

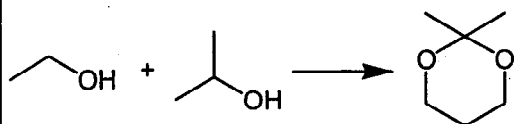
國立清華大學命題紙

99 學年度 生醫工程與環境科學系(所) 甲組碩士班入學考試

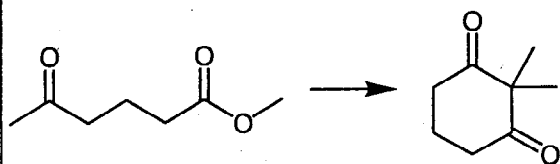
科目 有機化學 科目代碼 2304 共 3 頁第 1 頁 *請在【答案卷】內作答

100 pts; 5 pts for each of the following questions.

1. Show how the following compound could be synthesized. The only carbon-containing compound available to you for the synthesis is shown.



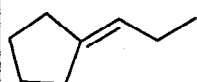
2. Indicate how the following compound could be synthesized from the given starting material and any other necessary reagents:



3. Show how 2-hydroxy cyclohexanone could be prepared from cyclohexanone

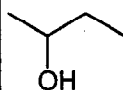
4. Show how 2-hydroxy cyclohexanecarboxylic acid could be prepared from 2-chloro cyclohexanol

5. What carbonyl compound and what phosphonium ylide are needed to synthesize the following compound?



6. Describe two ways to prepare anisole from benzene.

7. Draw the $^1\text{H-NMR}$ for the following compound:

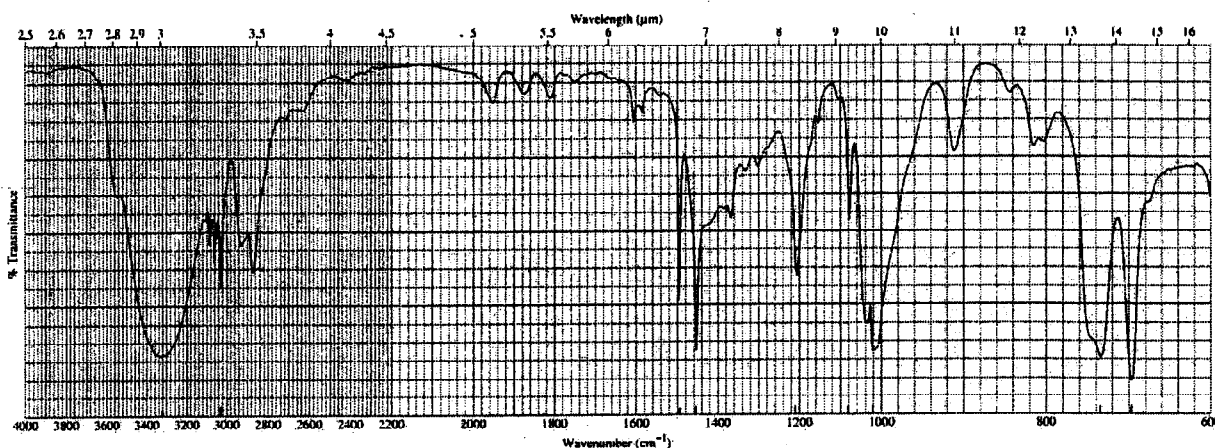
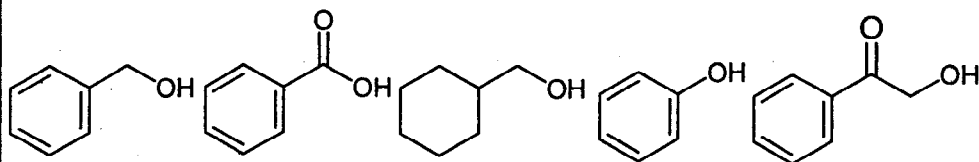


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8. Which one of the following compounds produced the IR spectrum.



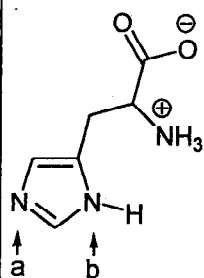
9. Why are the relative rates of radical formation so different when a bromine radical rather than a chlorine radical is used as the hydrogen-removing reagent during the halogenation of primary, secondary and tertiary alkanes? Discussion based on reaction coordinate diagram is preferred.
10. Give an example for each of Heck reaction, Stille reaction and Suzuki reaction.
11. How could you prepare ethyl methyl ketone from 1-bromobutane?
12. Why do *cis*-1-bromo-2-ethylcyclohexane and *trans*-1-bromo-2-ethylcyclohexane form different major products when they undergo an E2 reaction?
13. Why is S_N1 reaction but not S_N2 reaction favored by using the polar solvent? Depict your rationale by using the reaction coordinate diagram.
14. Depict the reaction coordinate diagram for the S_N1 reaction of *t*-butyl bromide with water.
15. Why, in a protic solvent, is the smallest atom the poorest nucleophile even though it is the strongest base?

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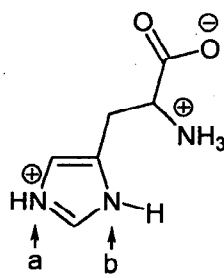
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16. Predict the thermodynamic and kinetic products obtained from the reaction of 1,3-butadiene with hydrogen bromide. Depict your rationale in terms of the reaction coordinate diagram (3 pts). How can one obtain the thermodynamic or kinetic products by adjusting the reaction conditions?
17. Why is the acidity of acetic acid greater than ethanol?
18. Draw the product(s) from the reaction between *cis*-2-pentene and bromine.
19. Calculate the ee value for an observed specific rotation of +9.2 if the specific rotation of (S)-(+)-2-bromobutane is +23.1.
20. Why is the protonation occurred in nitrogen atom a rather than nitrogen b when pH = 4.



pH = 8



pH = 4