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Part C
```

Q5)

A)

1. (nbutanedioicacid) / nNaOH = 1/2

OR for the identification of stoichiometry

(5marks)

Butanedioic acid = BDA

In benzenelayer,

[BDA]_benzene= $\{1/2 \times 0.05 \text{ moldm}^{-3} \times 4.8 \text{ cm}^{3}\} / 50.00 \text{cm}^{3}$ (3marks)

 $= 2.4 \times 10^{-3} \text{moldm}^{-3}$. (4+1marks)

In Aqueous layer,

[BDA]_aq =
$$\{1/2 \times 0.05 \text{ moldm}^{-3} \times 16.0 \text{ cm}^{-3} \} / 25.00 \text{ cm}^{-3}$$
 (2marks)

=1.6x10-2moldm⁻³ (4+1marks)

=
$$(2.4 \times 10^{-3} \text{moldm}^{-3}) / (1.6 \times 10^{-2} \text{moldm}^{-3}) = 0.15 \text{ or } 3/20.$$
 (4+1marks)

<u>OR</u>

=
$$(1.6 \times 10^{-2} \text{moldm}^{-3}) / (2.4 \times 10^{-3} \text{moldm}^{-3}) = 6.67 \text{ or} 20/3.$$

(Note: Steps can be combined award marks accordingly)

2. Solubility,

[BDA] benzene = [BDA] aq

Consider a mixture having 1.0dm³ of benzene layer and 1.0dm³ of aqueous layer.

$$x / M_{BDA} = 0.15(8.0 \text{gdm}^{-3}) / M_{BDA}$$
 (5marks)

(Note: Equation can be accepted without M_{BDA.})

$$X = 1.2 \text{gdm}^{-3}$$
 (4+1marks)

(B)

1.
$$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$$
 (5marks)

$$\Delta S = 2 \times 191 \text{JK}^{-1} \text{mol}^{-1} - (193 \text{JK}^{-1} \text{mol}^{-1} + 3 \times 131 \text{JK}^{-1} \text{mol}^{-1})$$

$$= (-204JK^{-1}mol^{-1}) (4+1marks)$$

$$\Delta H_{R} = 2 \times (-46 \text{kJmol}^{-1})$$

$$= (-92kJmol^{-1}) (4+1marks)$$

At 27°C,

$$\Delta G = \Delta H - T\Delta S$$
 (2marks)

=
$$(-92)$$
 - $300 \times (-204) \times 10^{-3}$

=
$$(-30.8 \text{kJmol}^{-1})$$
 (4+1marks)

Therefore, as ΔG is negative it is spontaneous in $27^{\circ}C$. (10mark)

2.

At 450°C,

$$\Delta G = (-92) - 723 \times (-204 \times 10^{-3})$$

$$= (-92) + 147.49$$

$$= 155.49 \text{kJ} \qquad (4+1 \text{marks})$$

Therefore, as ΔG is positive it is non-spontaneous in $450^{\circ}C$.

(10mark)

Reaction rate at 450° C is greater and fraction of molecules greater than activation energy also greater 450° C. Therefore, 450° C used in industries as optimum temperature as at 27° C reaction rate is very very slow (not industrially profitable). (5marks)

(C)

1.
$$KP = P^2CO / PCO_2$$
 (5marks)

$$C(s) + CO_2(g)$$
 \longrightarrow $2CO(g)$

2. Initial mole 0.075

Total number of gas moles =
$$0.075+x$$
 (5marks)

Apply PV = nRT assuming ideal behaviour,

$$0.075+x = {8.0 \times 10^{5} Pa \times 1.0 \times 10^{-3} m^{3}}/8 \times 10^{3} Jmol^{-1}$$
 (4+1marks)

$$x = 0.025 \text{mol} \qquad (4+1 \text{marks})$$

$$nCO = 0.05mol$$
 $nCO_2 = (0.075 - 0.025) mol = 0.05mol$ (3+2marks)

Therefore,

PCO =
$$(2 \times 0.025 \times 8.0 \times 10^{5} \text{Pa}) / 0.1 = 0.25 \times 10^{5} \text{Pa}$$
 (4+1marks)
PCO₂= $(0.05 \times 8.0 \times 10^{5} \text{Pa}) / 0.1 = 0.25 \times 10^{5} \text{Pa}$ (4+1marks)
KP = $(0.25 \times 10^{5} \text{Pa})^{2} / 0.25 \times 10^{5} \text{Pa}$ (4+1marks)
= $0.25 \times 10^{5} \text{Pa}$ (4+1marks)

3. Calculate Q using pressures.

Q =
$$(2 \times 10^{5} Pa)^{2} / 2 \times 10^{5} Pa$$

= $2 \times 10^{5} Pa$ (5marks)

Q is smaller than KP, Therefore, PCO2 decreases and PCO increases until Q = KP.

