



FWC

Conducted by Field Work Centre, Thondaimanaru

In Collaboration with Provincial Department of Education

Northern Province

Term Examination, July - 2019

Grade – 12 (2020)

Chemistry II

Time : 2 Hours

Part - II

A - Structured Essay

❖ Answer all four questions on this paper itself.

01. a) State whether the following statements are true or false. (Reasons are not required)

- i. S_C is considered as a transition element. (.....)
- ii. MnO_4^- react with I^- to not produce IO_3^- in basic medium. (.....)
- iii. $PV = nRT$ equation can't apply to real gas. (.....)
- iv. All group 18 elements have positive electron gain enthalpy. (.....)
- v. Oxidizing ability of halogens decreases down the group. (.....)

(5 x 5 = 25 Marks)

b) i. Draw the most acceptable Lewis structures for CO and CO₂.

ii. Write the IUPAC name of above compounds.

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.....

iii. CO_{2(g)} dissolving with water and give oxoacid of carbon. Write the formula of oxoacid of carbon.

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iv. Write the IUPAC name and draw the most acceptable Lewis structure of above acid.

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.....

(v) Draw the resonance structure associated with the compound in (iii) above.

(vi) Complete the table below.
(Consider the above (iv) compound)

	C	O (with H)
1. hybridization		
2. electron pairs shape		
3. shape around the atom		
4. oxidation number		

(vii) Write the formula of oxide of carbon (Don't write above oxide).

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(50 Marks)

c) Arrange the following (i) – (v) in the ascending order of the property as given in parentheses

1) NH_3 , NH_2^- , NH_4^+ , NO_2^+ (electronegativity of nitrogen)

..... < < <

2) Quantum number of electrons in an atom (n , l)

(4, 1), (4, 0), (3, 2), (3, 1) (stability of electron)

..... < < <

3) CH_3Cl , CHBr_3 , CH_2Cl_2 , CBr_4 (volatility)

..... < < <

4) AgCl , AgBr , AgI (Solubility with $\text{NH}_{3(\text{aq})}$)

..... < < <

5) NO^+ , FNO_2 , ClNO , NH_2OH (N – O bond energy)

..... < < <

(5 x 5 = 25 Marks)

02. a) Atomic number of A and B elements are less than 20. A gives a yellow flame in the flame test. A reacts with water liberating gas D and forms the solution of C. B reacts with both dil HCl and dilute KOH separately and gives of the same colourless diaatomic gas. Further B does not react with water and it reacts with the solution C liberating gas D and forms solution E. At gaseous state chloride of B exists as a dimer.

i. Identify A, B, C, D and E.

A - D -
B - E -
C -

ii. Write electron configurations of A and B.

A - B -

iii. Write most stable oxidation states of A and B.

A - B -

iv. Draw the structure of gaseous chloride of B.

v. A burns in the air easily and forms oxides, write the formula of these oxides seperately.

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vi. Show how B reacts with air using balanced equations.

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vii. Write balanced chemical equations for the reaction taking place between B and following things.

1. dil HCl
2. dil KOH

viii. Write the balanced chemical equation for the reaction of B when heated with KNO_3 and dilute KOH.

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ix. Write the three formulas of the chemical species that the ion of B having the most state oxidation state forms in an aqueous medium.

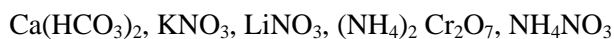
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x. Write one use of each A, B.

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(60 Marks)

b) Chemical compounds A to E are contains in test tubes while description about the products obtained by heating them is given below. (They are not in order from A to E)



Chemical compound	Description about the products obtained.
A	Reddish brown gas with a solid residues.
B	Two gaseous products with solid residues.
C	Remain a white solid residues.
D	Does not remains any residue after heating the solid compound.
E	Colourless gas which turns lime water to milky colour and white solid residues.

i. Identify solid substances from A to E.

A –

D -

B –

E -

C -

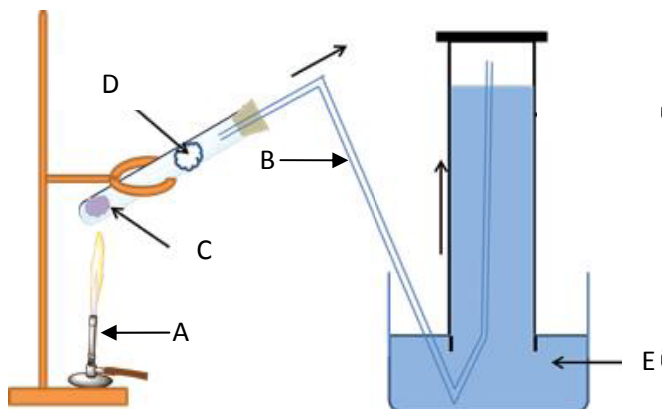
(5 x 3 = 15 Marks)

ii. Write balanced chemical equations for heating of the above chemical substances A to E.

