



FWC

G.C.E. A/L Examination June - 2015

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Zonal Department of Education Jaffna.

Grade :- 13 (2015)

Chemistry - I

Time :- Two hours

❖ Underline the correct answer.

01) Who discovered the X- ray?

1) Thomsan

2) Goldstein

3) Rutherford

4) Rontgen

5) Chadwick

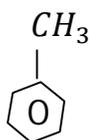
02) The increasing order of atomic radii of the elements Ca, Cs, Si, Rb, O, and F is

1) $F < O < Si < Ca < Rb < Cs$ 2) $O < F < Ca < Si < Rb < Cs$ 3) $F < O < Si < Cs < Ca < Rb$ 4) $F < O < Ca < Si < Rb < Cs$ 5) $O < F < Si < Ca < Rb < Cs$

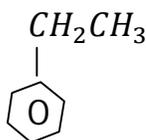
03) The correct structure of ethynyl propynoate

1) $CH_2 = CH - COOCH = CH_2$ 2) $H - C \equiv C - CH_2COO^-$ 3) $H - C \equiv C - COOC \equiv CH$ 4) $H - C \equiv C - COOCH_2CH_3$ 5) $CH_3CH_2COOC \equiv C - H$ 04) A certain salt dissolves in water and gives a coloured solution. When dil NaOH is added to this solution, a blue precipitate is formed. When NH_4OH is added to this precipitate, it dissolves then finally forming a brown coloured solution. The cation present in the salt is1) Cu^{2+} 2) Ni^{2+} 3) Cr^{3+} 4) Co^{3+} 5) Co^{2+}

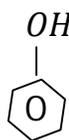
05) The increasing order in the rate of reaction of the compounds A, B, C, D, E and F given below when taking part in electrophilic substitution reaction is



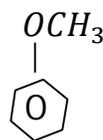
A



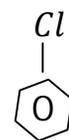
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C



D



E



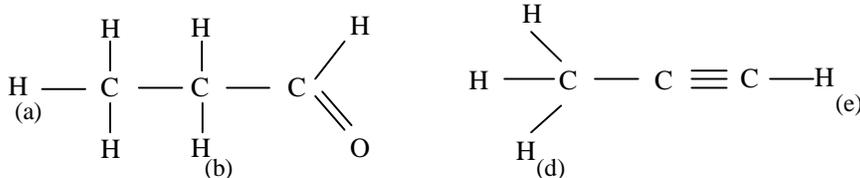
F

1) $E < F < A < B < C < D$ 2) $E < F < A < B < D < C$ 3) $F < E < A < B < D < C$ 4) $E < F < B < A < D < C$ 5) $E < F < B < A < C < D$

06) The pH of a 0.1 mol dm^{-3} monobasic weak acid solution is 3.0. The dissociation constant of this weak acid at this temperature is

- 1) $1.0 \times 10^{-3} \text{ mol dm}^{-3}$ 2) $1.0 \times 10^{-4} \text{ mol dm}^{-3}$ 3) $1.0 \times 10^{-5} \text{ mol dm}^{-3}$
 4) $1.0 \times 10^{-6} \text{ mol dm}^{-3}$ 5) $1.0 \times 10^{-9} \text{ mol dm}^{-3}$

07)



The increasing order of acidity of H atoms marked as (a), (b), (d) and (e) of the above two compounds is

- 1) $a < d < e < b$ 2) $a < d < b < e$ 3) $d < a < b < e$
 4) $b < a < d < e$ 5) $d < a < e < b$

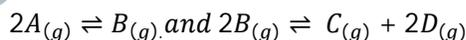
08) The structure of nylon 7, 6 is

- 1) $\left[\text{CO} - (\text{CH}_2)_6 \text{CONH} - (\text{CH}_2)_6 - \text{NH} \right]_n$
 2) $\left[\text{CO} - (\text{CH}_2)_5 \text{CONH} - (\text{CH}_2)_6 - \text{NH} \right]_n$
 3) $\left[\text{CO} - (\text{CH}_2)_7 \text{CONH} - (\text{CH}_2)_7 - \text{NH} \right]_n$
 4) $\left[\text{CO} - (\text{CH}_2)_5 \text{CONH} - (\text{CH}_2)_4 - \text{NH} \right]_n$
 5) $\left[\text{CO} - (\text{CH}_2)_7 \text{CONH} - (\text{CH}_2)_5 - \text{NH} \right]_n$

09) Equal volumes of H_2SO_4 of pH = 1.0 and of HCl of pH = 2.0 were mixed. The pH of the mixture is

- 1) 1.0 2) 1.1 3) 1.3
 4) 1.5 5) 1.8

10) The equilibrium constants at a particular temperature of the reactions



are K_1 and K_2 respectively. The equilibrium constant of the reaction.