(5marks)

(Any other correct alternative answers)

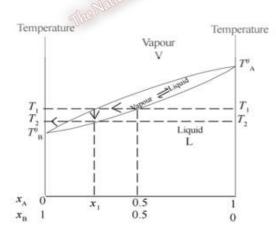
(Total 150marks)

Q6)

(A)

- 1. Fractional distillation is the process to separate <u>two volatile</u> miscible components from an <u>ideal</u> or nearly ideal solution of them. (10marks)
- 2. To increase the efficiency of separating the liquids in to pure forms. (5marks)
- 3. Because, at one stage highest or lowest boiling point azotrophic mixtures are obtained respectively. (10marks)

4.



V = Composition of the vapour

L=Composition of the liquid

 $T_A^0 = B.p. \text{ of } A$ $T_B^0 = B.p \text{ of } B$

(15marks)

(B)

1.
$$Agl(s) \longrightarrow Ag^{+}(aq) + I^{-}(aq)$$
 (5marks)

 $KSP = [Ag^{+}(aq)][I^{-}(aq)]$ (3marks)

3

 $[Ag^+(aq)] = [I^-(aq)] = x$

$$KSP = x^2 (2marks)$$

Therefore,

[Ag+(aq)] =
$$(5.0 \times 10^{-18})^{1/2}$$

= $2.236 \times 10^{-9} \text{moldm}^{-3} \text{or} \quad 2.2 \times 10^{-9} \text{moldm}^{-3}$ (4+1marks)

- 2. The solution is a saturated solution of Agl. (5marks)
 Therefore, [Ag+(aq)] is as same as above, 2.23 x 10⁻⁹moldm⁻³. (5marks)
- 3. The product of concentrations of Ag+ and I must be calculated and compared with K_{SP}.

[Ag+(aq)] =
$$(1.5 \times 10^{-4} \text{moldm}^{-3} \times 10.00 \text{cm}^{3}) / 15.00 \text{cm}^{3}$$

= $1 \times 10^{-4} \text{moldm}^{-3}$ (4+1marks)

$$[I^{-}(aq)] = (6.0 \times 10^{-4} \text{moldm}^{-3} \times 5.00 \text{cm}^{3}) / 15.00 \text{cm}^{3}$$

$$= 2.0 \times 10^{-4} \text{moldm}^{-3}$$
 (4+1marks)

$$[Ag+(aq)] \times [\Gamma(aq)] = 2.0 \times 10^{-8} \text{mol}^2 \text{dm}^{-6} > K_{SP}$$
 (10marks)

[OR any other correct approach]

Therefore, Agl will precipitate (slightly yellow precipitate will form). (5marks)

(50marks)

(C)

1.
$$B_0 + H_2 O \rightleftharpoons BH^+ + OH$$

1. BOH(aq) +
$$H_2O(I) \rightleftharpoons B+(aq) + OH-(aq)$$

Kc =
$$\{[B+(aq)] \times [OH-(aq)]\} / \{[BOH(aq)] \times [H_2O(I)]\}$$

$$Kc \times [H_2O(I)] = {[B+(aq)] \times [OH-(aq)]} / [BOH(aq)]$$

As $[H_2O(I)]$ is a constant at constant temperature.

Kb = {[B+(aq)] x [OH-(aq)]} / [BOH(aq)] /
$$K_b = \frac{[BH^+][OH^-]}{[B]}$$

(10marks)

2.
$$CH_3NH_2 (aq) + H_2O(I) \leftarrow CH_3NH_3^+(aq) + OH_2(aq)$$

Kb =
$$\{[CH_3NH_3^+(aq)] \times [OH_3NH_2(aq)]\}$$

But,
$$[CH_3NH_3^+(aq)] = [OH_3(aq)]$$

Dissociation of the weak acid is negligibly small compared to initial concentration.

```
6 x 10<sup>-6</sup> moldm<sup>-3</sup>
                                  2.45 x 10<sup>-3</sup>moldm<sup>-3</sup>
       [OH-(aq)]
                                                                                            (15marks)
3.
