



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

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with

Provincial Department of Education Northern Province.

Chemistry - II

Grade :- 12 (2018)

Part- II

Structured essay - A

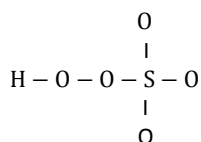
❖ Answer all questions on This paper itself.

01. a) A list of p – block elements of the periodic table is given below.

B	C	N	O	F	Ne
Al	Si	P	S	Cl	Ar

- 1) Write non – metallic element/s which form heteroatomic covalent lattice with high hardness.
.....
- 2) Identify the element with the lowest first ionisation energy
- 3) Element/s showing amphoteric property
- 4) Element/s in solid state which has more allotropes
- 5) Element which produces acid with the highest oxidation state
- 6) Element with the lowest atomic radius

b) Using the basic structure of HSO_5^- which is given below, answer the questions (i) – (v)



- 1) Draw acceptable Lewis structure of this ion.
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- 2) Draw acceptable resonance structures of this ion.
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3) Using VSEPR theory deduce the shapes around the following atoms.

a) O attached to H, O

.....

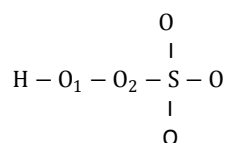
b) O attached to O,S

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4) In the table given below indicate the following

	O attached to H, O	O attached to O,S
i. geometry of the electron pair.		
ii. hybridization		

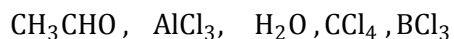
5) In the Lewis structure drawn in part (i) above identify the atom / hybridized orbital related to the formation of the following bonds. In the Lewis structure O atoms are named 1,2.



- i. H and O_1
- ii. O_1 and O_2

c)

1) From the list given below select the dipole species.



.....

2) State the type of intermolecular forces in each of the following pairs.

i. HCl , H_2O_2

ii. Ne , SiCl_4

iii. CH_3CHO , HF

02. a) A and B are elements belonging to the S block of the periodic table while A reacts with water at ordinary conditions to produce hydroxide, B does not react with water at ordinary conditions but reacts to form hydroxide. Hydroxide of A is more basic than the hydroxide of B. Hydroxide of A is used in the manufacture of soap. Hydroxide of B is used in the production of antacid tablets.

1) Identify A and B

A -

B -

2) Write the electronic configuration of A and B.

.....
.....

3) State the relative sizes of A and B in the following.

i. atomic size >

ii. density >

iii. melting point >

iv. First ionization energy >

4) Write the reactions taking place when B is burnt in air.

.....
.....

5) One of the products obtained in the above reactions dissolve in water to produce a basic gas. Write balanced equation.

.....

6) State a simple test to identify the above gas.

.....

b) The following questions are based on Mn, Cr and their compounds.

i. Write the electronic configuration of Mn.

.....

ii. State the positive oxidation states of Mn.

.....

iii. State the formulae of the oxides for each of the oxidation states indicated in (ii) above and indicate their acidic, basic, amphoteric properties.

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.....
.....

iv. Write the chemical formulae of the two oxyanions formed by Mn.

.....
.....

v. Of the anions stated above, write the half ionic equation where the most stable oxyanion acts as oxidizing agent in acidic medium.

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.....

vi. In aqueous medium state the colour and the formula of Cr.

.....

vii. What will you observe if small amount of dilute HCl is added to the above solution.

.....

viii. What will be the observation if concentrated HCl is added to the solution in (vii) above. state the formula of the complex responsible for the above observation.

.....

ix. Indicate the observation when NaOH is added to $K_2Cr_2O_7(aq)$

.....

x. Write balanced equation for the observation stated in (ix) above.

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03. a) Briefly explain the following.

1) Closed system

.....

2) Entropy.....

.....

3) Gibbs energy

.....

b) Consider the chemical reaction $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ and the thermo chemical data at $25^\circ C$ which is given below.

Chemical species	$CaCO_3$	CaO	CO_2
Standard enthalpy of formation kJ/mol	- 1207	- 635	-393
Standard entropy $Jmol^{-1}K^{-1}$	93	38	214

1) Calculate ΔH^θ for the above reaction at $25^\circ C$

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.....

.....

2) Calculate ΔS^θ for the above reaction at $25^\circ C$.

.....

.....

.....

.....

