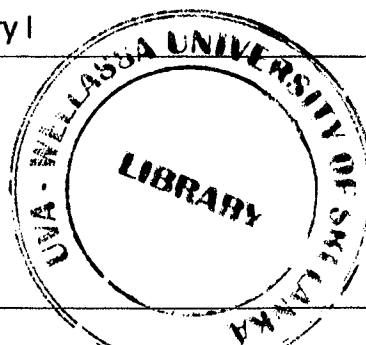


**Instructions to candidates**

Duration: One (01) hour  
Number of questions: Two (02)  
Answer All Questions  
Mark allocation: 100 mark



- 1 a. Predict and draw the shape of following molecules using VSEPR theory. Show steps in calculation. (15 mark)
- $\text{PCl}_5$
  - $\text{SO}_2\text{Cl}_2$
  - $\text{BF}_3$
  - $\text{I}_3^-$
  - $\text{H}_2\text{O}$
- b. In Which molecules do you expect to see a permanent dipole moment. Draw the direction of the net dipole moment of those molecules. (10 mark)
- c. Draw the molecular orbital diagram and occupation of show electrons in molecular orbitals of  $\text{O}_2$  (10 mark)
- d. Indicate hybridization of each Carbon atom in following molecules (15 mark)
- $\text{CH}_3\text{-CH}_3$
  - $\text{CH}_3\text{CH=O}$
  - $\text{CH}_3\text{CH=CH}_2$
2. a. Draw the Staggered and Gauche conformation of  $\text{CH}_3\text{CH}_2\text{CH}_3$  molecule. (10 mark)
- b. Identify the whether staggered or gauche form will have lowest energy. Give reasons for your choice. (10 mark)
- c. Draw the structure of Boat and Chair conformation of cyclohexane. Indicate axial and equatorial positions. (15 mark)
- d. Define following terms and give an example for each. (15 mark)
- Configurational isomers
  - Geometrical isomers
  - Stereo isomers