

國立臺灣科技大學 108 學年度碩士班招生試題

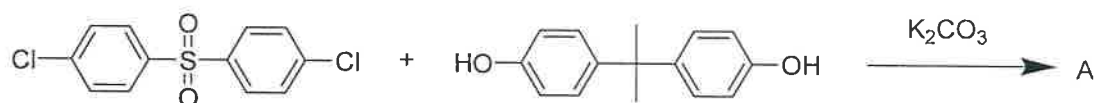
系所組別：材料科學與工程系碩士班甲組

科目：有機化學

(總分為 100 分)

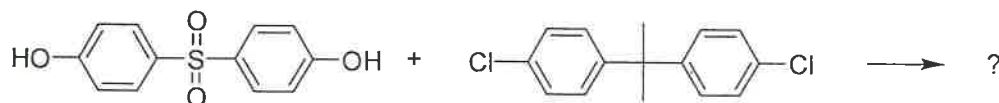
1. (Total 6%) Aromatic nucleophilic substitution (S_NAr)

(1). Draw the chemical structures of polymer A. (2%)



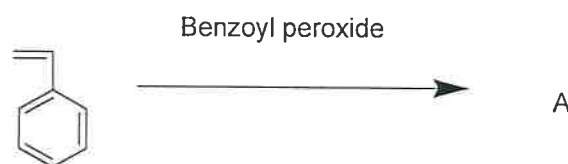
(2). If chloride is replaced by bromide or Iodide, no polymer with high molecular weight is formed. Please explain. (2%)

(3) If the reactants are changed as shown, what will happen? (2%)

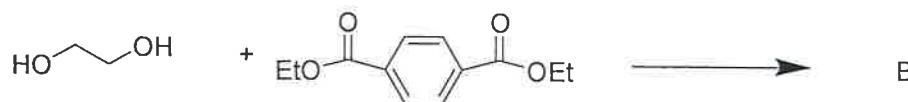


2. (Total 9%) Write the chemical structures of the following polymers

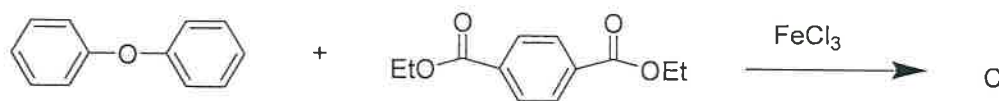
(1). (3%) Polymer A



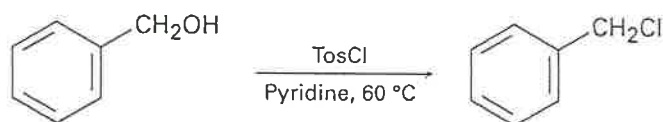
(2). (3%) Polymer B



(3) (3%) Polymer C

3. (Total 7%) What is deuterium isotope effect? (2%) Can the deuterium isotope effect be observed in the following reactions, S_N1 , S_N2 , E1, E2, E1cB, if properly deuterated compounds are used? (5%)

4. (5%) When a primary alcohol is treated with p-toluenesulfonyl chloride at room temperature in the presence of pyridine, a tosylate is formed. When the same reaction is carried out at higher temperature, an alkyl chloride is often formed. Please explain.



5.1 (Total 6%, each 2%) Identify the reagents a-c in the following scheme.