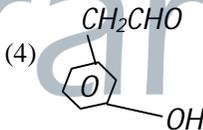
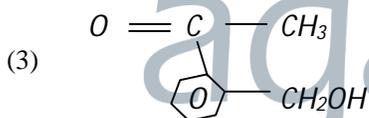
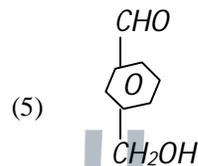
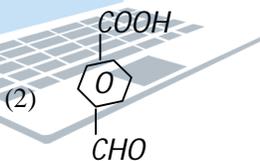
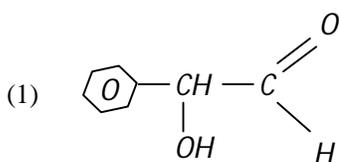
$4A_{(g)} \rightleftharpoons C_{(g)} + 2D_{(g)}$ at the same temperature is

- 1) $2k_1 \times 2K_2$ 2) $2k_1 + 2K_2$ 3) $\frac{1}{2} k_1 \times K_2$
 4) $K_1^2 \times K_2$ 5) $K_1^4 \times K_2^2$

11) The two volatile solvents H_2O and D_2O mix in all proportions. At a given temperature the vapour pressures of pure solvents of H_2O and D_2O are P^0 and P_1^0 respectively and at the same temperature the mole fraction of H_2O in Solution is X. The partial pressures of H_2O and D_2O in the vapour phase at equilibrium with the solution are P and P^1 respectively. Which one of the following mathematical expressions is correct for the above system?

- 1) $1 - X = \frac{P^0 - P_1^0}{P^0}$ 2) $X = \frac{P_1^0 - P_1}{P_1^0}$ 3) $(1 - X)P_1^0 = P_1^0 - P^1$
 4) $XP^0 = P^0 - P$ 5) $X - 1 = \frac{P - P^0}{P^0}$

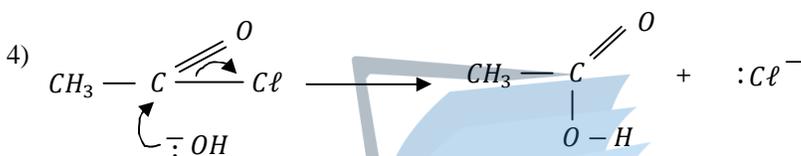
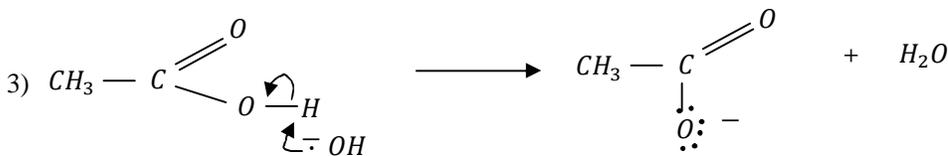
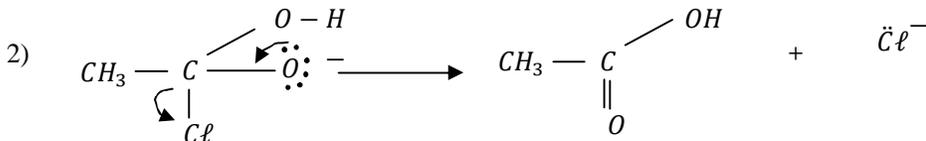
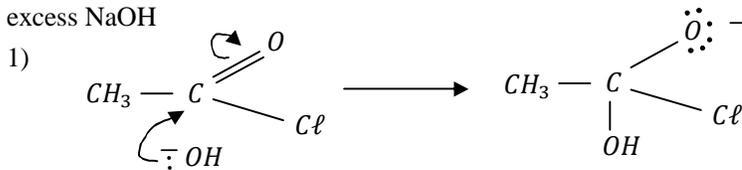
- 18) Which of the following aqueous solutions will have the highest pH value
- 1) $0.01 \text{ mol dm}^{-3} \text{ HCOOH}$
 - 2) $0.05 \text{ mol dm}^{-3} \text{ CH}_3 \text{ COONH}_4$
 - 3) $0.01 \text{ mol dm}^{-3} \text{ NH}_4 \text{ Cl}$
 - 4) $0.05 \text{ mol dm}^{-3} \text{ H}_2 \text{ SO}_4$
 - 5) $0.02 \text{ mol dm}^{-3} \text{ MgCl}_2$
- 19) A solution was prepared by mixing 50 cm^3 , 0.2 mol dm^{-3} , $\text{CH}_3 \text{ CH}_2 \text{ COOH}$ Solution with 50 cm^3 of 0.1 mol dm^{-3} , NaOH solution. The result of adding a further 50 cm^3 of water to the solution is to
- 1) Decrease the pH by half of initial
 - 2) Decrease the pH by $\frac{1}{4}$ of initial
 - 3) Increase the pH by half of initial
 - 4) Increase the pH by $\frac{1}{4}$ of initial
 - 5) Decrease the concentration of acid in the solution keeping the pH approximately constant.
- 20) Consider the following compounds



What compound shows all the following observation?