                                                                      CH<sub>3</sub>COOH(aq) + NaCl(aq)
              CH<sub>3</sub>COONa(aq) + HCl(aq)
     For A, When V_{HCI} = 0
                                         → CH<sub>3</sub>COO-(aq) +
              CH<sub>3</sub>COONa(aq) —
                                                                                  Na+(aq)
                                           H_2O(I) \leftarrow CH_3COOH(aq) + OH-(aq)
              CH<sub>3</sub>COO-(aq) +
              [CH_3COOH(aq)] = [OH-(aq)]
     As the degrees off hydrolysis of CH<sub>3</sub>COO-(aq) is very small,
                                                    [OH-(aq)]^2 / [CH<sub>3</sub>COO-(aq)]
              Κb
                                  Kw / Ka =
                                  (10^{-14} \times 0.18) / (1.8 \times 10^{-5}) \text{ moldm}^{-3}
                                  10<sup>-10</sup>mol<sup>2</sup>dm<sup>-6</sup>
     [OH-(aq)]<sup>2</sup>
                                  10<sup>-5</sup>moldm<sup>-3</sup>
     [OH-(aq)]
              рОН
                                  -log10[OH-(aq)]
              рОН
     pH+ pOH
              рΗ
                                                                                            (10marks)
     For B,
              CH_3COONa(aq) + HCl(aq) CH_3COOH(aq) + NaCl(aq)
     When V_{HCI} = 12.50cm<sup>3</sup> half equivalence point is obtained. Then,
              [CH_3COONa(aq)] = [CH_3COOH(aq)]
     Neglecting the ionisation of CH<sub>3</sub>COOH which is small,
              [H<sub>3</sub>O+(aq)]
                                           Ka
                                  = 1.8 x 10-5moldm<sup>-3</sup>
                                           -log10[1.8 x 10-5moldm<sup>-3</sup>]
                        рΗ
                        рН
                                           4.74
                                                                                            (10marks)
     For C, when V_{HCI} = 25.00 \text{cm}^3
              CH_3COONa(aq) in the medium = (0.18 / 1000) \times (25 / 50) \times 1000 \text{moldm}^{-3}
                                                               0.09 moldm<sup>-3</sup>
```

$$CH_3COOH(aq) + H_2O(I)$$
 \longrightarrow $CH_3COO-(aq) + H_3O+(aq)$

As CH₃COOH is a weak acid its degree of dissociation is negligibly small.

Ka =
$$[H_3O+(aq)]^2 / [CH3COOH(aq)]$$

 $[H_3O+(aq)]$ = $(Ka \times 0.09 \text{moldm-3})^{1/2}$
= $(1.8 \times 0.09)^{1/2} \text{moldm}^{-3}$
= 1.27moldm^{-3}
pH = $-\log 10(1.27 \times 10^{-3})$

pH = 2.89 or pH = 2.9 (10marks)

For D, when $V_{HCI} = 50.00$ cm³

[HCl(aq)] in the medium =
$$(0.18 / 1000) \times (50 / 75) \times 1000 \text{moldm}^{-3}$$

= 0.12moldm^{-3}

As the [H+] given by the dissociation of CH₃COOH is negligible compared to that provided by HCl,

pH =
$$-\log 10(1.2 \times 10-1)$$

pH = 0.92 (10marks)

(Total 150marks)

(Q7)

(A) (I)

1. Tertiary alcohols can easily from tertiary carbo cations. As tertiary carbocations are more stable they easily undergo substitution reaction with concentrated HCl.

(5marks)

The O-H group of phenol and the benzene ring have very stable bond. Because, in phenol the C-O bond shows double bond charactertherefore it cannot involve to substitution reactions easily. (5marks)

(II)

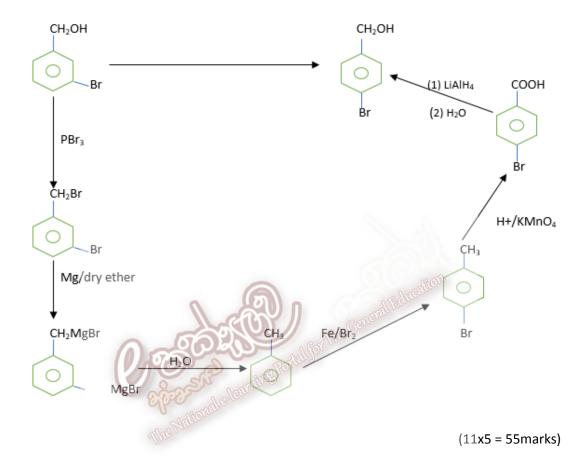
$$NH_2$$
 < NH_3 < $CH_3CH_2NH_2$ < $(CH_3CH_2)_2NH$ (5marks)

- (CH₃CH₂)₂NH contains 2 electron repulsing alkyl groups. Therefore, the electron density in nitrogen is greatly increased. Basicity increases as the ability to donate lone pair increases.
