RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Chemistry
Third Year Semester I Examination – November / December 2016

CHE 3215 – HETEROCYCLIC AND SYNTHETIC ORGANIC CHEMISTRY

Answer All questions **Time: Two (02) hours**

Question 1

(a) Draw the following molecules.

(i) 3-Chloro-5,8-dinitroisoquinoline

(ii) 5-Hydroxyindole-3-carboxylic acid

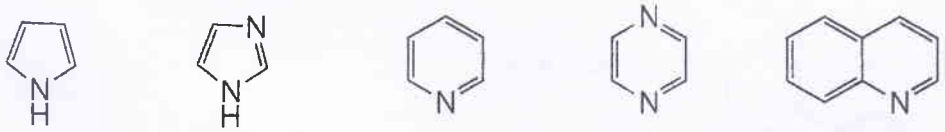
[16 marks]

(b) (i) Explain the term "aromatic stabilisation energy."

(ii) If the enthalpy of complete hydrogenation of furan to tetrahydrofuran is 153 kJ/mol, and that of 2,3-dihydrofyran is 108 kJ/mol, calculate the aromatic stabilisation energy of furan.

[24 marks]

(c) Arrange the following molecules in order of increasing reactivity towards electrophilic aromatic substitution reactions.

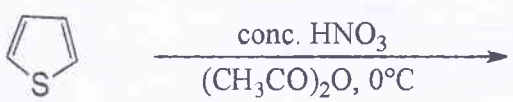


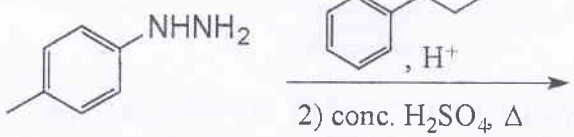
A **B** **C** **D** **E**

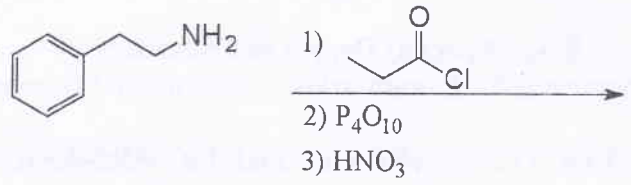
[12 marks]

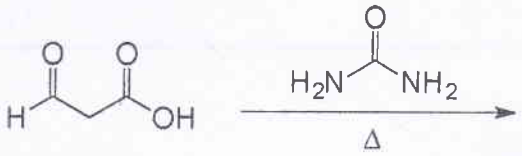
(d) Give the major product of each of the following reactions.

(i) 

(ii) 

(iii) 

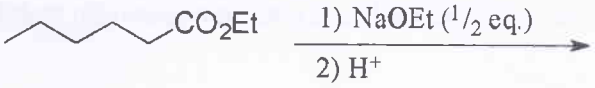
(iv) 

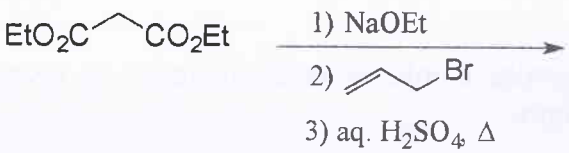
(v) 

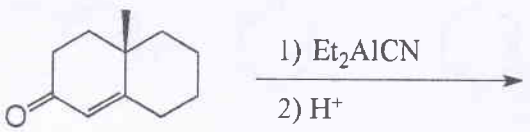
[48 marks]

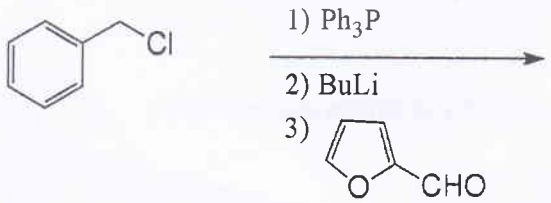
Question 2

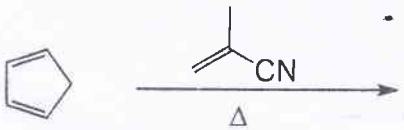
Give the major product of each of the following reactions. Where relevant, show the correct stereochemistry and/or regiochemistry.

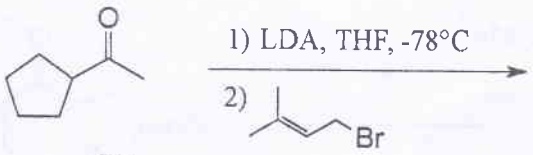
(a) 

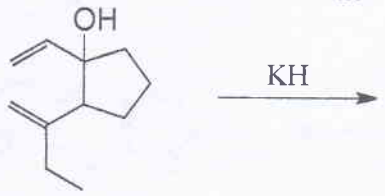
(b) 

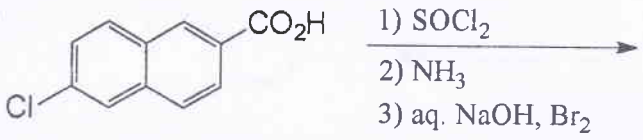
(c) 

