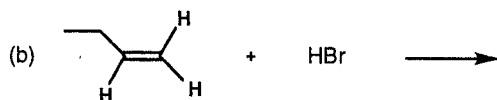
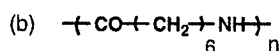
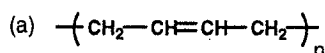


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1. Predict the **product** of each of the following reactions: (10 pts)

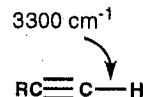
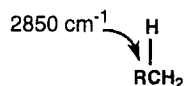
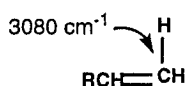


2. Deduce plausible **monomers** for polymers with the following repeating units: (10 pts)



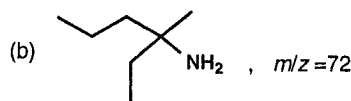
3. The compound H3C-C#C-CH3 is hydrogenated to an alkene using platinum as the catalyst. Predict whether the product is the pure trans isomer, the pure cis isomer, or a mixture of cis and trans isomers. Based on your prediction, **comment on the mechanism** of the heterogeneous catalysis. **Draw the structure of the product.** (10 pts)

4. Given the stretching frequencies for the C—H bonds shown below, **arrange** the corresponding bonds in **order of increasing strength**. **Explain your reasoning.** (8 pts)

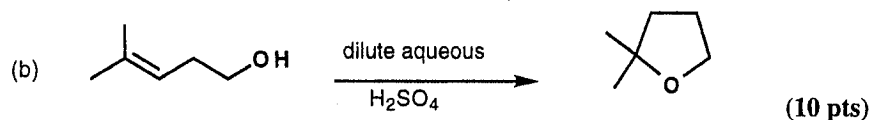
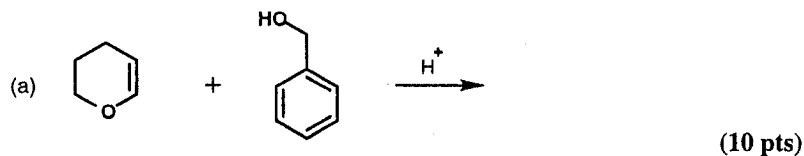


5. Rationalize the indicated fragments in the mass spectrum of each of the following molecules by proposing a **structure** of the fragment and a **mechanism** by which it is produced. (12 pts)

- (a) 1-pentanol, $m/z = 70$



6. Using the **curved-arrow formalism**, suggest a **mechanism** for each of the following reactions.



參考用

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7. Suppose you needed to synthesize *m*-chloroethylbenzene from benzene. You could begin by chlorinating benzene and then follow with a Friedel-Crafts alkylation using $\text{CH}_3\text{CH}_2\text{Cl}$ and AlCl_3 , or you could begin with a Friedel-Crafts alkylation followed by chlorination. **Neither** method will give the desired product, however.

(a) Please predict the **products** formed when either method was used. (6 pts)

(b) There is a **three-step method** that will work if the steps are done in the right order. What is this method? (9 pts)

8. Provide **structures** for compounds A-C. (15 pts)

