Provincial Department of Education - Northern Province

Third Term Examination – 2026

Grade – 12(2027)

Chemistry I		02	E	I	

Time :- 03Hrs and 10 min

Instructions

- *Periodic Table is provided*
- *Answer **all** the questions.*
- ***Use of calculators is not allowed***
- *Write your **index number** in the space provided in the answer sheet.*
- *Follow the instructions given on the back of the answer sheet carefully.*
- *In each of the questions 1 to 25, pick one of the alternative from (1), (2), (3), (4) ,(5) which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross (x) in accordance with the instructions given on the back of the answer sheet.***

- *Universal gad constant, R = 8.314 J K^{-1} mol^{-1}*
- *Avogadro constant, NA = 6.022 x 10^{23} mol^{-1}*
- *Plank's constant, h = 6.626 x 10^{-34} JS*
- *Velocity of Light, c = 3 x 10^{8} ms^{-1}*

(01) Consider the following statements I and II.

I. Explained the shapes of molecules when the central atom is a main group element.

II. Electrons that move around the nucleus of an atom show the properties of a wave.

The Scientists who proposed the principles given in the statements I and II respectively are,

1. Ronald Sydney Nyholm, Max Planck
2. Ludwig Drude, Niels Bohr
3. Gilbert Lewis, J. J Thomson
4. Hendrik Lorentz, Moseley
5. Ronald Gillspie, Lewis De Broglie

(02) What is the maximum number of electron pairs that could be seen for the Zn^{2+} ion with the quantum number $n = 3$ and $m_l = -1$?

1. 2 2. 3 3. 4 4. 5 5. 6

(03) Which of the following correctly shows the change of first ionization energy of N, S, K, Be, Na, Ar, F ?

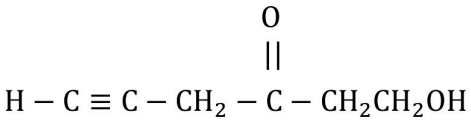
1. $K < Be < Na < S < N < F < Ar$
2. $K < Na < Be < N < S < F < Ar$
3. $K < Na < Be < S < N < Ar < F$
4. $K < Na < F < Be < S < N < Ar$
5. $Na < K < Be < S < N < Ar < F$

Past Papers Wiki

(04) A particular energy is emitted as light during the burning of a light bulb with power 150 Js^{-1}. The wavelength of this light is 165.65 nm. What percentage of energy is emitted as light if the light bulb can emit 1×10^{19} Photons in one second?

1. 6%
2. 8%
3. 10%
4. 12%
5. 14%

(05) IUPAC name of the compound



1. 6 − hydroxy − 1 − hexyn − 4 − one
2. 3 − oxo − 5 − hexyn − 1 − ol
3. 1 − hydroxy − 1 − hexyn − 3 − one
4. 1 − hydroxy − 5 − hexyn − 3 − one
5. 1 − hydroxy − hex − 5 − yn − oxo

(06) Which of the following compounds A, B, C, D Can give $N_{2(g)}$ during heating?

A. NH_4NO_3 B. NH_4NO_2 C. $(NH_4)_2Cr_2O_7$ D. NH_4Cl

1. A and B
2. B and C
3. C only
4. A, B and C
5. C and D

(07) Which of the following species need highest number of moles to oxidize 1 mole of I^- ions in acidic medium?

1. Cl_2
2. K_2CrO_4
3. $K_2Cr_2O_7$
4. $FeCl_3$
5. $KMnO_4$

(08) A lorry tyre at 27°C has air at pressure 6×10^6 Pa and volume of the tyre is $4.157 dm^3$. How many times air should be pumped using a pump to increase the pressure to 8×10^6 Pa as 27°C Average volume of the pump is $8.314\ cm^3$ and air is at the pressure 1 atm and temperature 27°C. Consider the moles of air is equal during each pumping.

1. 10
2. 200
3. 1000
4. 2000
5. 10 000

(09) The incorrect statement regarding the S − block metals?

1. All group I elements show colours to the flame test.
2. Li_2CO_3 can undergo thermal decomposition.
3. All group 2 elements can react with Hydrogen to give metal hydrides.
4. The polarizing power of alkali metal cations decreases with the increase of atomic number
5. All group 2 elements are denser than water at standard conditions.

