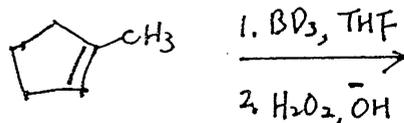


# 大同大學 九十一 學年度 轉學考試 試題

考試科目：有機化學 系別：化學工程學系 級別：三年級 第 / 頁，共 2 頁

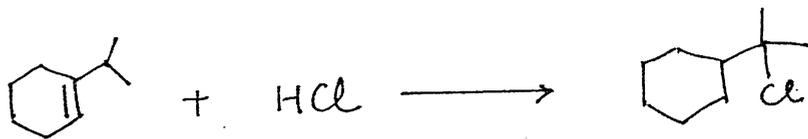
註：本次考試不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

1. What kind of hybridization do you expect for the following? (5%)  
(a) The oxygen in  $\text{CH}_3\text{OCH}_3$  (b) The nitrogen in  $\text{CH}_3\text{CN}$  (c) The boron in  $(\text{CH}_3)_3\text{B}$  (d) The carbon in  $^+\text{CH}_3$  (e) The carbon in  $\text{CO}_2$ .
2. Consider the acidity constant below to answer the following questions:  
 $\text{CH}_3\text{CH}_2\text{OH}$  (ethanol;  $\text{pK}_a = 16.00$ ),  (phenol;  $\text{pK}_a = 10.00$ ),  $\text{CH}_3\text{COOH}$  (acetic acid;  $\text{pK}_a = 4.76$ )  
(a) Which one is the strongest acid? (2%)  
(b) Which acid has the strongest conjugate base? (2%)  
(c) Explain why phenol has a much lower  $\text{pK}_a$  than ethanol. (2%)  
(d) What is the pH value of a 0.05 M solution of acetic acid? (4%)
3. (a) Sight along the C2-C3 bond of 2,3-dimethylbutane, draw a Newman projection of the most stable conformation and the least stable conformation, respectively. (4%)  
(b) Draw the most stable chair conformation of *cis*-1-*tert*-butyl-4-chlorocyclohexane and *trans*-1-*tert*-butyl-4-chlorocyclohexane. Which is more stable? Explain. (6%)
4. (a) An unknown compound **A**, with formula  $\text{C}_6\text{H}_{12}$ , reacts with 1 molar equivalent of  $\text{H}_2$  over a Pd catalyst. **A** also reacts with  $\text{OsO}_4$  to give a diol **B**. When oxidized with  $\text{KMnO}_4/\text{H}_3\text{O}^+$ , **A** gives two fragments,  $\text{CH}_3\text{CH}_2\text{COOH}$  and a ketone **C**. What are **A**, **B**, and **C**? Write all reactions. (6%)  
(b) What product will result from hydroboration/oxidation of 1-methylcyclopentene with deuterated borane,  $\text{BD}_3$ ? Show both the stereochemistry (spatial arrangement) and the regiochemistry (orientation) of the product. (4%)

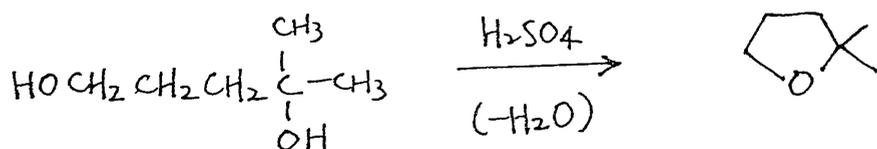


5. Suggest a stepwise reaction mechanism for the following reactions. Show all intermediate structures and electron flow with curved arrows. (10%)

(a)



(b)

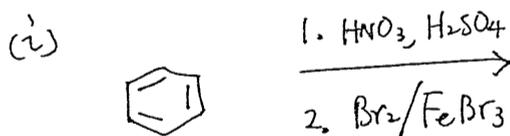
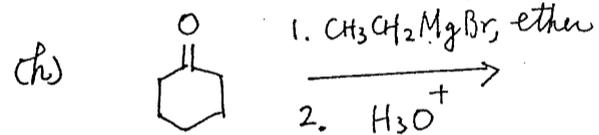
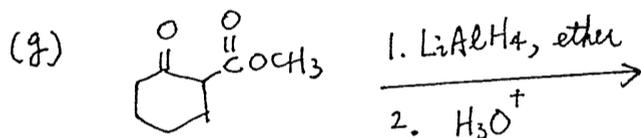
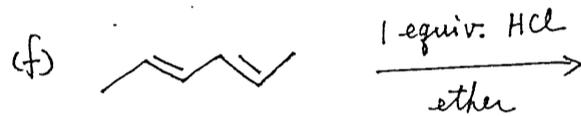
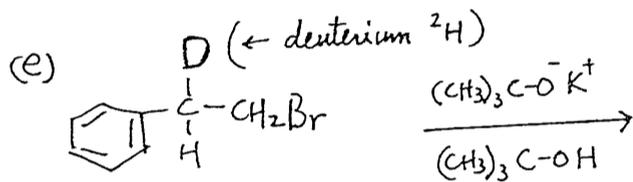
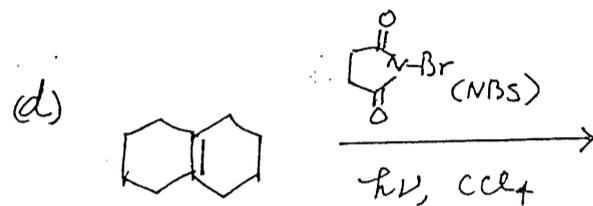
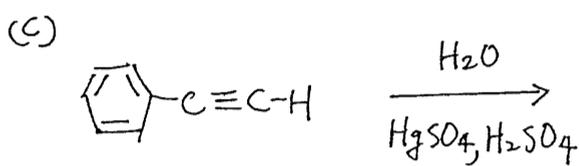
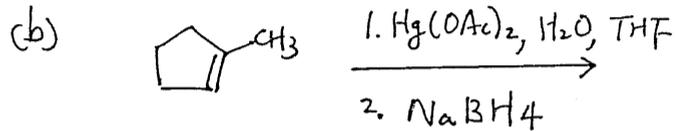
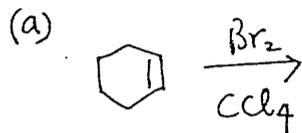


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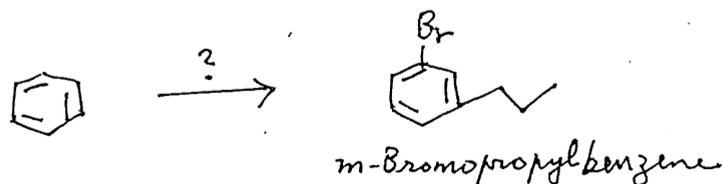
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6. Predict the major product(s) of the following reactions. Indicate stereochemistry if necessary. (40%, each 4%)



7. Beginning with acetylene and any alkyl halides needed, how would you synthesize 1-hexanol? (5%)

8. Propose an efficient synthesis of *m*-bromopropylbenzene from benzene. More than one step may be required. (5%)



9. How would you prepare isopropyl ethyl ether using a Williamson synthesis? (5%)

