



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

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Provincial Department of Education Northern Province.

Chemistry I

Grade :- 13 (2018)

Time :- Three hours

Part - I

$$N_A = 6.022 \times 10^{23} \text{ mol}^{-1} \quad h = 6.62 \times 10^{-34} \text{ Js} \quad c = 3 \times 10^8 \text{ ms}^{-1}$$

❖ Answer all the questions

1. Which of the following groups of scientists presented atomic models,

1. Thomson, Rutherford, Stoney
2. Niels Bohr, Thomson, Rutherford
3. Thomson, Millican, Rutherford
4. Dalton, Niels Bohr, Stoney
5. Rutherford, Millican, Stoney

2. What should be the element with the maximum first ionization enthalpy from the elements with following electronic configurations?

1. $ns^2 np^4$
2. $ns^2 np^1$
3. $ns^2 np^3$
4. ns^2
5. ns^1

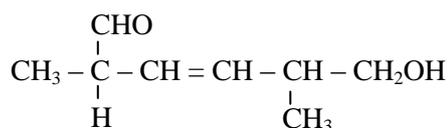
3. The pair of compounds with different shapes is,

1. C_2H_2 , $BeCl_2$
2. H_2O , H_2Se
3. CH_4 , BF_4^-
4. $^+PCl_4$, SF_4
5. $BeCl_2$, ICl_2

4. Which cannot be accepted as the set of quantum numbers of electron in an atom of element which is at third period on periodic table

n	l	ml	ms
1. 3	0	0	$+\frac{1}{2}$
2. 3	1	+1	$-\frac{1}{2}$
3. 3	2	-2	$+\frac{1}{2}$
4. 3	1	0	$+\frac{1}{2}$
5. 3	0	+1	$-\frac{1}{2}$

5. IUPAC name of the given organic compound is,



1. 5 - formyl - 2 - methylhex - 3 - en - 1 - ol
2. 6 - hydroxyl - 2,5 - dimethylhex - 3 - ene - 1 - al
3. 6 - hydroxyl - 2,5 - dimethylhex - 3 - enal
4. 2,5 - dimethyl - 1,6 - oxohexan - 1 - ol
5. 5 - formyl - 2,5 - dimethyl - 3 - hexenol

6. Energy of one mole of photon which has a wave length of 5×10^{-2} nm is,
1. 3.98×10^{-15} J
 2. 3.98×10^{-17} J
 3. 29.69×10^5 KJ
 4. 23.96×10^4 KJ
 5. 23.96×10^5 kJ
7. 1.28 g of hydrocarbon C_7H_{16} is burnt completely in 4.5 g of O_2 gas, As a result 3.94g of CO_2 gas and water vapour were evolved. What is the mass of water vapour evolved?
1. 1.84g
 2. 3.68 g
 3. 0.92 g
 4. 5.52 g
 5. 1.97 g
8. Which is the response with correct increasing order of acidity of CO_2 , SiO_2 , N_2O_5 and SO_3
1. $N_2O_5 < CO_2 < SiO_2 < SO_3$
 2. $CO_2 < N_2O_5 < SO_3 < SiO_2$
 3. $SiO_2 < CO_2 < N_2O_5 < SO_3$
 4. $SO_3 < SiO_2 < CO_2 < N_2O_5$
 5. $CO_2 < SiO_2 < N_2O_5 < SO_3$
9. Experimental procedure given below can be suggested to identify SO_4^{2-} ions in a dilute aqueous solution of Ag_2SO_4
1. Adding a dilute aqueous solution of $BaCl_2$
 2. Adding a dilute aqueous solution of $BaCl_2$ and then adding dilute HNO_3
 3. Adding $Ba(NO_3)_2$ to the filtrate obtained after addition of an aqueous solution of $(NH_4)_2CO_3$
 4. Adding an aqueous solution of $Mg(NO_3)_2$ to the filtrate obtained after addition of an aqueous solution of dil $NaOH$
 5. Adding $BaCl_2$ in acidic medium to the product obtained by heating the initial solution.
10. When a sample of N_2 gas in a rigid vessel of $t^\circ C$ was heated upto $347^\circ C$, the temperature in the vessel $t^\circ C$ be?
1. $27^\circ C$
 2. $320^\circ C$
 3. 300 k
 4. $37^\circ C$
 5. 27 k

11. consider the following equilibrium system



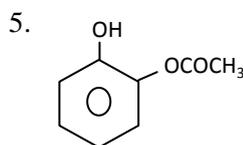
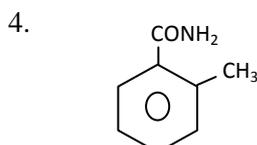
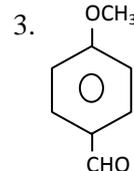
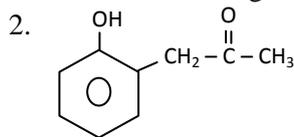
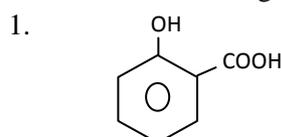
If the equilibrium constant of the system is kp and total pressure is P , the dissociation coefficient of A is α given by