(10) The data necessary to calculate the standard change of enthalpy for the reaction $I_{2(g)} + 3Cl_{2(g)} \rightarrow 2ICl_{3(s)}$

a) Standard bond energy of Cl_2
b) Standard energy of Sublimation of $I_2(s)$
c) Electron gain energy of $Cl_{(g)}$

d) Standard enthalpy of formation of $ICl_{3(s)}$

e) Standard enthalpy of combustion of $ICl_{3(g)}$

1. a and b
2. b and c
3. c and d
4. b and d
5. a, b and e

(11) Which of the following statement is true regarding the chlorination chain reaction of methane?

1. UV radiation is required for the initiation step of the reaction only.
2. Only heterolytic reactions take place.
3. Carbon free radicals formed during the terminating steps are called reactive intermediates.
4. Only three chain terminating reactions take place.
5. Free radicals can form and react in terminating step reactions.

(12) Which of the following statement is correct regarding 3d elements?

1. Zn has the highest electronegativity.
2. Colours of MnO_4^- is not due to the electron transition of electrons among the d orbitals
3. Aqueous solutions of all cations are coloured.
4. Transition metals with completely filled d orbitals can act as catalyst
5. All the chloro complex ions are coloured.

(13) $Br_2 | CCl_4$ is added the organic compound A and then alc | KOH is added to the product following that $H_2 | Ni$ is added and Propane was obtained. Then what could be the compound A ?

1. $CH_3CH_2CH_2OH$
2. $CH_3C \equiv CH$
3. CH_3CH_2CHO
4. $CH_3CH_2CH_2Br$
5. $CH_3CH = CH_2$

(14) Which is the incorrect statement regarding ideal gases?

1. There is no attractive or repulsive forces between molecules.
2. The distribution of molecular velocity depends on temperature.
3. The magnitude of gas molecules is negligibly small when compared to the distance between those molecules.
4. Molecules randomly move in straight lines at same speed.
5. Pressure of the gas is due to the number of total collisions with the wall of the container.

PAST PAPERS WIKI

(15) $CHCl_3$ is contained in a common water provider at composition of 0.20 ppb by mass. What is the number of $CHCl_3$ molecules in one drop of water of volume $0.478\ cm^3$?

[Density of water $1 gcm^{-3}$] [$C - 12$ $H - 1$ $Cl - 35.5$]

1. 6.022×10^{23}
2. 24.088×10^{10}
3. 48.176×10^{10}
4. 12.044×10^{13}
5. 3.011×10^{14}

Instructions for the questions 16 to 20 is given

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

(16) Which of the following is/are endothermic reaction

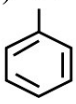
a. $H^{+}_{(aq)} + OH^{-}_{(aq)} \longrightarrow H_2O_{(l)}$

b. $NH_4Cl_{(s)} + aq \longrightarrow NH_4Cl_{(aq)}$

c. $2H_2O_{2(l)} \longrightarrow 2H_2O_{(l)} + O_{2(g)}$

d. $2Na_{(s)} + 2H_2O_{(l)} \longrightarrow 2NaOH_{(aq)} + H_{2(g)}$

(17) $C \equiv CH$



Which of the following statement/ statements is/ are correct regarding this molecule?

a. Three carbon atoms can stay in a straight line at maximum.

b. It reacts with $NaNH_2$ to give NH_3.

c. It gives white precipitate with Tollent's reagent.

d. Each $C-C-C$ bond angles are $120°$.

(18) Which of the following statement/ statements is/ are incorrect?

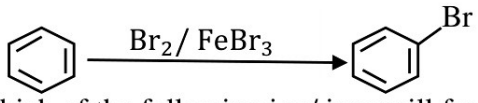
a. NH_3 can act as an acid, a base, an oxidant and reductant.

b. Ozone can disinfect water by destroying germs.

c. Carbon monoxide is used commonly in food industry as a freezing agent.

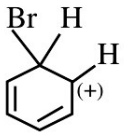
d. Aqueous solution of $AlCl_3$ has basic nature.

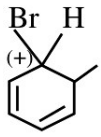
(19) Consider the mechanism of the following reaction.



Which of the following ion/ ions will form during this reaction

a. $FeBr_4^-$

b. 

c. 

d. $FeBr_4^+$

(20) Which of the following group | groups has | have all components with almost same colour ?

a. $CuSO_{4(s)}$, $NiSO_{4(s)}$, $CdCO_{3(s)}$

b. $CuCl_{2(s)}$, $AgI_{(s)}$, $BaCrO_{4(s)}$

c. $[CuCl_4]^{2-}_{(aq)}$, $[NiCl_4]^{2-}_{(aq)}$, $[MnCl_4]^{2-}_{(aq)}$

d. $[Cu(NH_3)_4]^{2+}_{(aq)}$, $[Ni(NH_3)_6]^{2+}_{(aq)}$, $[Co(NH_3)_6]^{2+}_{(aq)}$

