

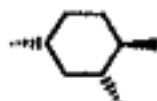
請將您的答案寫在答案紙上

1. Select the best one answer for each of the following statements. (30%)

(1) A racemic mixture of (2R, 3R)- and (2S, 3S)-2,3-butanediol is obtained by the reaction of

- (a) *cis*-2-butene with B_2H_6, HO_2^- (b) *cis*-2-butene with dilute $KMnO_4(aq)$
(c) *trans*-2-butene with B_2H_6, HO_2^- (d) *trans*-2-butene with dilute $KMnO_4(aq)$

(2) In the most stable conformation of the following compound, How many methyl groups are toward equatorial orientation?



- (a) 1 (b) 2 (c) 3 (d) 0

(3) Consider the two C-C bonds in the allyl radical. Which of the following statements is true?

- (a) Both bonds are the same length and longer than the C-C bond in ethane.
(b) Both bonds are the same length and longer than the C-C bond in ethene.
(c) One bond is shorter than the C-C bond in ethane and one bond is longer than the C-C bond in ethene
(d) One bond is shorter than the C-C bond in ethene and one bond is longer than the C-C bond in ethane

(4) The saponification number is the number of milligrams of potassium hydroxide (formula weight 56.1 g/mol) that is required to saponify 1.00 g of a fat or oil. What is the saponification number of glyceryl tripalmitate (molecular weight 806 g/mol)?

- (a) 209 (b) 139 (c) 69.6 (d) none of above

(5) Phenol is less acidic than _____.

- (a) ethanol (b) ammonia (c) p-nitrophenol (d) cyclopentadiene

(6) The isoelectric point of glycine is 6.0. Then, the actual structure of predominant form of glycine at pH = 10 solution is

- (a) $NH_2-CH_2-CO_2H$ (b) $\overset{+}{N}H_3-CH_2-CO_2^-$ (c) $NH_2-CH_2-CO_2^-$ (d) $\overset{+}{N}H_3-CH_2-CO_2H$

(7) Pyrrole, unlike pyridine, _____ upon protonation.

- (a) decomposes (b) is increased in reactivity toward electrophiles
(c) undergoes ring scission (d) loses its aromatic property

(8) The action of base on an alkylphosphonium salt generates an ylide which can react with _____.

- (a) activated alkyl halides (b) carbonyl compounds (c) carboxylate esters (d) conjugated dienes

(9) Which of the following compounds will absorb UV or visible light of the longest wavelength?

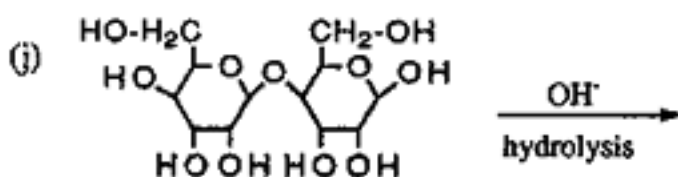
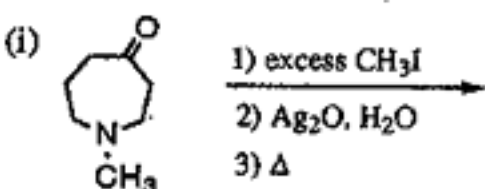
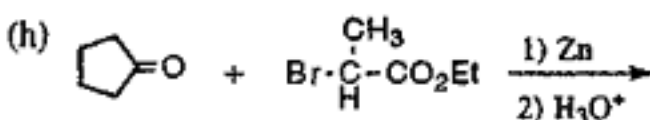
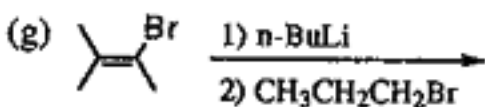
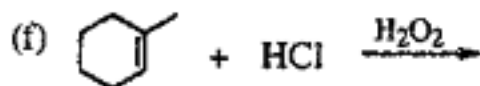
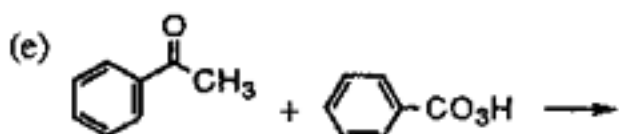
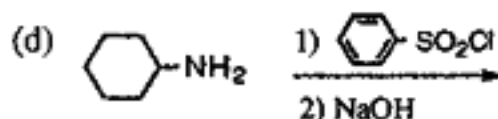
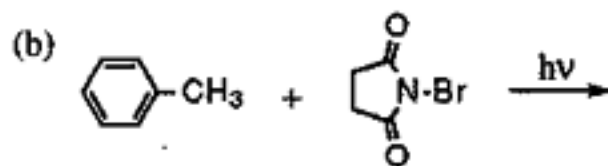
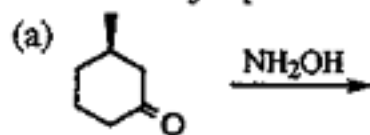
- (a) 1,3-cyclohexadiene (b) cyclohexane (c) cyclohexene (d) 2-bicyclo[2.2.2]octene

