THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME / STAND ALONE COURSE 2013/2014

LEVEL 5-FINAL EXAMINATION

CHU 3126/CHE 5126-ORGANIC CHEMISTRY

DURATION: 2 HOURS

Monday 02nd June 2014 1.00 p. m. – 3.00 p. m.

Answer any FOUR questions only.

If you have answered more than four questions, only the first four answers will be mark

(1) Answer **all** parts.

(a) Draw the resonance structures of the following heterocycles and explain why the resonance energy of furan (16 kJ/mol) is much less than that of thiophene (25 kJ/mol).

furan

thiophene

(25 marks)

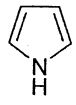
(b) Pyridine undergoes electrophilic substitution very slowly like a deactivated benzene derivative and gives 3-nitropyridine. Explain.

(25 marks)

(c) Electrophilic substitution in pyrrole occurs mainly at α-position. Explain.

(25 marks)

(d) Predict the products of the following reactions.

(i) 

$\xrightarrow{CHCl_3/NaOH}$ A + B

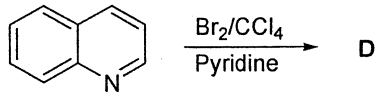
(ii) $CH_3COCH_2CH_2COCH_3 \xrightarrow[160\ °C]{P_2O_5}$ C

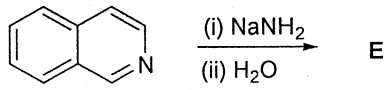
(25 marks)

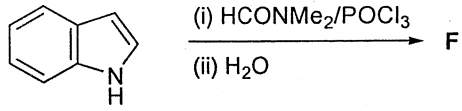
(2) (a) Give an example of a nucleophilic substitution reaction in a pyridine or substituted pyridine. Draw the resonance structures of the intermediate ion and indicate the most stable contributing structure.

(30 marks)

(b) Predict the products (**D–F**) of the following reactions.

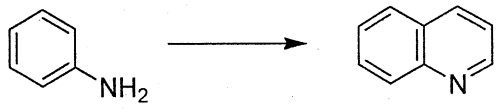
(i) 

(ii) 

(iii) 

(35 marks)

(c) Giving the necessary reagents indicate how you would effect the following transformation? Give the mechanism for the reaction.

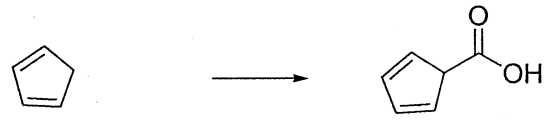


(35 marks)

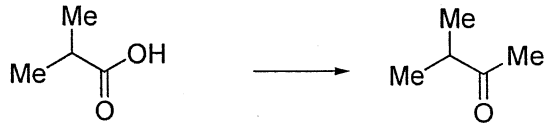
3. (a) Discuss briefly the two methods available for the preparation of Grignard reagents.

(20 Marks)

(b) Indicate how you would carry out any **TWO (02)** of the following syntheses using **organo metallic reagents**.

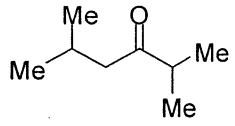
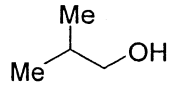
i. 

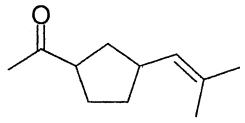
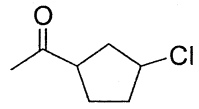
ii. 

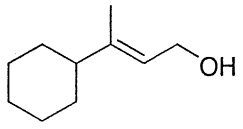
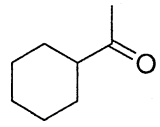
iii. 

(20 Marks)

(b) Giving necessary reagents and conditions outline show how you would synthesize any **TWO (02)** the following.

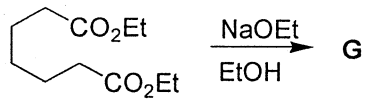
i.  from 

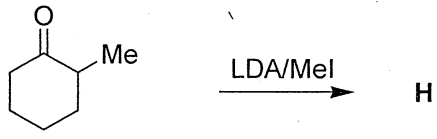
ii.  from 

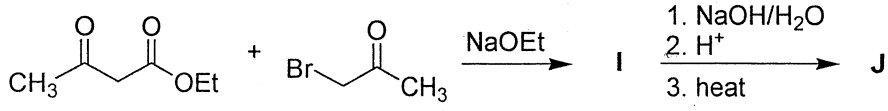
iii  from 

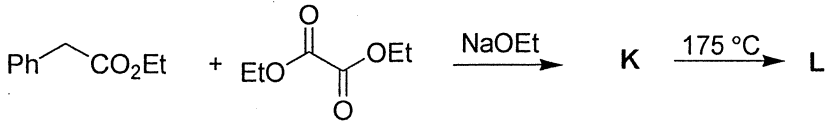
(60 Marks)

4. (a) Give the structures of the compounds (**G–L**) of the following reactions/reaction schemes.

