**[CLASS - XI]**

**CHEMISTRY (THEORY)**

**[SAMPLE PAPER-VIII]**

**Time Allowed: 3 hrs M.M.: 70**

1. Write the mathematical expression for the First law of Thermodynamics? (1)
2. Write the corresponding conjugate acid and conjugate base for HCO3⁻? (1)
3. Arrange the following acids in the increasing order of their acidic strength.

A – (pKa = 4.74)

B – (pKa = 5.43)

C – (pKa = 6.73) (1)

1. Pick out the cation which will have the highest and lowest hydration energy.

Ca2+, Mg2+, Sr2+ (1)

1. Give the formula of ‘inorganic benzene’. (1)
2. Give the number of a-carbons in the following molecules?

CH3 – CH2 – CH – CH3

OH (1)

1. Identify non-aromatic compound form the following:

(a)

(b)

(c)

⦁⦁ (1)

1. Which hybrid orbitals are used by ‘C’ atoms labeled as ‘x’ and ‘y’.

‘x’ ‘y’ O

CH3 – CH – C C – C (1)

CH3 H

1. (a) Which out of NH3 and NF3 has high dipole moment and why?
2. Distinguish between σ and π bonds in terms of extent of overlap and rotation along the internuclear axis. (2)
3. (a) Give two properties to show similarity between Li and Mg.

(b) BaO in soluble but BaSO4 is insoluble in water. Explain.

Or

1. Give reason for anomalous behaviour of Li.
2. Caesium and Potassium are used in photo electric effect. Explain? (2)
3. (a) What is inert pair effect?

(b) What is the effect of heat on orthoboric acid? (2)

1. Give the IUPAC name of the following:

(i) CH3 CH2 CH(OH) CH2 COOH

(ii) (CH3)3 C CH2C(CH3)2CH3 (2)

1. (a) For an isolated system, ∆U = O, What will be ∆S?

(b) Given: N2(g) + 3H2(g) 🠖 2NH3(g) ∆*r*H° = -92.4 kJ mol-1

What is standard enthalpy of formation of NH3? (2)

1. The following reaction has attained equilibrium CO(g) + 2H2(g) ⇌ CH3OH(g) ∆H = -92 kJ mol-1

What will happen if,

1. Volume of the reaction vessel is suddenly reduced
2. Partial pressure of H2 is suddenly doubled? (2)
3. (a) Classify the following species as Lewis Acid & Lewis base
4. BCl3 (ii) F⁻

(b) The ionisation constant of HCOOH is 1.8 x 10-4. Calculate the ionisation constant of the corresponding conjugate base. (2)

1. Balance the following redox reaction in Acidic medium –

H2O2 (aq) + Fe2+ (aq) 🠖 Fe3+ (aq) + H2O(l) (2)

1. Balance the following redox reaction in Basic medium –

MnO⁻4 (aq) + I⁻ (aq) 🠖 MnO2(*s*) + I2(*s*) (2)

1. Arrange the following in the increasing order of the property mentioned:

⊕ ⊕ ⊕

1. CH3 CH2, (CH3)3 C, (CH3)2 CH (stability)

O

1. Cl – CH2 – CH2 – C – C

OH

(Acidic strength)

O

CH3 – CH2 – C

OH

O

CH3 – CH – C

Cl OH (2)

1. How will you convert (Give equations)
2. Ethyne to Benzene
3. Acetylene to Acetophenone
4. Methane Ethane (3)
5. (a) Give the structure of 4-Methylcyclohexene

(b) Explain metamerism with a suitable example.

(c) Draw all the canonical forms of benzylic carbanion showing electron displacement by suitable arrows. (3)

1. (a) C – C bond length in propene is little shorter (1.49 Å) than C – C bond length (1.54 Å) in ethane. Why?

(b) Which type of isomerism is exhibited by the following pairs.

O O

1. and

Cl Cl H Cl

1. C = C and C = C

H H Cl H

1. What is the minimum number of carbon atom that an alkane must contain to have chain isomers? (3)
2. (a) Using Molecular orbital theory. Explain that O⁻2 molecule can exist and is paramagnetic. (At. No. =8)

(b) Draw the Lewis dot diagram of O3 and find out the formal charge of each O atom.