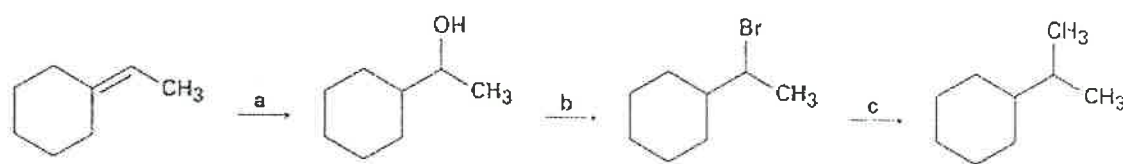


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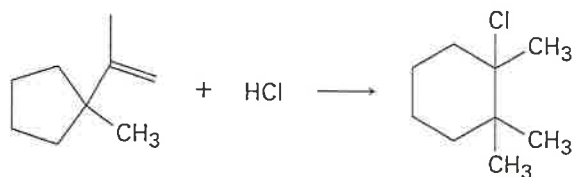
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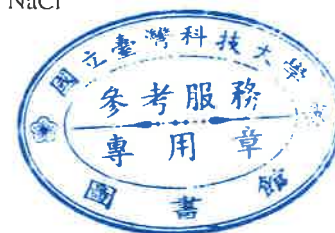
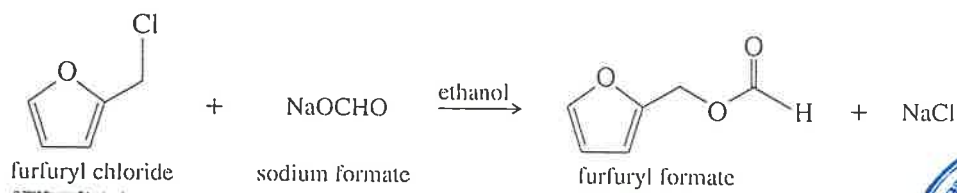
(總分為 100 分)



- 5.2 (5%) Addition of HCl to 1-isopropenyl-1-methylcyclopentane yields 1-chloro-1,2,2-trimethylcyclohexane. Propose a mechanism, showing the structure of intermediates and using curved arrows to indicate electron flow in each step.



6. (5%) Can a solution of potassium *tert*-butoxide be prepared in water? (pK_a of water=15.7 and Pk_a of *tert*-butyl alcohol=18). Please explain.
7. (Total 7%) Furfuryl chloride can undergo substitution by both S_N2 and S_N1 mechanism.
- 7-1. How can this primary halide undergo S_N1 reaction? Please show the mechanism (S_N1) and explain. (3%)
- 7-2. Why is there no competition with E2 and E1 mechanisms? (4%)



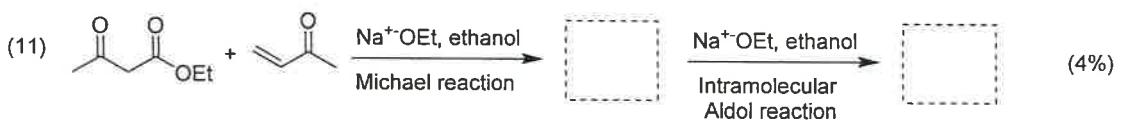
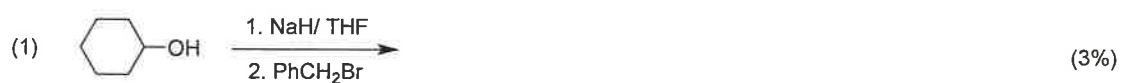
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8. Predict the major products, reactants, or intermediates of the following reactions. (34%)

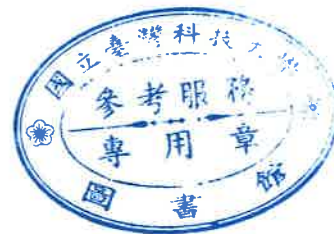


9. How might you synthesize the following compounds from benzene? (6%)

(1) 4-Chloro-1-nitro-2-propylbenzene (3%)

(2) 3-Bromo-2-methylbenzenesulfonic acid (3%)

10. Please convert the following names or chemical structures to the corresponding chemical structures or names. (10%)

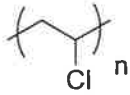
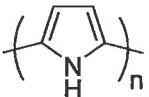


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- (1) Poly(3-hexylthiophene) (2%)
- (2) Polyethylene (2%)
- (3) Polystyrene (2%)
- (4)  (2%)
- (5)  (2%)