In question Nos 21 to 25 two statements are given in respect of each question. From the table given below ,select the response, out of the responses (1),(2),(3),(4) and (5) that the best fits statements and mark appropriately on your answer sheet

Response	**First Statement**	**Second Statement**
(1)	True	True, and correctly explains the first statement
(2)	True	True, but does not correctly explains the first statement
(3)	True	False
(4)	False	True
(5)	False	False

(21) Statement I :- Cr_2O_3, and MnO_2 has basic nature among the oxides of Cr and Mn.
Statement II :- Acidic nature of the oxides of Cr and Mn decreases with the increase of oxidation number of metal.

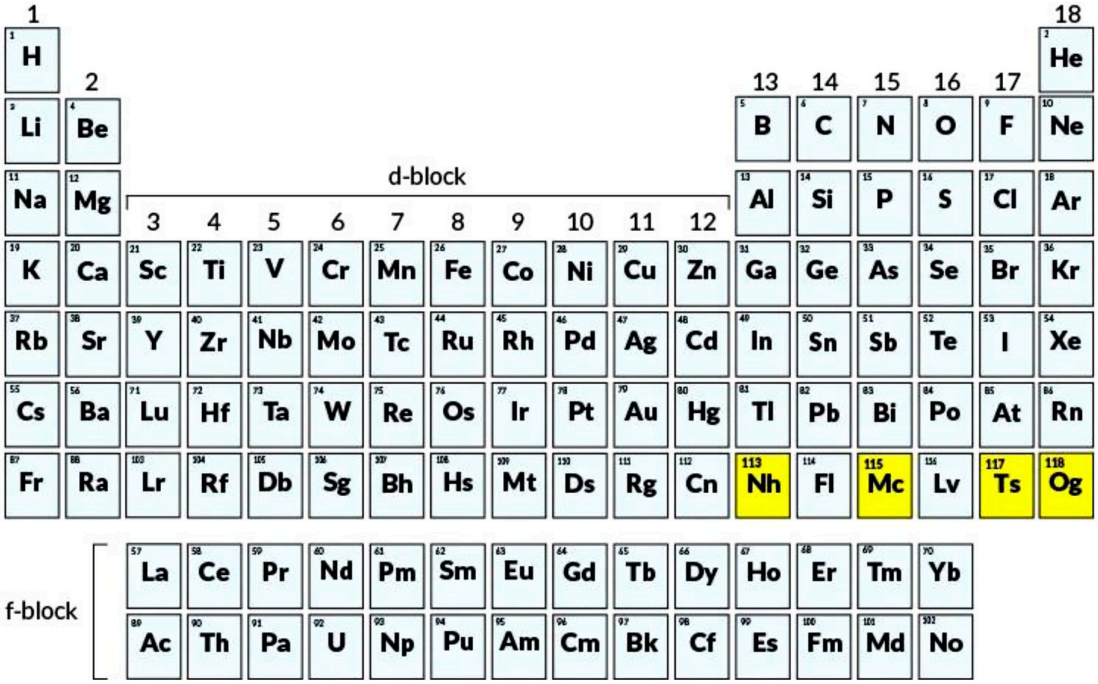
(22) Statement I :- Entropy of a free reaction is always positive.
Statement II :- The direction of a reaction can always and any conditions be deduced using the change of Gibbs energy.

(23) Statement I :- Molar volumes of ideal gases are equal at same temperature and pressure.
Statement II :- Molar volume of an ideal gas at temperature 298K and pressure 1 atm is $22.4\ dm^3mol^{-1}$.

(24) Statement I :- $2-$pentene can show diastereoismerism.
Statement II :- $2-$pentene has two structures which are not mirror images of each other.

(25) Statement I :- $d-block$ elements have d, S electrons to localize during the formation of metallic bonds.
Statement II:- All metals can conduct electricity

Past Papers Wiki



Provincial Department of Education
Northern Province
3rd Term Examination – 2026

Chemistry	Grade - 12 (2027)	02	E	II (A,B)

Use additional reading time to go through the question paper, select the question and decide on the questions that you give priority in answering.