3)

i. Write an expression for a chemical reaction connect ΔG , ΔH and ΔS .

.....

ii. Calculate ΔG^\ominus for the above reaction at $25^\circ C$.

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

iii. Giving reasons state the spontaneity of the reaction.

.....

iv. Calculate the dissociation temperature of $CaCO_3$.

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

v. State the assumption you used in part (iv) above.

.....

c) Enthalpies of formation of some substances are given below.

substance	$H_2O(l)$	$CO_2(g)$	$C_4H_{10}(g)$
$\Delta H_f^\ominus \text{ kJmol}^{-1}$	- 286	- 394	- 126

1) Calculate the standard enthalpy of combustion of C_4H_{10}

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

2) Calculate the quantity of heat needed to raise the temperature of 800cm^3 of water from $25^\circ C$ to $55^\circ C$ (density of water 1gcm^{-3} , heat capacity of water $4.2\text{Jg}^{-1}\text{C}^{-1}$)

.....
.....

3) Calculate the mass of C_4H_{10} required to raise the above temperature.

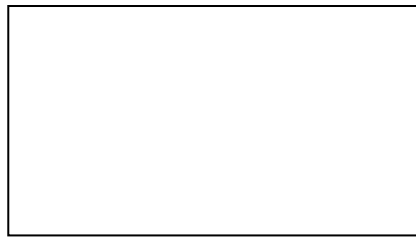
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04. a) A is an unsaturated hydrocarbon with molecular formula C_7H_{14} . It may exhibit only optical isomerism / only geometrical isomerism / both optical and geometrical isomerism. / does not exhibit both geometrical and optical isomerism.

1) If A exhibits only optical isomerism, draw 2 structures which are not mirror image.

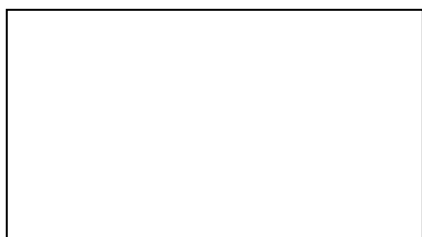


B



C

2) If A exhibits only geometrical isomerism draw its structure.



D

3) Draw the structure if A exhibits both geometrical and optical isomerism.



E

4) Draw one structure of A which does not exhibit both geometrical and optical isomerism.



F

5) On catalytic hydrogenation of B, C, D, E, F if the only product is optically active compound G, draw its structure.



G

6) Draw the structure of another compound H which is a chain isomer of G.



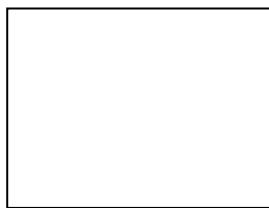
H

b) State the reactants and conditions in each of the following reactions from 1 to 8.

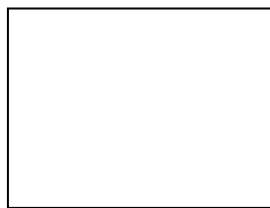
- | | | |
|---|---------------|---|
| 1) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_3$ | J | $\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_2\text{CH}_3$ |
| | \rightarrow | |
| 2) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{H}$ | K | $\text{CH}_3\text{CH} = \text{CH}_2$ |
| | \rightarrow | |
| 3) $\text{CH}_3\text{CH}_2\text{CH}_2 - \text{Br}$ | L | $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgBr}$ |
| | \rightarrow | |
| 4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2 - \text{Br}$ | M | $\text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2$ |
| | \rightarrow | |
| 5) CH_4 | N | CCl_4 |
| | \rightarrow | |
| 6) $\text{CH}_3\text{CH}_2 - \text{C} \equiv \text{CH}$ | O | $\text{CH}_3\text{CH}_2 - \text{C} \equiv \text{C Cu}$ |
| | \rightarrow | |
| 7) $\text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2$ | P | $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ |
| | \rightarrow | |
| 8) $\text{CH}_3\text{C} \equiv \text{C} - \text{CH}_3$ | Q | $\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$ |
| | \rightarrow | |