- 1) Gives an orange coloured precipitate with Brady's reagent
 - 2) Produces a gas on reaction with Na
 - 3) Gives phthalic acid with $\text{H}^+ / \text{K}_2 \text{Cr}_2 \text{O}_7$
 - 4) Does not produce a gas when mixed with aqueous NaHCO_3
- 21) Which one of the following is an oxidation reduction reaction.
- 1) $\text{BaCO}_3 \xrightarrow{\Delta} \text{BaO} + \text{CO}_2$
 - 2) $2\text{K}_2\text{O}_2 \xrightarrow{\Delta} 2\text{K}_2\text{O} + \text{O}_2$
 - 3) $\text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O} \xrightarrow{\Delta} 2\text{CrO}_4^{2-} + 2\text{H}^+$
 - 4) $\text{P}_4\text{O}_{10} + 6\text{H}_2\text{O} \rightarrow 4\text{H}_3\text{PO}_4$
 - 5) $\text{SO}_3 + \text{D}_2\text{O} \rightarrow \text{D}_2\text{SO}_4$

22) Which of the following incorrectly represents a step in the mechanism of the ethanol chloride with excess NaOH



5) 3rd and 4th are incorrect

23) Which of the following statements is incorrect?

- 1) Diazonium salts can react as electrophiles in electrophilic substitution reaction
- 2) Benzene diazonium chloride reacts with phenol to give orange coloured compound
- 3) The compounds in which at least one benzene ring is attached to the nitrogen atom are called aryl amines
- 4) If the catalyst and the reactants are in different phases, they are heterogeneous catalysts
- 5) According to the shape of the graph between $1/t$ vs concentration, order of all reactions can be determined

24) The increasing order of boiling points of diethylether, octane, water & ethanol is

- 1) ethanol < diethylether < Octane < water
- 2) diethylether < Octane < ethanol < water
- 3) Octane < diethylether < water < ethanol
- 4) diethylether < ethanol < water < Octane
- 5) diethylether < Octane < water < ethanol

25) Which of the following statements is not true?

- 1) Bromoethane and iodo ethane solution does not obey Raoult's law
- 2) Propanone and Methanol solution exhibits a negative deviation from Raoult's law.
- 3) Critical temperature of water is greater than the critical temperature of NH_3
- 4) Water and butanol is a partially miscible liquid - liquid solution
- 5) Temperature decreases and volume increases when the solvents ethanol and benzene are mixed

26) Which equipment is not used in the fractional distillation process?

- 1) Liebig condenser
- 2) Thermometer
- 3) Distillation column
- 4) Distillate flask
- 5) Separating funnel

27) Acidic gases in the atmosphere dissolve in water to contribute to the acid rain. Which of the following reactions very less contributes to the acid rain?

- 1) $SO_2(g) + H_2O(l) \rightarrow H_2SO_3(aq)$ 2) $CO_2(g) + H_2O(l) \rightarrow H_2CO_3(aq)$
3) $2SO_2(g) + 2H_2O(l) + O_2(aq) \rightarrow 2H_2SO_4(aq)$ 4) $SO_2(g) \xrightarrow{\text{Oxidant}} SO_3(g) \xrightarrow{H_2O(l)} H_2SO_4(aq)$
5) $4NO_2(aq) + 2H_2O(l) + O_2(aq) \rightarrow 4HNO_3(aq)$

28) Which is not true regarding the photochemical smog

- 1) The starting reaction of photochemical smog is $NO_2 \xrightarrow{h\nu} NO + O$
2) $O + O_2 + M \rightarrow O_3 + M$
 M absorbs excess energy
3) NO_x and unburnt C_xH_y are converted to PAN in the presence of sunlight
4) Most of the photochemical smog products are not toxic to plants
5) photochemical smog affects the respiratory system

29) Consider the following tests

- A : Addition of *but - 2 - enal* to $H^+ / K_2Cr_2O_7$
B : Addition of con *HCl* to a $CuSO_4$ solution
C : Addition of $Fe_2(SO_4)_3$ to a solution of salicylic acid
D : Addition of β - naphthol to a benzene dia-zonium salt
E : Addition of phenol phthalein to a $Na_2CO_3(aq)$,

The colours of solutions / precipitates obtained in A, B, C, D, and E are respectively

