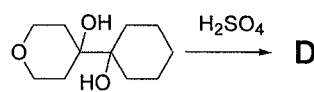
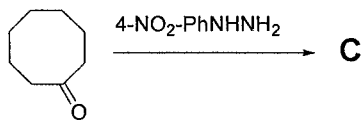
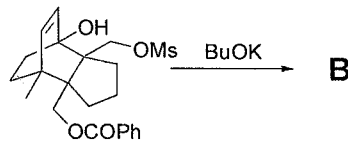
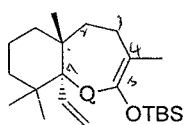
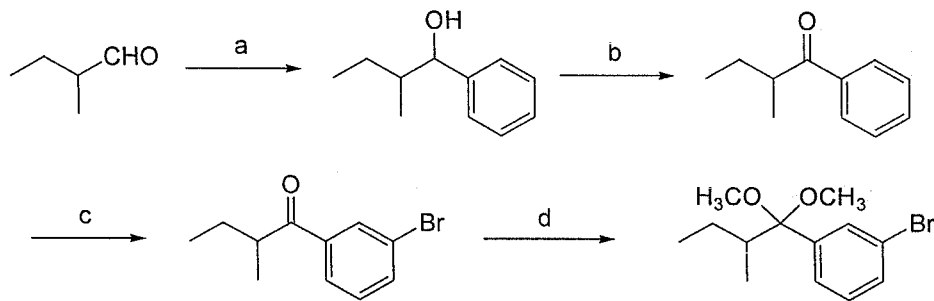


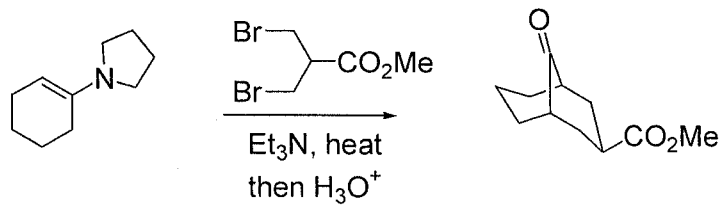
1. (8 pt) Complete the following reactions:



2. (8 pt) Identify the reagents a through d in the following synthetic sequence:



3. (4 pt) Propose a mechanism for the following reaction:



4. (5 pt) Show the structure for the following items:

(a)  $\alpha$ -glucose (b) glycine (c) *p*-xylene (d) morpholine (e) thiophene

高雄醫學大學 98 學年度博士班招生考試 綜合化學 (無機) 試題第 2 頁 (共 3 頁)

(1) The six fluorine S - F bonding hybrid orbitals of the SF<sub>6</sub> and the corresponding symmetry operations are plotted in Fig. 1. The reducible representation generated by the transformation of these σ - orbitals is :

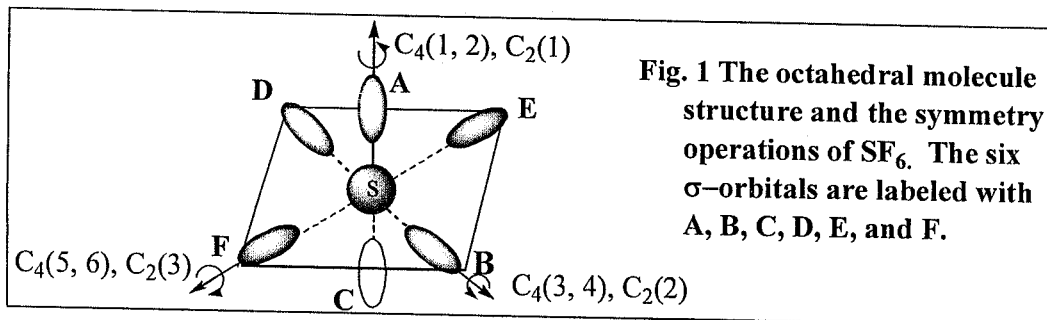
$$\begin{array}{cccccc} \Gamma & E & 8C_3 & 6C_4 & 3C_2 & 6C_2' \\ \chi & 6 & 0 & 2 & 2 & 0 \end{array}$$

- (a) Using the following character table to find the related *irreducible* representations.  
 (b) Using the projection operator method to prove that the following symmetry - adapted wave functions (i.e.,  $\psi(a_1)$  and  $\psi(t_1)$ ) are belonging to the A<sub>1</sub> and T<sub>1</sub> symmetry, respectively.

