

Mid-Sem Exam: CH3102 (Autumn 2018)

Full Marks: 40

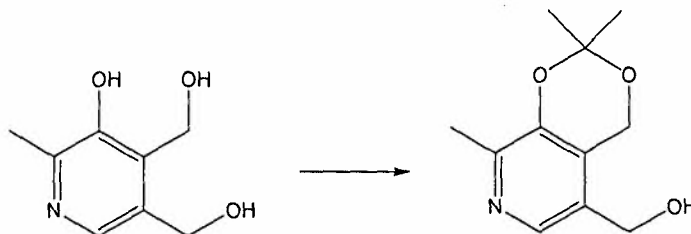
Time: 100 min

Part A

Provide mechanism only when it is asked.

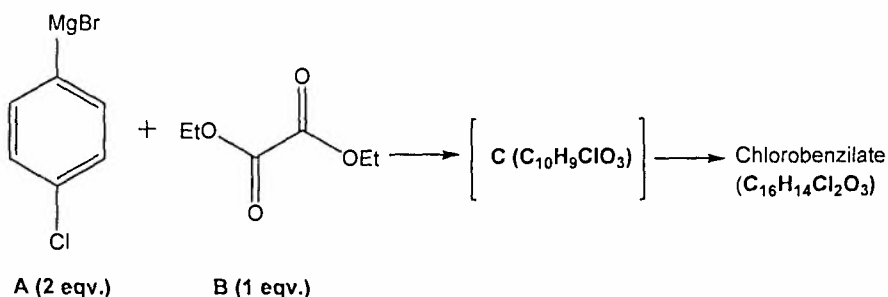
1. Which reagent(s) would you use for the following transformation? Provide a mechanism.

(3 marks)



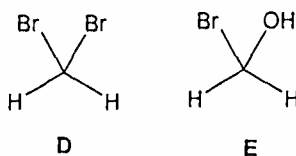
2. A synthesis of the mite and spider killer *Chlorobenzilate* is shown below. When the Grignard reagent **A** is added slowly to a solution of diethyl oxalate **B** at low temperatures, the intermediate **C** is first formed, but this reacts with further Grignard reagent to form (after work-up in aqueous acid) *Chlorobenzilate*. Suggest a structure for the intermediate **C** and give a mechanism for its formation. Also provide a mechanism for the reaction of the intermediate **C** with the Grignard reagent **A**.

(3 marks)



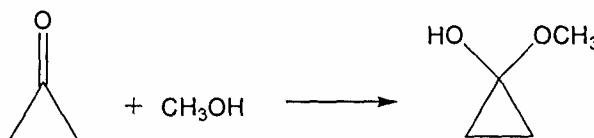
3. Compound **D** is readily available and is stable under normal conditions, whereas compound **E** is not listed by any chemical supplier. Why?

(1.5 marks)



4. Explain the fact that, although hemiacetal formation between methanol and cyclohexanone is thermodynamically disfavoured, addition of methanol to cyclopropanone goes essentially to completion.

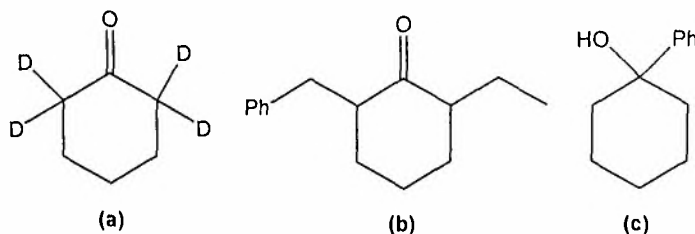
(2 marks)



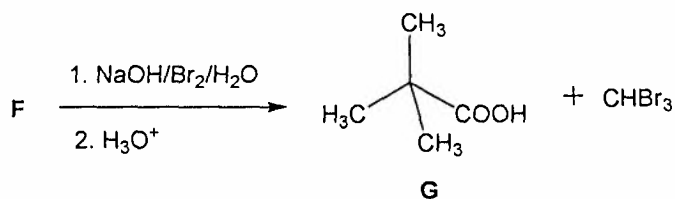
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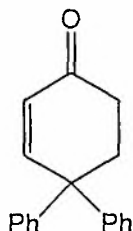
5. Provide simple synthetic routes (only the reagents and conditions) for the following compounds from cyclohexanone. (3 marks)



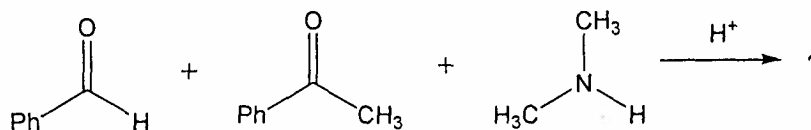
6. Treatment of compound **F** with an aqueous solution of bromine and sodium hydroxide affords, after acidification, pivalic acid **G** and bromoform. Deduce the structure of **F** and write a mechanism for the conversion. Also, indicate how many equivalents of bromine and sodium hydroxide are necessary for this reaction. (3 marks)



7. Identify the starting material(s) for the following aldol product. (1.5 marks)

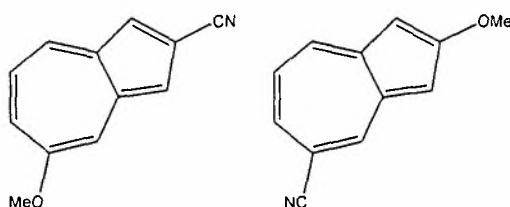


8. What is the product of the following reaction? Explain with a mechanism. (3 marks)



Part B

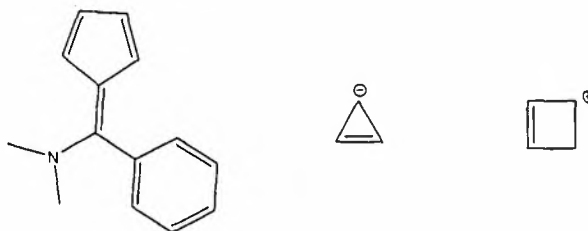
9. Compare the dipole moments of the following compounds with reasons. (2 marks)



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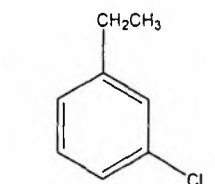
10. Classify the following compounds as aromatic, anti-aromatic, homoaromatic or non-aromatic and justify. (3 marks)



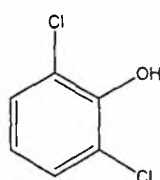
11. Write the structures of 'A' and 'B' and explain with mechanism. (3 marks)



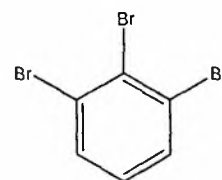
12. Synthesize the following (only reaction steps with conditions, reactants, you do not have to show the mechanistic steps). (2x3=6 marks)



(from benzene)



(from phenol)

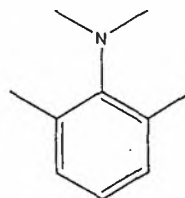
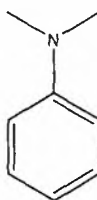
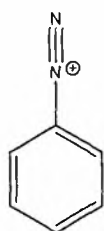


(from benzene)

13. Phenol undergoes nitration even in dilute nitric acid. Explain. (1.5 marks)

14. Ethylene epoxide reacts with benzene in presence of AlCl_3 to form $\text{PhCH}_2\text{CH}_2\text{OH}$. Suggest the mechanism. (1.5 marks)

15. What coupling product(s) will be formed when you mix all the following compounds together? Justify. (3 marks)



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D. H. J.