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(5 x 5 = 25 Marks)

03. a) Oxygen gas is collected by displacement of water in the following experimental.



i. Identify the A, B, C, D and E.

A -

D -

B -

E -

C -

Experimental readings is given below.

	Readings
• Weight of the boiling tube and it's content before heating /g.	10.1481
• Weight of the boiling tube and it's content after heating.	10.1000
• Volume of water displaced / cm ³ .	38
• Temperature / °C	27
• Pressure / mmHg	745

ii. Calculate pressure of dry O₂ (vapour pressure of water at 27 °C is 5mmHg).

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iii. Convert this pressure from mmHg to Nm⁻².
(760 mmHg = 1.01 x 10⁵ Nm⁻²)

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iv. Write the combined gas equation.

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v. Calculate the volume of oxygen gas at STP.
(1 mol of has occupies 22.4 l litres at STP)

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vi. Calculate the mass of oxygen above experiment.

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vii. What is the moles of oxygen. [0 – 16]

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viii. Calculate the molar volume of oxygen gas at STP.

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ix. Explain

i. Why cotton wool is inserted into the boiling tube.

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ii. Why it is important to let boiling tube cool to room temperature before weighing the contents.

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(50 marks)

b) i. Explain

1. Entropy

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2. Extensive properties.

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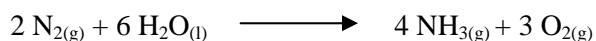
3. State function

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(15 Marks)

ii. Consider the following reaction which occurs at 25 °C.



Some thermo chemical data at 25 °C had been given below.

Substance	$\text{N}_{2(\text{g})}$	$\text{H}_2\text{O}_{(\text{l})}$	$\text{NH}_{3(\text{g})}$	$\text{O}_{2(\text{g})}$
$\Delta H_f^\ominus / \text{kJ mol}^{-1}$	0	- 242	- 46	0
$S^\ominus / \text{J mol}^{-1}\text{K}^{-1}$	192	189	193	205

i. Calculate the standard enthalpy change.

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ii. Calculate the standard entropy change.

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iii. Calculate the standard Gibbs free energy change at 25 °C.

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iv. Find out the minimum temperature above reaction take place spontaneously.

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(35 Marks)

04. a) i. The relative molecular mass of a acyclic hydrocarbon A is 72. Write the molecular formula of A ($C - 12$ $H - 1$).

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ii. Write possible structures for A.

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.....

iii. When one mole of the acyclic hydrocarbon B is subjected to complete catalytic hydrogenation it reacts with 4 moles of hydrogen and gives one mole of A. What is the structure of A?

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iv. Write four possible structures for B.



v. One mole B reacts with excess NaNH_2 to give two moles of H_2 . What is the structure of B.

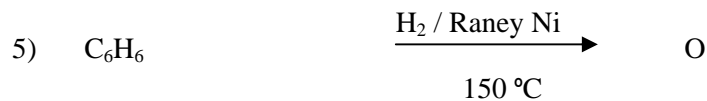
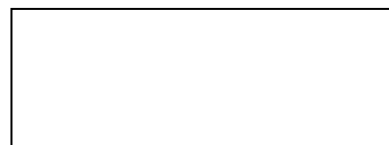
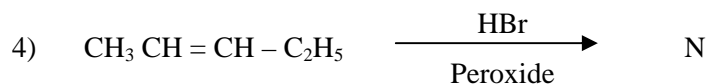
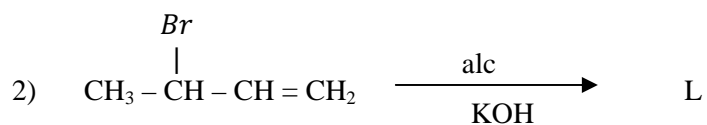
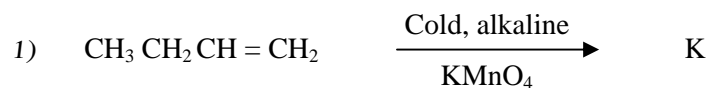
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vi. B is containing three SP hybridized carbon atoms. What are the structures of B.

