THE OPEN UNIVERSITY OF SRI LANKA

B. Sc. DEGREE PROGRAMME / STAND ALONE COURSE 2015 / 2016

LEVEL 5 - FINAL EXAMINATION

CHU3126 / CME5126 - ORGANIC CHEMISTRY

DURATION: 02 HOURS

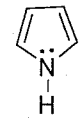
Monday 27th June 2016 1.00 –3.00p.m.

Answer any FOUR (04) questions only.

1. (a) 'Pyrrole is more acidic and less basic than pyrrolidine'.
Explain the above statement.

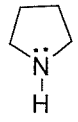
(25 marks)

(b) The dipole moment (μ) of pyrrole and its saturated analogue pyrrolidine are given below. Indicate the directions of the dipole moments in each compound and account for your answer.



μ = 1.81 D

pyrrole



μ = 1.58 D

pyrrolidine

(25 marks)

(c) 'Five membered aromatic heterocycle pyrrole undergo electrophilic substitution more rapidly than benzene, while the six membered aromatic heterocycle pyridine is less reactive than benzene in these reactions'.
Explain the above statement.

(25 marks)

(d) Predict the products of the following reactions.

(i) $CH_3COCH_2CH_2COCH_3 \xrightarrow[160^0C]{P_2O_5} A$

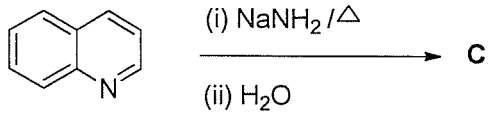
(ii)  $\xrightarrow{Ac_2O/\ SnCl_4}$ B

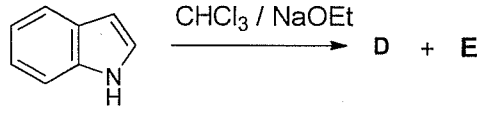
(25 marks)

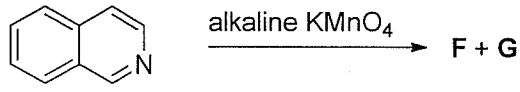
2. (a) '2-Chloropyridine undergoes nucleophilic substitution much faster than 3-Chloropyridine'.
Explain the above statement.

(30 marks)

(b) Predict the products of the following reactions.

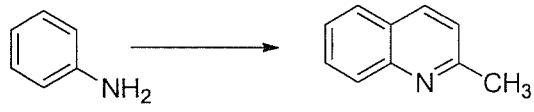
(i) 

(ii) 

(iii) 

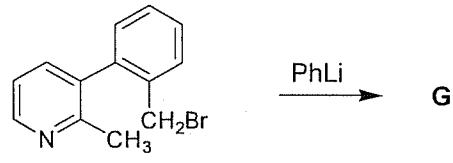
(40 marks)

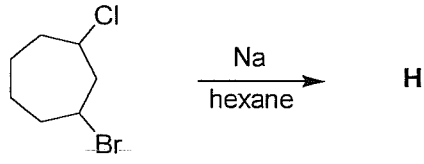
(c) Giving the necessary reagents indicate how you would effect the following transformation? Give the mechanism for the reaction.

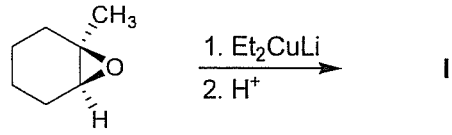


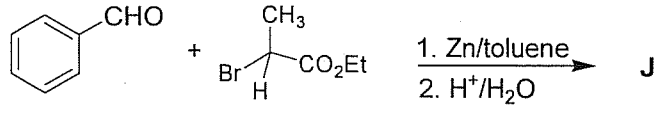
(30 marks)

3. (a) Give the structures of the products **G** – **J** of the following reactions.

(i) 

(ii) 

(iii) 

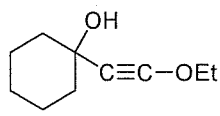
(iv) 

(40 Marks)

(b) Giving appropriate examples, discuss **three (03)** limitations of the use of Grignard reactions in organic synthesis.

(40 Marks)

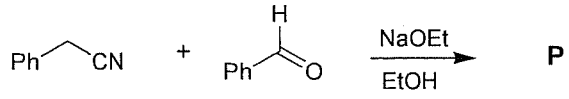
(c) Illustrate the use of α-acetylenic alcohol (**K**) in organic synthesis by stating **two (02)** different reactions with appropriate examples.

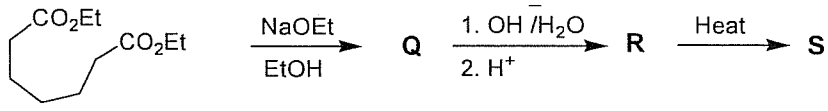


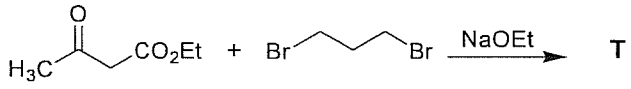
K

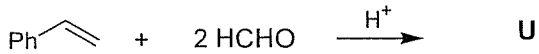
(20 Marks)

4. (a) Give the structures of the compounds **P** – **U** of the following reaction schemes.