J



K



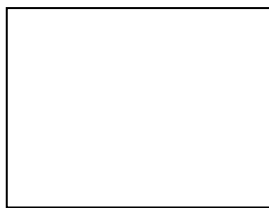
L



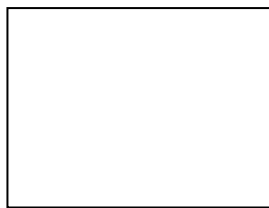
M



N



O



P

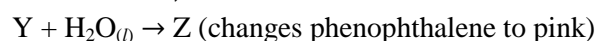
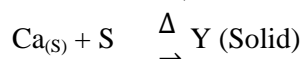
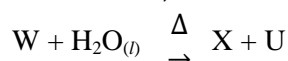
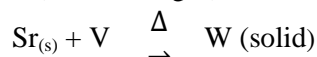
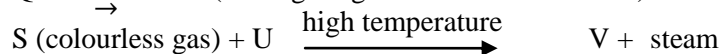
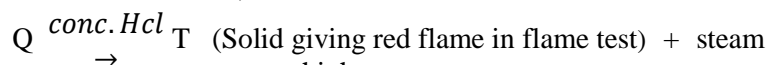
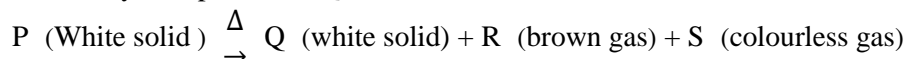


Q

C) Write the mechanism of the reaction between $\text{C}_2\text{H}_5 - \text{CH} = \text{CH}_2$ and Br_2/CCl_4

Essay Questions – B

05. a. The question given below is based on the elements belonging to the s, p block of the periodic table. Identify the species P, Q, R, S, T, U, V, W, X, and Y.



- b. An aqueous solution T contains three metallic ions. The following tests were performed to identify the metallic ions.

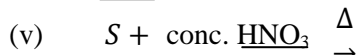
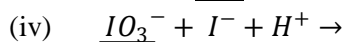
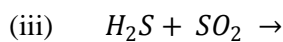
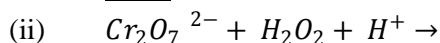
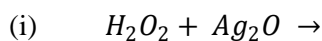
Test	Observation
1. acidified with cold dilute HCl	A white precipitate Q ₁ was formed.
2. Q ₁ was removed by filtration and H ₂ S passed through the filtrate. H ₂ S was completely expelled by boiling the solution cooled and NH ₄ Cl, NH ₄ OH added.	Clear solution obtained. A green colour precipitate Q ₂ was formed
3. Q ₂ was removed by filtration and H ₂ S was passed through the solution	White precipitate Q ₃ was formed.

Tests for precipitates Q₁, Q₂, and Q₃


Tests	Observation
1. water added to Q ₁ , boiled and then cooled	When heated the precipitate dissolved and formed clear solution. when cooled it was deposited
2. Dilute NaOH and H ₂ O ₂ were added to precipitate Q ₂	A yellow coloured solution was obtained.
3. Q ₃ was dissolved in dilute HCl and dilute NH ₄ OH added dropwise.	A white precipitate was formed which was dissolved in excess.

- (i) Identify the three metallic ions in solution T (explanations not necessary)
 (ii) Write the chemical formulae of the precipitates Q₁, Q₂ and Q₃.

