



தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
இரண்டாம் தவணைப் பரீட்சை - 2022
Conducted by Field Work Centre, Thondaimanaru.
2nd Term Examination - 2022

இரசாயனவியல் I
 Chemistry I

One hour

02

E

I

Gr -12 (2023)

Part – I

❖ Answer all questions.

01) Consider the following statements I and II

- I. The shapes of molecules with transition elements as the central atom
 II. Radioactive materials produce three types of emissions α , β , and γ

The two scientists who proposed related as given by statements I and II respectively are,

- (1) J. J. Thompson and Henri Becquerel
 (2) Hendrick Lawrence and Ernest Rutherford
 (3) Ronald Nyholm and Ernest Rutherford
 (4) Eugene Goldstein and Henry Becquerel
 (5) Lewis and Ernest Rutherford

02) The maximum number of electron pairs of chromium (Cr , $z = 24$) That are associated with $n = 2$, $m_l = 0$ are,

- (1) 8, 12 (2) 8, 13 (3) 10, 3 (4) 5, 4 (5) 4, 6

03) The correct increasing order of ionic radius of Li^+ , Mg^{2+} , Al^{3+} , N^{3-} , S^{2-} is

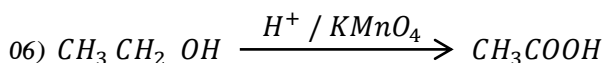
- (1) $Li^+ < Mg^{2+} < Al^{3+} < N^{3-} < S^{2-}$
 (2) $Al^{3+} < Mg^{2+} < Li^+ < S^{2-} < N^{3-}$
 (3) $Mg^{2+} < N^{3-} < Li^+ < S^{2-} < Al^{3+}$
 (4) $Al^{3+} < Li^+ < Mg^{2+} < N^{3-} < S^{2-}$
 (5) $Li^+ < Al^{3+} < Mg^{2+} < N^{3-} < S^{2-}$

04) The number of resonance structures that can be drawn for the molecule N_2O_3 ($O - N - O - N - O$) with positive charge on the most electronegative Oxygen atom is,

- (1) 2 (2) 4 (3) 6 (4) 8 (5) 9

05) (A) BCl_3 , (B) PCl_3 , (C) PCl_5 (D) SO_3 (E) SO_2 The molecule / molecules which shows the bond angle 120° ?

- (1) Only A and B (2) Only A and D (3) Only A, B and D
 (4) Only A, C and D (5) Only A, B, D and E



Ethanol reacts with acidified $KMnO_4$ to give Acetic acid. Which of the following statement is incorrect regarding above reaction?

- (1) Carbon is Oxidized.
- (2) Intermolecular interaction is higher in acetic acid than ethanol.
- (3) Two Oxygen atoms in acetic acid exhibit different VSEPR pairs.
- (4) Oxidation and Reduction both are takesplace in the above reaction.
- (5) Only H – bond and dipole – dipole in teractions are present between the Acetic acid Molecules

07) When a mass of 1.43g of $Na_2CO_3 \cdot 10H_2O$ is dissolved in 50ml, $0.1mol\ dm^{-3} Na_2SO_4$ and 25ml, $0.2mol\ dm^{-3} Na_3PO_4$ solution. The Na^+ composition of the resulting solution in ppm is ($1ppm = 1mg\ dm^{-3}$) ($C = 12, O = 16, Na = 23$)

- (1) 400
- (2) 4600
- (3) 9200
- (4) 10733
- (5) 11500

08) A gaseous mixture contains only x and y gases. The mass fraction of y is $\frac{2}{7}$ molarmass of x is five times that of molarmass of y . The correct mole fraction of x is?

- (1) $\frac{5}{7}$
- (2) $\frac{2}{3}$
- (3) $\frac{1}{3}$
- (4) $\frac{1}{5}$
- (5) $\frac{4}{5}$

09) Which of the following statement is correct regarding gases?

- (1) Gases mix evenly and completely without any mechanical aid.
- (2) Gas can be liquify when only given pressure
- (3) For an ideal gas at constant temperature, Pressure inversely proportion for volume.
- (4) Under the same conditions of temperature and Pressure, equal volume of ideal gases do not not contain equal number of moles.
- (5) At high pressure, high temperature conditions real gas behave as ideal.

10) Which of the following has the highest solubility in water?

- (1) $BaSO_4$
- (2) $BaCO_3$
- (3) $MgSO_4$
- (4) $MgCO_3$
- (5) $Mg(OH)_2$

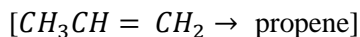
11) Which of the following is the stable oxy acid?