(i) 

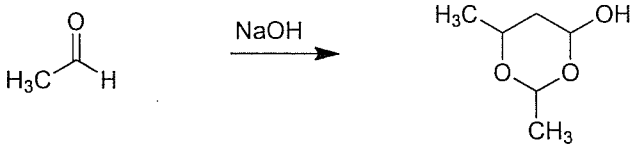
(ii) 

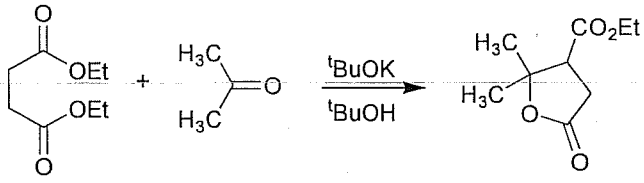
(iii) 

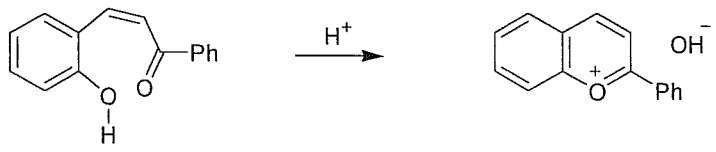
(iv) 

(30 Marks)

(b) Write down the mechanisms of any **TWO (02)** of the following reactions.

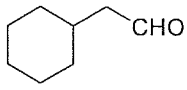
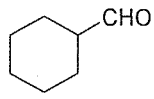
(i) 

(ii) 

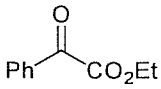
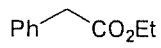
(iii) 

(30 Marks)

(c) Giving necessary reagents and conditions show how you would carry out any **TWO (02)** of the following syntheses using the indicated reaction/method.

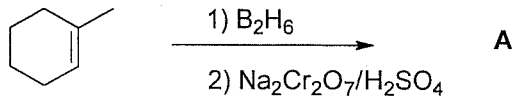
(i)  from  using Darzen reaction

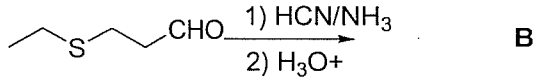
(ii) $(CH_3)_3CNH_2$ from $(CH_3)_3COH$ using Ritter reaction

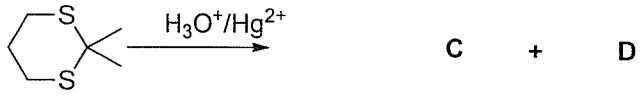
(iii)  from  using a nitrosation reaction

(40 Marks)

5. (a) Give the structures of the major products (**A – D**) in the following reaction schemes.

i) 

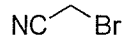
ii) 

iii) 

(20 marks)

(b) Indicate how you would carry out the following synthesis using only the reagents given below. Give the mechanism of the reactions involved.

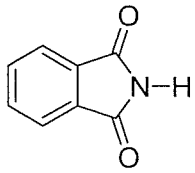
Reagents:

$P(OEt)_3$ PhLi 

(40 marks)

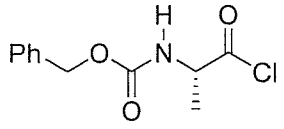
(c) Explain the following.

(i) The H atom attached to the N atom of phthalimide shows significant acidity.



Phthalimide

(ii) 'The activation of the acid group by preparing the acid chloride is not suitable in peptide synthesis when an amino group is protected with benzoyloxycarbonyl group'.
Explain the above statement using the compound **E** given below.



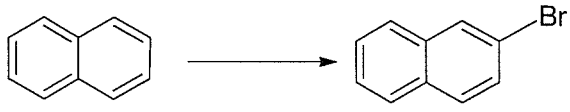
E

(40 marks)

6. (a) On heating naphthalene with bromine in CCl_4 solution α-bromo naphthalene is obtained as the major product.
Explain the above observation.

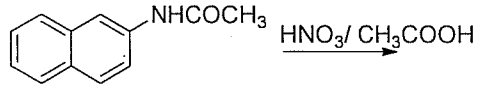
(20 marks)

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

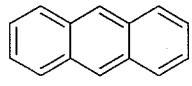


(20 marks)

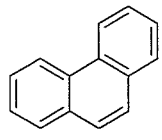
(c) Give the structures of the major products of the following reactions.

(i) 

H

(ii) 

I

(iii) 

J

(30 marks)

(d) Give the necessary reagents and essential conditions to synthesize phenanthrene using naphthalene as the starting material.

(30 marks)