- 1) Green, purple, red, Yellow, Pink
2) Green, Yellow, red, Orange, Pink
3) Green, Yellow, purple, red, Pink
4) Green, Blue, Orange, red, Colourless
5) Violet, Yellow, Orange, red, Colourless
- 30) Which of the following statement is not true?
1) Natural rubber is transpoly isoprene
2) Calcium carbide is manufactured by electric heating CaO with coke
3) Iron ore, coke and limestone are used as raw materials in the extraction of iron
4) Bleaching powder is manufactured by passing dry $Cl_{2(g)}$ in to powdered $Ca(OH)_2$
5) Ammonia and carbon dioxide are used as raw materials to the industrial. production of Urea
- 31) Which of the following is not a green house gas / gases
a) dinitrogen oxide b) *CFC* c) N_2 d) O_3

➤ **Instructions for questions No 31 to 40**

- (1) *If Only (a) and (b) are correct*
(2) *If Only (b) and (c) are correct*
(3) *If Only (c) and (d) are correct*
(4) *If Only (a) and (d) are correct*
(5) *If another combination are correct*
- 32) Which of the following may be used to distinguish between $SO_2(g)$ and $H_2S(g)$
a) A Piece of moistened red - coloured flower petal.
b) A Filter paper moistened with lead nitrate
c) $Na_2CO_3(aq)$
d) A solution of $Sr(OH)_2$

- 40) Which of the following may be considered as the notation of standard zinc electrode
- $Zn_{(s)} / ZnSO_4(aq, 1 atm)$
 - $Zn^{2+}(aq 1.0 moldm^{-3}) / Zn_{(s)}$
 - $Zn_{(s)} / ZnSO_4(aq 1.0 moldm^{-3}, 298k)$
 - $Zn_{(s)} / ZnSO_4(aq 1.0 moldm^{-3}, 298k) // H_2(g, 1 atm,) / H^+(aq 1.0 moldm^{-3}), pt_{(s)}$

➤ **Instructions for questions No 41 to 50**

Response	1 st Statement	2 nd Statement
(1)	True	True and correctly explains the 1 st Statement
(2)	True	True but does not explain correctly
(3)	True	False
(4)	False	True
(5)	False	False

	1 st Statement	2 nd Statement
41)	The amount of dissolved oxygen is a measure of water pollution	Concentration of oxygen in polluted water depends only on the aquatic animals
42)	$SO_2(g)$ and $NO_2(g)$ contribute to acid rain	pH of the acid rain water is between 5 to 7
43)	Diazonium salts of aromatic amines react with HCl to form chlorobenzene	Diazonium salts form dyes with phenol
44)	KIO_3 does not react with KI in the presence of dil H_2SO_4	KIO_3 acts as only the reducing agent
45)	$HCl_{(aq)}$ is a stronger acid than $HI_{(aq)}$	Electronegativity of chlorine is greater than that of iodine
46)	In acidic solution only $pH = -\log_{10} [H_3O^+_{(aq)}]$	The ionic product of water increase as the temperature is decreased
47)	Electrophilic addition reactions, of benzene are generally more reactive than alkenes	Stability of carbocation of benzene is greater than that of carbocations of alkenes
48)	In the fermentation of glucose by yeast, all carbon atoms of glucose molecule are oxidised	The chemical products of fermentation of glucose are CO_2 and H_2O only
49)	There is a rapid change of pH near the end point of $NaOH_{(aq)}, HCl_{(aq)}$ titration	There is no rapid change of pH at the beginning of $NaOH_{(aq)} - HCl_{(aq)}$ titration
50)	A solution containing 3 - amino acid functions as a buffer solution	In an 3-amino acid a carbonyl group and an amino group are attached to the consecutive carbon atoms



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Grade :- 13 (2015)

Chemistry - II

Time :- Three hours

Part A

Structured Essay

➤ Answer all four question on this paper itself. (Each question carries 10 marks)

1) (a) Arrange the following in the decreasing order of the property indicated in parenthesis.

i. Na, Be, B, O (first ionization energy)

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ii. O, S, F, Cl (first electron affinity)

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iii. H₂O, CH₄, H₂S, NH₃ (bond angle)

..... > > >

iv. NH₃, NO₂, NO₂⁺, NH₄⁺ (electro negativity of N atom)

..... > > >

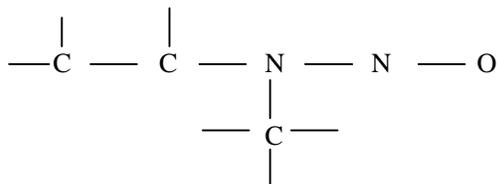
v. BeO, CaO, MgO, Al₂O₃ (melting point)

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vi. NH₂OH, NO, ClNO, FNO₂ (N-O bond length)

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(b) The skeleton of N - Methyl - N - nitroso ethenyl amine is given below.



i. Draw the most acceptable Lewis structure for this molecule

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ii. Draw the resonance structures of it.

