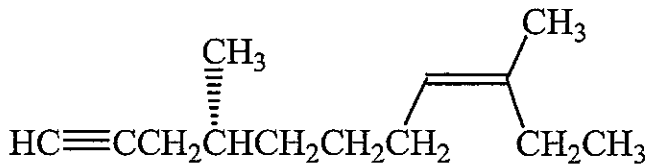


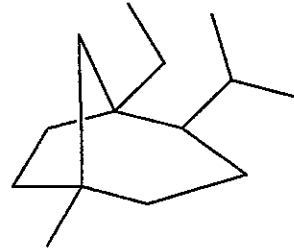
※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Name the following compounds. (each 2 %, totally 10 %)

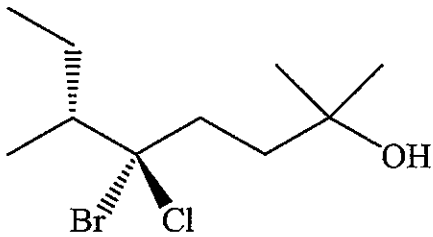
(a)



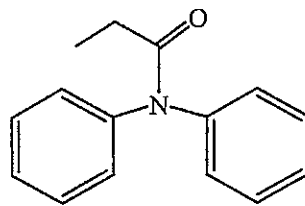
(b)



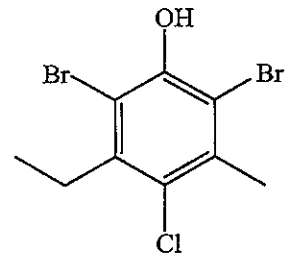
(c)



(d)

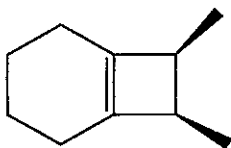


(e)

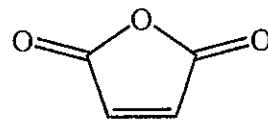
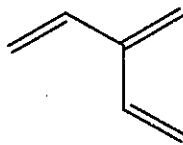


2. Complete the following reactions. (each 3 %, totally 30 %)

(a)

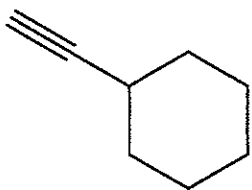


(b)

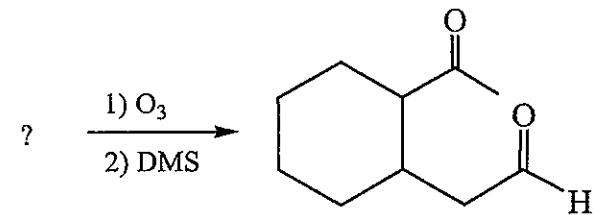


$C_{14}H_{12}O_6$   
(propose the structure and ignore the stereochemistry)

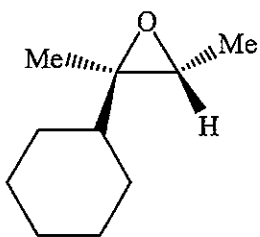
(c)



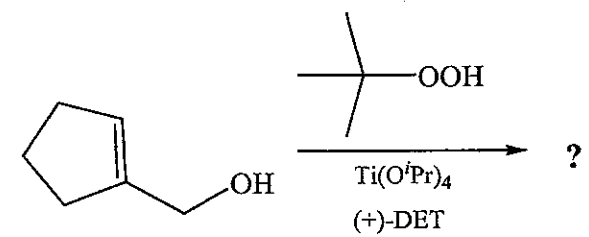
(d)

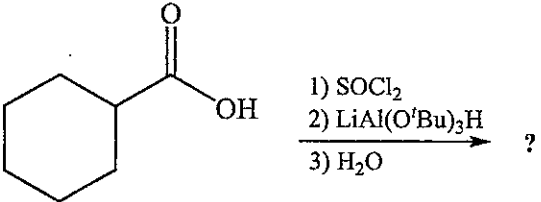
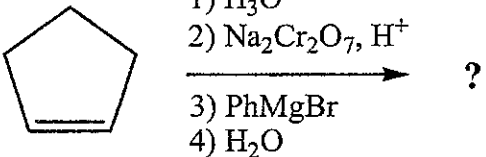


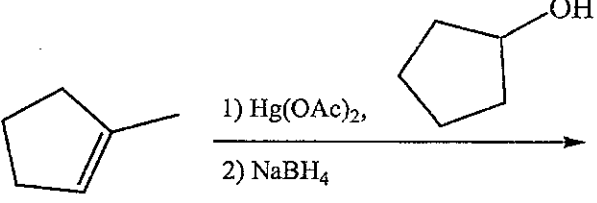
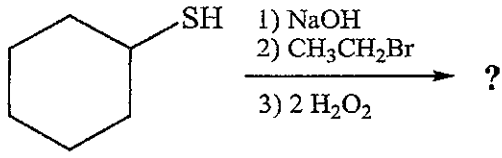
(e)



(f)



(g)  (h) 

(i)  (j) 

3. A compound with molecular formula  $C_8H_{10}$  produce an IR spectrum with many signals, including 3108, 3066, 3050, 3018, and  $1608\text{ cm}^{-1}$ . The  $^1\text{H}$  NMR spectrum of this compound exhibits a singlet at 2.2 ppm (6H) and a multiplet at 7.1 ppm (4H). The  $^{13}\text{C}$  NMR spectrum of this compound exhibits signals at 19.7, 125.9, 129.6, and  $136.4\text{ ppm}$ .