(i) 

(ii) 

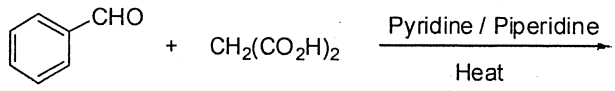
(iii) 

(iv) 

(30 Marks)

(b) Answer **either** part **A or B**

Part A:
Consider the following reaction.



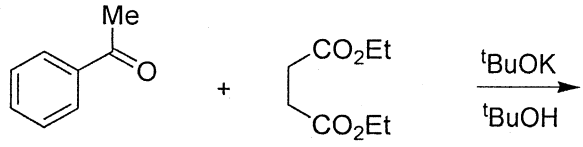
i. Giving the mechanism predict the structure of the product.

In an experiment, 0.583 g of benzaldehyde was reacted with 0.520 g of malonic acid using above reaction conditions to obtain 0.592 g of the product.

ii. Using appropriate calculations determine the limiting reagent of the reaction?
iii. Calculate the expected yield of the reaction and the percentage yield of the product.

Part B:

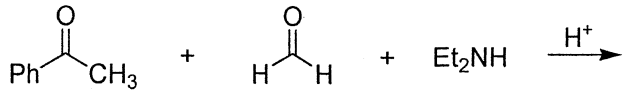
i. Giving the mechanism Predict the structure of the product of the following reaction.



ii. Indicate the use of the above reaction in organic synthesis?

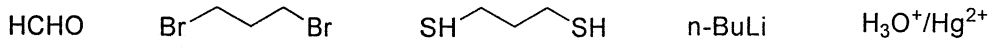
(40 Marks)

(c) Giving the mechanism predict the product of the following reaction.



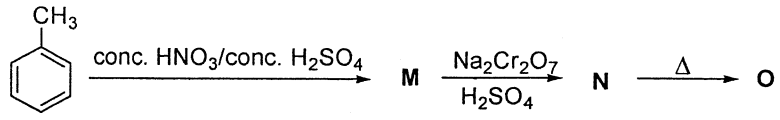
(30 Marks)

5. (a) Show how you would synthesize **cyclobutanone** using the following compounds and reagents
You may need some other reagents too.



(20 Marks)

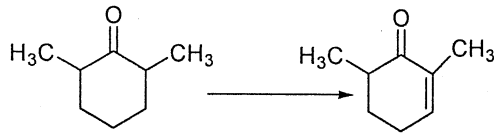
(b) Identify the compounds (**M**–**R**) in the following reactions.

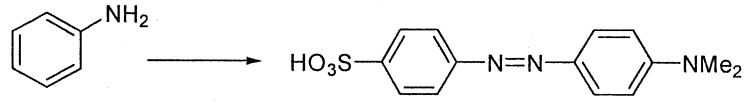
(i) 

(ii) 

(30 Marks)

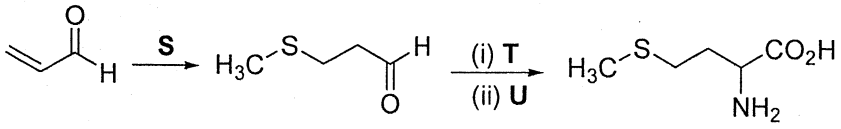
(c) Indicate how you would carry out the following conversions/synthesizes Give the necessary reagents and conditions

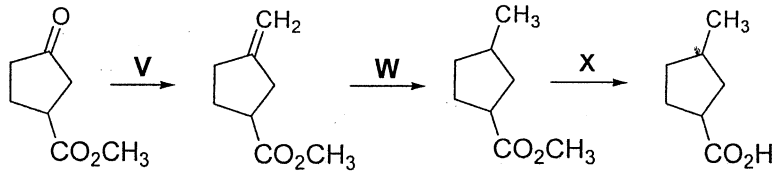
(i) 

(ii) 

(30 Marks)

(d) Identify the reagents (**S**–X) needed for following conversions.

(i) 

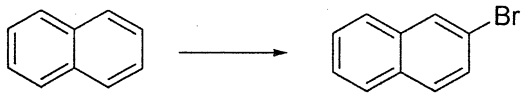
(ii) 

(20 Marks)

(6) (a) When naphthalene is heated with bromine in CCl_4 solution α-bromonaphthalene is obtained as the major product. Explain.

(20 marks)

(b) Giving the necessary reagents and essential experimental conditions, show how you would effect the following transformation.



(20 marks)

(c) Indicate the structures of the major products (**F**–**H**) of the following reactions.

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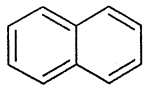
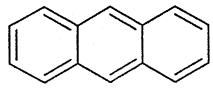
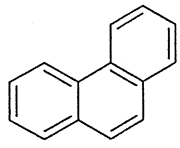
(i)  $\xrightarrow[\text{alcohol}]{\text{Na/aq. NH}_3}$ **F**

(ii)  $\xrightarrow[H_2SO_4]{Na_2Cr_2O_7}$ **G**

(iii)  $\xrightarrow[CH_3COOH]{H_2O_2}$ **H**

(30 marks)

(d) How would you synthesis phenanthrene starting from naphthalene? Give the necessary reagents and essential reaction conditions.

(30 marks)