1. $\alpha = \frac{kp/p}{4 + \frac{kp}{p}}$
2. $\alpha = \frac{kp}{4 + kp}$
3. $\alpha = \left(\frac{kp/p}{4 + \frac{kp}{p}} \right)^{\frac{1}{2}}$
4. $\alpha = \left(\frac{kp}{4 + kp} \right)^{\frac{1}{2}}$
5. $\alpha = \frac{kp}{2p + 1}$

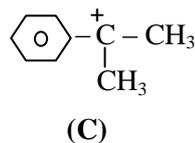
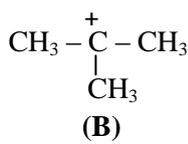
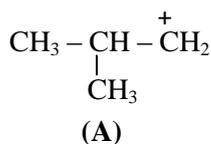
12. Consider the following observations

- a. A neutral solution of $FeCl_3$ is turned purple colours
- b. Formation of a yellow / orange precipitate with 2,4 - DNPH
- c. Oxidized by $OH^- / KMnO_4$. The product after the oxidation forms a white precipitation upon acidification

Which of the following compounds show all there observation given above?



13. The correct increasing order of following A, B C and D Carbocation is,



1. $D < A < B < C$ 2. $A < B < D < C$ 3. $A < D < B < C$
 4. $D < A < C < B$ 5. $A < B < C < D$

14. 25.0 cm³ Volume of acidified 0.02 moldm⁻³ K₂Cr₂O₇ solution was treated with excess of KI and the liberated I₂ was titrated with aqueous solution of Na₂S₂O₃, the volume of Na₂S₂O₃ solution was 20.00cm³. What is the concentration of Na₂S₂O₃ solution.

1. 0.01 moldm⁻³ 2. 1.25 moldm⁻³ 3. 0.15moldm⁻³ 4. 0.5moldm⁻³ 5. 0.6moldm⁻³

15. The most correct expression about an ideal gas formed by diatomic molecules according to the kinetic theory is,

- The pressure exerted by the gas is directly to the root mean square velocity of gaseous molecules
- The pressure exerted by the gas is directly proportional to the mean velocity of molecules.
- The mean square velocity of molecules is inversely proportional to the temperature.
- mean kinetic energy of molecules is directly proportional to absolute temperature.
- The density of the gas is directly proportional to the molar volume.

16. A,B,C and D are four cations which belongs to several groups in group analysis. A gives a white precipitate in dil HCl medium, while B gives an orange precipitate at the same medium when H₂S(g) is added, D gives a white gelatinous precipitate when NH₄Cl, and NH₄OH aqueous are added. After precipitating D, H₂S(g) is passed through its filtrate then C gave a pink precipitate. elements that form above A,B,C and D cations are respectively.

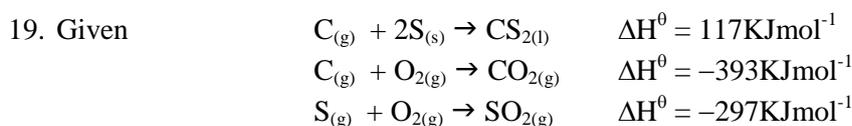
1. Pb, Sb, Al, Mn 2. Hg, Al, Zn, Pb 3. Ag, Sb, Mn, Al
 4. Mg, Sb, Mn, Al 5. Ag, Sb, Al, Mn

17. The correct statement regarding compound formed by elements in nitrogen family is,

- Existence of nitrogen in atmosphere has importance in living matter.
 - All ammonium salt show acidic nature in aqueous solution
 - nitrogen can exist as N₂ molecules as well as N₄ molecules
 - Nitrogen does not form chlorides with formula NCl₅ type.
1. (a) and (c) 2. (b) and (c) 3. (a) and (d)
 4. (a) (b) and (d) 5. (a) (c) and (d)

18. 25.0cm³ of solution of 0.100moldm⁻² BaCl₂ is mixed with 50.00cm³ of a solution of 0.050 moldm⁻³ Na₂CO₃ solution at 25^oC. The Ba²⁺ ion concentration in the resulting solution is in moldm⁻³ (ksp of BaCO₃ at 25^oC = 8.1 x 10⁻⁹ mol²dm⁻⁶)

1. 3.3 x 10⁻² 2. 9.0 x 10⁻³ 3. 6.0 x 10⁻⁴ 4. 9.0 x 10⁻⁵ 5. 5.0 x 10⁻²

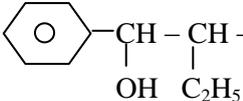


The heat of combustion of CS_{2(l)} to form CO₂ and SO₂ is,

1. -1104 KJmol⁻¹ 2. +1104KJmol⁻¹ 3. 807KJmol⁻¹ 4. -807KJmol⁻¹ 5. 1041KJmol⁻¹

29. Two metal oxides contain 50% and 25% of metal respectively. If the formula of the first oxide is MO, what is the formula of the other oxide?

