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D2BCH2301 (PAGES 2) Reg.No.....

Name: .....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024

(Regular/Improvement/Supplementary)

CHEMISTRY

GCHE2B02T: THEORETICAL AND INORGANIC CHEMISTRY- II

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling 20 Marks)

1. Explain de Broglie's concept of matter waves with evidence.
2. Calculate the kinetic energy of a photoelectron emitted by a sodium surface when light of wavelength 400 nm is incident on it. The work function of sodium atom is 3.653×10^{-19} J.
3. What are non-commuting operators? Explain.
4. Give the angular distribution plots for p-orbitals.
5. State and explain the Pauli's exclusion principle.
6. Write the time in dependent Schrödinger wave equation and explain the terms.
7. What is Born-Oppenheimer approximation?
8. State the Variation theorem.
9. Explain the magnetic behavior of O_2 on the basis of MOT.
10. Write down the electronic Schrödinger equation for the H_2^+ ion.
11. Draw the experimental potential energy curve for H_2 molecule.
12. Which has greater bond order – NO or NO^+ ? Explain.

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 30 Marks)

13. What is a black body? What types of radiations are emitted by such a body? Explain, why these radiations could not be rationalized on the basis of classical theory of radiation.
14. Derive an expression for the radius of a Bohr orbit and the binding energy of an electron in a hydrogen atom.
15. What are the postulates of quantum mechanics?
16. Discuss the Radial distribution functions and their plots with illustrative examples.
17. Distinguish between bonding and antibonding molecular orbitals.
18. Explain valence bond theory of H_2 molecule.
19. Explain the need for hybridization in explaining the bonding in polyatomic molecules.

(PTO)

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Set up the Schrödinger wave equation for a particle in a three-dimensional box and solve it by applying the separation of variables method.
21. How does the LCAO approximation explain the concept of hybridization. Explain the mathematical expression obtained for sp, sp^2 and sp^3 hybridized orbitals with suitable examples.

(1 x 10 = 10 Marks)