C 15727 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION MAY 2011

(CCSS)

Chemistry – Core Course II

CH2 B03 – THEORETICAL CHEMISTRY

Time : Three Hours Maximum : 30 Weightage

I. Answer all *twelve* questions.

1. The radius of the second orbit in hydrogen atom is :
   (a) 220pm (b) 240pm
   (c) 212pm (d) 224pm
2. How many radial nodes are found in the case of 4p orbital?
   (a) 1 (b) 2
   (c) 3 (d) 4
3. The bond order of CO molecule is :
   (a) 1.5 (b) 2
   (c) 2.5 (d) 3
4. The shape of IF_7 molecule is :
   (a) square pyramidal (b) linear.
   (c) T shaped. (d) pentagonal bipyramid.
5. In a semiconductor, there is ———— gap between the two energy bands.
6. A zero bond order suggests that the molecule is ————.
7. The region where there is zero probability of locating the electron between two nonzero probability region is called ————.
8. The Pfund series of the emission spectrum of hydrogen occurs at ———— region.
9. Who proposed "plum pudding model" of atomic theory?
10. What is the expression for the energy of a particle in a one dimensional box?
11. Give the name of the orbital which opposes the formation of chemical bond.
12. What type of hybridization is present in SF_6 molecule?

(12 × ¼ = 3 weightage)

Turn over

II. Short answer type questions (Answer all *nine* questions) :

13. Which postulates of the Bohr theory was in accordance with the quantum theory?
14. What is de-Broglie equation? Explain the symbols.
15. What is an operator? Give an example.
16. What are quantum numbers? Mention their names.
17. Is B_2 molecule paramagnetic or diamagnetic? Discuss.
18. What is Born-Oppenheimer approximation?
19. Give the shapes of the molecules having sp^3d^2 and sp^3d^3 hybridization for the central atom. Give one example for each.
20. What is hybridization? Give two characteristics.
21. Calculate the uncertainty in the position of a particle whose uncertainty in momentum is 1.65×10^{-2} $kgms^{-1}$.

($9 \times 1 = 9$ weightage)

III. Short essay or paragraph questions (Answer any *five* questions from seven) :

22. What are the short comings of Bohr Theory? Explain.
23. Explain Heisenberg's uncertainty principle with suitable examples.
24. What are the postulates of quantum mechanics?
25. What are radial probability distribution curves? Draw the probability curves for 2s, 3s and 3p orbitals.
26. Explain the differences between valence bond theory and molecular orbital theory.
27. Give the molecular orbital configurations of N_2 and O_2 molecules and calculate their bond order.
28. What is meant by metallic bond? Discuss the band model for the metallic bond.

($5 \times 2 = 10$ weightage)

IV. Essay questions (Answer *two* questions from three) :

29. Using Bohr's postulates derive an equation for radius of an orbit and energy of an electron in an orbit.
30. Derive Schrodinger wave equation. Apply it to a particle in one dimensional box.
31. Give an account of molecular orbital theory of H_2^+ molecule. Also explain the potential energy diagram of H_2 molecule formation.

($2 \times 4 = 8$ weightage)