UNIVERSITY EXAMINATIONS 2014/2015 ACADEMIC YEAR

3rd YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE AND BACHELOR OF SCIENCE

COURSE CODE/TITLE: SCH 302: CHEMISTRY OF AROMATIC COMPOUNDS

END OF SEMESTER: I DURATION: 3 HOURS

DAY/TIME: FRIDAY 8.00 TO 11.00AM DATE: 5.12.2014 (NL1)

INSTRUCTIONS:

ANSWER ALL QUESTIONS IN SECTION A AND ANY OTHER TWO IN SECTION B

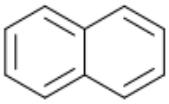
SECTION A: ANSWER ALL QUESTIONS [40 MARKS]

QUESTION ONE

a) Define the following terms as used in benzene chemistry?
   (i) Resonance effect.
   (ii) Inductive effect

(2 marks)

b) Determine whether or not the following compounds are aromatic and if NOT explain?

1 

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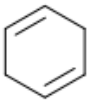
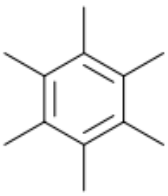
3 

4 

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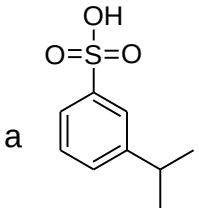
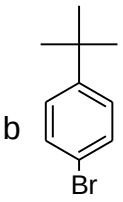
6 

(6 marks)

c) Using an arrow indicate on the following structures where incoming electrophile will attack?



a



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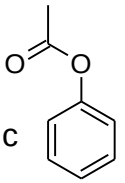

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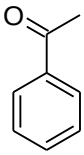

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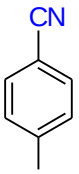

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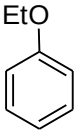


f

(6 marks)

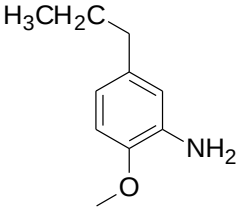
d) Bromobenzene directs incoming substituents to ortho/para positions. Using resonance structures, explain this phenomenon.

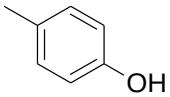
(3 marks)

e) Aniline is much less basic than dimethylamine, why?

(2 marks)

f) Give the systematic (IUPAC) name of each of the following compounds:

(I)


(II)


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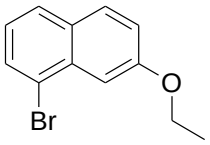

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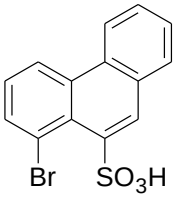

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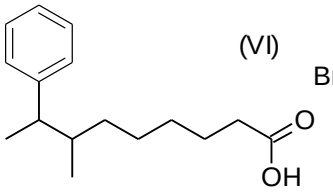

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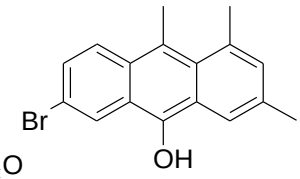
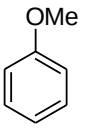
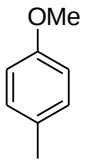
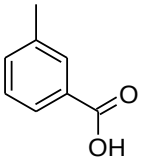


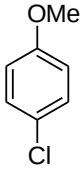
(6 marks)

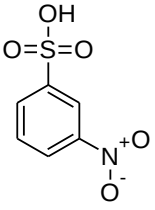
g) Arrange the following compounds from the most reactive to the least reactive with $Br_2/FeBr_3$? Justify your answer and predict the structure of the major product.









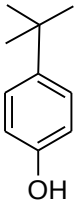


(5 marks)

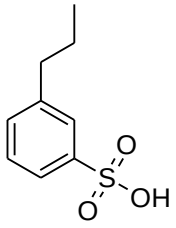
SECTION B ANSWER ANY TWO QUESTIONS, [30 MARKS]

QUESTION TWO

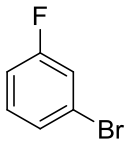
a) Starting with benzene draw a scheme, complete with reagents and conditions required to obtain the following compounds?

i) 

(5 marks)

ii) 

(5 marks)

(iii) 

(5 marks)

QUESTION THREE

a) The explosive TNT (2,4,6-trinitrotoluene) can be made by nitrating toluene with a mixture of nitric and sulphuric acids, but the reaction conditions must gradually be made more severe as the nitration proceeds. Explain.

