

31. a. Derive Gibbs-Helmholtz equation. Give its applications.

(OR)

b. With a neat sketch explain Pourbaix diagram for Iron.

32. a. Explain in detail the conformational analysis of n-butane with potential energy diagram.

(OR)

b. How is isomerism exhibited in transition metal compounds? Explain the types with an example each?

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B.Tech. DEGREE EXAMINATION, NOVEMBER 2018
First Semester

18CYB101J - CHEMISTRY

(For the candidates admitted during the academic year 2018-2019)

Note:

- (i) Part - A should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.
- (ii) Part - B and Part - C should be answered in answer booklet.

Time: Three Hours

Max. Marks: 100

PART - A (20 × 1 = 20 Marks)
Answer ALL Questions

- Two electrons occupying the same orbital are distinguished by
(A) Azimuthal quantum number (B) Spin quantum number
(C) Magnetic quantum number (D) Orbital quantum number
- The de-Broglie hypothesis is associated with
(A) Wave nature of electrons only (B) Wave nature of protons only
(C) Wave nature of radiation (D) Wave nature of all material particles
- For a homonuclear diatomic molecule the bonding orbital is
(A) σ_g of lowest energy (B) σ_u of second lowest energy
(C) π_g of lowest energy (D) π_u of lowest energy
- Organic compounds which contain more than one benzene rings are termed
(A) Arenes (B) Aryls
(C) Acyls (D) Benzenes
- The crystal field splitting energy for octahedral (Δ_o) and tetrahedral (Δ_t) complexes is related as
(A) $\Delta_t = 4/9\Delta_o$ (B) $\Delta_t = 1/2\Delta_o$
(C) $\Delta_o = 2\Delta_t$ (D) $\Delta_o = 4/9\Delta_t$
- The number of unpaired electrons in d^6 , low spin octahedral complex is
(A) 0 (B) 1
(C) 2 (D) 3
- The vibrational rotational spectrum is observed in _____ region
(A) Near IR (B) Microwave region
(C) Visible region (D) Radio frequency region
- In a rotational spectrum transitions are only observed between rotational levels of $\Delta J =$
(A) ± 1 (B) ± 2
(C) 0 (D) ± 3

9. The kinetic energy of the ejected photoelectron is dependent upon the energy of the
 (A) Ions around (B) Photons around
 (C) Material (D) Impinging photon

10. Compute the miller indices for the intercepts $x = \frac{1}{2}, y = \frac{1}{2}$ and $z = \frac{1}{\infty}$
 (A) 110 (B) 101
 (C) 100 (D) 210

11. The smallest interplanar spacing in a crystal which will give n^{th} order Bragg's reflection is
 (A) $d_{hkl} = n$ (B) $d_{hkl} = \frac{n}{2}$
 (C) $d_{hkl} = \frac{n}{3}$ (D) $d_{hkl} = \frac{n}{4}$

12. The second ionization energy is always higher than the first ionization energy because the
 (A) Electron is attracted more by the core electrons (B) Electron is more tightly bound to the nucleus in an ion
 (C) Stability increases on attaining an octet or duplet configuration (D) Atomic size is larger

13. First law of thermodynamics states that
 (A) $\Delta U = q - w$ (B) $\Delta U = q + w$
 (C) $\Delta U = q + \Delta w$ (D) $\Delta E = \Delta q + w$

14. In a reversible process, entropy of the system

- (A) Increases (B) Decreases
 (C) Zero (D) Remains constant

15. The name of the equation showing relation between electrode potential (E), standard potential (E°) and concentration of ions in solution is

- (A) Kohlrausch's law (B) Nernst equation
 (C) Faraday's equation (D) Ohm's law

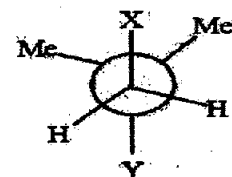
16. Corrosion of metals involves
 (A) Electrochemical reactions
 (C) Both A and B

- (B) Chemical reactions
 (D) Thermal reactions

17. Enantiomers are

- (A) Molecules that have a mirror image (B) Molecules that have atleast one stereogenic center
 (C) Non-super imposable molecules (D) Non-super imposable molecules that are mirror images of each other

18. In the Newmann projection of 2,2- dimethyl butane X & Y can be represented as



- (A) H & CH_3 (B) CH_3 & CH_3
 (C) H & C_2H_5 (D) Both B & C

19. The E_1 mechanism proceeds via formation of
 (A) Carbanion (B) Carbocation
 (C) Double bond (D) Free radical

20. Reduction of ketone to hydroxyl group takes place by one of the following reagents.
 (A) NaBH_4 (B) O_2
 (C) KMnO_4 (D) CrO_3

PART - B ($5 \times 4 = 20$ Marks)
 Answer ANY FIVE Questions

21. Discuss the radial wave functions of hydrogen atom.
 22. Discuss the energy level diagram of O_2 molecule.
 23. Explain briefly about high spin and low spin complexes with examples.
 24. Discuss the criteria for absorption in the IR region.
 25. Write a note on the variation in atomic and ionic sizes across the periods and groups.
 26. Define: Entropy. Give its significance.
 27. Briefly explain Dieckmann condensation.

PART - C ($5 \times 12 = 60$ Marks)
 Answer ALL Questions

28. a. Discuss in detail the Schrodinger wave equation of a particle in a box.

(OR)

- b. What is Linear combination of atomic orbitals? Draw and explain the molecular orbital energy level diagram for hydrogen molecular ion $[\text{H}_2^+]$ and calculate the bond order.

29. a.i. Give the salient features of crystal field theory. (4 Marks)

- ii. Discuss the crystal field splitting in an octahedral complex. (8 Marks)

(OR)

- b. Discuss the vibrational spectrum of a diatomic molecule undergoing simple harmonic motion.

30. a. Discuss the principle, instrumentation and applications of XPS.

(OR)

- b.i. Write a note on Vander Waal's interactions. (4 Marks)

- ii. Discuss in detail Bragg's law for the diffraction of crystals with a neat sketch. (8 Marks)