- CH₃CH₂NH₂has only one electron repulsing alkyl group when compared to (CH₃CH₂)₂NH.But the basic character is greater than that of NH₃.

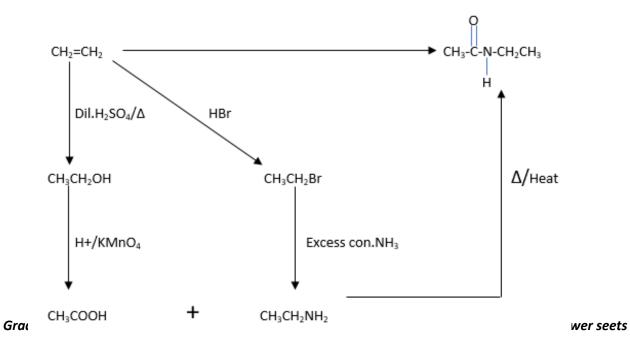
• Aniline is less basic, because the Lone pair electrons of nitrogen is stabilized by the De localisation of electrons with (π bond electrons) the benzene ring. Therefore, ability to donate lone pair decreases, basicity decreases.

(5x3 = 15marks)

(B)



(C)



(9x5 = 45 marks)

(D)
$$OCH_2CH_3$$
 $CH_3-CH_2-CH-CH_3$

$$CH_3$$
- CH_2 - $CH=CH_2$
(2X5 = 10marks)

cis-2-butene

trans-2-butene

(2X5 = 10 marks)

(Total = 150marks)

Q8) A)

1.

MnSO₄ / [Mn (H₂O)₆]SO₄ Α

В KMnO₄

 K_2MnO_4 С

NH₄MnO₄ D

 MnO_2 Ε

 N_2

G $Sr_3N_2\\$

 NH_3

 H_2O

MnS

(10x5 = 50 marks)

2.
$$MnO_4^-(aq) + e \longrightarrow MnO_4^{2-}(aq)$$

(B) (I)

1. NH₄⁺, PO₄³⁻ 2. (NH₄)₃PO₄

(2x5 = 10 marks)

(5marks)

(5marks)

(11)

1. Sn⁴⁺, Cr³⁺

(5x2 = 10marks)

2. Q1 SnS_2

Q2 Cr(OH)₃

 $[Cr(NH_3)_6]^{3+}$ Q3

Q4 SnS (5x4 = 20 marks)

(C)

```
248gmol<sup>-1</sup>
1. Molar mass of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.5H<sub>2</sub>O
                                                                                                         (3marks)
                                                                                             0.620g / 248gmol<sup>-1</sup>
      Moles of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>
                                                                                             0.0025mol
                                                                                                         (3marks)
                                                                                             0.0025 / (250 x 10<sup>-3</sup>) moldm<sup>-3</sup>
      Concentration of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>
                                                                                                         (3marks)
                                                                                             0.010moldm<sup>-3</sup>
                                                                                                         (3marks)
2. IO_3(aq) + 5I(aq) + 6H^+(aq)
                                                                                31<sub>2</sub>(aq) + 3H<sub>2</sub>O(I)
                                                                                                         (5marks)
                                                                                             0.0024 x 10 x 10<sup>-3</sup>mol
      Moles of IO<sub>3</sub>
                                                                                             2.4 x 10<sup>-5</sup>mol
                                                                                                         (3marks)
      Total number of I<sub>2</sub> produced
                                                                                            7.2 x 10<sup>-5</sup>mol
                                                                                                         (3marks)
                              2S<sub>2</sub>O<sub>3</sub><sup>2-</sup>
                                                                                                         2I<sup>-</sup>
      <u>OR</u>
                              2S<sub>2</sub>O<sub>3</sub><sup>2-</sup>
                                                                                                         31
                                                                                                          (3marks)
      Moles of S_2O_3^{2-}
                                                                                            0.010 \times 7.4 \times 10^{-3} \text{mol}
                                                                                            7.4 x 10<sup>-5</sup> mol
                                                                                                         (3x2 = 6marks)
      Moles of I<sub>2</sub> reacted with S<sub>2</sub>O
                                                                                             3.7 x 10<sup>-5</sup>mol
                                                                                                         (3marks)
      Therefore, moles of I<sub>2</sub> reacted with ascorbic acid=
                                                                                             (7.2 \times 10^{-5}) - (3.7 \times 10^{-5})
                                                                                             3.5 x 10<sup>-5</sup>mol
                                                                                                         (3marks)
      As in 10cm<sup>3</sup> of fruit drink
                                                                                             3.5 x 10<sup>-5</sup>mol
      Therefore, in 1000cm<sup>3</sup>
                                                                                             3.5 x 10<sup>-3</sup>mol
                                                                                                          (3marks)
                                                                                             176gmol<sup>-1</sup>(3marks)
      Molar mass of ascorbic acid
                                                                                             3.5 \times 10^{-3} \times 176 \times 10^{3} \text{mgdm}^{-3}
      Therefore, [C<sub>6</sub>H<sub>8</sub>O<sub>6</sub>]
                                                                                =
                                                                                             616mgdm<sup>-3</sup> (3marks)
                                                                                             616ppm(3marks)
                                                                                                         (50marks total)
                                                                                (Total 150marks)
```

Q9)

(A)

