron in B help to attain stable state.

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Hence I_1 of A > B. (10)

(iv) Element C/(Cl) (05)

(v) Group VIII A (05)

(vi) PCl_3, PCl_5 (05)

(vii) H_2SO_4 H_2SO_3 (05)

(viii) F, Br, I (any two) (06) [03+03]

(b) (i) Deflects like electrons in magnetic field (08)

(ii) Towards Positive electrode. (08)

(iii) Release of Photons. (08)

100

(3)

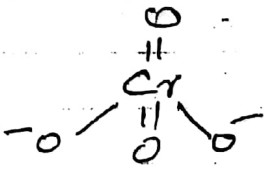
(a) (i) CrO_4^{2-}

(i) No of VSEPR pairs = 4

(ii) No of σ bond pair = 4

(iii) No of lone pairs = 0

(iv) Shape = tetrahedral



(ii) ICl_4^-

(i) No of VSEPR pairs = 6

(ii) No of σ bond pairs = 4

(iii) No of lone pairs = 2

(iv) Shape = square planer

(iii) $TeCl_4$ (i)

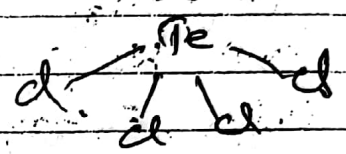
(3) $TeCl_4$

(i) No of VSEPR Pairs = 5

(ii) No of σ bond pairs = 4

(iii) No of lone pairs = 1

(iv) Shape See-Saw.



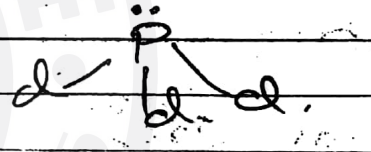
(4) PCl_3

(i) No of VSEPR pairs = 4

(ii) No of σ bond pairs = 3

(iii) No of lone pairs = 1

(iv) Shape Trigonal Pyramidal shape.



5) NO_3^-

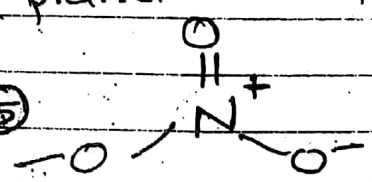
(i) No of VSEPR pairs = 3

(ii) No of σ bond pairs = 3

(iii) No of lone pairs = 0

(iv) Shape Trigonal planer

$5 \times 05 = (25)$



(b)

(i) Polar covalent

(ii) Polar ~~covalent~~ Dative covalent, Ionic bond

(iii) Metallic bond

(iv) Non-Polar covalent

(v) Ionic bond

$7 \times 05 = (35)$

(c) (I) H-bonds, londonforces
(II) Ion-dipole interactions, london forces
(III) Ion-induced dipole interactions, London forces
(IV) London forces
(V) Dipole - dipole interactions

(d) (I) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$
(II) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$
(III) $1s^2 2s^2 2p^6$
(IV) $1s^2 2s^2 2p^6$
(V) $1s^2 2s^2 2p^6 3s^2 3p^6$

4)

(a)

	C	H	O
mass %	40	6.67	53.33
mole	$\frac{40}{12}$	$\frac{6.67}{1}$	$\frac{53.33}{16}$ (05)
	3.33	6.67	3.33 (05)
	$\frac{3.33}{3.33}$	$\frac{6.67}{3.33}$	$\frac{3.33}{3.33}$
	1	2	1 (05)

Empirical formulae
CH_2O (05)

(b) $(CH_2O)_n = 90$ (05)
$30n = 90$
$n = 3$ (05)
molecular formulae is $C_3H_6O_3$ (05)

(B) $d = m/V$

$m = Vd$ (05)

$= 100\,ml \times 1.04\,g\,ml^{-1}$ (05)

$= 104\,g$ (03)

$W/W\,\% = \frac{4.68\,g}{104\,g} \times 100 = 4.5\,\%$ (05)