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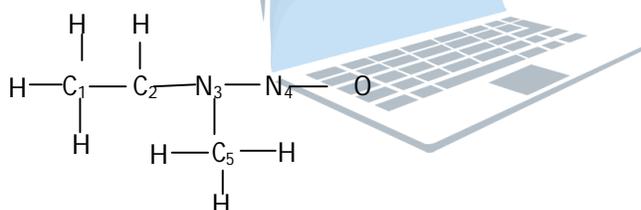
iii. Which of them is / are stable? Give reason.

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iv.



State the following regarding the C and N atoms given in the table below.

	C ₁	C ₂	C ₅	N ₃	N ₄
Electron pair geometry					
Shape					
Hybridization					

v. Sketch the shape of the Lewis structure drawn in part (i) above indicating approximate value of the bond angles.

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vi. Identify the atomic / hybrid orbitals involved in the formation of the following σ - bonds in the Lewis.

1. $C_1 - C_2$:
2. $C_2 - N_3$:
3. $C_5 - N_3$:
4. $N_3 - N_4$:

(c) $HNO_3(l)$, CH_2Cl_2 , CH_3COOH , $Na^+(aq)$, $Ca(ClO)_2$

Which of the above substances is / are related with the following interactive forces / bonds.

- i. Ion - dipole interaction
- ii. Having both ionic bond and co - valent bond
- iii. Dipole - dipole interaction
- iv. Having both covalent bond and co-ordination(dative) bond
- v. Having only covalent bond

2)(a) X is an element which belongs to S - block, an amphoteric element, Which doesn't react with water and react with steam

- i. Identify element X.
- ii. Write the excited state electronic configuration of X.

iii. Give the most suitable positive oxidation state of X.

iv. Give balanced chemical equations for the reaction of element X with

- a. dil HCl
- b. dil NaOH

(b) Y is an element in the fourth period and belongs to d - block. Is an amphoteric element.

i. Identify Y.

ii. Write the balanced chemical equation for the reaction of Y. When heated with $NaNO_2$ and dilute NaOH.

iii. a. Write the balanced chemical equation for the thermal decomposition of a carbonate of Y.

b. State the colour of the above product formed in question (a) in hot condition.

iv. Write two use of Y.

(c) The test tube name from A to E contain aqueous of $MgCl_2$, Na_2CO_3 , K_2CrO_4 , Ni_2SO_4 and $Pb(NO_3)_2$. (but they not in order)

Aqueous $BaI_2(aq)$ and $NH_3(aq)$ were added separately into a portion of each solutions. The following observations were taken.

Solution	BaI_2	dil $NH_3(aq)$
A	a yellow precipitate soluble in hot water.	a white precipitate
B	a White precipitate insoluble in dil HCl	a pale green precipitate soluble in excess $NH_3(aq)$
C	a precipitate insoluble in dil HCl	a clear solution
D	a yellow precipitate soluble in dil HCl	a clear solution
E	a clear solution	a white precipitate

i. Identify the solution from A to E?

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ii. Write the balanced chemical equations for the following reaction.

1. All the reaction forming precipitate (indicate the precipitate with an arrow(\downarrow) in the equations.

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2. All the reaction involving dissolution of precipitate.

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3)(a) Answer the following question using the data given below.

Compound	$\Delta H_f^\theta \text{ KJ mol}^{-1}$	$\Delta S^\theta \text{ Jmol}^{-1}\text{K}^{-1}$
1. $\text{Al}_2\text{O}_3 \text{ (s)}$	-1676	51
2. $\text{AlCl}_3 \text{ (s)}$	-706	109
3. $\text{H}_2\text{O} \text{ (l)}$	-285	70
4. $\text{HCl} \text{ (g)}$	-22	187



i. Calculate the ΔS^θ for the above reaction.

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ii. Calculate ΔG^θ for the above reaction at 25°C.

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iii. Does it take place spontaneously?

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(b) i. State the Raoult's law using symbols. Give the correct descriptions for each symbols

State the conditions to be fulfilled to the Raoult's' law.

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ii. X and Y form an ideal solution. This solution performs an equilibrium with its gas phase in a rigid vessel. Number of moles of X and Y in liquid phase are 0.20mol and 0.30 mole.

The saturated vapour pressures of X and Y are $P_x^0 = 200 \times 10^4 \text{ Pa}$ and $P_y^0 = 400 \times 10^4 \text{ Pa}$

i. Calculate the partial pressure of X.