1. R1 - Air / liquid air.

R2 - Naptha (C_6H_{12}) / natural gas (CH_4) .

R3 - Sea-water / Brine. R4 - Limestone / CaCO₃.

R5 - Coke / C.

(5x2 = 10marks)

2. M1 - Fractional distillation of liquid air.

M3 - Manufacture of ammonia / Heber process.

M4 - Manufacture of nitric acid / Oswald process.

M5 - Manufacture of urea.

M7 - Manufacture of sodium carbonate / Solvay process.

(5x2 = 10marks)

3. P1 - N_2 P7 - $CO(NH_2)_2$ P8 - CO_2 P8 - CO_2 P9 - CaO

P4 - CO P10 - Na₂CO₃ / NaHCO₃

P5 - NH₃ P11 - CaC₂

P6 - HNO₃

(11x2=22marks)

4. M2 - Partial oxidation with oxygen / reaction with steam.

M6 - Heating limestone (900°C).

M8 - Heating in an electric arc at a temperature about 2000°C.

(3x2 = 6marks)

5.

Process	Catalyst	Temperature	Pressure	
M3	Iron	450°C	250atm	
M4	Pt/Rh	850-1225°C	1-9atm	

(6x2 = 12marks)

6. M7 / Solvay process / Manufacturing of Na₂CO₃. (2marks)

7. P6 - Fertilizer, explosives, NaNO₃, KNO₃, AgNO₃, aqua-regia, to clean soldering surfaces.

(2marks)

P10 - Washing soda, softening of hard water, manufacture of soap, paper, detergents, glass.

(2marks)

8. $Ca(OH)_2$ and C_2H_2 . (2x2 = 4marks)

9. $ZnS \longrightarrow ZnO + SO_2(g)$ (2marks)

 $SO_2(g) + O_2(g)$ \longrightarrow $SO_3(g)$ (2marks)

• Catalyst: V₂O₅ (2marks)

• Temperature: 450°C (2marks)

Pressure: 1-2atm (2marks)

• Mixed with more air (2marks)

 $SO_3(g) + H_2SO_4(I) \longrightarrow H_2S_2O_7(I)$ (2marks)

 $H_2S_2O_7(I) + H_2O(I) \longrightarrow 2H_2SO_4(I)$ (2marks)

 $3Ca_3(PO_4)_2.CaCl_2(s) + 7H_2SO_4(l)$ $3Ca(H_{PP}O_4)_2(s) + 7CaSO_4(s) + 2HCl(aq)$

(4marks)

(B)

1. Smog is a yellowish haze formed by complex organic molecules which are formed using the oxides of Nitrogen NO_x unburnt hydrocarbons C_xH_y emitted by vehicle smokes in the presence of Sunlight and temperatures above $15^{\circ}C$.

(5+3+3 = 11 marks)

- 2. Primary NO_x and unburnt hydrocarbons(C_xH_y). (2+2 = 4marks) Secondary – Ozone, aldehydes, PAN, PBN. (4marks)
- 3. NO₂ (2marks)
- 4. Any suitable answers. (5marks)
- 5. One mechanism for regulating the earth's temperature by gases around earth surface by maintaining balance between received energy from sun and energy radiated back from earth.