1. M_2O_3 2. MO_3 3. M_2O_4 4. M_2O_5 5. M_2O

30. Which one of the following statements about the compound  is not true?

1. It is soluble in dil HCl
2. It has four enantiomer isomers
3. It reacts with ethanoylchloride to form an amide
4. It reacts with hot alkaline $KMnO_4$ to form benzoic acid.
5. It react with acidify $KMnO_4$

❖ For each of the question 31 to 40 one or more response out of four responses (a), (b), (c) and (d) given is / are correct. Select the correct responses / responses. In accordance with the instruction given on your answer sheet mark.

1	2	3	4	5
only (a) and (b) are correct	only (b) and (c) are correct	only (c) and (d) are correct	only (a) and (d) are correct	any other number or combination is correct

31. Which of the following statements is / are true,

- (a) Standard atomization enthalpy of chlorine is half of the standard bond dissociation enthalpy of chlorine
- (b) Standard lattice enthalpy of MgO is greater than the standard lattice enthalpy of CaO
- (c) When the sign of ΔH^θ and ΔS^θ values are negative and positive respectively the reaction is always spontaneous
- (d) Enthalpy of second electron affinity of any element is positive value.

32. Which of the following reaction/s liberated colour gas?

- (a) $NaNO_3(aq) + Al(s) + NaOH(aq) \rightarrow$
- (b) $CaCl_2(s) + K_2Cr_2O_7(s) + Con H_2SO_4 \rightarrow$
- (c) $NaBr(s) + H_2SO_4(aq) + KMnO_4(aq) \rightarrow$
- (d) $FeCl_3(aq) + KI(aq) + Cl(aq) \rightarrow$

33. Which of the following statements / s is / are incorrect regarding Hydrogen spectrum

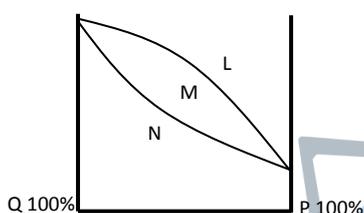
- (a) Hydrogen emmsion spectrum, shows as a dark line in bright background
- (b) The energy of radiation of Balmer series is less than the energy of radiation of lyman series.
- (c) Adsorbtion spectrum is non - continuous spectrum
- (d) Lymon series in the visible range due to the electron transmission to high energy level to first energy levels.

34. Which of the following statements is / are true about the compound



- (a) when reduced with NaBH_4 the product molecule formed are optically active.
- (b) when brominated in the presence of dry AlCl_3  is formed.
- (c) when reduced with Zn(Hg) con HCl the product molecules formed are optically active
- (d) on oxidation with KMnO_4  can be formed.

35. Show below is the constant temperature phase diagram of P and Q which form an ideal solution. Which of the following statements is / are true?



- (a) The vapour phase and liquid phase exist in equilibrium in the region M.
- (b) The boiling point of compound P is higher than the boiling point of compound Q.
- (c) Only the vapour phase exists in the region L.
- (d) Only the liquid phase exists in the region N.

36. Which compounds do not contain S - S bonds?

- (a) $\text{H}_2\text{S}_2\text{O}_6$ (b) $\text{H}_2\text{S}_2\text{O}_7$ (c) $\text{H}_2\text{S}_2\text{O}_5$ (d) $\text{H}_2\text{S}_2\text{O}_4$

37. What is / are correct statement / s regarding pure substance having more critical point

- (a) convert to liquid (b) only liquid phase
- (c) liquid and gas only in equilibrium (d) solid, liquid and gas in equilibrium

38. The solution / s that change pH is considerable amount during addition of 0.5cm^3 of 0.1mol dm^{-3} HCl to 0.1mol dm^{-3} 100.0cm^3 of following solution is / are

- (a) $\text{CH}_3\text{COOH(aq)}$ (b) HCl(aq) (c) NaOH(aq) (d) $\text{H}_2\text{O(l)}$

39. The kinetic molecules theory equation for an ideal gas is $PV = \frac{1}{3}mN\overline{c^2}$. which of the following statement/s is / are true for an ideal gas.

- (a) $\overline{c^2}$ is independent of temperature
- (b) $\overline{c^2}$ is constant at constant temperature
- (c) PV is a constant at constant temperature
- (d) PV is independent of the number of moles.

40. Which of the following substance/s would produce acidic solution when dissolved in water.

- (a) CH_3COONa (b) NaCl (c) NH_4ClO_3 (d) NH_4Cl

❖ Instructions for questions 41 to 50

Response	First statement	Second statement
(1)	True	True and correctly explain in the first statement.
(2)	True	True, but not explain in the first statement correctly
(3)	True	False
(4)	False	True
(5)	False	False