( $\psi(a_1)$  and  $\psi(t_1)$  can be obtained by the calculations with the operator  $\hat{p}(A)$ , where  $\hat{p}(A) = \frac{1}{h} \sum_R \chi_R \hat{R}$ ,  $\hat{R}$  is the symmetry operation and  $\chi_R$  is the character of that operation in the appropriate point group)

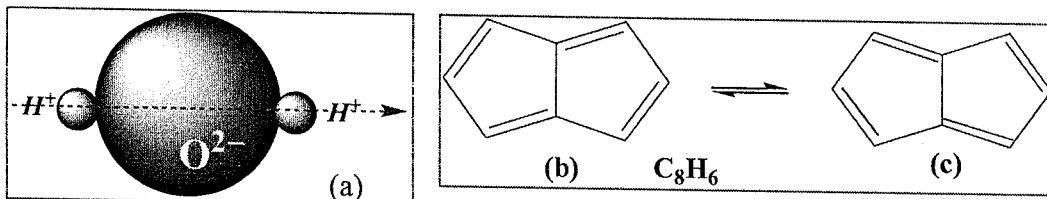
$$\psi(a_1) = \frac{1}{\sqrt{6}}(A + B + C + D + E + F),$$

$$\psi(t_1) = \frac{1}{\sqrt{2}}(A - C),$$

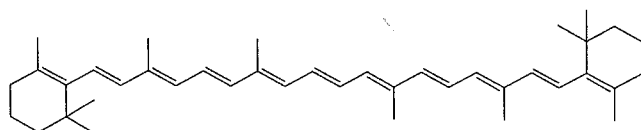


O	E	8C <sub>3</sub>	6C <sub>4</sub>	3C <sub>2</sub>	6C <sub>2</sub> '	
A <sub>1</sub>	1	1	1	1	1	$x^2 + y^2 + z^2$
A <sub>2</sub>	1	1	-1	1	-1	
E	2	-1	0	2	0	$(x^2 - y^2)$
T <sub>1</sub>	3	0	1	-1	-1	$(x, y, z)$
T <sub>2</sub>	3	0	-1	-1	1	$xy, yz, zx$

- (2) 下圖(a)為 Kossel 在 1916 年提出有關水分子的模型, (b)及(c)為有關 Pentalene 分子共振的模型, 請寫出分子(a), (b), (c)各別的點群(point group), 同時寫出(b)及(c)分子共振時的點群.



1. The chemical structure of  $\beta$ -Carotene is as follow. If we take each CC bond length to be about 140 pm, please roughly estimate the wavelength of the first electronic absorption. (5%)



$\beta$ -Carotene

2. Please briefly describe the three elementary steps involved in radical-chain reaction. (6%)
3. How do you use the van't Hoff plot to determine the standard enthalpy change and entropy change for a chemical reaction? (6%)
4. Please explain the following terms: (a) Pauli exclusion principle (b) state function (c) fluorescence vs. phosphorescence (d) intersystem crossing vs. internal conversion. (8%)

- 1.(14 pt) Define: 1) Transducer 2) Resonance Raman Spectroscopy 3) Hyphenated Method 4) Isocratic Elution 5) Time of Flight 6) ICP 7) Radiation Buffer
- 2.(6 pt) Describe two types of wavelength selectors of optical instrument.
- 3.(5 pt) In NMR spectroscopy, what are the advantages of using a magnet with as large a field strength as possible?