(3)

1. (a) State Hess’s law of constant heat summation.

(b) Calculate the change in Enthalpy for the reaction:

H2C CH2 (g) + 3O2 (g) 🠖 2 CO2(g) + 2H2O(*l*)

Given Bond energy:

(C – H) 414 kJ mole-1, (O – O) 499 kJ mole-1

(C = C) 619 kJ mole-1, (C = O) 724 kJ mol-1(2)

(O – H) 460 kJ mol-1 (3)

1. (a) Kp for the reaction 2SO2 (g) + O2 (g) ⇌ 2SO3 (g) is 16 at a certain temperature.

Calculate the value of Kp at the same temperature for the reaction

SO3 (g) ⇌ SO2 (g) + O2 (g)

(b) One mole of H2O and one mole of CO are taken in a 10 litre vessel and heated to 725 k. At equilibrium, 40% of water (by mass) reacts with CO according to equation:

H2O (g) + CO (g) ⇌ H2(g) + CO2 (g)

Calculate the equilibrium constant for the reaction. (3)

1. (a) What will be the effect of the aqueous solution of the following salt on blue litmus

paper.

(i) NH4NO3 (ii) NaCl

(b) Equal volume of 0.002 M solution of sodium iodate and cupric chlorate are mixed together. Will it lead to the precipitation of copper iodate?

Ksp [Cu(IO3)2] = 7.4 ‘ 10-8. (3)

1. (a) Ka2 << Ka1 for H2SO4. Why?
2. Calculate the pH of the resultant mixture when 10 ml of 0.2 M Ca(OH)2 is mixed with 25 ml of 0.1 M HCl.

Or

1. NH4Cl is added before adding NH4OH for the qualitative analysis of 3rd gp cation. Explain.
2. The ionisation constant of phenol is 1 x 10-10. What is the concentration of phenate ion in 0.05 M solution of Phenol? What will be the degree of ionization if solution is also 0.01 M I sodium phenate? (3)
3. (a) Give the mechanism of nitration of benzene.

(b) Write the following reactions:

(i) Friedal Craft Alkylation

(ii) Wurtz reaction (3)

1. (a) An Alkene ‘A’ gives 2-Methyl propanal and 2, 2-Dimethyl butanal on reductive ozonolysis. Identify ‘A’ and write the equation.

(b) Complete the following reaction:

(i) CH3 – CH = CH2 + HBr

(ii) CH3 – C = CH + H2O

1. Terminal alkynes are acidic in nature. Explain.

Or

1. Isopropyl alcohol on dehydration with conc. H2SO4 gave ‘A’ which on reaction with HBr in dark formed ‘B’ as major product. Identify ‘A’ and ‘B’ and give chemical equation.
2. How would you distinguish between Propane and propene? Give equation.
3. Benzene undergo electrophilic substitution reaction easily. Explain. (3)
4. (a) When an alkali metal dissolves in liquid NH3, the solution can acquire different colors. Explain the reasons giving relevant equations.

(b) Give reasons:

(i) LiI is more soluble than KI in alcohol.

(ii) Be and Mg do not give colour to flame whereas other members give.

(iii) Li+ forms oxide but Na+ form peroxide and superoxide.

Or

(a) Write the balanced equation for the following:

(i) Lithium nitrate is strongly heated.

(ii) Sodium peroxide is dissolved in water.

(b) Give reasons for the following:

(i) First I.E. of alkaline earth metals are higher than those of the corresponding group I metals.

(ii) Li2CO3 decomposes at lower temperature whereas Na2CO3 at higher temperature.

1. Alkaline earth metals have higher M.P. than alkali metals. (5)
2. (a) What happens when:
3. Silicon is heated with methyl chloride at high temperature is presence of Cu.
4. SiCl4 is hydrolysed in water.

(b) Explain the following giving reasons:

(i) Boric acid is not a protic acid.

(ii) Boron is unable to form ion

1. Atomic radius of Gallium is less than Aluminium

Or

1. Explain the structure of diborane.
2. Give reasons for the following:
3. [SiF6]2- is known whereas [CF6]2- not.
4. In group 14, there is considerable increased in covalent radius from C to Si but small increases from Si to Pb.
5. B – Cl bond has a dipole moment but BCl3 has zero dipole moment. (5)