



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.
2. (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.
3. (a) Write a short note on d^2sp^3 Hybrid orbitals.
(b) State the shapes and types of orbitals in each of these compounds:
(i) BH_3 (ii) NH_4^+ (iii) BeF_2 (iv) ClF_3 (v) SF_6
(c) Draw the schematic of ethane molecular orbital.
4. (a) Highlight the steps to writing resonance, and show resonance in ozone and benzene.
(b) What is Nuclear coupling?
(c) Explain briefly why you think quantum mechanics is very useful to the scientist.
5. (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.

6. (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.
7. (a) Account for the formation of vibration-rotation spectra.
(b) Describe coordinates in Vibration Spectroscopy