	First statement	Second statement
41.	The ionic product of water (K_w), decreases as the temperature increases.	Dissociation of water vapour is an endothermic process,
42.	Under a given set of condition a catalyst increases the amount of product obtained unit time.	A catalyst alters the enthalpy change of a reaction
43.	NaF has more ionic character than NaI	When the anion is large and / or has a high charge it has a high polarizability
44.	The average molecules speed of $H_2(g)$ at $60^\circ C$ is greater than that of $O_2(g)$ at $30^\circ C$	Average molecules speed is directly proportional to the square root of temperature and inversely proportional to the square root of molar mass.
45.	Electro negativity of NH_4^+ ion is greater than that of NH_2^- ion	in NH_2^- Nitrogen has uninegatively charged but in NH_4^+ Nitrogen has unipositively charged.
46	In hydrides of group 16 boiling point of SbH_3 is higher than the boiling point of NH_3	Strength of secondary interactions in SbH_3 molecules is higher than the strength of secondary interaction in NH_3 molecules.
47	CH_3CONH_2 and $CH_3CH_2NH_2$ can be distinguished by heating with aqueous NaOH.	CH_3CONH_2 release NH_3 gas when heated with aqueous NaOH.
48	Limestone can be used to absorb the acidic gases in atmosphere.	$CaCO_3$ react with SO_2 and formed $CaSO_4$ and CO_2 gas.
49	If formation of HI at less temperature is endothermic at the high temperature, it is exothermic	At high temperature I_2 consist of sublimation energy.
50	p – nitro phenol is more acidic than o – nitro phenol	The intra molecular hydrogen bonds are stronger in p - nitro phenol than in o – nitro phenol.



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Chemistry IIA

Grade :- 13 (2018)

Time :- Three hours

Structure questions A

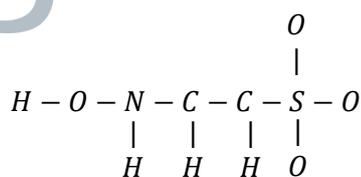
01. (A) Answer the following questions in the space provided

- (i) The highest valency shown by element is 7, and to get the inert gas electronic arrangement that element can accept only one electron at room temperature A_2 is non radio active solid identify A.
- (ii) Of the three iso electronic anions P^{3-} , S^{2-} , Cl^- which one has the largest.....
- (iii) The most thermally stable carbonate among K_2CO_3 , $BeCO_3$, $MgCO_3$
- (iv) Write the increasing order of the electro negativity of oxygen atom for the following NO_3^- , NO_2^- , NO_2
- (v) Out of As, Zn, Bi, and Be two elements which shows amphoteric properties.....
- (vi) Write the increasing order of the bond angle for the following ions NO_2^+ , SO_3^{2-} and CO_3^{2-}

.....

6 x 5 = 30

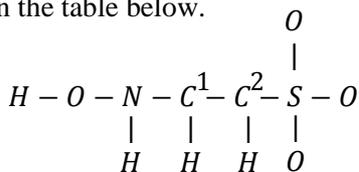
(B) The following parts (i) to (v) based on the ion $[C_2H_4SNO_4]^-$. It has the following skelton.



- (i) Draw the most acceptable lewis structure for this ion.

- (ii) Draw four resonance structure for this molecule. (including the structure draw in part (i))

- (iii) Based on the Lewis structure drawn in (i) above, state the following regarding the C, N and S atoms given in the table below.



	N	C ₁	S
i. VSEPR Pairs			
ii. Electron Pair geometry			
iii. shape around the atom			
iv. Hybridization			

- (iv) identify the atomic hybrid orbitals involved in the formation of the following σ bonds in the Lewis structure drawn in part (i) above.

- i. N - H N..... H
- ii. N - C¹ N C¹
- iii. C¹ - H C¹..... H
- iv. C² - S C²..... S

50 Marks

- (C) Select most appropriate answer and write in the box given.

- (i) Species in which bond angle $Cl \hat{A} l Cl$ of $AlCl_3$ is greater (NH_3 , CH_4 , $POCl_3$, XeF_2)
- (ii) Compound do not have the 3 dimensional lattice structure (diamond, Graphite, $NaCl$, Silica)
- (iii) species has both ionic bond and covalent bond (K_2SO_4 , SO_3 , H_3PO_4)
- (iv) The element which has the highest boiling point (Mn, Cr, Zn, V)

20 Marks

02. (A) A is an element and its atomic number is less than 20. A gives clear solution B and liberate colours less gas C, with dil HCl, further A gives clear solution D and liberate the same gas C with dil NaOH. molecular shape of the stable chloride of A is tetrahedral.

- (i) Identify the element A.
.....
- (ii) Write the electronic configuration of A
.....
- (iii) Identify the products B, C and D.
.....
.....
- (iv) Write is the balance chemical equations for the above two reactions.
A + HCl(aq)
- A + NaOH(aq)
- (v) Write the two important uses of A
.....
- (vi) What is the confirmatory test to identify the ion of A
.....

42 Marks

(B) Unlabeled four colorless solutions contain H_2SO_4 , $\text{Ba}(\text{NO}_3)_2$, MgSO_4 and Na_2SO_3 . These solution were named as A,B, C and D and then one of these solutions was mixed with the rest of three solutions.

The following observations were given as in the chart below.

	A	B	C	D
A	-	White precipitate	White precipitate	White precipitate
B	White precipitate	-	White precipitate	Colourless gas
C	White precipitate	White precipitate	-	x
D	White precipitate	Colourless gas	x	-

Identify A, B, C and D.

A.....

B.....

C.....

D.....

