

八十四學年度 原子科學研究所 乙 組碩士班研究生入學考試

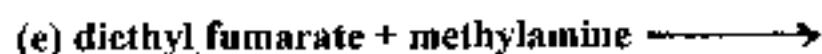
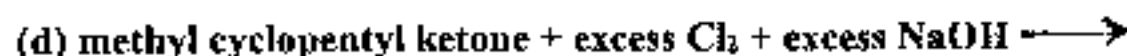
科目 有機化學 科號 3204 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

1. Draw the structure of the following compounds. (a) Glycine; (b) Aspirin; (c) DDT; (d) Urea; (e) Vitamin A. (10%)

2. Rank the following compounds in decreasing order of their boiling points. (a) $(\text{CH}_3)_3\text{CC}(\text{CH}_3)_3$; (b) $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{CH}(\text{CH}_3)_2$; (c) $(\text{CH}_3)_2\text{COHCOH}(\text{CH}_3)_2$; (d) $(\text{CH}_3)_3\text{CCH}_2\text{CHOHCH}_3$; (e) $\text{CH}_3(\text{CH}_2)_6\text{CH}_3$; (f) $\text{CH}_3(\text{CH}_2)_5\text{CH}_2\text{OH}$. (5%)

3. Define the following terms and give an example. (a) Collins reagent; (b) extinction coefficient; (c) Cannizzaro reaction; (d) PCBs; (e) racemization. (10%)

4. Give major products for each of the following reactions. (20%)



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5. An unknown compound gives a sharp IR absorption at 2200 cm^{-1} . It also decolorizes bromine in CCl_4 , and it gives a white, nitric acid-soluble precipitate with the silver ammonia complex. What conclusions can you make about the functional group(s) present in this compound? (10%)

6. A compound of formula $\text{C}_6\text{H}_{10}\text{O}_2$ shows only two absorptions in the proton NMR: a singlet at 2.67 ppm and a singlet at 2.15 ppm. These absorptions have area of ratio 2:3. Propose a structure for this unknown compound. (10%)

7. The UV spectrum of 1-phenyl-2-propen-1-ol shows an intense absorption at 220 nm and a weaker absorption at 258 nm. When this compound is treated with dilute sulfuric acid, it rearranges to an isomer with an intense absorption at 250 nm and a weaker absorption at 290 nm. Suggest a structure for the isomeric product and give a mechanism for its formation. (10%)

8. Predict the results of the chromic acid test with the following substances. (a) cyclohexanol; (b) ethanol; (c) acetaldehyde; (d) cyclohexane; (e) 1-methylcyclohexanol. (10%)

9. Rank each of the following groups of compounds in order of decreasing heat of hydrogenation. 1,2-hexadiene; 1,3,5-hexatriene; 1,3-hexadiene; 1,4-hexadiene; 1,5-hexadiene; 2,4-hexadiene. (5%)

10. Predict the mononitration products of the following compounds. (a) o-nitrotoluene; (b) m-chlorotoluene; (c) o-bromobenzoic acid; (d) p-methoxybenzoic acid; (e) m-cresol. (10%)