(5marks)

CO₂, H₂O(g), Methane, N₂O, NO₂, SO₂, CFC, O₃

(5marks)

- 6. Respiration, deforestation, burning of fossil fuels, cement production etc.(3+3 = 6marks)
- 7. Photosynthesis, dissolving in water etc.

(2+2 = 4marks)

8. CO_2 , N_2 and H_2O

(4marks)

9. Platinum / Copper / Chromium oxide.

(5marks)

10. Leads to global warming, Respiratory problems/irritant, eye irritation, etc.

(5marks)

(60marks)

(Total 150marks)

Q10)

A)

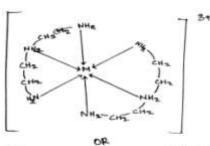
1. $[Co(NH_3)_4(SO_4)]$

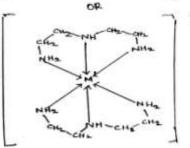
(10marks)

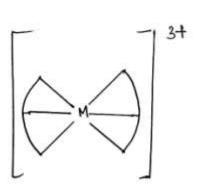
2. $[Co(NH_3)_4(NO_2)Cl]Cl$ - tetraamminechloridonitrocobalt(iii) chloride. (5x2 = 10marks)

 $[Co(NH_3)_4(ONO)Cl]Cl$ - tetraamminechloridonitritocobalt(iii) chloride. (5x2 =10marks) $[Co(NH_3)_4Cl_2]NO_2$ - tetraamminedichloridocobalt(iii) nitrite. (5x2 = 10marks)

3. $[M(dien)_2]^{3+}$ (10marks)







,10marks)

4. [Mn(EDTA)]²⁻ (10marks) (B) 1. Pressure: 101.3kPa (1013Pa) $/ 1 \times 10^5$ Pa. (3marks) Temperature: 25°C / 298K (3marks) 2. Salt Bridge. (2marks) 3. Anode, (2marks) Mg is a stronger reducing agent than H₂ and therefore, (Mg) will be oxidized. (5marks) 4. $Mg(s) / Mg^{2+}(aq, 1.00 \text{moldm}^{-3}) // H^{+}(aq, 1.00 \text{moldm}^{-3}) / H_{2}(g), Pt(s).$ (10marks) 5. E^θCell E[⊕]Cathode E^θAnode (3marks) E^θAnode 0.00V 2.36V = (2marks) E^θAnode = (-2.36V)(3marks) 6. Anode: $Mg(s) \longrightarrow Mg^{2+}(aq)$ 2e (3marks) Cathode: 2H⁺(aq) + 2e — (3marks) $2H^{+}(aq) \longrightarrow Mg^{2+}(aq)$ 7. Mg(s) +(5marks) (C) 1. $Pb^{2+}(aq)$ (2marks) 2. E^ΘCell E^eCathode E[⊕]Anode (3marks) E^θAnode 1.53V (-0.13V)(2marks) E^θAnode (-1.66V)(3marks) Therefore, unknown metal is "AI". (3marks) 3. Decreases. (5marks) 3Pb²⁺(aq) → 2Al³⁺(aq) 4. 2AI(s) +3Pb(s) (5marks) (D) + 6e — Cr³⁺ $Cr_2O_7^{2-} + 14H^+$ $7H_2O$ (2marks) 2Cr³⁺ + (2marks) $(0.5\text{m}^2 \text{ x } 1 \text{ x } 10^{-5}\text{m}) \text{ x } 10^6\text{cm}^3 \text{ x } 7.28\text{gcm}^{-3}$ Mass of Cr deposited 36.4g (3marks) Moles of Cr deposited 36.4g / 52gmol⁻¹ 0.7mol (2marks) Grade :- 13 (2017) June 2017 F.W.C 12 **Chemistry Answer seets** Q = It

 $n = It/F = 4.2 mol = (50A x t) / 96500 C mol^{-1}$ (2marks)

t = 8106 seconds. (2marks)

(Total 150marks)

Marking system

M.C.Q 50x 1 = 50 Marks

Structured 4x 100 = 400

Essay 4x 150 = 600

20 = 1000 50 Marks

total = 100 Marks





G.C.E. A/L Examination June - 2017

Conducted by Field Work Centre, Thondaimanaru In Collaboration with Provincial Department of Education Northern Province

Grade:13(2017) Chemistry Marking Scheme

Q1)

A)

- 1. CI
- 2. H, Na, Cl
- 3. C
- 4. C, Al
- 5. Al

(5x2 = 10marks)

(B)

1.

H₂C=CH-CH=CH-CH₂-C=O

(10marks)

 NH_2

1

2.