Instructions:

- *A Periodic Table is provided.*
- ***Use of calculators is not allowed.***
- *Universal gas constant R = 8.314 J K^{-1} mol^{-1}*
- *Avogadro constant N_A = 6.022 x 10^{23} mol^{-1}*

PART A – Structured Essay (pages 02 – 10)

- *Answer all the questions on the question paper itself.*
- *Write the answer in the space provided for each question. Please note that the space provided is sufficient for the answer and that extensive answers are not expected.*

PART B – Essay (pages 11 – 13)

- *Answer any two questions.*
- *You are permitted to remove only Parts B of the question paper from the Examination Hall*

For Examiner's Use Only

Part	Question No:	Marks
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
Total		

Total

In Numbers	
In Letters	

Code Numbers

Marking Examiner 1	
Marking Examiner 2	
Checked by	
Supervised by	

Structured Essay

✶ **Answer all questions.**

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

i. In all the elements electrons are filling completely inner shell and then filling outer shells. (.....)

ii. A particular electron arrangement of an element $I\left(310+\frac{1}{2}\right), II\ \left(320+\frac{1}{2}\right),$ $III\left(400+\frac{1}{2}\right)$ The energy increasing order $I < II < III$ (.....)

iii. All the bond angles of PCl_5 molecule is approximately equal. (.....)

iv. Electron affinity of Li is greater than Na (.....)

v. Among Ni, Cu, Zn the atomic radius decreases in order $Ni > Cu > Zn$.(.....)

vi. The highest first ionization element is He. (.....)

b) i. Draw the most acceptable Lewis dot-dash structure for chlorsulfuric acid (HSO_3Cl)

ii. Give the oxidation state of S in the structure drawn (i) above.

S: .....

iii. The most stable Lewis dot – dash structure for $isocyanic\ acid$ $(HNCO)$ is shown below Draw two additional Lewis dot – dash structures (Resonance structures) for this molecule. Indicate their stability as unstable, less stable or stable.

$$H-\ddot{N}=C=\ddot{O}:$$

.....

.....

.....

.....

.....

.....

.....

iv. Complete the given table based on the Lewis dot-dash structure and its labelled skeleton given below.

$$:\ddot{O} = C - \ddot{S} - C \equiv N: \qquad O - C^1 - S^2 - C^3 - N^4$$

		C^1	S^2	C^3	N^4
I	*VSEPR* pairs around the atom.				
II	Electron Pair geometry around the atom.				
III	Shape around the atom.				
IV	Hybridization of the atom.				

Parts (v) to (viii) are based on the Lewis dot-dash structure given in part (iv) above labelling of atoms is as in Part (iv)

v. Identify the atomic / hybrid orbitals involved in the formation of σ bonds between two atoms given below.

(I) $C^1 - S^2$ C^1: ..... S^2: .....

(II) $S^2 - C^3$ S^2: ..... C^3: .....

(III) $C^3 - N^4$ C^3: ..... N^4: .....

(IV) $C^1 - O$ C^1: ..... O: .....

(V) $C^1 - H$ C^1: ..... H: .....

vi. Identify the atomic orbitals in the formation of π bonds between the two atoms given blow.

I. $C^1 - O$ C^1: ..... O: .....

II. $C^3 - N^4$ C^3: ..... N^4: .....

vii. State the approximate bond angles around C^1, S^2 *and* C^3 atoms.

C^1:..... S^2: ..... C^3: .....

viii. Arrange the atom C^1, O, N^4, C^3 in the increasing order of electronegativity.

.....<.....<.....

c) i. At standard pressure, Boiling point of same group element hydrides are given below.

Molecule	Boiling point (°C)
$H_2\,W$	100
$H_2\,X$	-60.3
$H_2\,Y$	-41.3
$H_2\,Z$	-4

Atomic Number W < X < Y < Z

1. Identify the element X .....
2. Write down the electronic configuration of X .....

ii. When all the bonds between W and X are double bonds complete the table.

	Chemical formula	Molecular shape	Polarity (Yes / No)
$X\,W_2$			
$Y\,W_3$			

02) a) A and B are respectively the oxide and hydride of an element X belonging to third period of the periodic table. A and B exist as the gases at room temperature Both A and B can act as oxidizing agent as well as reducing agent. When A and B dissolve in water separately, weakly acidic solution are formed.

The product C formed when compound A is oxidized has acidic nature and when C dissolves in water a, strong acid D is formed

When Na metal reacts with limited amount of B, a colourless, diatomic gas E is formed when A is bubbled through an aqueous solution of B, X is formed as turbid.

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

A: .....

B: .....

C: .....

D: .....

E: .....

2. Mention the element X and write the at stable oxidation statis of it

Element X: .....

Stable oxidation states : .....

