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**University Examinations 2015/2016**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE CHEMISTRY

**SCH 2309: CHEMISTRY OF NON BENZENOID AROMATIC COMPOUNDS**

**DATE: NOVEMBER, 2015 TIME:** $2$**HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE – (30 MARKS)**

1. Draw the four resonance structures of anthracene. (4 Marks)
2. Draw the structures of the following compounds ; (5 Marks)
3. 1 – aminonaphthalene
4. pyrrole
5. 2-bromofuran
6. 9,10-anthraquinone
7. Pyridine-3-sulfonic acid
8. What are heterocylic compounds? (2 Marks)
9. Briefly explain the following observations:
10. Thiophene is less reactive than furan towards electrophilic substitution.(3 Marks)
11. Thiophene is more reactive than benzene towards electrophilic subtistitution. (2 Marks)
12. Furan is less reactive than pyrrole in electrophillic substitution reactions(3 Marks)
13. Electrophilic substitution in pyrrole normally occur at position 2(C2) rather than position 3(C3) (2 Marks)
14. Using relevant equation(s), briefly describe how oxidation of phenols is a useful reaction in black and white photography. (6 Marks)
15. Indicate the order of reactivity for the following compounds towards electrophilic aromatic substitution.

   (3 Marks)

**QUESTION TWO (20 MARKS)**

1. Complete the following reactions by giving the structure and the name of the products.
2. 
3. 
4. 
5. 
6.  (10 Marks)

b) (i) Define the term annulene. (1 Mark)

 (ii) Draw the structure and describe the aromaticity of $\left[14\right]$ - annulene. (6 Marks)

c) What are activating substituent groups. Give two examples. (3 Marks)

**QUESTION THREE (20 MARKS)**

1. How would you prepare the following compounds from naphthalene?
2. Naphthalene -1-sulfonic acid
3. Phthaldehyde
4. 2-naphthol
5. 1,4-dihydronaphthalene
6. Phthalic acid (10 Marks)
7. What is the difference between an aromatic and anti-aromatic compound. (4 Marks)
8. Briefly explain why pyrrole has a higher boiling point that furan. (3 Marks)
9. (i) What is polarimetry? (2 Marks)
10. How would you determine that a compound is optically active? (1 Mark)

**QUESTION FOUR (20 MARKS)**

1. Draw the structures of the compounds in each pair below and describe their relationship.
2. Benzene and 1,3,5- hexatriene
3. Cyclobutadiene and 1,3-butadiene (6 Marks)
4. Using relevant equations, briefly describe the synthesis of anthracene from 1,4-naphthoquinone. (8 Marks)
5. Briefly explain why pyridine undergoes electrophilic attack predominantly at C3 rather than at C2 or C4 (6 Marks)