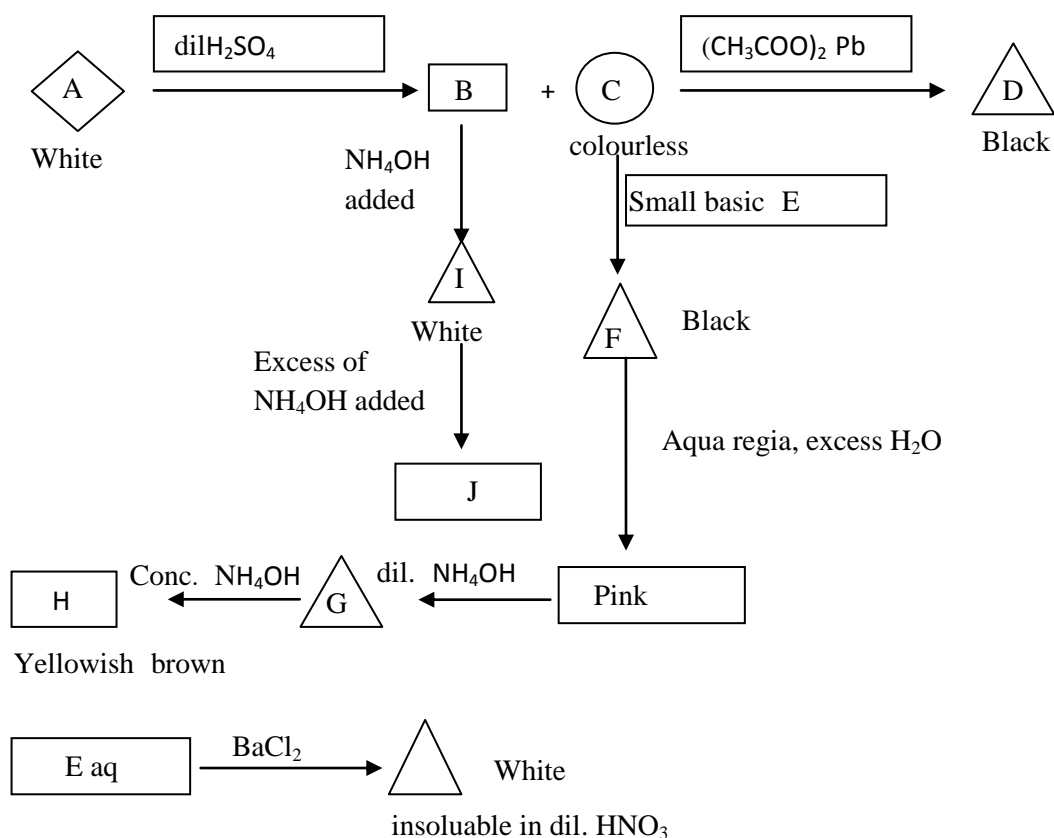
c. Write balanced equations for the following reactions and indicate the functions of the species underlined.



06. a. The following procedure was used to find the percentage of Cu in an alloy. 11g of the alloy was dissolved in concentrated H_2SO_4 and the solution was made upto 500cm^3 . H_2S was passed through 25cm^3 of this solution. 80cm^3 of 0.1mol dm^{-3} $KMnO_4$ solution was added in excess to this solution to convert the CuS precipitated into Cu^{2+} , Mn^{2+} & SO_2 and the SO_2 produced into SO_4^{2-} . The excess $KMnO_4$ was titrated against 0.5mol dm^{-3} Fe^{2+} solution. At the end point the reading on the burette was 10cm^3 . Calculate the percentage of Cu (Cu – 63.5).

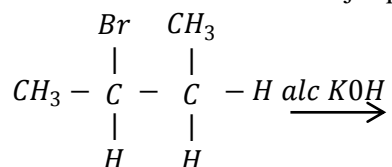
b.  Solid  precipitate  solution  gas

Write the formulae of compounds A – J given below.



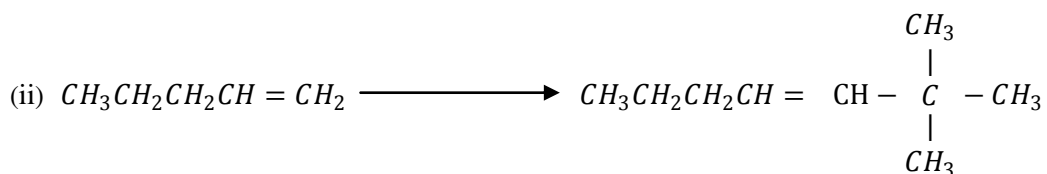
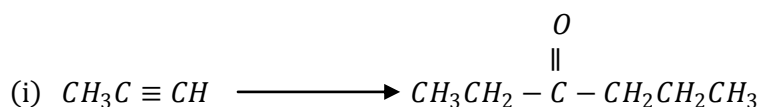
c. M^{n+} ion of an element belonging to 3d series can be oxidized to MO^+ by $Cr_2O_7^{2-}$ in the presence of dilute H_2SO_4 . In an experiment 10cm^3 of 0.1mol dm^{-3} $K_2Cr_2O_7$ was required to oxidize 6×10^{-3} mol of M^{n+} to MO^+ . Using these data calculate the value of n.

07. a. Draw the structures of 3 major products that can be expected in the following reaction



b. Show how $CH_3CH_2 - \overset{O}{\parallel} C - CH_2CH_2CH_3$ could be synthesized using acetylene (C_2H_2) as the only organic starting material.

c. Show how the following conversions could be effected.



d. State a method to differentiate each of the pairs of compounds given below.