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(60 Marks)

b) Draw the structure of the major organic products K, L, M, N and O



(25 Marks)

c) Write the mechanism for the reaction between 2-methyl-1-butene and HCl

(15 Marks)



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Chemistry II

Part – II

Essay Questions - B

Answer only two questions.

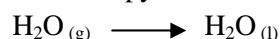
05. a) At 127 °C, Three gases C₃H₈, SiH₄ and CO₂ present in three vessels which are 2 : 3 : 8 volume ratio and 3 : 2 : 1. Pressure ratio respectively. At 127 °C, Three vessels are connected using a tube which volume is negligible. After the connection pressure of the system is 16.628 x 10⁴ Pa. Total mass of gases is 4.07 g in the system. [C – 12, H – 1, Si – 29, O – 16]
- Calculate the total volume of the system?
 - Calculate the partial pressure of CO₂ ?
 - Find the density (gdm⁻³) of gas system?
 - When adding KOH solid only CO₂ gas was absorbed. What is the pressure of the system now?
 - What is the density of system now? (50 Marks)

- b) CO_(g) and H_{2(g)} can be produced by the reaction between CH_{4(g)} and CO_{2(g)} in the presence of sunlight and a catalyst A. The standard enthalpy change for this reactions - 174 kJ mol⁻¹. Above products can also be formed by reacting graphite with water vapour and the relevant enthalpy change is - 125 kJ mol⁻¹

Standard enthalpy of formation of CO_{2(g)} is - 394 kJ mol⁻¹

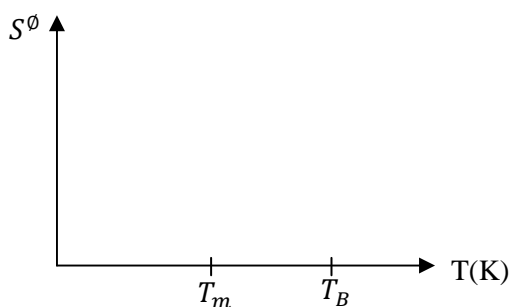
Standard enthalpy of combustion of CH_{4(g)} is - 800 kJ mol⁻¹

- Write balanced chemical equations for the above chemical reactions.
- Calculate the enthalpy of following reaction. Use the thermo chemical cycles only.



(75 Marks)

- c) i. The heat of fusion of ice is 6 kJmol⁻¹. Calculate the entropy change of H₂O_(s) ⇌ H₂O_(l) at 0°C and 1atm.
- ii. Sketch the graph standard entropy and temperature (K) of water.