(C) molecular mass of $Na_2CO_3 = 2\times23 + 12 + 16\times3$

$= 106\,g\,mol^{-1}$ (2)

molecular mass of $H_2O = 2\times1 + 16$

$= 18\,g\,mol^{-1}$ (2)

amount of $Na_2CO_3 = \frac{10.6\,g}{106\,g\,mol^{-1}} = 0.1\,mol$ (2)

amount of $H_2O = \frac{90\,g}{18\,g\,mol^{-1}} = 5\,mol$ (2)

$\chi_{Na_2CO_3} = \frac{n_{Na_2CO_3}}{n_{Na_2CO_3} + n_{H_2O}} = \frac{0.1\,mol}{0.1\,mol + 5\,mol}$ (5)

$= \frac{1}{51}$ (05)

$\chi_{H_2O} = 1 - 1/51 = 50/51$ (02)

(D) $d = m/V$ $\quad V = m/d = \frac{90\,g}{1\,g\,ml^{-1}} = 90\,ml$ (3)

$V_{H_2O} = 90\,ml$ $\quad [Na_2CO_3(aq)] = \frac{0.1\,mol}{90/1000\,dm^3}$ (5)

$[Na_2CO_3(aq)] = \frac{10}{9} = 1.11\ mol\ dm^{-3}$ (5)

100

Essay

5) (a) Ans (10)

(b) Ans. It refers to waves (photons) of energy in which electromagnetic field propagating through space (10)

(c) Lyman series, Balmer series, Paschen series, Pfund series, Bracket series (any 3) (30)

(d) (i) frequency

$E = h\nu$

$\nu = c/\lambda = \frac{3\times10^{8}\ ms^{-1}}{460\times10^{-9}\ m}$

$= 6.521\times10^{14}\ s^{-1}$ (20)

(ii) Energy of a photon

$E = h\cdot c/\lambda$

$= \frac{6.63\times10^{-34}\ Js \times 3\times10^{8}\ ms^{-1}}{460\times10^{-9}\ nm}$

$= 4.323\times10^{-19}\ J$ (20)

(iii) Energy of 1 mol of photons

$E = 4.323\times10^{-19}\ J \times 6.022\times10^{23}\ mol^{-1}$

$= 2.6038\times10^{3}\ J$

(20)

(Q) Visible spectrum. (10) DATE: ...../...../.....

(f) Energy of 1 Photon = 4.323×10^{-19} J

No of photons per second = 3.6×10^{18}

Amount of Energy radiated in 1 second

$= 3.6 \times 10^{18} \times 4.323 \times 10^{-19}$ J

$= 15.5628 \times 10^{-1}$ J s^{-1}

Time needed for 100J energy

$= \frac{100 \text{ J}}{1.5567 \text{ J s}^{-1}}$

= ~~64.267 sec~~ (20)

$= 64.267$ sec

150

6) (a) (v) Melting point of Mg > Na

- Metalic bond is present
- Metalic Strength depends on charge and size of cation
- Charge of Mg > Na
- Size of Cation Mg < Na
- Increase of charge metalic bond Strength increases.
- Decrease of size of cation bond Strength increases

(30)

(vi) NO > O_2 boiling point

NO is polar molecule

molar masses of NO and O_2 are comparable.

O_2 is a nonpolar molecule.

The relative strength of intermolecular interaction forces among NO molecules should be greater than the intermolecular interaction strength among O_2 molecules

NO molecule having dipole moments
Oxygen molecule is a nonpolar molecule with zero dipole moment.
Polar NO has dipole-dipole attractions among the molecules. non polar Oxygen molecules have relatively weak london forces.
Hence b.p of NO > O_2. (30)

iii) $Cl^- < Cl < Cl^+$

- Cl^- has (-) charge and in full filled state
- Cl^+ has (+) charge and have high tendency to neutral its charge
- Cl needs one electron to become stable
- (+) charge in Cl^+ attracts electron than neutral atom Cl
- Cl^- repulse any excess electron added to it (30)

b) i) $3CuO + 2NH_3 \longrightarrow 3Cu + N_2 + 3H_2O$

ii) $BrO_3^- + 6I^- + 6H^+ \longrightarrow Br^- + 3I_2 + 3H_2O$

iii) $SO_2 + 2H_2O + Br_2 \longrightarrow 4H^+ + SO_4^{2-} + 2Br^-$

iv) $4NH_3 + 3O_2 \longrightarrow 2N_2 + 6H_2O$

v) $4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$ $0.5 \times 5 = (2.5)$