(10) A compound ($C_4H_8O_2$) reacted with an excess of CH_3MgBr to give 1 mole of CH_4 and reacted with alkaline iodine solution to give yellow precipitate. Which structure is consistent with the data?

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

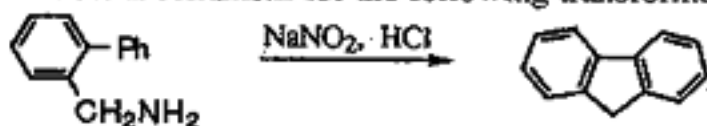
(背面仍有題目,請繼續作答)

2. Give the major product for each of the following reactions. (30%)



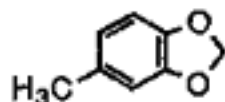
3. Propose a reasonable route for the synthesis of 2,3-dichlorobutane from an two or three carbon alkyne as starting material. (4%)

4. Write a reasonable mechanism for the following transformation. (4%)



5. How many chiral center are there in 1,2-dichlorocyclohexane? (4%)
 How many configurational isomers are there?
 Draw each and indicate which would be optically active and which would be optically inactive.

6. The following compound can be oxidized by permanganate ion but give tars and low molecular weight compound by $K_2Cr_2O_7 / H_2SO_4, \Delta$. Explain. (4%)



7. Bromoalkenes are usually converted to alkynes by treatment with $NaNH_2$. (4%)
 1-Bromocyclohexene does not undergo dehydrohalogenation under these conditions. Explain.

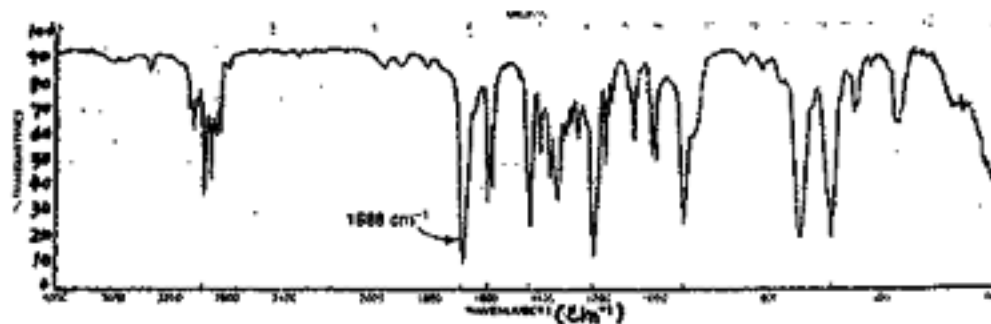
8. Describe how you would distinguish between benzyl acetate and ethyl benzoate chemically. (4%)

9. Give a structure which exhibited the mass spectral data as follows. (4%)

MS m/z (relative intensity) 110 (62), 108 (64), 95 (3), 93 (4), 29 (100), 27 (88)

10. Deduce a structure which is consistent with the following infrared spectrum. (4%)

Ph CH₂CH₂CHO, PhCOCH₂CH₃, PhCH₂COOH, PhCH₂COCH₂CH₃, PhCH₂CONH₂



11. Derive the structure of the compound (C₄H₆O₂) that has the following (8%)

¹H (300 MHz) and ¹³C (75 MHz) spectra in CDCl₃.

Explain the splitting pattern in the ¹H NMR signals.