4 x 07 = 28 Marks

(C) The following questions are based on the transition metal Cr and its compounds

(i). State the common oxidation state of Cr.

.....

(ii). Give the chemical formula of the oxides formed by Cr in this common oxidation states, Indicate whether each of these oxides is acidic, amphoteric or basic.

.....

(iii). Write two oxianions of Cr, and write the colours of two oxidations given by you.

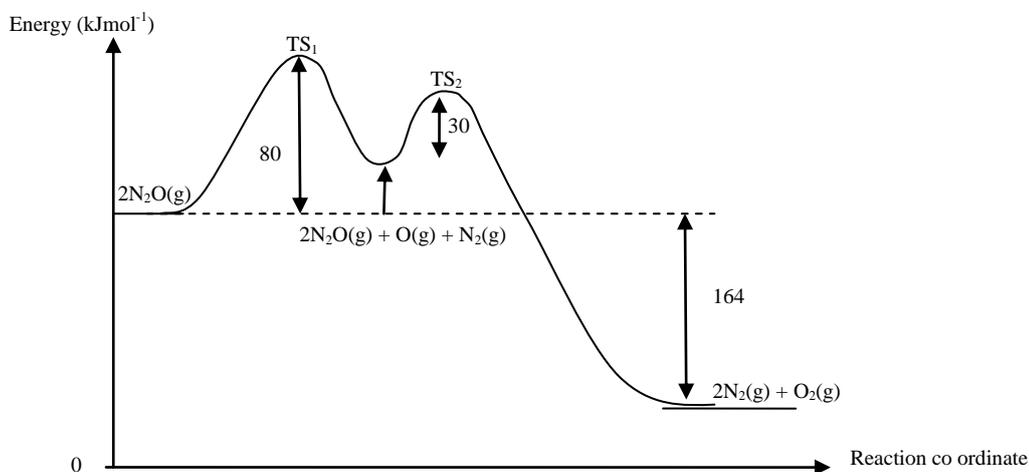
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(iv). Give half reactions to show how $\text{K}_2\text{Cr}_2\text{O}_7$ behave as an oxidizing agent in acidic medium.

.....

30 Marks

03. (A) N_2O is neutral gases compound and it is called laughing gas. At 500k temperature and $1 \times 10^5\text{Pa}$ pressure, N_2O gets thermally decomposed into N_2 and O_2 gases. The studies have revealed that reaction progress of the thermal decomposition reaction takes the following manner.



(i) Write the mechanism of this decomposition reaction and obtain overall reaction

.....
.....
.....

(ii) What is / are the intermediate products.

.....
.....

(iii) What are the values of ΔH and E_a of this reaction

ΔH E_a

.....
.....

(iv) $S_f \text{ Jmol}^{-1}\text{k}^{-1}$

$\text{N}_2(\text{g})$ 192

$\text{O}_2(\text{g})$ 205

$\text{N}_2\text{O}(\text{g})$ 220

a. Calculate the ΔS value for the reaction at 500K.



.....
.....
.....

b. Calculate ΔG for the above reaction

agaram.lk

c. State whether the above reaction is spontaneous or non spontaneous, and give the reason for your answer.

.....
.....

45 Marks

(B) Q is hydrated salt containing Na, S, H and O only. It contain 18.5% of Na, 25.8% of S and 4.0% of H and remaining O by mass. In this compound H is present as H_2O only.

(Na = 23, S = 32, H = 1, O = 16)

(i) Determine the empirical formula of Q.

.....
.....
.....
.....
.....
.....

(ii) If the relative moles mass of Q is 248, reduce its molecular formula.

.....
.....
.....
.....

(iii) Write the shape of the anion in the salt Q.

.....
.....

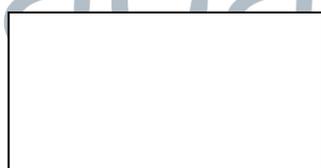
(iv) 0.5mol dm^{-3} , 25.0cm^3 aqueous solution of salt Q was titrated with 0.2mol dm^{-3} KI_3 aqueous solution in the presence of 2 drops of structure as an indicator. Calculate the volume of $\text{KI}_3(\text{aq})$ at the end point.

.....
.....
.....
.....

55 Marks

04. (A) The halides A,B and C are structural isomers of each other having the molecular formula $\text{C}_4\text{H}_9\text{Cl}$. All three isomers are reacted with diluted NaOH solution formed products D,E,F respectively. Only D and E are reacted with PCC (Pyridinium chlorochromate) formed products G and H respectively. within the products G and H only G is reacted with Tollents reagent in a hot condition formed silver mirror.

(i) Draw the structures of A,B,C,D,E,F,G and H.



A



B



C



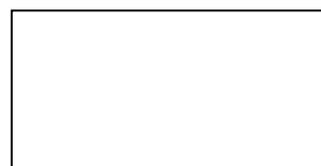
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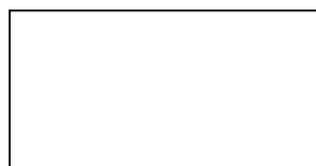
E



F



G



H

- (ii) When C heated with ethanolic KOH, obtained a product I. This product I formed F when treated with diluted H_2SO_4 .

a. Draw the structure I.

