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63□(FY) (SEM–2)□MAJ2/CHMMAJ1024

2025

CHEMISTRY

(MAJOR)

Paper : CHMMAJ1024

(Fundamentals of Chemistry – 2)

Full Marks : 50

Pass Marks : 20

Time : Two hours

The figures in the margin indicate full marks for the questions.

1. Choose the correct answer : 1×5=5

   (a) The radius ratio of an ionic compound is in the range 0.155–0.255. What will be the structural arrangement of the compound?

   (i) Cubic

   (ii) Octahedral

   (iii) Tetrahedral

   (iv) Trigonal planner

(b) The increasing order of bond order of O_2^-, O_2 *and* O_2^+ is

(i) $O_2^- > O_2 > O_2^+$

(ii) $O_2^- > O_2^+ > O_2$

(iii) $O_2^+ < O_2 < O_2^-$

(iv) $O_2^- < O_2 < O_2^+$

(c) Which of the following cubic unit cells possesses 32% vacant space?

(i) Simple cubic unit cell

(ii) bcc unit cell

(iii) fcc unit cell

(iv) None of the above

(d) Friedel Crafts alkylation of nitrobenzene with methylchloride results

(i) 2-methylnitrobenzene

(ii) 3-methylnitrobenzene

(iii) 4-methylnitrobenzene

(iv) 2,4-dimethylnitrobenzene

(e) Ozonolysis of 2-methylbut-2-ene results-

(i) Propanone and ethanal

(ii) Propanal and ethanal

(iii) Propanol and ethanol

(iv) Butanone and methanol

2. Answer the following questions : ***any five*** 2×5=10

(a) Explain the term 'solvation energy'.

(b) BeF_2 is linear while BF_2 is angular. Explain.

(c) What is co-efficient of viscosity ? How does viscosity of a liquid change with temperature?

(d) State the law of rational indices.

(e) What is Wurtz-Fittig reaction ? Give example.

(f) Write Hückel rules for aromaticity. Give example.

(g) Define activating and deactivating groups with examples.

3. Answer the following questions : ***(any five)*** 5×5=25

(i) What is Born-Haber cycle? Discuss how the lattice energy of an ionic solid can be calculated with the help of Born-Haber cycle. 2+3=5

(ii) Explain the terms polarization, polarizing power and polarizability. State Fajan's rule for covalent character of ionic compounds. 3+2=5

(iii) What is surface energy? What is the effect of temperature on surface tension? What will be the surface tension of a liquid at its critical temperature? 2+2+1=5

(iv) What are Miller indices? A crystal plan has intercepts on the three axes of a crystal in the ratio $\frac{3}{2}:2:1$. What will be Miller indices of the plane? What is the difference between Weiss indices and Miller indices? 1+2+2=5

(v) What are space lattice and unit cell of a crystal? Explain law of consistancy of interfacial angles. 2+3=5

(vi) Explain E1 mechanism of elimination

reaction. What are Saytzeff and Hoffmann elimination? 3+2=5

(vii) Discuss the arenium ion mechanism of aromatic electrophilic substitution reaction. Give *any one* evidence in support of the mechanism. 3+2=5

(viii) Draw all the conformations of cyclohexane. Explain their relative stabilities and draw the energy profile diagram. 2+2+1=5

4. Answer the following question : ***(any one)*** 10

(i) (a) Draw the molecular orbital energy level diagram of O_2^+. Discuss the bond order and magnetic property from the molecular orbital energy level diagram. 3+2=5

(b) What is hybridization ? Discuss the shape of SF_4 on the basis of hybridization. 2+3=5

(ii) (a) What is Markownikoff addition to an alkene ? Discuss the bromination in allylic position by N-bromosuccinimide. What is Diel-Alder reaction ? 1+2+2=5

Contd

(b) Write short notes on :

Wurtz reaction and Corey-House reaction 5