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ii. Calculate the total pressure of the system

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 (c) Draw the structure of the major products of the reaction gives in the table below. Classify each of the reactions as nucleophilic addition (A_N), electrophilic addition (A_E), nucleophilic substitution (S_N), electrophilic substitution (S_E) or Elimination E, by writing A_N , A_E , S_N , S_E , E in the appropriate cages.

Reaction number	Reactant	Reagent	Major Product	Reaction type
1		dil HNO_3		
2	CH_3CHO	$RMgX$		
3	RCH_2CH_2OH	anhydrous Al_2O_3		
4	CH_3CH_2OH	PCl_3		
5		CH_3COCl , anhydrous $AlCl_3$		

(d) Write the mechanism for reaction 5. Explain why the intermediate formed from nitro benzene.

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Chemistry - II

PART - B

ESSAY QUESTION

➤ Answer the two question only

1)(a)

- State the Le-chaterlier's principle.
- N_2 gas and H_2 gas, with a ratio of 1 : 3 respectively were mixedtogethr into a closed system. The system became to equilibrium at $600^\circ C$. At equilibrium, The pressure of the system was $1 \times 10^6 Nm^{-2}$ 15% gases converted as Ammonia gas, Calculate the K_p for the system.

(b) At $25^\circ C$, X is a solution, of a weak acid, HA of 1.00M, with a $P^H = 3$.

A $200cm^3$ of the sample is taken into shaking bottle, and a $200cm^3$ of an organic solvent was added to it. Two distinct layer were separated after the equilibrium. A $25cm^3$ of the sample of got from the aquous layer Y was titrated with NaOH aqueous of 0.50m using phenolphalein as an indicator. $40cm^3$ of NaOH was required.

- At $25^\circ C$, Dissociation amount, α , of the weak acid, in the solution X.
- At $25^\circ C$, Dissociation constant (K_a) of acid HA
- At $25^\circ C$, Dissociation amount (α) of acid HA, in the solution Y.
- At $25^\circ C$, Dissociation partition co-efficient of the weak acid HA, between water and the organic solvent.
(HA did not dissociate in organic solvent, and neglect the dissociation in aqueous medium)
- The P^H of the mixture containing $25.0cm^3$ of 0.50m NaOH and $25cm^3$ of aqueous X.

2)(a)

- If the solubility of a sparingly soluble solid $Bi_2S_3(s)$ is $S gdm^{-3}$, Give the solubility product of the above compound in term of S. ($Bi = 209$, $S = 32$)
- If the initial concentrations of $CU^{2+}(aq)$ and $Ni^{2+}(aq)$ are $0.01mol dm^{-3}$ and $0.1mol dm^{-3}$ respectively, Find the minimum concentration of H^+ in the solution to avoid the precipitation of N : S show that CuS is precipitate during this even.

$$K_{sp}(NiS) = 1 \times 10^{-20} mol^2 dm^{-6}$$

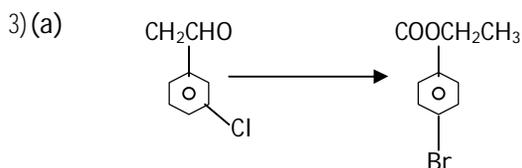
$$K_{sp}(CuS) = 1 \times 10^{-41} mol^2 dm^{-6}$$

$$K_{sp}(H_2S) = 1 \times 10^{-23} mol^2 dm^{-9}$$

(b) The data given are about the two electro chemical cells A and B, Which are made by three different standard electrodes. P and Q are metals.

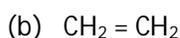
	Electrode - 1	Electrode - 2	Electro motive force (E.M.F)
A	$H^+(aq) / H_2(g)$	$P^{2+}(aq) / P(s)$	1.40V
B	$P^{2+}(aq) / P(s)$	$Q^{2+}(aq) / Q(s)$	1.00V

- Find the standard electrode potential of metal Q, E^{\ominus}
 - Write the cell reaction of electro chemical cell B.
 - When the concentration of $Q^{2+}(aq)$ in cell B, increases to 2.0 mol dm^{-3} , Predict the change in the E.M.F. of the cell using qualitative way.
 - Draw the cell of $Ag(s) / AgCl(s) / Cl^{-}(aq)$ and label it. State the specific feature of that cell.
- (c) A 0.1 mol dm^{-3} , 25 cm^3 of $Na_2CO_3(aq)$ is being titrated by 0.1 M , $HCl(aq)$. Sketch correctly in graph to show the variation of the PH during the titration with the volume of solution.



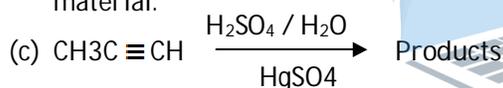
Using only chemicals given in the list, show how would you carry out the above conversion.