3.

(5x5 = 25marks)

$$H_2C=CH-CH=CH-CH_2-C-\overset{\circ}{\bigcirc}$$
 $-\overset{\circ}{\bigcirc}$ $-\overset{\circ}{\bigcirc}$

Grade :- 13 (2017) June 2017 F.W.C

Chemistry Answer seets

		C¹	C ³	N	0
1.	VSEPR Pairs	3	4	4	3
2.	Electron Pair geometry	Trigonal Planer	Tetrahedral	Tetrahedral	Trigonal Planer
3.	Shape	Trigonal Planer	Tetrahedral	Angular	Linear
4.	Hybridization	SP ²	SP ³	SP ³	SP ²

(2x16 = 32marks)

4. C4 is more electronegative,

C4 is bonded with double bond with more electronegative atom "O". Therefore, bond pair electrons are shifted towards oxygen. So that positive character of C4 increases, electronegativity increases. (5marks)

5. i. SP² H.O of C¹ and SP² H.O of C².

ii. SP³ H.O of C³ and 1S A.O of H.

iii. SP² H.O of C⁴ and SP² H.O of O.

iv. SP²H.O of C⁴ and SP³ H.O of N.

(2x4 = 8marks)

(C) 1. True

2. True

3. False

4. True

5. False

(2x5 = 10 marks)

(Total = 100marks)

Q2)

A)

1.
$$A - Zn$$
 $B - Cl$ $(2x5 = 10marks)$

2. $A - 1S^2 2S^2 2P^6 3S^2 3P^6 3d^{10} 4S^2$.

 $B - 1S^2 2S^2 2P^6 3S^2 3P^5$. (2x5 = 10marks)

3.
$$2Zn + O_2 \longrightarrow 2ZnO$$

$$3Zn + N_2 \longrightarrow Zn_3N_2$$
 (2x2.5 = 5marks)

4. ZnS, ZnO, Zn_3N_2 , $ZnCl_2$. (4x2.5 = 10marks)

5. i. B > A

ii. A > B

iii. B > A

iv. A > B (2.5x4 = 10marks)

6. HCl. (2marks)

7. NH_3 + Cl_2 + NH_4Cl (NH_3 Excess)

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Chemistry Answer seets

```
3HCl (Cl<sub>2</sub>Excess)
                                                                      NH<sub>4</sub>OCl (In aqueous medium)
                                                                                (3x2 = 6marks)
                                   → 2Na(s) + Cl<sub>2</sub>(g) (Electrolysis of fused NaCl)
8. 2NaCl(I) —
                                                                                (2marks)
9. Carbon(graphite) electrodes.
    Electrolyte: NaCl(I) / Fused NaCl.
                                                                                (2x2.5 = 5marks)
10. Na<sup>+</sup>(I) + e ———
                                       → Na(s)
    2CI-(I) \longrightarrow CI_2(g) +
                                          2e
                                                                                (2x5 = 10 marks)
1. A
                       Na_2S_2O_3
                       H_2CO_3
    С
                       PCl_3
    D
                       KMnO<sub>4</sub>
    Ε
                                                                                (2x5 = 10 \text{marks})
                       NaNO<sub>3</sub>
2. i. Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>
                                                       → 2NaCl + S +
                             2HCl —
                                                                                SO<sub>2</sub>
                                                                                                H_2O
                                                  → H<sub>3</sub>PO<sub>3</sub> + 3HCl
    ii. PCl₃
    iii. KMnO<sub>4</sub> -
                                      \rightarrow K<sub>2</sub>MnO<sub>4</sub> + MnO<sub>2</sub> + O<sub>2</sub>
    iv. 3NaNO<sub>3</sub>
                                    + 5NaOH —
                                                                    →8NaAlO<sub>2</sub>
                             8AI
                                                                                                   3NH_3
                                                                                (5x4 = 20marks)
                                                                      (Total = 100marks)
                       8.00 x 10<sup>-4</sup>
```

(03)

(B)

A)

1. R1 -
$$8.00 \times 10^{-4}$$

R2 - 1.60×10^{-3}
R3 - 3.20×10^{-3}
R4 - 3.20×10^{-3} (2.5x4 = 10marks)

2. Rate = $k[P]^P[Q]^q[R]^r$

 $(1/2)^{r}$

Therefore,

(1) / (4): 1/4 =

: r = 2

Rate =
$$k[P][Q][R]^2$$
 (10marks)

- 3. Overall order = 4 (10marks)
- 4. From equation (1),

$$K = 8.0 \times 10^{-4} \text{moldm}^{-3} \text{s}^{-1} / \{(0.2)(0.2)(0.2)^2 \text{mol}^4 \text{dm}^{-12}$$

$$K = 0.5 \text{mol}^{-3} \text{dm}^{9} \text{s}^{-1}$$
 (10 marks)

(Note: Same answer from other equations too)

B) 1.