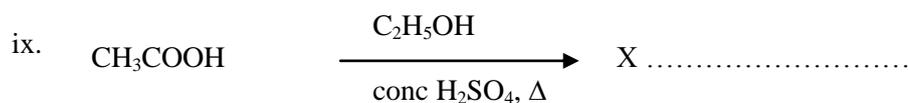
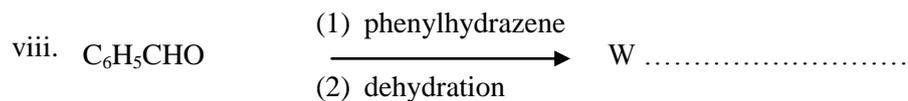
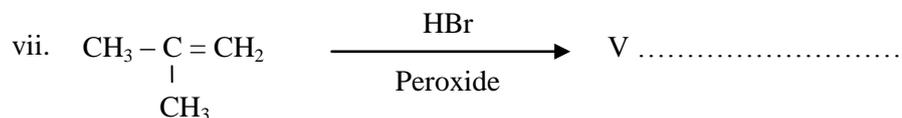
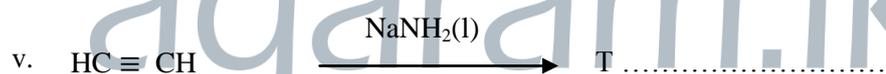
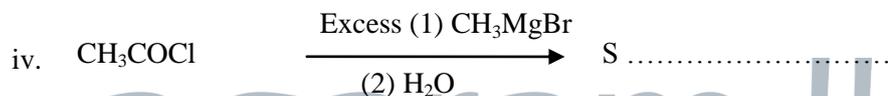
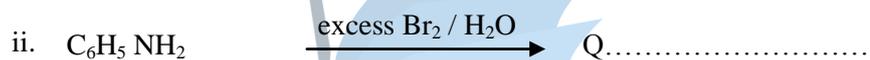
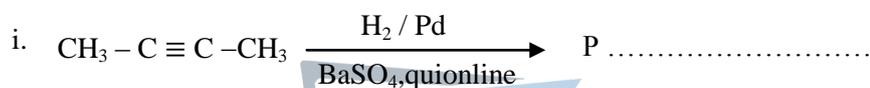
b. Write the mechanism for the following reaction.



.....

55 Marks

(B) Draw the structure of the major products P, Q, R, S, T, U, V, W and X of the following reaction.



45 Marks



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

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Provincial Department of Education, Northern Province.

Chemistry IIB

Grade :- 13 (2018)

Essay Questions II B

- 05) (a) i. Write the ideal gas equation and mention the terms in this equation.
- ii. Balloon with hot air had a open end in bottom, and connect to passenger carrier which can be carried two or three passenger. The burner include inside the balloon heated air by burning propane. Consider the volume of the balloon is $1.5 \times 10^4 \text{ dm}^3$ and assume that the volume is not changed when heating. Calculate the mass of the gas inside the balloon at $1.0 \times 10^5 \text{ Pa}$ at 300 K temperature. (mean molar mass of the gas is 35)
- iii. Standard enthalpy of combustion of propane gas is $-2220 \text{ kJ mol}^{-1}$. Standard enthalpy of formation of $\text{CO}_2(\text{g})$ and $\text{H}_2\text{O}(\text{g})$ are -393 kJ mol^{-1} and -286 kJ mol^{-1} respectively. Calculate the standard enthalpy of formation of propane gas.

60 Marks

- (b) Consider the following exhibited by gas P contain in a 10 dm^3 closed rigid vessel.
- i. At a temperature 47°C , 'P' under goes the following reaction.



After equilibrium is reached 60% of 'P' is remaining in the mixture. At equilibrium total pressure of the system is $6 \times 10^5 \text{ Pa}$. Calculate the equilibrium constant K_p and K_c at 47°C temperature. [at 47°C $RT = 2.66 \text{ kJ mol}^{-1}$]

- ii. When the temperature of the system is increases to 77°C in addition to the above. reaction 'P' under goes another reaction as shown blow.



After the system reaches equilibrium at 77°C it has been found that 15% of the initial amount of P has been converted to s(g) and that 20% of initial amount of P is remaining. Initial mole of P was 3.

- a. Calculate the moles of P,Q,R and cut this equilibrium at 77°C .
- b. Calculate the equilibrium constant K_p at 77°C for the reaction (1).
- c. State whether this reaction is endothermic or exothermic.

90 Marks

06. (a) i. Define the term average rate for a given chemical reaction.
- ii. The reactant A, B and C react with each other in an aqueous medium to yield products D and E. Shown below.



The table given below the result of the four experiments performed at 32⁰c to investigate the kinetics of reaction.