$CH_2 = CH_2$, Mg dust, dry ether, Br_2 , $AlBr_3$, $LiAlH_4$, H_2O , $KMnO_4 / H^+$, $PbCl_2$, Conc. H_2SO_4



A

Show how would you synthesize compound B using compound A as the only organic starting material.



State the products and write a suitable mechanism for the above reaction.

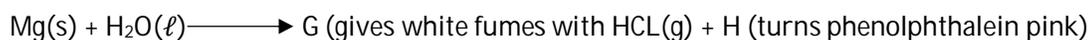
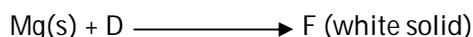
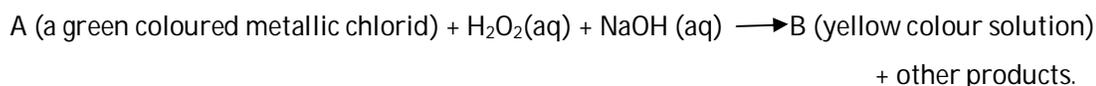


State the products and write a suitable mechanism for the above reaction.

PART - C (ESSAY)

➤ Answer the two question only

- 4) (a) The following question is based on S, P and d block elements in the periodic table. (Their atomic numbers less than 30) Identify the chemical species A, B, C, D, E, F, G, H, I and J in the reaction scheme given below.



(b) Tests (1), (2) and (3) were carried out with an inorganic gaseous compound X. The tests and observations are given below.

Test	Observation
1. Added an acidified solution of $K_2Cr_2O_7$ to the gaseous compound	a green colour solution obtained.
2. On boiling it with H_2O_2 , Cooling it and then adding aqueous solution of $BaCl_2$	a white precipitate insoluble in dilute HCl
3. On passing H_2S to the gaseous compound.	a Pale yellow (sometimes white) turbidity.

- Identify X.
 - Give balanced chemical equations for the reaction that occur in test (1), (2) and (3).
 - Give two uses of X.
 - What is the most important intermolecular force that is present in X.
- (c) The following experiment was carried out to determine the concentration of ethanol in a brand of spirit.

Procedure :

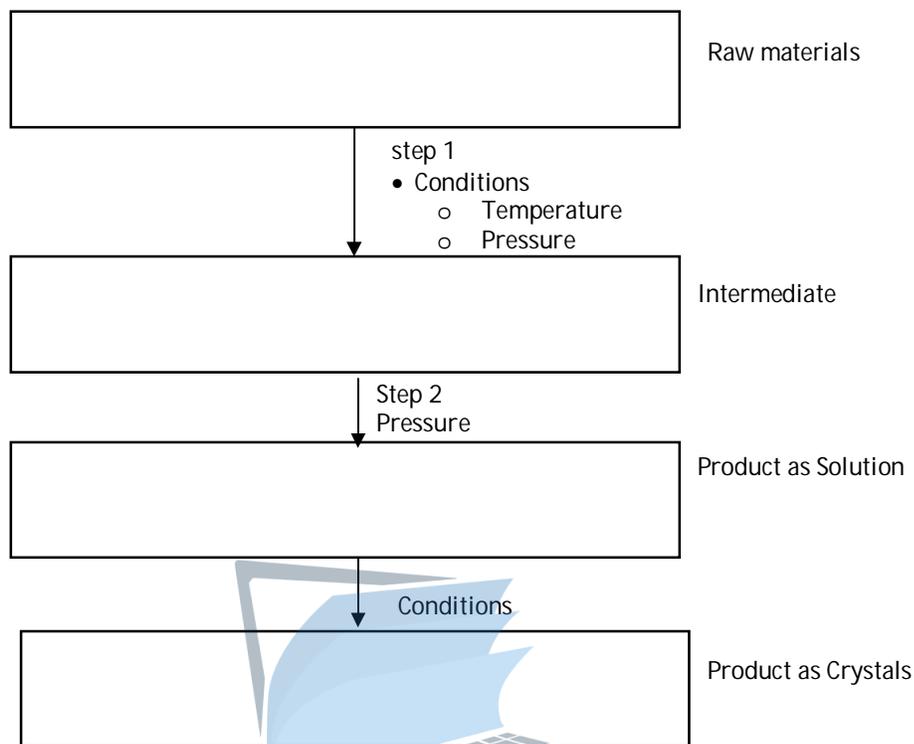
10.0cm³ of a sample of spirit was diluted to 25.0cm³. To a 25.0cm³ portion of the dilute solution, 25.0cm³ of 0.156mol dm⁻³ $K_2Cr_2O_7$ (aq) and excess dilute H_2SO_4 were added. Ethanol reacts with acidified $K_2Cr_2O_7$ (aq) as follows.