3. Write balanced equation for the following instances.
   i. Reaction of Na with limited amount of B

   .....

   ii. Reaction between A and the aqueous solution of B

   .....

   iii. Reaction taking place when gas B is bubbled through $KMno_4$ solution acidified with dilute H_2SO_4

   .....

b) Aqueous solutions of $Zn\,SO_4, KI, Pb(Ac)_2, Mg\,Cl_2, NaOH\ and\ Ag\,NO_3$ are in bottles labelled as A, B, C, D, E and F (not in the order)

.....

To identify each of them, the solution were mixed pairwise and the observation were tabulated as follows

Mixture	Observation
i. $F + E$	White precipitate.
ii. $D + B$	greyish – brown precipitate
iii. $D + C$	White precipitate, which dissolves in dilute NH_3
iv. $A + E$	yellow precipitate, when the solution to gather with the precipitate is heated, it dissolves forming a clear, colorless solution.
v. $F + B$	White precipitate which dissolves on addition of excess B

i. Identify the solution from A to F

A: ..... B: .....

C: ..... D: .....

E: ..... F: .....

ii. Write balanced chemical equation for the reactions that take place during the process from (i) to (v)

.....

.....

.....

.....

.....

Past Papers Wiki

03) (A)

i. Define the standard enthalpy of Neutralization.

.....

.....

.....

ii. $0.2\ moldm^{-3}$ of $50\ cm^3$ $KOH_{(aq)}$ was taken in an insulated glass beaker. The initial temperature of the solution was 25°C. Then $0.2\ moldm^{-3}$ of $50\ cm^3$ of $HCl_{(aq)}$ was added into this solution. The final temperature was 26.4°C.

Density of the solution $1\ g\ cm^3$.

Specific heat capacity $4.2Jg^{-1}°C^{-1}$.

(1) Calculate the amount of heat liberated in this reaction.

.....

.....

.....

(2) Write down the chemical equation for the reaction.

.....

(3) Calculate the standard Neutralization enthalpy of the reaction between $KOH_{(aq)}\ and\ HCl_{(aq)}$

.....

.....

.....

(4) Give two assumptions during this calculation

.....

.....

(5) Standard enthalpy of dissolution of $KOH_{(s)}$ is $-56\ KJmol^{-1}$. Using thermochemical cyclic method to find the standard enthalpy change of the reaction

$KOH_{(s)} + HCl_{(aq)} \rightarrow KCl_{(aq)} + H_2O_{(\ell)}$

.....

.....

.....

.....

.....

(B) Consider the following thermochemical data at 25℃ and the reaction given below.

	$(NH_4)_2CO_{3(s)}$	$NH_{3(g)}$	$CO_{2(g)}$	$H_2O_{(\ell)}$
$\Delta H^\theta f(\ KJmol^{-1}\ )$	-942	-46	-394	-282
$\Delta S^\theta(\ Jmol^{-1}\ K^{-1})$	166	192	214	70

$(NH_4)_2\ CO_3 \xrightarrow{\Delta} 2NH_{3(g)} + CO_{2(g)} + H_2O_{(\ell)}$

(1) Find the standard enthalpy change of the reaction.

.....

.....

.....

(2) Find the standard entropy change of the reaction.

.....

.....

.....

(3) Find the standard Gibb's Energy change of the reaction.

.....

.....

.....

.....

.....

.....

(4) "When only increasing temperature$(NH_4)_2CO_{3(s)}$ can be decomposed. " Explain this statement.

.....

.....

.....

(5) Calculate the minimum temperature to decompose $(NH_4)_2CO_{3(s)}$

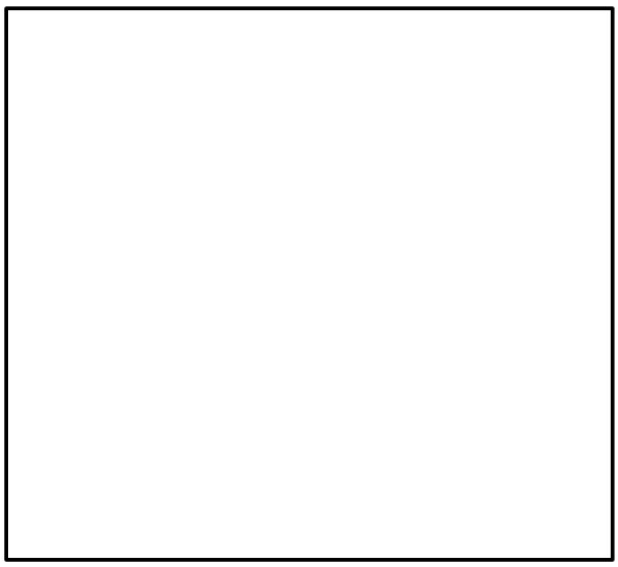
.....

