COURSE CODE: CHM 307
COURSE TITLE: Atomic and Molecular Structure and Symmetry
COURSE UNIT: 3
TIME: 3 HOURS
INSTRUCTION: Answer question one and any other three questions.

QUESTION ONE

(1a) State the equation for symmetrical and antisymmetric wave functions (4 marks)

1(b) Complete the missing contents in the table given below

Symmetry operation	Angle of rotation in degree	Angle of rotation in radian
C_1	360	2π
C_2	180	
C_3	120	
C_4		$2\pi/4$
C_5	72	
C_6	60	

(10 MARKS)

(1c) Calculate the wavelength of electron moving at 2×10^6 m/s using the de Broglie equation
(5 marks)

(1d) Construct the Hamiltonian for the system if there are two particles in the system such that their masses are m_1 and m_2.
(6 marks)

QUESTION TWO

(2a) What is the limitation of the valence bond theory? (5 marks)

(2b) Draw the diagram for the radial distribution functions for 1s-3p orbitals. (5 marks)

(2c) Using a molecular orbital diagram, show the number of non-bonding electrons in NO.
(5 marks)