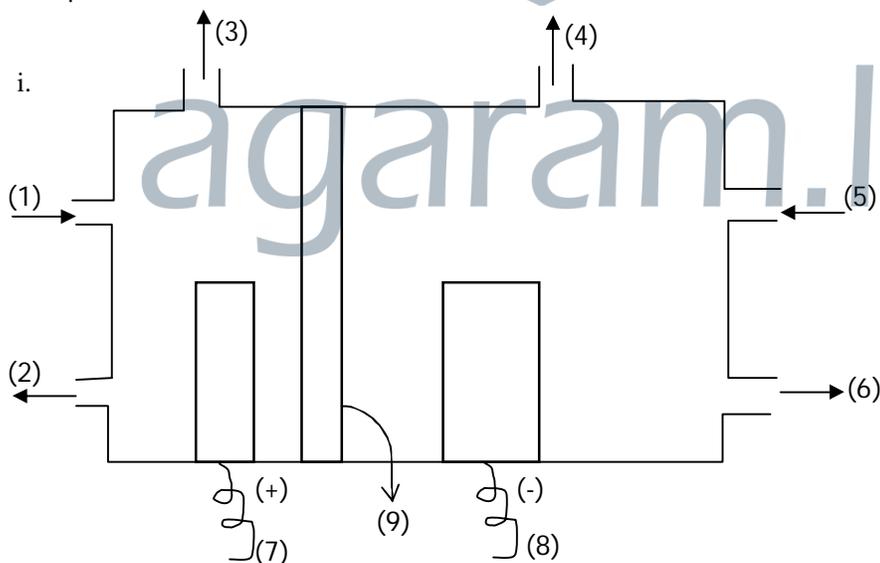
After allowing the mixture to stand for about an hour at room temperature. The excess $K_2Cr_2O_7$ in the mixture was then titrated with 0.118mol dm⁻³ $(NH_4)_2 Fe(SO_4)_2 \cdot 6H_2O$ (aq) using an appropriate indicator. In the titration, 12.25cm³ of the Fe^{2+} (aq) solution was used.

- Give balanced equations for the reaction of
 - $Cr_2O_7^{2-}$ (aq) with C_2H_5OH (aq)
 - Fe^{2+} (aq) with $Cr_2O_7^{2-}$ (aq)
- Find the concentration of ethanol in mol dm⁻³, in this of spirit.

5)(a) Complete the flow chart related with the production of urea.



(b) Sodium hydroxide is commercially produced by electrolysis, using a membrane cell. (1) label the parts and the chemical materials 1 - 9



ii. Write the half-cell reactions.

1. At anode

2. At Cathode

iii. Write the whole cell reaction.

iv. What's the function of the part labeled as 9.

v. Write two uses of NaOH.

(c)

- i. State three sources which pollute the water.
- ii. Write three processes used to infect water.
- iii. Write one demerits of F^- and NO_3^- separately.
- iv. What are the demerits of using hard water.
- v. What are the ions responsible for it.

6) (a) The following experimental results were taken to find the order with respect to Fe^{3+} and I^- in a reaction between acidic Fe^{3+} (aq) and I^- (aq)

Experiment Number	0.1mol dm^{-3} acidic Fe^{3+} (aq) (in cm^3)	0.1mol dm^{-3} acidic KI (aq) (in cm^3)	0.1mol dm^{-3} $Na_2S_2O_3$ (aq) & 1 drop of Starch (in cm^3)	Water (in cm^3)	Time taken to form blue colour
1	25	10	10	-	20
2	25	5	10	5	40
3	15	10	10	10	56
4	10	10	10	15	128
5	5	5	10	25	t

- i. Write an expression for the rate of reaction.
- ii. Find the orders with respect to Fe^{3+} and I^-
- iii. What is the purpose of using equal amount of $Na_2S_2O_3$ solution?
- iv. State a difficult you could face, if the starch is used with out $Na_2S_2O_3$.
- v. Calculate the time taken to form blue colour in the experiment 5.

(b)

- i. Write two natural occurrence of Iron.
- ii. Fe_3O_4 , Magnetite is a mixed oxide. State the formula of each oxides and their colours.
- iii. A mixture contains Fe_2O_3 and Fe_3O_4 11.4g of the above sample was dissolved in dilute HCl. 20.0 cm^3 of 0.16mol dm^{-3} $K_2Cr_2O_7$ (aq) was needed to completely react with the above entire solution.
 - a. Find the molar ration of Fe_2O_3 : Fe_3O_4 in the mixture.
 - b. How much iron can be extracted from 1.0kg of the above sample.

(c) Helium is an inert gas present in air as very low in amount. The composition of He in air is 0.086ppm. Which volume, in dm^3 , of He gas present in the 1000 dm^3 air, under same pressure and temperature.