Experiment	Initial concentration of A moldm ⁻³	Initial concentration of B moldm ⁻³	Initial concentration of C moldm ⁻³	Initial rate of formation of product moldm ⁻³ s ⁻¹
1	0.1	0.1	0.1	8.0 x 10 ⁻⁴
2	0.2	0.2	0.1	3.2 x 10 ⁻³
3	0.1	0.1	0.2	1.6 x 10 ⁻³
4	0.2	0.1	0.1	1.6 x 10 ⁻³

1. Write the mathematical expression to relate the rate of the above reaction to concentration of A, B and C.
2. Calculate the order of the reactant with respects to A, B and C.
3. Write the total order of the reactant
4. What are the factors affecting the rate of the reactions. (give three factors)

50 Marks

(b) An insecticide Y is soluble in carbon tetra chloride (CCl₄) as well as in water. By shaking an aqueous solution of y with CCl₄ some of the y can be extracted into the CCl₄ layer. 500cm³ of aqueous solution of 0.36moldm⁻³ was extracted with a total volume of 500cm³ of CCl₄ of 30⁰c. Two alternate extraction procedures of (m) and (n) described below where used for this purpose.

(m) Extraction with 500cm³ of CCl₄ in one step. At equilibrium CCl₄ layers is found to certain 0.165 mol Y.

(n) Extraction with two successive. 250cm³ portion of CCl₄ in two steps.

- i. Write down an expression for the partion co – effiecnt k_D for y between CCl₄ and water.
- ii. Calculate the volume of k_D at 30⁰c
- iii. Calculate the total number of moles of y extracted in two 250cm³ portion of CCl₄ in procedure (n).
- iv. State which of the two extraction procedures (m) and (n) is more efficient for the extraction of y from an aqueous solution into CCl₄.

50 Marks

- (c) i. The solubility product of AgBr is $9 \times 10^{-12} \text{ mol}^2\text{dm}^{-6}$ at 27⁰c. Calculate the Ag⁺ concentration in a saturated aqueous solution of AgBr at this temperature.
- ii. Calculate the mass of pure solid NaBr that should be added to 1dm³ of the solution in part (i) above to halve the concentration of Ag⁺ at 27⁰c. [Na = 23, Br = 80]

- iii. The solubility product of CuBr is $4.2 \times 10^{-9} \text{ mol}^2\text{dm}^{-6}$ at 27°C . Calculate the concentration of Ag^+ and Cu^+ separately in an aqueous solution saturated with both AgBr and CuBr at this temperature.

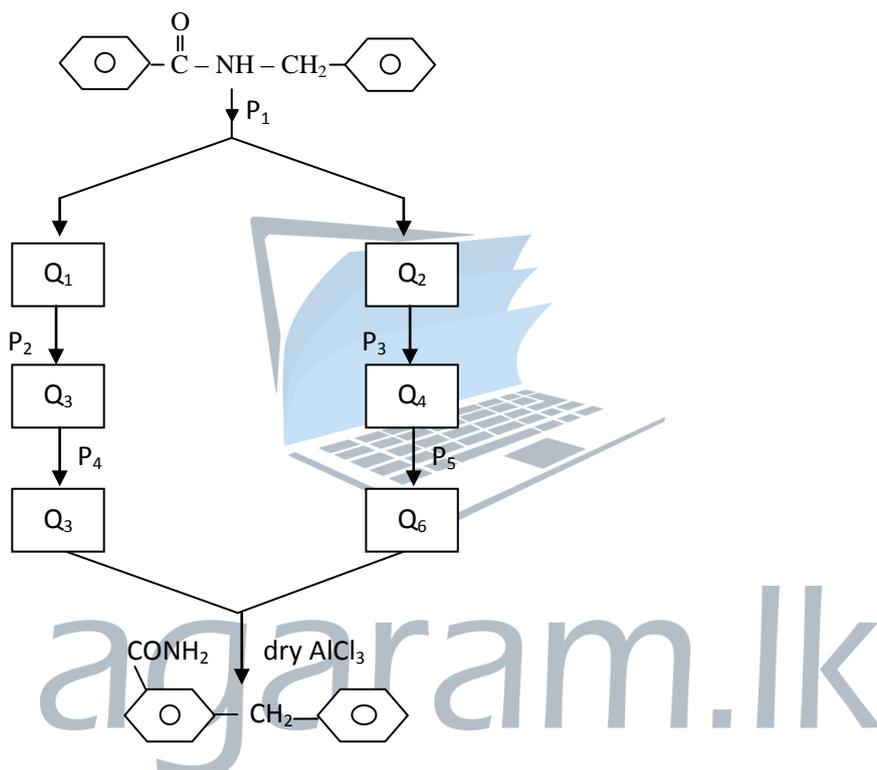
50 Marks

07. (a) Show how you would carry out the following conversion in not more than six steps.



45 Marks

- (b) Identify $\text{P}_1 - \text{P}_5$ and Q_1 to Q_6 in order to complete reaction scheme.



Write down the use of dry AlCl_3 in the above reaction scheme.

75 Marks

- (c) Using your knowledge of the mechanism of the reaction between acetaldehyde (CH_3CHO) and dilute NaOH, Propose mechanism for the above reaction.

30 Marks

Part C

08. (a) The colour aqueous solution Q contains. three metal ions as their chlorides. The test performed with solution Q together with their observation are given below.