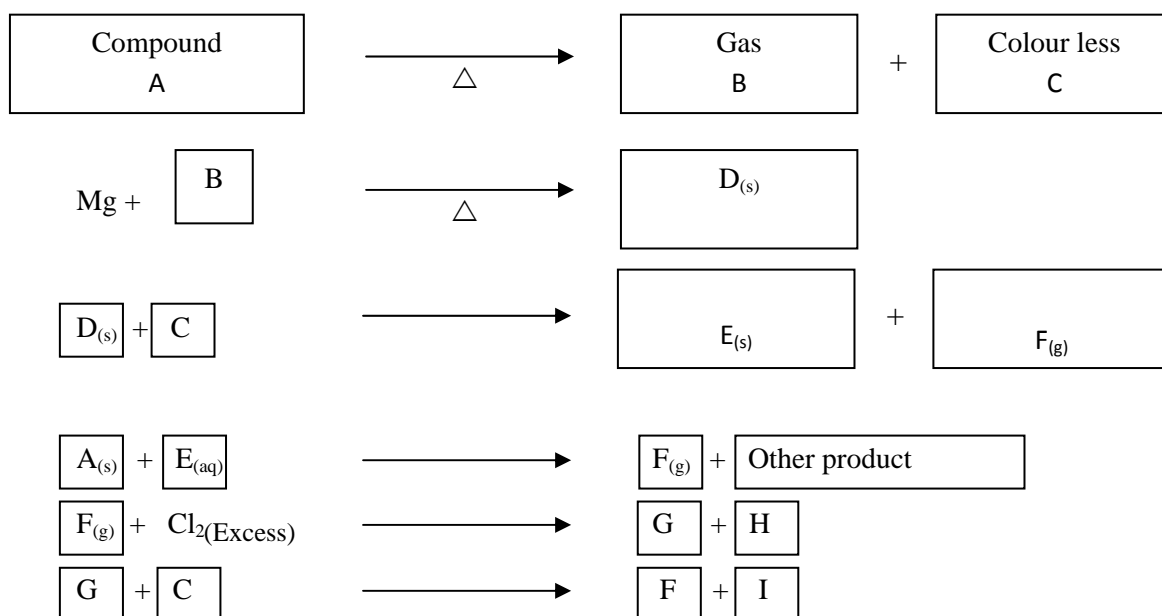
T_m - melting point of water

T_B - boiling point of water

(25 Marks)

06. a) Following Questions is based on the elements of S and P block of the periodic table and inorganic compounds.

Identify chemical species A – I of following reaction given below.



G – is used as a water disinfecting agent.

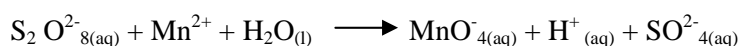
F – Central atom of F gas is sp^3 hybridization.

(9 x 5 = 45 Marks)

- b) The following procedure was used to determine the thickness of a layer of Mn coated on one surface of a rectangular sheet of an inert material.

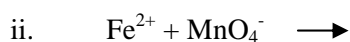
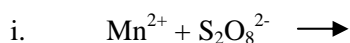
A dilute acid was to dissolve the Mn in a 10 cm x 4 cm rectangular sample of the given sheet. The resulting Mn^{2+} , was oxidized with $\text{S}_2\text{O}_8^{2-}$ in neutral medium as given below.

($\text{S}_2\text{O}_8^{2-}$ - peroxydisulfate ion)



After removal of excess $\text{S}_2\text{O}_8^{2-}$ the solution was acidified and an excess of ferrous ammonium sulphate [$\text{FeSO}_4(\text{NH}_4)_2 \cdot \text{SO}_4 \cdot 6\text{H}_2\text{O}$] 2.94g was added. The unreacted Fe^{2+} was then titrated with $0.025 \text{ mol dm}^{-3}$ KMnO_4 solution. The volume required was 20 cm^3 .