- (1) H_2SO_3
- (2) H_3PO_4
- (3) HNO_2
- (4) H_2CO_3
- (5) $H_2S_2O_3$

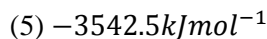
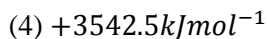
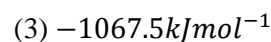
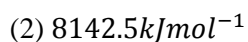
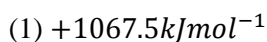
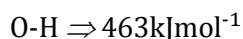
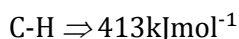
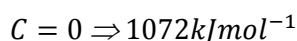
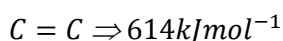
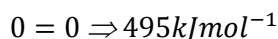
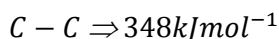
12) Which of the following statement is incorrect regarding catalysts?

- (1) V_2O_5 is used for oxidation of SO_2 to SO_3
- (2) $TiCl_3 / Al(C_2H_5)_6$ is used for the polymerization of ethene.
- (3) Pd is used for hydrogenation
- (4) MnO_2 is used to decompose H_2O_2
- (5) Pt / Rh is used for oxidation of ammonia to Nitrogen

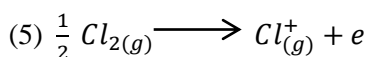
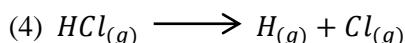
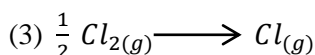
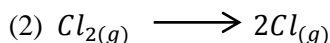
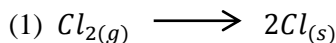
13) The correct enthalpy change when propene gas ignited is



Bond dissociation



14) The correct reaction relevant to the standard enthalpy of atomization of chlorine is?



15) The mean square speed of a gas at temperature $27^\circ C$ is 200ms^{-1} , At which temperature its mean square speed reaches 300ms^{-1}

(1) 450

(2) 350

(3) 177

(4) 723

(5) 167

16) Which of the following statements is / are correct regarding H_2O , NH_3 and CH_4

a) Electron pair geometry of the above molecules are same

b) Decreasing order of bond angle is CH_4 , H_2O , and NH_3

c) All the above molecules are polar compounds

d) The central atoms of CH_4 , H_2O and NH_3 Consist lone pair electrons.

17) Which of the following statements is / are correct regarding 3d block Elements

a) Oxides MnO_2 and CrO_2 show amphoteric properties

b) The highest oxidation states gradually increasing from Sc to Mn .

c) Among these elements Cu has the highest 2nd ionization energy.

d) An aqueous solution of cobalt, when treated with excess NH_3 gives a yellow brown precipitate

18) Which of the following statements is / are correct regarding gases.

a) Molar mass of an ideal gas can be calculated by using an ideal gas equation.

b) In vander waal's equation the correction of pressure factor directly proportion to density of gas

c) A gas cannot be liquified at critical Temperature .

d) The existence of three states of matter can be regarded as a result of balance between inter particle forces and the thermal energy of the particles .

19) Which of the following statements is / are correct regarding entropy.

- The spontaneity of a system of constant entropy can be determined by ΔH .
- In an isolated system when entropy increases spontaneity will be change
- There is no effect in entropy when physical and chemical changes
- The unit of ΔS is given by kJmol^{-1}

20) Which of the following gives $N_{2(g)}$ as a product to their thermal decomposition

- NH_4Br
- NH_4NO_2
- $(NH_4)_2Cr_2O_7$
- NH_4NO_3

❖ Instructions for questions 21 – 25.

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

Statement I	Statement II
21) Electron affinity of Nitrogen is higher than phosphorous	Three unpaired electrons m present in both nitrogen and phosphorous
22) Oxidation number describes the interchange of electrons from an atom in a chemical compound .	Oxidation number of an atom in a chemical compound cannot be zero
23) When $Cl_{2(g)}$ reacted with $NaOH_{(aq)}$ gives $NaCl_{(aq)}$, $NaClO_{3(aq)}$ at room temperature	All the halogens undergo disproportion reaction with $NaOH_{(aq)}$
24) At a constant temperature and pressure, nT product is a constant for a given gas sample	In a fixed amount of the gas at constant temperature, pressure inversely proportional to its volume
25) H bonds do not exhibit in $NaOH$ aqueous solution	O – H group in $NaOH$ forms hydrogen bond with water



**தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
இரண்டாம் தவணைப் பரீட்சை - 2022
Conducted by Field Work Centre, Thondaimanaru.
2nd Term Examination - 2022**

இரசாயனவியல் II A
Chemistry II A

Two Hours 10 min

02

E

IIA

Gr -12 (2023)

Structure essay Questions

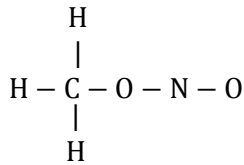
Answer all questions

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

- (i) H, N, S, Cl (Electronegativity)
- (ii) HF, HCl, HI, HBr (Boiling Point)
- (iii) I₂, ICl, Cl₂ (Strength of intermolecular interaction)
- (iv) Li, Na, Be, Mg (Second ionization Energy)
- (v) Na₂CO₃, (NH₄)₂CO₃, SrCO₃, BeCO₃
(Decomposition Temperature)
- (vi) Cl₂O₇, Mn₂O₇, Cl₂O, CrO₃ (Acidity)

b)

i) Draw the most acceptable Lewis structure for methyl Nitrite. The skeleton is given below.

