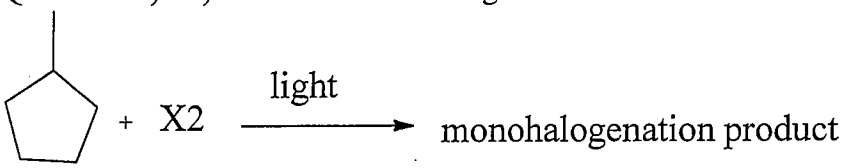
國立中山大學102學年度碩士暨碩士專班招生考試試題

科目名稱：有機化學【材光系碩士班甲組】　　題號：439003

※本科目依簡章規定「不可以」使用計算機　　

1. 選擇題 (單選, Each 2%, Total: 20%)

Questions 1) - 3) concern the following reaction:



1) ( ) What is the main intermediate involved in the above reaction? (a) Cation; (b) Anion; (c) Radical; (d) Carbene.

2) ( ) Light is involved in which of the following reaction steps? (a) Initiation only; (b) Termination only; (c) Propagation only; (d) Initiation and propagation.

3) ( ) How many monohalogenation products are possible? (Do not consider stereoisomers.) (a) 2; (b) 3; (c) 4; (d) 5.

4) ( ) Which of the statement about allene ($H_2C=C=CH_2$) is correct? (a) The central carbon has sp^2 configuration; (b) The two terminal carbons have sp configuration; (c) The four hydrogen atoms lies on two parallel planes; (d) The four hydrogen lies on two planes perpendicular to each other.

5) ( ) The separation of a reaction mixture into the pure enantiomers is termed: (a) Racemization; (b) Resolution; (c) Isomerization; (d) Equilibration.

6) ( ) The reaction of (*R*)-1-chloro-3-methylpentane with sodium iodide in acetone will yield 1-iodo-3-methylpentant that is (a) *R*; (b) *S*; (c) A mixture of *R* and *S*; (d) Meso; (e) None of these.

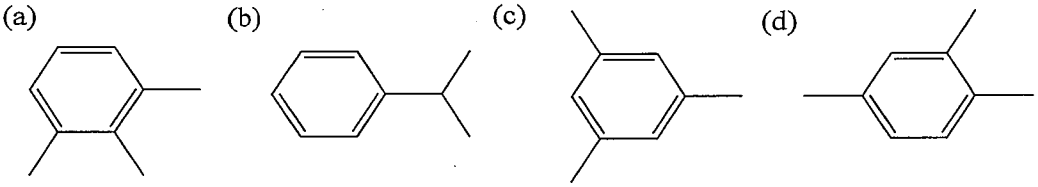
7) ( ) When an organic molecule is irradiated with ultraviolet radiation, the energy absorbed by the molecule corresponds to: (a) The amount necessary to increase molecular motions in functional groups; (b) The amount necessary to excite electrons from one molecular orbital to another; (c) The amount necessary to "flip" the spin of atomic nuclei; (d) The amount necessary to strip a molecule of one electron to generate a radical cation.

8) ( ) What m/z ratio range might be common to many substituted benzene compounds? (a) 72 - 77 ppm; (b) 81 - 88 ppm; (c) 26 - 38 ppm; (d) less than 59 ppm.

9) ( ) In the formation of an addition polymer such as polyvinylchloride: (a) The monomers must have at least one degree of unsaturation; (b) The formation occurs via a polar reaction; (c) The products have the same degree of complexity as biopolymers; (d) The resulting polymer generally contains two types of monomer.

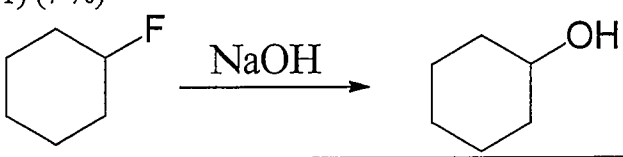
10 ( ) Which of the following had the fewest signals in ^{13}C NMR?

(a) (b) (c) (d)

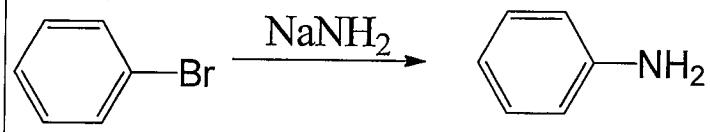


2. (Total: 30 %) Most substitutions (or elimination) reactions between substrates and nucleophiles (or base) are strongly influenced by the experimental parameters such as chemical structures of the substrates and the nucleophiles, the leaving group, the applied solvent or the potential side reaction. With appropriate experimental conditions, the expected products from the intended substitution (or elimination) reactions can be obtained without any problem; however, unfavorable experimental conditions failed the reaction. Give the main reason responsible for the failures of the substitution (or elimination) reactions listed below:

