SHRI S.H.KELKAR COLLEGE OF ARTS, COMMERCE AND SCIENCE, DEVGAD. (SINDHUDURG)

S.Y.B.Sc. SEMESTER III EXAMINATION OCTOBER 2023

COURSE: General Chemistry I **COURSE CODE – USCH 301**

TIME : 8:30 am to 11:00 am **MAX. MARKS: 75**

SET 1 **DURATION: 2.5 HOURS**

N.B. 1.All the questions are compulsory
2. Figures to the right indicates full marks
3. The use of log table/Programmable calculators are allowed.
4. Answers for the same question should be written together.

Q. 1) Select the correct option and complete the following statement. **(15)**

1) Gibbs free energy is .....
a) Extensive property b) Intensive property c) constitutive property

2) For a system at equilibrium
a) $\Delta G = 0$ b) $\Delta G<0$ c) $\Delta G> 0$

3) As the pressure on the system increases, its free energy
a) Decreases b) Increases c) Remain same

4) When a reaction is carried out in liquid phase K_{eq} is designated as
a) K_p b) K_c c) K_l

5) The unit for cell constant is.....
a) cm^{-1} b) cm c) S^{-1}

6) The most efficient mode of packing of identical atoms in one layer is.....
a) square close packing. b) hexagonal close packing. c) both a and b

7) Crystal structure of CsCl is _____
a) FCC b) BCC c) HCP

8) The atom in the molecule of water adopts what kind of geometry?
a) Linear b)Tetrahedral c) Trigonal planar

9) Which one of the following is correct bond angle between atoms adopting a trigonal planar geometry ?
a) 180°. b)120° c) 109.5 °

10) The number of bonds in nitrogen molecule is .....
a) one sigma & one pi. b) one sigma n two pi. c) three sigma

11) SN^1 reactions results in .....of configuration
a) Inversion b) Retention c) Both Retention and Inversion

12) Organolithium compounds react with alcohol to form .....
a) Alkyl halide b) Ethane c) Alkane

13) Epoxide contain ..... Membered ring.
a) Four b) three c) five

14) Phenols are ..... in nature.
a) Basic b) neutrals c) acidic

15) Grignard reagent is .....

a) organozinc b) ethyl magnesium bromide c) organolithium halide

Q. 2) Attempt any THREE of the following. **(15)**

A) Show that decrease in Helmholtz free energy at constant temperature gives maximum work. (5)

B) Derive relation between Gibbs free energy and Helmholtz free energy (5)

C) The free energy change accompanying a given process is -93.21 kJ at 290 K and -86.12 kJ at 305 K. Calculate the enthalpy change at 298 K. (5)

D) Define specific conductance and equivalent conductance. How they are related with each other. (5)

E)Explain the following with relevant equations (5)

a)fugacity b) activity coefficient c) activity

Q. 3) Attempt any THREE of the following. **(15)**

A) Calculate the heat of formation (ΔH) of KF from its elements from the followong data by the use of Born - Haber cycle. (5)

Sublimatiom energy of Potassium (S) = 87.8 kJ mol^{-1}

Dissociation energy of F2 (D) = 158.9 kJ mol^{-1}

Ionisation energy of K(g) (I) = 414.2 $kJmol^{-1}$

Electron affinity for F (g) (E) = - 334.7$kJmol^{-1}$

Lattice energy KF (U_0) = - 807.5 $kJmol^{-1}$

B) (i) Explain different types of void in ionic crystal. (3)

(ii) The radii of K^+ and Cl^- are 1.13A^0 and 1.18 A^0 respectively. Predict the coordination number of K^+ ions in KCl ionic crystal. (2)

C) Discuss in brief the postulates and limitations of Valence band theory (5)

D) Draw a neat labelled molecular orbital energy level diagram for N_2 molecule and give its molecular ES. Comment on its bond order and magnetic property. (5)

E) Define sp^3 hybridisation and on the basis of sp^3 hybridisation explain the geometry of following molecule PF_5, SF_4 and ClF_4. (5)

Q. 4) Attempt any THREE of the following. **(15)**

A)Explain the mechanism of SN^2 with suitable example . (5)

B)Discuss Elimination-Addition mechanism with suitable example (5)

C)What are Organolithium compounds ? Discuss the reactions with carbonyl compound (5)

D)Explain the following with suitable example , (5)

i) Hydration of alkenes ii) Reduction of aldehydes & Ketones

E)Explain the following with suitable example , (5)

i) Nitration of Phenol ii) Bromination of Phenol

Q. 5) Attempt any THREE of the following. **(15)**

A) What are the characteristics of electrolytic conductors? (5)

B) Conductance of a 0.1 N solution of an electrolyte was found to be 4.76×10^{-3} S at 25 ^{0}C. Calculate the cell constant, equivalence conductance, molar conductance of the solution at 25 ^{0}C, if the electrode in the cell are 0.8 cm apart and have an area of 0.7628 cm^2. (5)

C) Discuss the importance of exchange energy , shielding effect in the formation of Hydrogen molecule (5)

D) i) Define terms a) crystal b)Lattice c)unit cell. (3)

ii)Name seven crystal system. (2)

E) How are Grignard reagent compounds prepared ? Discuss the reactions of Grignard reagent with , a) water b) alcohol c) ammonia (5)

F) How is ethylene oxide prepared by the following methods ? (5)

a) Oxidation of olefins b) From vicinal halohydrins (5)

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