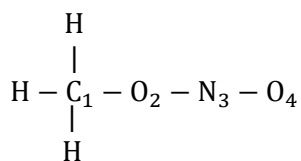


.....
.....
.....

ii) Draw two resonance structures for this molecule Indicate their stability.

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

iii) Based on the stable structure above (ii), complete the chart.



		C_1	O_2	N_3	O_4
I.	VSEPR Pairs.				
II.	Electron pair Geometry				
III.	Shape				
IV.	Hybridization				

iv) Identify the atomic/ hybrid orbitals involved in the formation of the following σ bonds in the stable Lewis structure of (ii) above.

- I. $\text{H} - \text{C}_1$. H C_1
- II. $\text{C}_1 - \text{O}_2$ C_1 O_2
- III. $\text{O}_2 - \text{N}_3$ O_2 N_3
- IV. $\text{N}_3 - \text{O}_4$ N_3 O_4

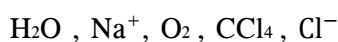
v) Identify the atomic orbitals involved in the formation of the following π bonds in given structure



vi) State the approximate bond angles around C_1 , O_2 and N_3



c) Consider the following chemical species.



Indicate one species for each interaction given below.

I. Hydrogen bond :

II. Vander Waals Interaction :

III. Dipole – induced Dipole interaction :

IV. Ion – induced dipole interaction :

V. Ion – dipole interaction :

(All Rights Reserved/ முழுப்பதிப்புரிமை உடையது)

2) a) X is a non transition element. It is the 3rd most natural abundant element in earth crust Some chemical properties of Element X is given below.

- It reacts with acid and base liberates the same colourless, odourless diatomic gas.
- It forms incomplete octet compound.

i) Identify the element X.

.....

ii) Give the most stable positive oxidation state of X

.....

iii) Give the electronic configuration for stable ion of X .

.....

iv) Give the balanced chemical equation for element X with (1) HCl

(2) $NaOH$

.....

.....

.....

v) Explain why this element is non reactive with air.

.....

.....

.....

.....

vi) Give the possible chemical formula of cations be present in aqueous solution of ion X write their IUPAC Name.

.....

.....

.....

.....

vii) Addition of $OH^-_{(aq)}$ drop wisely to the aqueous solution of ion X, write the observations obtained?

.....

.....

.....

.....

.....

.....

viii) Give balanced chemical equations for the above observation.

.....

.....

.....

.....

ix) Write a dimer compound of X in gaseous phase.

.....

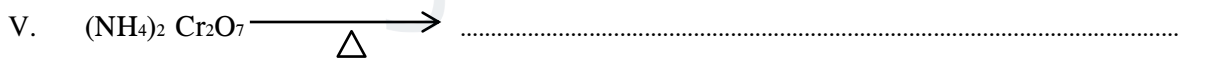
.....

.....

x) Give one use of element X.

.....

b) Write down the balanced chemical equation for the followings.



3) a) Give suitable equations for the followings.

i) Standard enthalpy of formation MgCl (s)

.....

ii) Standard enthalpy of atomization $\text{Mg}_{(s)}$

.....

iii) Standard enthalpy of Lattice dissociation of NaCl (s)

.....

iv) Standard enthalpy of combustion $\text{C}_3\text{H}_8(\text{g})$

.....

v) Standard enthalpy of vaporization of $\text{Br}_{2(l)}$

.....

b) 2g of each compounds Graphite, $H_2(g)$ and $C_2H_2(g)$ (ethyne) completely ignited, 65.5, 286, 100 kJ heat evolved respectively. Draw a suitable thermochemical cycle and find the formation enthalpy for $C_2H_2(g)$

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4) a) Consider the following elements.

Xe, F, S, O, I

Give one compound for each description given below. One molecule contains two elements only.

	Shape	Dipole moment	Example
1.	Linear	No
2.	Square planar	No
3.	Square pyramid	Yes
4.	Angular	Yes
5.	Trigonal planar	No
6.	Octahedral	No

b) An organic compound contains carbon, hydrogen and oxygen only. The percentage composition of carbon is 50%. Molecular mass of this compound is 72 gmol^{-1}

i) Determine its molecular formula

.....

