

Part I (50%)

一、單選題 (30 pts, 3 pts/ each)

1. What is the ground state electron configuration of chloride ion ?

- (A) $1s^2 2s^2 2p^6 3s^2 3p^4$ (B) $1s^2 2s^2 2p^6 3s^2 3p^5$ (C) $1s^2 2s^2 2p^6 3s^1 3p^6$ (D) $1s^2 2s^2 2p^6 3s^2 3p^6$

2. Which element has the highest electronegativity ?

- (A) O (B) C (C) N (D) B

3. Which molecules are polar ?

CH_4 (I), NH_3 (II), H_2O (III), CO_2 (IV)

- (A) I, III (B) II, III (C) I, IV (D) II, III, IV

4. Which substance is the strongest base ?

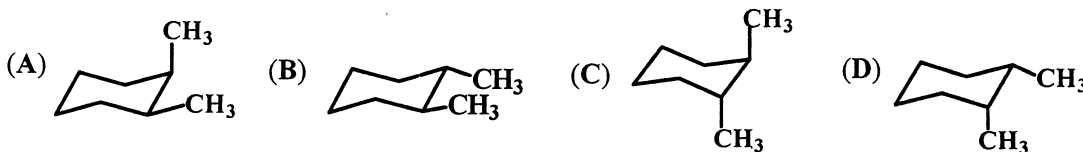
- (A) Br^- (B) NH_3 (C) H_2O (D) $CH_3CH_2O^-$

5. Which substances are Lewis acids ?

F^- (I), $AlCl_3$ (II), H_2O (III), $(CH_3)_3C^+$ (IV)

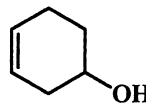
- (A) I, III (B) I, IV (C) II, III, IV (D) II, IV

6. Which structure represents the most stable conformation of *trans*-1,2-dimethylcyclohexane ?



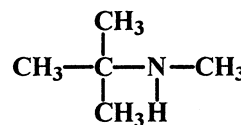
7. Which is the IUPAC name for the following structure ?

- (A) cyclohexenol (B) 1-cyclohexen-4-ol
(C) 3-cyclohexen-1-ol (D) 4-cyclohexenol



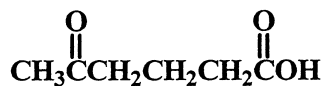
8. Which is the IUPAC name for the following structure ?

- (A) *N*-methyl-*tert*-butylamine (B) *tert*-butyl methylamine
(C) *N*-methyl-2-methyl-2-propanamine (D) *N*-methyl-1,1-dimethyl ethylamine



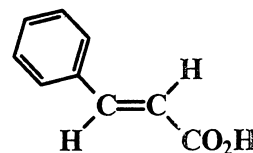
9. Which is the IUPAC name for the following structure ?

- (A) 2-oxohexanoic acid (B) 5-oxohexanoic acid
(C) methyl butyroxone (D) 4-ketopentanoic acid



10. Which is the IUPAC name for the following structure ?

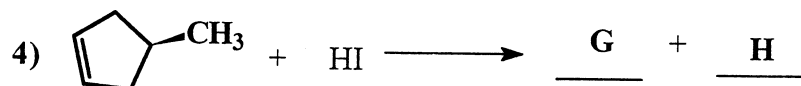
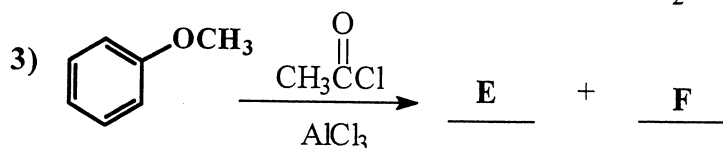
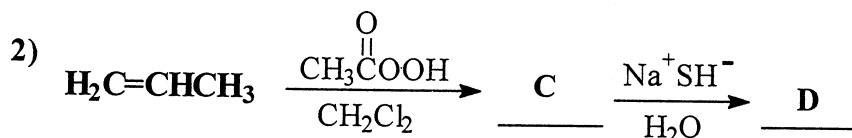
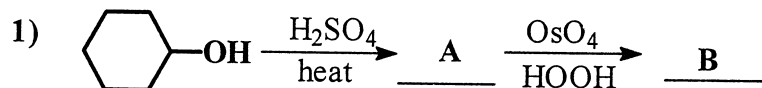
- (A) (*E*)-3-phenylpropenoic acid (B) (*Z*)-benzylacrylic acid
(C) (*E*)-1-phenylpropenoic acid (D) (*Z*)-3-carboxy-1-phenylethene



Part I

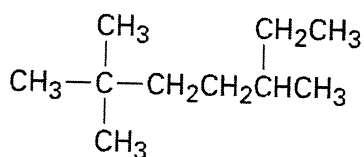
二、非選擇題

1. Please write the structural formula for the **major product** in each of the following reactions.
 (Note: Please give the correct stereochemistry, if necessary.) (20 pts, 5pts/each)



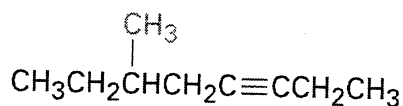
Part II (50%) 問答題

- Both carbon dioxide (CO_2) and sulfur dioxide (SO_2) are triatomic molecules. Account for the fact that carbon dioxide is a nonpolar molecule, whereas sulfur dioxide is a polar molecule? (4%, 4%)
- Calculate the number of sigma (σ) bond and pi (π) bond in CH_3COOH ? (4%, 4%)
- Calculate the number of primary carbon, secondary carbon, tertiary carbon and quaternary carbon of the following compound? (8%, each 2%)

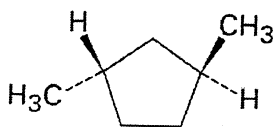


- Write the line-bond structures for the two primary amines with the molecular formula $\text{C}_3\text{H}_9\text{N}$? (4%, 4%)
- Write the IUPAC name for the following compound? (12%, 4% each)

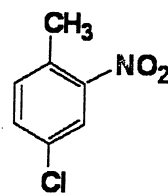
(i)



(ii)



(iii)



- Assign absolute configurations (R or S) for the following compound which has three stereocenters? (6%, 2% each)