$$CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$$

Or

1.
$$CH3COOH(aq) \rightleftharpoons CH3COO - (aq) + H + (aq)(5marks)$$

2.
$$CH_3COOH(aq)$$
 + $H_2O(I) \longrightarrow H_3O^+(aq)$ + $CH_3COO^-(aq)$

$$Ka = [H3O+(aq)] \times [CH3COO-(aq)] / [CH3COOH(aq)]$$
 (10marks)

(Physical states are required)

3.
$$pH = 3.0$$

$$[H^{+}(aq)] = 1.0 \times 10^{-3} \text{moldm}^{-3}$$

Ka =
$$(1 \times 10^{-3} \text{moldm}^{-3})^2 / 0.10 \text{moldm}^{-3}$$

$$=$$
 1.0x 10-5moldm⁻³ (10marks)

4. Temperature of the system doesn't change.

Hydrolysis of water itself is negligible compared to acid. (5marks)

5.
$$CH_3COO-(ag) + H_2O(I)$$
 CH_3COOH(ag) + OH-(ag)

$$Ka / Kw = {[H_3O+(aq)] \times [CH_3COO-(aq)] / [CH_3COOH(aq)]}$$

$$[H3O+(aq)] \times [OH-(aq)]$$
 (10marks)

6. pH at the equivalence point is determined by the degree of hydrolysis of the salt.

At the equivalence point [CH₃COOH(aq)] nearlyequal to [OH-(aq)] (5marks)

7. Ka / Kw =
$$[CH_3COO-(aq)]/[OH-(aq)]^2$$

$$[OH-(aq)] = {[CH3COO-(aq)] x (Kw/Ka)}^{1/2}$$

At the equivalence point [CH₃COO-(aq)] = [salt]

Since pH =9.0 at the equivalence point, $[OH-(aq)] = 1 \times 10^{-5} \text{moldm}^{-3}$

$$[salt] = {[OH-(aq)]}^2 x (Ka/Kw)$$

$$[salt] = ([1.0 \times 10-5 \text{moldm}^{-3}])^2 = (0.1 \text{moldm}^{-3} / 1.0 \times 10^{-14} \text{mol}^2 \text{d}^{-6})$$

$$= 0.1 \text{moldm}^{-3} \tag{15 marks}$$

Q4)

A) 1. OH
$$CH_2OH$$

A - $HC \equiv C - CH - CH = C$

ОН

C - CH₃CH₂CHCH₂CH₂CH₂OH

D - CH₃CH₂COCH₂CH₂COOH

E - CH₃CH₂CH₂CH₂COOH

F - CH₃CH₂COCH₂CH₂CH₂COCl

CI CI
H - CH₃CH₂CCH₂CH₂CCH₃
CH₃ CH₃

- I CH₃CH₂CCH₂CH₂CH₂C=CH₂
 - CH₂ CH₃
- J CH₃CH₂COCH₂CH₂COOH
- $K H_2O/CO_2$
- $L H_2O/CO_2$

(5x12 = 60 marks)

2. By the fractional distillation of the liquid mixture.

(10marks)

(B)

- 1. AE CH3CH2COCH2CH3
- 2. SE NH2 Br OR OR Br
- 3. H+/KMnO4 CH3 $C CH_3$ HOOC CH2CH3
- 4. Y
- 5. SE (3x10 = 30marks)

(Total = 100marks)

M.C.Q

А	ทร	wε	ers

1. 3	11. 3	21. 4	31. 2	41. 1
2. 1	12. 5	22. 4	32. 2	42. 1
3. 4	13. 2	23. 2	33. 4	43. 1
4. 2	14. 4	24. 4	34. 4/5	44. 3
5. 4	15. 4	25. 4	35. 5	45. 4
6. 2	16. 5	26. 5	36. 5	46. 1
7. 2	17. 4	27. 3	37. 4	47. 4
8. 4	18. 2	28. 3	38. 3	48. 1
9. 1	19. 1	29. 3	39. 2	49. 4
10. 2	20. 2	30. 1	40. 5	50. 4