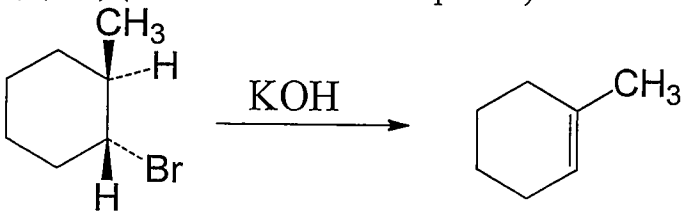
1) (7 %)



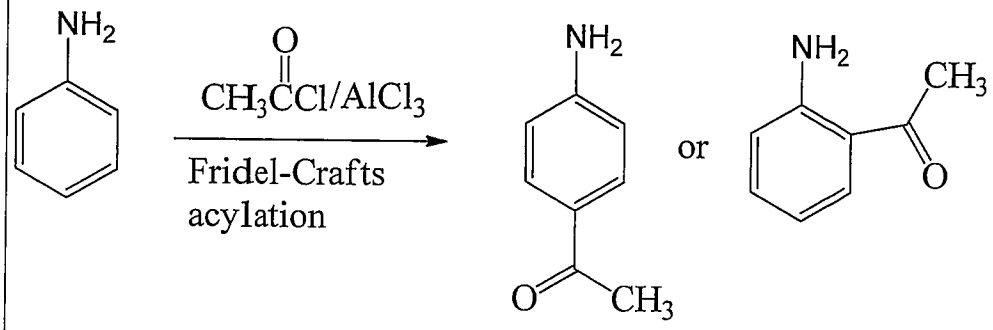
2) (7 %)



3) (8 %) (use the chair form to explain it)



4) (8 %)



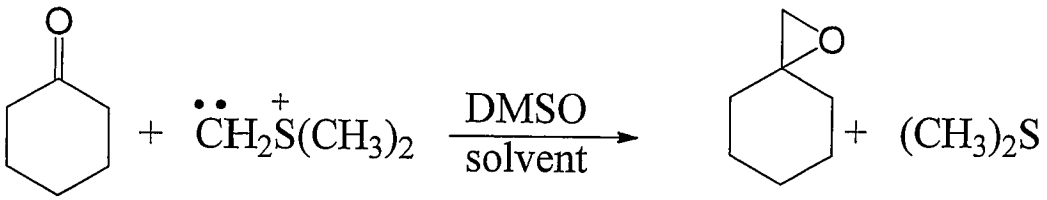
3. (Each 10 %, Total: 20%) Infrared and ^{1}H NMR spectroscopies are used to evaluate the real structure of organic compounds. With the known chemical formula, the real structures of the following compounds can be easily confirmed. Suggest the structures that are consistent with the molecular formula and spectroscopic properties of each of the following:

1) $C_3H_5ClO_2$
IR (cm^{-1}), 1720, 3300-2500
^{1}H NMR (δ): 2.9 triplet (2H); 3.8 triplet (2H) and 11.7 singlet (1H)

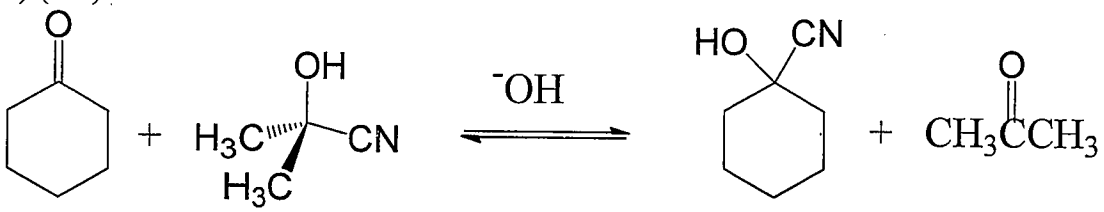
2) $C_5H_{10}O_2$
IR (cm^{-1}), 2750, 1740
^{1}H NMR (δ): 1.2 singlet (6H); 3.5 singlet (3H) and 9.7 singlet (1H)

4. (Each 6%, total: 30 %) Write down the mechanistic steps involved in the following reactions.

1) (6%)



2) (6%)



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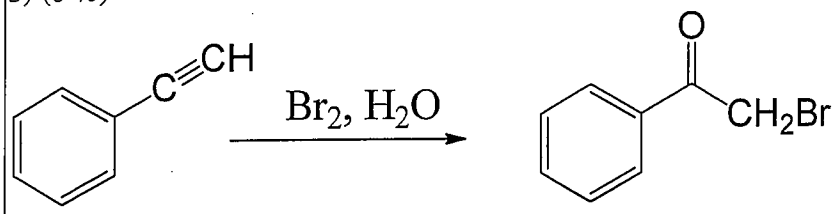
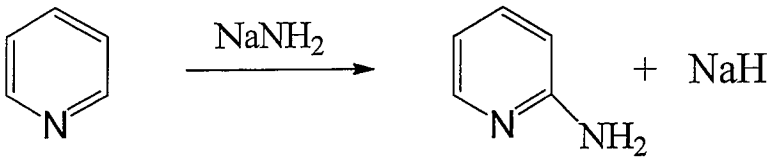
3) (6 %)



4)(6 %)



5) (6 %)