1. Give balanced chemical equations for the reaction of.

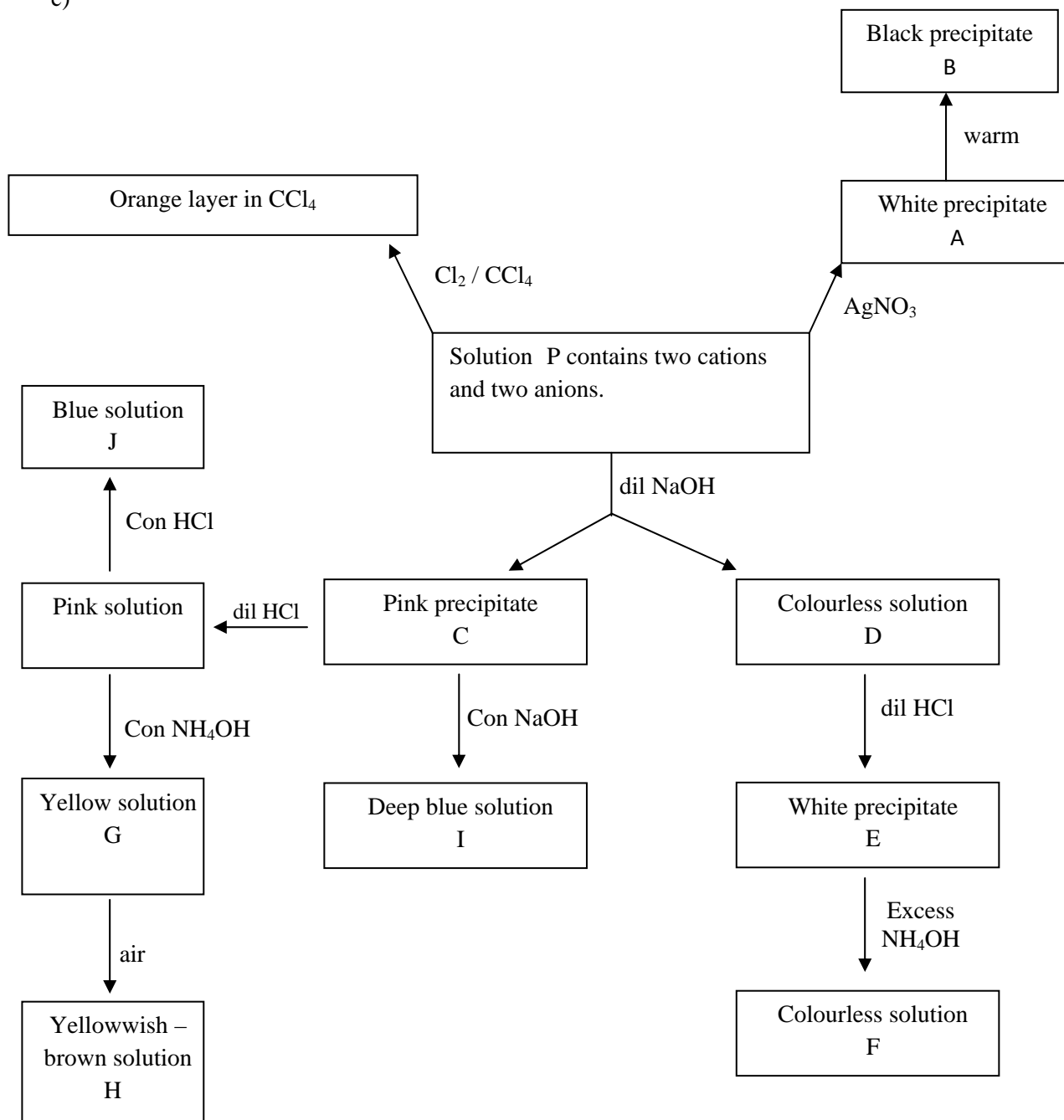


2. Calculate the thickness of Mn layer coated on the sheet.

[Density of Mn 13.75 g cm^{-3} , H – 1, Fe – 56, Mn – 55, S – 32, O – 16, N – 14]

(50 Marks)

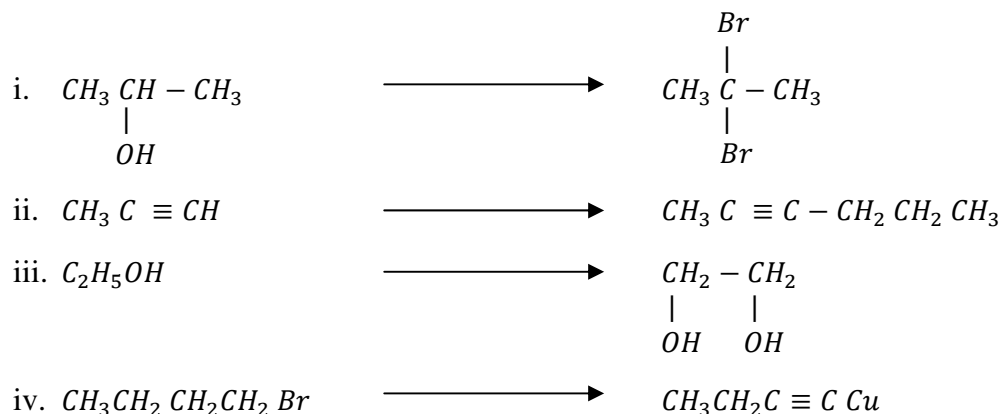
c)



- i. Identify the two anions.
- ii. Identify and write the compound of A – J.
- iii. Write the IUPAC name of J and F.
- iv. Calculate of oxidation number of the central metal ion of I.
- v. What are the factors affecting the colour of the complexes?

(55 Marks)

07. a) Show how you would carry out the following conversions.
[Only use given starting compound for starting organic compound]



(69 Marks)



Only use given reagents.

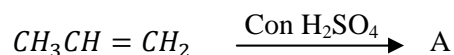
Mg, dry ether, alc KOH, HBr, Con H_2SO_4
 $\text{Br}_2 / \text{CCl}_4, \text{H}_2\text{O}, \text{HgSO}_4, \text{dil H}_2\text{SO}_4$

(42Marks)

- c) Compound A exhibits optical isomerism and has the molecular formula C_7H_{16} .
- Draw two possible structures for A which are not enantiomers of each other.
 - State the isomeric relationship between the two structures you have drawn.

(15 Marks)

- d) i. Write the major product of given reaction.



- Write the mechanism for above reaction.
- It has been found that B is also formed above reaction, as a minor product, By considering the mechanism of the reaction. Explain why the major product in above reaction is A and not B.

(24 Marks)