.....

.....

.....

.....

.....

.....

.....

ii) Find its empirical formula ?

.....

c) a)

i) Who proposed first that radiation shows wave and particle like character?

.....

ii) Write the equation for wavelength λ related with mass m and velocity V of particle .

.....

.....

.....

iii) Released or emitted energy of a particle is given by $E = \frac{hc}{\lambda}$

Energy of tiny particles indicated by $E = mc^2$ Using these two equations, derive a suitable equation indicated 4 - C(ii)

.....

.....

.....

.....

.....

b) What is the wavelength of a particle with mass 2×10^{-24} g travelling at 1×10^8 ms⁻¹ speed
($h = 6.626 \times 10^{-34}$ Js)

.....

.....

.....

.....

.....

.....



**தொண்டமானாறு வெளிக்கள நிலையம் நடாத்தும்
இரண்டாம் தவணைப் பரீட்சை - 2022
Conducted by Field Work Centre, Thondaimanaru.
2nd Term Examination - 2022**

**இரசாயனவியல் II B
Chemistry II B**

Gr -12 (2023)

02

E

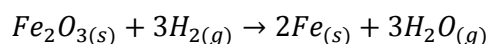
IIB

Part – II B

❖ **Answer any two questions from this section.**

- 05) A) i) Write down the ideal gas equation.
ii) Give five assumptions of the molecular kinetic Theory of an ideal gas.
iii) When N number of molecules in a constant volume container at constant temperature travel with different speeds of C_1, C_2, \dots, C_N write the equation for Average speed, Mean square speed, Root mean square speed.
iv) Write down the molecular kinetic Equation.
v) Using the molecular kinetic equation, then Derive $\sqrt{C^2} = \sqrt{\frac{3RT}{M}}$
- B) A container with volume Vm^3 contains 2g of pure A gas at $2 \times 10^5 Nm^{-2}$ pressure at $27^\circ c$. Another same volume Vm^3 vacuum container connected with the system. Then the system was heated to $127^\circ c$ At this temperature, 6g of pure gas B was inserted into the system until the pressure became $4 \times 10^5 Nm^{-2}$ Find the molecular mass ratio between gas A and gas B.
- 06) A) A crystalline salt $Cu_2S.xH_2O$ reacted with acidified $KMnO_4(aq)$ and gives $Cu_{(aq)}^{2+}, Mn_{(aq)}^{2+}, SO_{2(g)}$ 1.335g of the hydrated salt reacted with $0.2moldm^{-3}$ acidified $KMnO_4$ The required volume of $KMnO_4$ solution was $40.00cm^3$. ($Cu = 63.5, S = 32$)
i) Oxidation half ionic equation.
ii) Reduction half ionic equation.
iii) Oxidation Reduction ionic equation.
iv) Calculate the mass of Cu_2S in hydrated salt.
v) Find the value of x
- B) i) Nitrogen is an inert gas. Briefly explain your answer.
ii) Nitrogen takes the oxidation states from -3 to $+5$ Given Examples for each oxidation states.
iii) Give balanced chemical equations as NH_3 act as.
a) Oxidizing agent
b) Reducing agent
c) Acid
- C) The melting point of Mg is greater than that of Na Explain your answer.

07) A) Consider the following reaction.



Using the following thermochemical data at $25^\circ C$.

	$Fe_2O_{3(s)}$	$H_{2(g)}$	$Fe_{(s)}$	$H_2O_{(g)}$
Standard enthalpy of formation ($KJmol^{-1}$)	-822	0	0	-242
Standard entropy ($KJK^{-1}mol^{-1}$)	0.090	0.131	0.027	0.189

- Calculate the ΔH^θ for the above reaction at $25^\circ C$
- Calculate the ΔS^θ for the above reaction at $25^\circ C$.
1. Write the relationship ΔG^θ for the reaction with ΔH^θ and ΔS^θ
2. Calculate the ΔG^θ at $25^\circ C$, state the spontaneity of the reaction.

B) P is an S -block Element in the periodic table P gives red colour in flame test. Its ionization energy is highest among the same group elements. Element P reacts with water gives a solution and gas Q. Evaporation of this solution produce a metal oxide. Element P reacts with $N_{2(g)}$ and also $H_{2(g)}$ given compounds R and basic compound S respectively compound R treated with water given gas T which change Red litmus to blue colour

- Identify P, Q,R,S,T
- Give the balanced chemical equations involved above

C) Construct a Born Haber cycle for standard Lattice dissociation for $KBr_{(s)}$

agaram.lk