.....

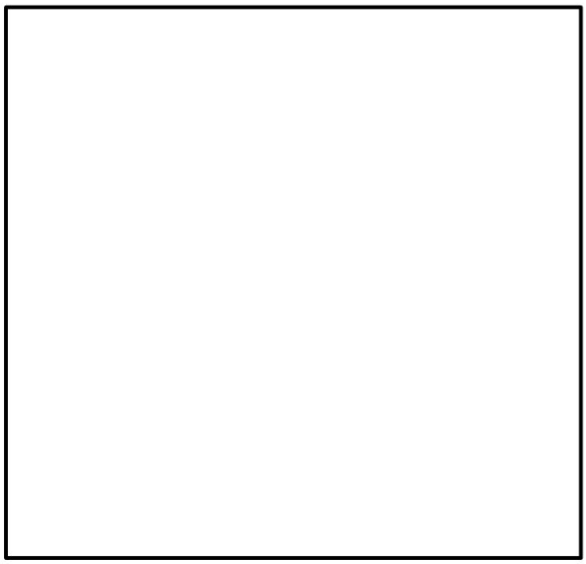
.....

04) (A) A, B, C, D, E and F are isomers with molecular formula $C_5H_{11}Br$. Among them only A, B and C show enantiomers. E and F are position isomers. D,F are primary Halides.

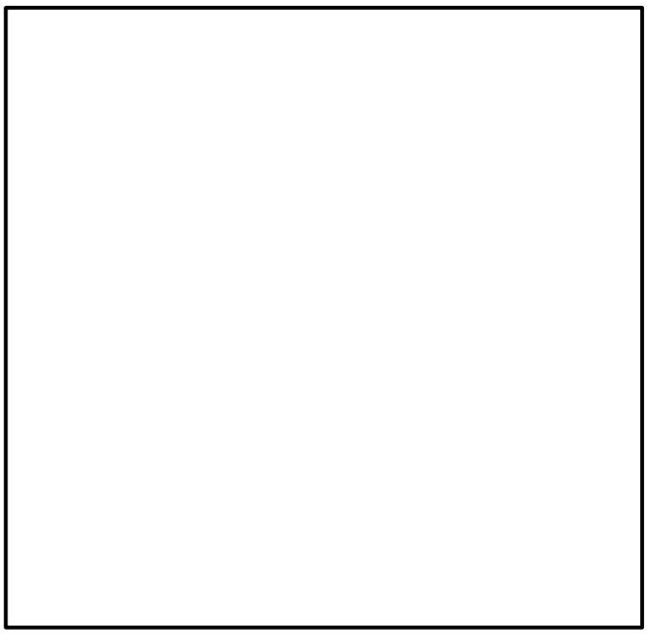
1) Among D, E and F when treated with alcoholic KOH, if D did not undergo any reaction. E and F give the products G and H respectively. G shows geometrical isomerism. Draw the structures of D, G and H