(a) Draw the structure of this compound. (4 %)

(b) What is the common name of this compound? (2 %)

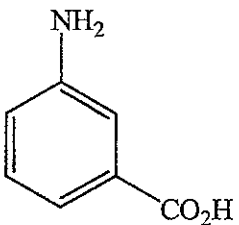
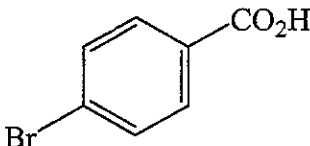
(c) Treating this compound with chromic acid yields a product with molecular formula  $C_8H_6O_4$ . Draw the product of this reaction. (4 %)

4. An unknown compound exhibits the following spectra. In its mass spectrum, the  $M^+$  appears at  $m/z = 104$ , and  $(M+1)^+$  peak is 4.4 % height of the parent ion. Elemental analysis reveals that the compound consists only of carbon, hydrogen, and oxygen atoms. The IR spectrum displayed many signals, including 3420 and  $1742\text{ cm}^{-1}$ . The  $^1\text{H}$  NMR spectrum of this compound exhibits a triplet at 1.2 ppm (3H), a quartet at 4.3 ppm (2H), a singlet at 4.2 ppm (1H), and a  $D_2O$  exchangeable singlet at 3.7 ppm (1H). The  $^{13}\text{C}$  NMR spectrum of this compound exhibits signals at 16.0, 56.3, 59.5, and  $174.5\text{ ppm}$ .

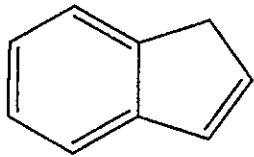
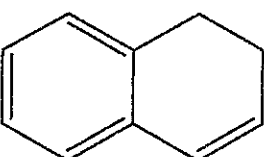
(a) Determine the molecular formula of the compound. (2 %)

(b) Deduce the structure of the compound. (8 %)

5. Propose syntheses of the following compounds starting from benzene (each 5 %, totally 10 %).

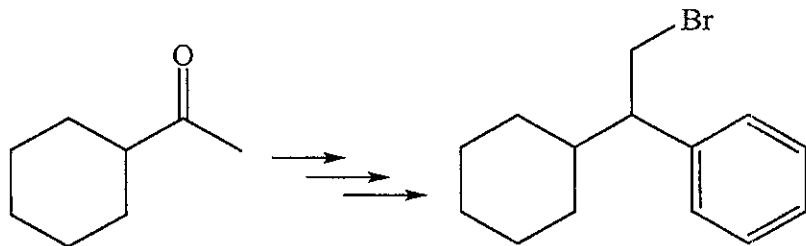
(a)  (b) 

6. Identify which of the following compound is more acidic and explain your choice. (5 %)

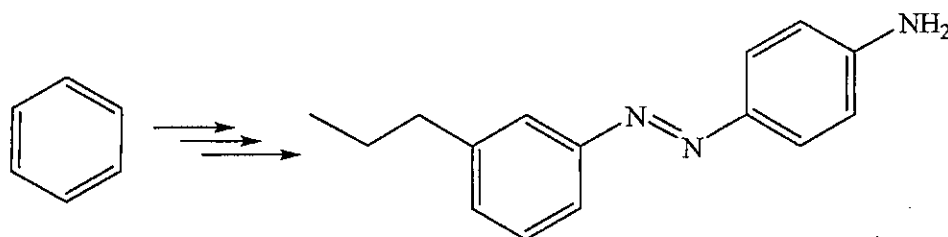
(a)  (b) 

7. Complete the following transformation. (each 5 %, totally 25 %)

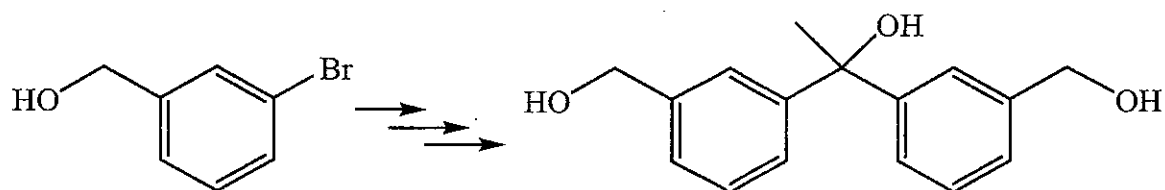
(a)



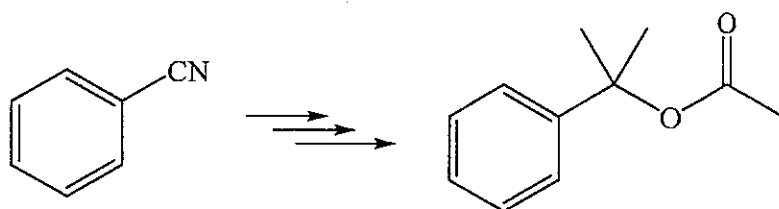
(b)



(c)



(d)



(e)