(5.2) (c) $d = m/V$

$m = Vd$

$m_{CH_3OH} = 25ml \times 0.8 g ml^{-1} = 20g$

molecular mass of $CH_3OH = 12 + 3 + 16 + 1 = 32 g mol^{-1}$

$n = w/M = 20g / 32 g mol^{-1} = 5/8 mol$ (25)

$$[CH_3OH_{(aq)}] = \frac{5/8 \text{ mol}}{125/1000 \text{ dm}^3}$$

$$= 5 \text{ mol dm}^{-3} \quad (05)$$

Q5 → 150

(7) $n = CV/1000$

$= 0.1 \text{ mol dm}^{-3} \times \frac{200}{1000} \text{ dm}^3$

$= 0.02 \text{ mol}$

molecular mass of $Na_2CO_3 = 2\times23 + 12 + 48$

$= 106 \text{ g mol}^{-1}$ (20)

$W_{Na_2CO_3} = 0.02 \text{ mol} \times 106 \text{ g mol}^{-1}$

$= 2.12 \text{ g}$

preparation of above solution (5 steps) (20)

(a) $0.1 \text{ mol dm}^{-3} \times \frac{100}{1000} \text{ dm}^3 = C \times \frac{500}{1000} \text{ dm}^3$

$5C = 0.1$

$C = 0.02 \text{ mol dm}^{-3}$ (20)

(b) $1 \text{ mol dm}^{-3} \times \frac{V}{1000} \text{ dm}^3 = 0.2 \text{ mol dm}^{-3} \times \frac{100}{1000} \text{ dm}^3$

$V = 20 \text{ cm}^3$ (30)

Preparation (steps must)

(c) $Ba(OH)_{2(aq)} + 2HNO_{3(aq)} \longrightarrow Ba(NO_3)_{2(aq)} + 2H_2O_{(l)}$

$\frac{n_{Ba(OH)_2}}{n_{HNO_3}} = \frac{C \times 25/1000 \text{ dm}^3}{0.1 \text{ mol dm}^{-3} \times \frac{34}{1000} \text{ dm}^3} = \frac{1}{2}$ (30)

$C = 6.8 \times 10^{-2} \text{ mol dm}^{-3}$

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(d) $Fe^{2+} \longrightarrow Fe^{3+} + e$

$MnO_4^- + 8H^+ + 5e \longrightarrow Mn^{2+} + 4H_2O$ (5)

$MnO_4^- + 8H^+ + 5Fe^{2+} \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$ (5)

$\frac{n_{MnO_4^-}}{n_{Fe^{2+}}} = \frac{1}{5}$ (5)

amount of $KMnO_4 = 0.6\ mol\ dm^{-3} V$

amount of $Fe^{2+} = 0.25\ mol\ dm^{-3} \times 27\ cm^3$

$= 6.75 \times 10^{-3}\ mol.$

$\frac{n_{MnO_4^-}}{n_{Fe^{2+}}} = \frac{1}{5} = \frac{0.6\ mol\ dm^{-3} V}{6.75 \times 10^{-3}\ mol}$ (10)

$5 \times 0.6V = 6.75 \times 10^{-3}$

$0.6V = 1.35 \times 10^{-3}$

$6V = 1.35 \times 10^{-2}$

$V = 0.225 \times 10^{-2}\ dm^3$

$= 2.25\ cm^3.$

(5)

Part I $25 \times 2 = 50\%$

Part II A $4 \times 100 = 400$

B $2 \times 150 = 300$

700

Part II → $700/14 = 50\%$

Part I + Part II $= 50 + 50 = 100\%$

Q7 → 150