

**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS**

**SCHOOL OF SCIENCE AND TECHNOLOGY**

**JUNE/JULY EXAMINATION**

**COURSE CODE: CHM307**

**COURSE TITLE: ATOMIC AND MOLECULAR STRUCTURE AND SYMMETRY**

**TIME ALLOWED:2 hours**

**INSTRUCTION: ATTEMPT ANY FIVE QUESTIONS**

1. (a) Highlight the shortcomings of the Aufbau Principle.

(b) State the Pauli’s Exclusion Principle.

(c) Explain explicitly the quantum numbers by which the electrons in an atom are described.

1. (a) What do you understand by “pseudo-noble gas configuration”? . Give appropriate examples.

(b) List the various molecular orbitals that can be formed from the combination of orbitals on two atoms.

(c) Discuss two consequences from Molecular Orbital theory.

1. (a) Write a short note on d2sp3 Hybrid orbitals.

(b)State the shapes and types of orbitals in each of these compounds:

 (i) BH3(ii) NH4+ (iii) BeF2(iv) ClF3 (v) SF6

(c) Draw the schematic of ethane molecular orbital.

1. (a) Highlight the steps to writing resonance, and show resonance in ozone and benzene.

(b) What is Nuclear coupling?

(c) Explain briefly whyyou think quantum mechanics is very useful to the scientist.

1. (a) State the conditions for the formation of chemical bond.

(b) Write the Schrodinger wave equation for the hydrogen molecule ion.

 (c) Differentiate between bond order and bond length.

1. (a) Discuss the classes of molecules based on Rotational Behaviour.

(b) Discuss the effect of vibration on rotation of one of the classes mentioned in 6a above.

1. (a) Account for the formation of vibration-rotation spectra.

(b) Describe coordinates in Vibration Spectroscopy