Test	Observation
1. Equal volume of NH_4OH aqueous and NH_4Cl aqueous were added to the solution Q.	A green colour precipitate was formed. This precipitate dissolve in excess KOH solution formed dark green solution.
2. to the above filtrate from (i), NH_4Cl and NH_4OH were added then H_2S gas passed to it.	pink precipitate was formed.
3. To the above filtrate form (2) NH_4Cl and NH_4OH were added and then $(\text{NH}_4)_2\text{CO}_3$ was added to it. To the above precipitate flame test was done.	white precipitate was formed. crimson red colour was observed.

- i. Identify the metal ions in solution Q
- ii. Identify the precipitate obtained in the tests (1), (2) and (3).
- iii. Give the balanced chemical equation for the reaction of the dark green colour solution formed in test (1).

55 Marks

- (b) An aqueous solution 'A' contains three anions. The following tests were carried out to identify three anions.

	Test	Observation
1.	(a) Pb(NO ₃) ₂ solution was added to solution A.	Yellow is white precipitate was formed.
	(b) The solution containing yellowish white precipitate was boiled.	portion of the precipate was dissolved.
	(c) The solution obtained from (b) was filtered in a hot condition. After that is was allowed to cool to room temperature.	Golden spangle cristal was formed.
2.	dilute HCl solution was added to the solution A.	A pea yellow colour precipite was formed at the sametime pungent smell was felt.
3.	Aluminum power and dilute NaOH was added to the solution and it was heated. The evolved gas was tested with the filter paper which was dipped. in the Nessler's reagent.	The filter papers tunns to brown colour.

Identify the anions in the solution.

45 Marks

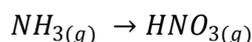
- (c) Write balanced chemical equations to the following reactions.

- i. Oxidizing action of SO₂
- ii. oxidizing action of H₂S
- iii. Reducing action of H₂O₂
- iv. Hydrolysis of NCl₅
- v. Hydrolysis of BiCl₃

50 Marks

09. (A) The following questions are based on nitrogen and its compounds.

- i) Nitrogen gas is inert at room temperature. Explain this statement briefly.
- ii) Write the chemical formula and common names of oxides of nitrogen.
- iii) Give the oxidation number of nitrogen in each oxide you identified.
- iv) Indicate whether each oxide is acidic basic or neutral.
- v) Draw the resonance structure of the of nitrogen where the oxidation number of nitrogen is + V.
- vi) Complete the conversion given below



Balance the chemical equation with appropriate conditions.

75 Marks

(B) The following questions are based on the 3d transition metals X and Y.

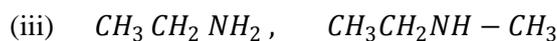
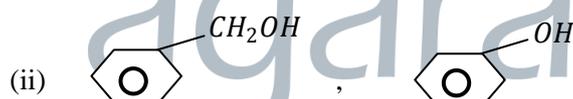
- a) X has the highest melting point and boiling Point in 3d elements.
- b) Y has the highest oxidation states in 3d elements
 - (i) Identify elements X and Y.
 - (ii) Write the electronic configuration of X and Y
 - (iii) State the positive oxidation states of X.
 - (iv) Give the chemical formula of the oxides formed by X and indicate whether each of these oxide is basic, amphoteric or acidic.
 - (v) Give two oxianions of Y and indicate their colours in aqueous medium.
 - (vi) Give half reaction to show how the univalent ionic anion given by you behave as an oxidizing agent in acidic and basic medium.
 - (vii) Give one important use of X and Y.

75 Marks

10. (a) A solution "Q" contain SO_3^{2-} and $C_2O_4^{2-}$ ions, 25.0 cm^3 of solution "Q" required 50.0 cm^3 of 0.04 mol dm^{-3} , $KMnO_4$ solution for the complete reaction under acidic condition. The resulting solution was treated with excess of $BaCl_2$ in the presence of dil HNO_3 . The mass of the white precipitate obtained after drying was 0.233 g . ($Ba = 137, S = 32, O = 16$) Calculate the concentration of SO_3^{2-} and $C_2O_4^{2-}$ ions in solution Q.

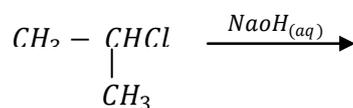
50 Marks

(b) Show how do you distinguish between the following pairs of chemicals.



30 Marks

c) (i) Give the product to this reaction.



(ii) Write the mechanism of the above reaction

20 Marks

d) Two volatile liquids P and Q form ideal solution with each other at all composition. One such solution begin to boil at temperature 68°C under an external pressure at $1 \times 10^5\text{ Pa}$. The mole fraction of P in the vapour phase is 0.72 while the mole fraction of Q in the liquid phase is 0.24. Boiling point of P is less than the boiling point of Q.

- (i) Calculate the vapour pressure of P and Q at the above conditions.
- (ii) Calculate the saturated vapour pressure of P and Q
- (iii) Sketch the temperature Vs composition diagram for the P and Q system under the above conditions and label it fully.

50 Marks