D

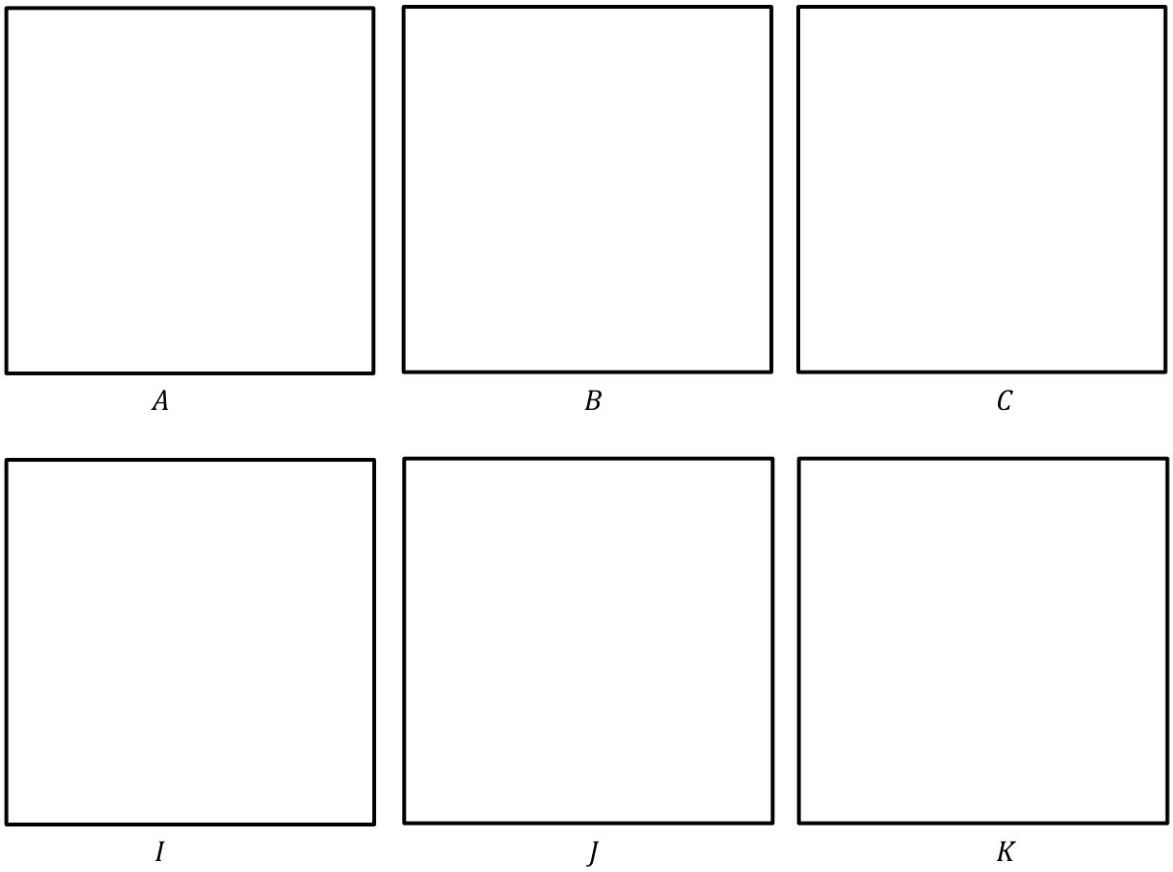


G



H

2) When A, B and C treated with $NaOH_{(aq)}$ and then heated with con H_2SO_4, A given products I , J and K. Among the products I only shade geometrical is merism. Draw the structure of A, B and C and I, J, K



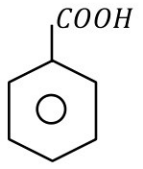
A B C

I J K

(B) Write the products for the followings.

1) $CH_3CH = CH_2 \xrightarrow[KMnO_4]{1\%OH^-/}$

2) $HC \equiv CH \xrightarrow[Quinoline]{H_2/Pd - BaSO_4}$

3)  $\xrightarrow[\text{con } H_2SO_4, \Delta]{\text{con } HNO_3}$

4) $CH_3CH_2CH = CH_2 \xrightarrow{HBr\ ,\ R_2O_2}$

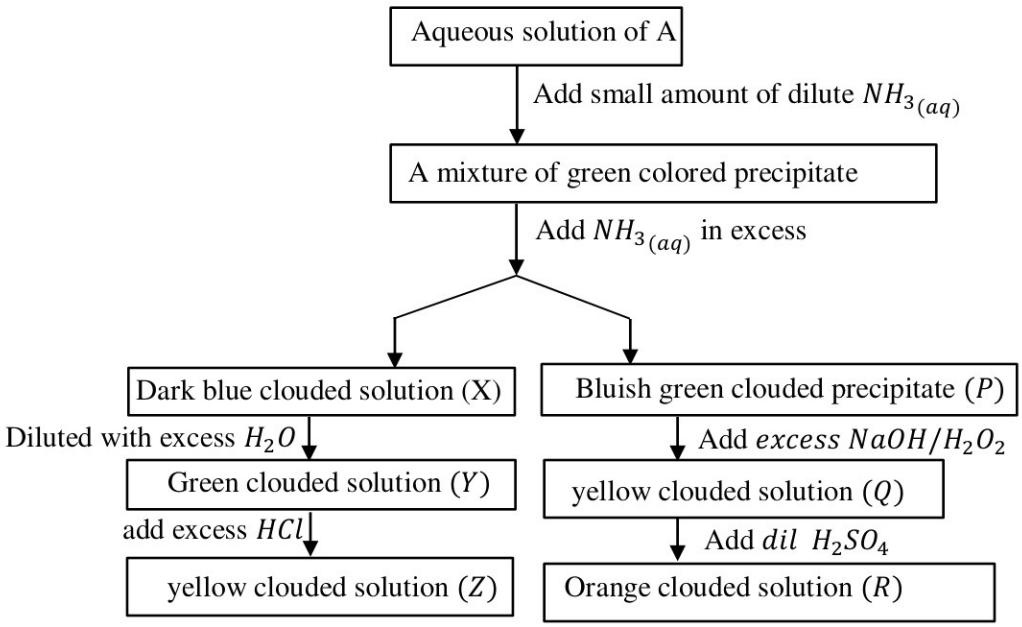
5) $CH_3CH \equiv CH \xrightarrow{NH_3/\ AgNO_3}$

(C) Write the mechanism of the reaction between propene $CH_3CH = CH_2$ with HBr.

