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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2022-23 ONLY)

SUBJECT CODE 22PCY206

REG.NO.

N.G.M.COLLEGE (AUTONOMOUS): POLLACHI

END-OF-SEMESTER EXAMINATIONS: MAY 2023

M.Sc. CHEMISTRY **MAXIMUM MARKS: 50**

II SEMESTER **TIME : 3 HOURS**

PHYSICAL CHEMISTRY-II-QUANTUM CHEMISTRY AND NANO CHEMISTRY

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.(K1)

1. The definite region in three dimensional space around the nucleus where there is high probability of finding an electron of a specific energy E is called _____.

   a. Atomic orbital b.Molecular orbital c.Nodal plane d.Median lobes

2. In the variation method _____.

   a. a system which wave functions may be guessed

   b. method to obtain approximate solutions to the wave equation

   c. method to obtain accurate solutions to the wave equation

   d. a system which wave functions is accurately known

3. Which of the following is a condition for the combination of atomic orbitals?

   a. Combining atomic orbitals need not have equal energy

   b. Combining atomic orbitals must have symmetry as per molecular axis

   c. Combining atomic orbitals must overlap to a minimum extent

   d. For combining atomic orbitals, X-axis should be taken as a molecular axis

4. Who discovered nanotubes?

   a. Gerd Binning b. Alex Zettl c. PM Ajayan d. Sumio Iijima

5. In which year was the scanning tunneling microscopy invented?

   a.1982 b.1934 c. 2003 d.1999

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES (K2)

6. Explain Crompton effect.
7. What is meant by Hydrogen like atoms?
8. Which type of Hybrid orbital present in $CH_3^- CH_3$ molecular Carbon?
9. Define nano rods.
10. Give the expansion of ESCA.

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ETHICAL PAPER

SECTION – B (5 X 3 = 15 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K3)

11. a) Elaborate various Operators in quantum chemistry.

(OR)

b) Define Einstein's photoelectric effect. Find out how does it support Planck's hypothesis of quantization of energy.

12. a) Using the variation method solve the Schrodinger wave equation for the ground state energy of helium atom.

(OR)

b) Explain the heat for Approximation method. .

13. a) Apply Hückel theory to describing the pi bonding in cyclical conjugated system(Benzene)

(OR)

b) State slater rule.

14. a) Discuss the Classification of Nanomaterial's in detail.

(OR)

b) List the applications of Nanomaterial's and neatly explain them.

15. a) Describe the instrumentation of Scanning tunneling microscopy.

(OR)

b) Explain the study of Nano ESCA.

SECTION – C (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

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(K4 (Or) K5)

16. a) What are the postulates of quantum mechanics? Solved based on the postulates of quantum mechanics, derive Schrodinger wave equation.

(OR)

b) Explain the determination of ψ and energy of Rigid rotor of diatomic molecular.

17. a) Interpret the Variation methods applicable to H atom in ground state.

(OR)

b) Prove the perturbation theory with suitable example.

18. a) Describe the simple Huckle molecular treatment of ethylene molecule($CH_2=CH_2$)

(OR)

b) Construct the wave functions for the sp^3 hybrid orbitals.

19. a) Discuss Bottom up and top down approach for the synthesis of Nanomaterial

(OR)

b) Explain Chemical Vapor Deposition of Carbon Nanotubes

20. a) Make a short note on Scanning Electron Microscopy

(OR)

b) Outline the instrumentation of atomic force microscopy.

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