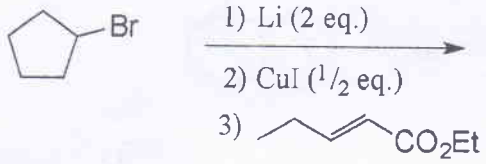
(d) 

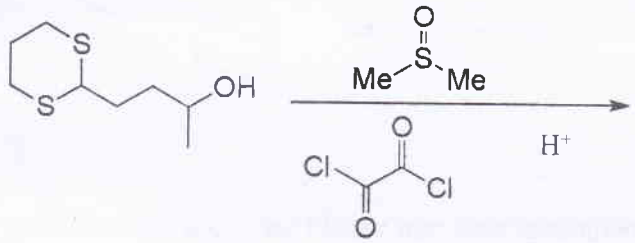
(e) 

(f) 

(g) 

(h) 

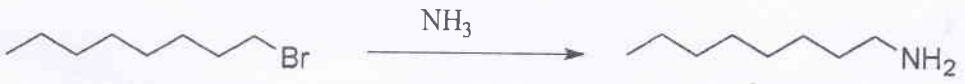
(i) 

(j) 

[100 marks]

Question 3

(a) Consider the following synthesis of 1-octanamine.

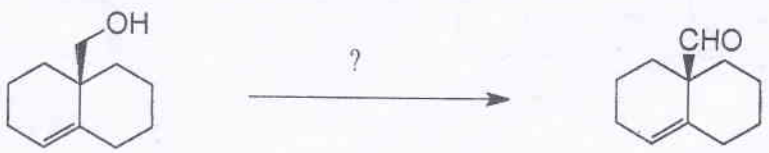


(i) Explain why this would be a poor way to synthesize 1-octanamine.

(ii) Suggest a better way to carry out the above transformation.

[22 marks]

(b) What reagents should you use to carry out each of the following reactions? If the reagents are added sequentially, number them accordingly.

(i) 

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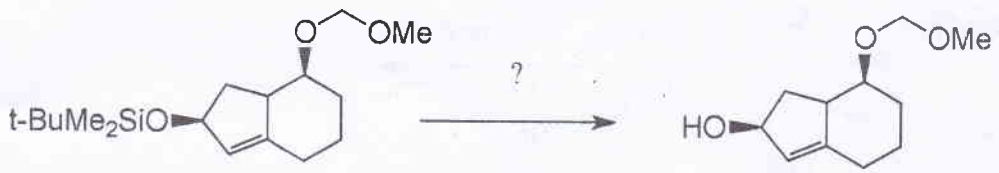
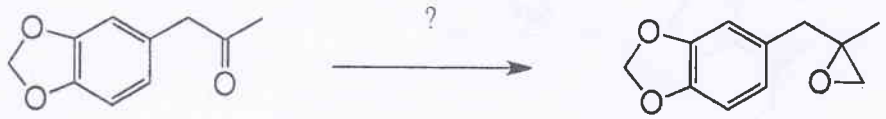
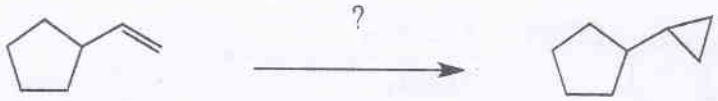


(iii)



(iv)



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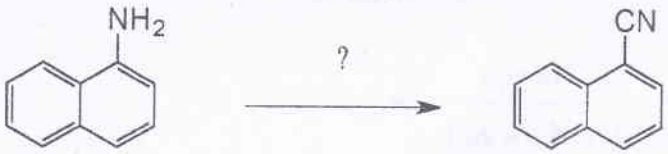

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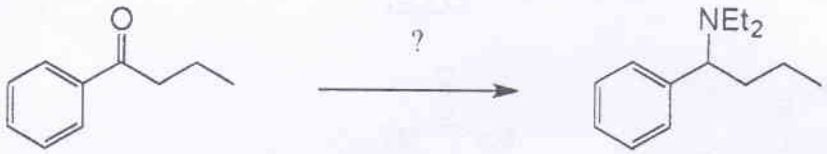


[52 marks]

(c) Show, by a sequence of reactions, how you would carry out the following transformation. Several steps will be needed.

[26 marks]

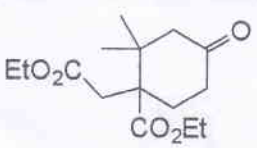
Question 4

(a) Explain what is meant by the term "protecting group." What is the advantage and the disadvantage of using protecting groups?

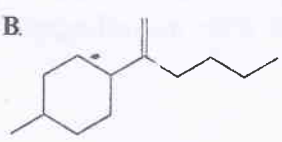
[20 marks]

(b) Show how you would synthesize **any two** of the following molecules, starting from commonly available starting materials. Your answer should give a retrosynthetic analysis, followed by a sequence of reactions showing the actual synthesis for each molecule.

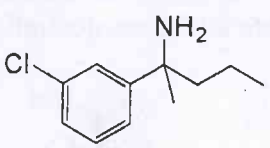
A.



B.



C.



[2 x 40 marks]