(3 marks)

b) Although Arenes, Alkenes and Alkynes all have π-bonds, Arenes typically undergoes electrophilic substitution reactions unlike alkenes and alkynes which undergo addition reactions. Explain?

(3 marks)

c) List down two limitations that affect BOTH Friedel-Craft alkylation and Friedel-Craft acylation

(2 marks)

d) In benzyne chemistry, the negative charge is placed furthest away from electronegative groups. True or false

(1 mark)

e) Diazonium salts are very valuable, particularly for the manufacture of dyes. Draw the reaction scheme inclusive of all reagents starting with benzene.

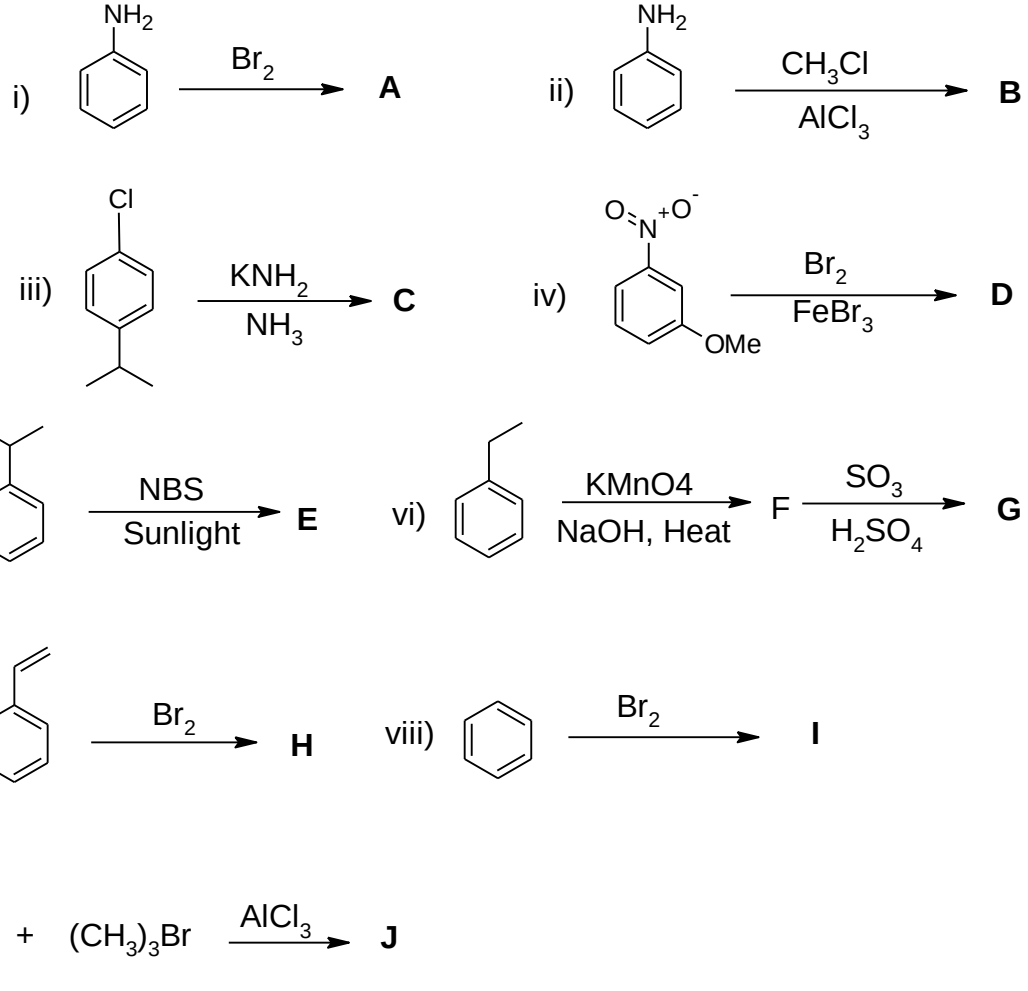
(5 marks)

f) List the reagents for Iodination of benzene ring

(1 mark)

QUESTION FOUR

a) Write structural formulas for the products if a reaction occurs. If No reaction occurs write No Reaction:



(10 marks)

b) Draw a reaction mechanism for Friedel-Craft alkylation between a benzene molecule and ethanol.

(3 marks)

c) Draw the final product that will be formed between phenol and chlorine water

(2 marks)