Part II(B) Essay

✶ **Answer any two questions.**

05) (A) A is an aqueous solution containing two cations of 3d – block elements. The flow chart diagram related to the experiment for identifying these cation is given below.



i. What are the cations present in solution A?

ii. Write the chemical formula of the species responsible for X, Y, Z, P, Q and R

iii. Write balanced equations using relevant chemical formulae for the following reaction.

1. $P \xrightarrow{\text{excess } NaOH/H_2O_2} Q$
2. $Q \xrightarrow{H_3O^+_{(aq)}} R$
3. $Y \xrightarrow{\text{Concentrated } HCl} Z$

(B) Z is an element belonging to the first row of d block. Z form two oxo anions with different colours in its highest oxidation state.

(i) Identify the element Z

(ii) Write the complete electron configuration of 2.

(iii) Mention the formulae of the oxides of z and state their acid/ base natur.

(iv) Mention the two oxo anions formed in the highest oxidation state of Z and state which of the two stable in acidic medium.

Past Papers Wiki

06) (A) 1. $3dm^3$ closed rigid container A contains $5g$ of Ne gas at 27°C. Calculate the pressure of Ne gas $(Ne - 20)$

2. Another $4dm^3$ closed rigid container B contains. He gas at 47°C with pressure $2 \times 10^5 Nm^{-2}$. Calculate the mass of He gas in this container B $(He = 4)$

3. These two containers were connected with a negligible volume tube. The system was kept 127°C. Find the pressure of He in the container B.

4. When the system connected, another 2g He was added into the container and the temperature was kept 127°C. Find the pressure of container A.

5. When the above part (4) system, container A was kept 27°C and container B was 127°C, Find the pressure of the system.

(B) 1. Define "standard lattice dissociation enthalpy.

2. Write the chemical equation for the following enthalpy changes.

i. Standard enthalpy of lattice dissociation of $MgCl_{2(s)}$

ii. Standard enthalpy of hydration of Cl^-

iii. Standard enthalpy of dissociation $MgCl_2$

3. Using the following thermochemical data, calculate the standard enthalpy of dissolution of $MgCl_{2(s)}$ form thermos chemical cycle.

Standard enthalpy of Sublimation $Mg_{(s)}$ $+146\ KJmn^{-1}$

Standard enthalpy of 1st, 2nd Ionization of $Mg_{(s)}$ $740, 1450\ KJmn^{-1}$

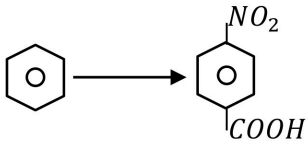
Standard enthalpy of hydration $Cl^-{}_{(g)}$ $242KJmn^{-1}$

Standard enthalpy hydration of $mg^{2+}{}_{(s)}$ $-1980\ KJ/mol$

Standard enthalpy of formation of $MgCl_{2(s)}$ $-640KJ/mol$

Standard enthalpy of 1st electron gain $-364\ KJ/mol$

07) (A) Show how the conversions can be carried out using not more than four steps.

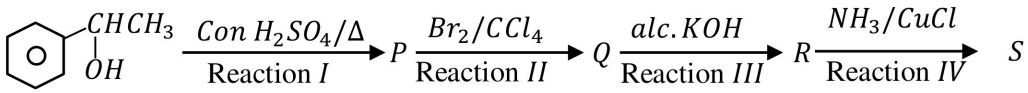
1. 

2. $CH_3CH_2CH_2OH \longrightarrow CH_3\overset{\overset{O}{\|}}{C}-CH_3$

(B) 1. Show that the following conversion can be carried out using only ethene as the starting organic compound.

$$Ethene \longrightarrow CH_3\overset{\overset{O}{\|}}{C}CH_2CH_3$$

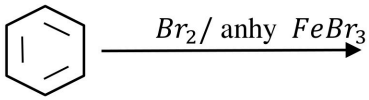
2. Consider the following reaction sequence.



i. Draw the structures of P, Q, R and S

ii. Give the type of Reaction I - IV

(C) Write the product for the following reaction and give the mechanism.



PAST PAPERS WIKI

www.PastPapers.Wiki
Downloaded From Past Papers WiKi - Sri Lanka's Largest Past Papers Library