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 16 MAR 2022
 THE OPEN UNIVERSITY OF SRI LANKA
 KANDY REGIONAL CENTRE
 EXAMINATION



THE OPEN UNIVERSITY OF SRI LANKA
 FACULTY OF HEALTH SCIENCES
 DEPARTMENT OF BASIC SCIENCES
 ACADEMIC YEAR 2020/2021 – SEMESTER 01

BACHELOR OF PHARMACY HONOURS
 BSU4340-PHARMACEUTICAL CHEMISTRY III-LEVEL 4
 FINAL EXAMINATION
 DURATION: 3 HOURS

DATE: 16th March 2022 DURATION: 3 HOURS
TIME: 01.30 a.m. – 4.30 p.m.

INDEX NO:

This question paper consists of 10 pages with 20 Multiple Choice Questions (Part A) and 06 Essay Questions (Part B).

IMPORTANT INSTRUCTIONS / INFORMATION TO CANDIDATES

- This question paper consists of **10 pages** with **2 Parts**:
 - PART A: Multiple Choice Questions - MCQs (20 marks):** There are 20 MCQs. Indicate answers for **all** questions in the answer sheet provided by placing a cross (x) in ink in the relevant cage (answers in pencil will not be marked).
 - PART B: Essay Questions (EQs) (80 marks):** There are 6 questions. Write answers for **all** questions in booklets provided.
- Write your **Index Number** in the space provided.
- Do **NOT** bring in on person or have in possession unauthorized materials, including mobile phones and other electronic devices, or violate any other examination rules.
- Do **NOT** remove any page/part of this question paper from the examination hall.

BACHELOR OF PHARMACY HONOURS - LEVEL 4 - 2020/21
BSU4340- PHARMACEUTICAL CHEMISTRY III
FINAL EXAMINATION

INDEX NO:

ANSWER SHEET FOR PART A

Q. No.	(a)	(b)	(c)	(d)
1				
2				
3				
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BACHELOR OF PHARMACY HONOURS - LEVEL 4 - 2020/21
BSU4340- PHARMACEUTICAL CHEMISTRY III
FINAL EXAMINATION

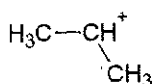
INDEX NO:

Part A – Multiple Choice Questions

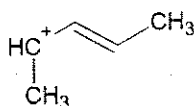
(20 marks)

Choose the most suitable answer and indicate with a 'X' in the answer sheet provided.

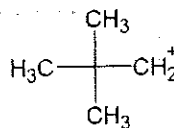
- Conjugated double bonds ——— nonconjugated double bonds.
 - have greater stability than
 - have less stability than
 - have no relationship to the stability of
 - have equal stability to
- The s-cis structure refers to:
 - configuration around a double bond
 - conformation around a single bond
 - configuration around an alkene bond
 - configuration around an alkyne bond
- Which of the followings is the main limitation of Friedel–Crafts alkylation reactions?
 - rearrangement reactions
 - adding deactivating groups to the benzene ring
 - spontaneous reactions without a Lewis acid
 - multiple acylation reactions
- How many constitutional (structural) isomers would you expect from the reaction in between HCl and 1,3-butadiene?
 - one
 - two
 - three
 - four
- Rank the following carbocations in the order of increasing stability.



A



B

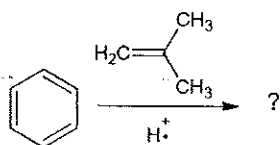


C

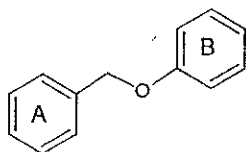
- A < B < C
- B < C < A
- C < A < B
- B < A < C



6. Phenols are stronger acids than alcohols because of the
- resonance stabilization of phenoxide ions.
 - resonance stabilization of phenols.
 - resonance stabilization of alkoxide ions.
 - hydrogen bonding in phenols.
7. Carbocations undergo rearrangement reactions
- to give more stable carbocations.
 - by hydride shifts.
 - by methyl shifts.
 - for all of the above reasons.
8. What is the product of the following reaction?



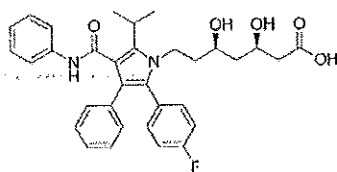
- isobutyl benzene
 - sec-butylbenzene
 - 2-methyl-1-phenylpropene
 - tert-butylbenzene
9. Rank the following compounds in the order of decreasing reactivity to aromatic electrophilic bromination.
- I. benzene II. toluene III. benzoic acid IV. phenol
- IV > II > I > III
 - II > I > IV > III
 - IV > III > II > I
 - II > III > IV > I
10. In the Friedel-Crafts alkylation of benzene, dialkylation is a significant by-product. However, diacylation is not a significant by-product in the Friedel-Crafts acylation of benzene. Which of the following is the primary reason for this difference?
- Alkyl groups activate the ring to further substitution, acyl groups deactivate it.
 - Alkyl groups are less sterically hindered than acyl groups.
 - Acyl cations are more difficult to make with Lewis acids.
 - Unlike acyl cations, carbocations can undergo rearrangements.
11. Identify the preferred site(s) of electrophilic attack on the following compound.



- ortho/para positions on ring A
- ortho/para positions on ring B
- meta position on ring A
- meta position on ring B



12. What will be the product formed when phenol reacts with Br_2 in CCl_4 medium?
 a) 3-Bromophenol b) 4- Bromophenol c) 3,5-Dibromophenol d) 2,4,6-Tribromophenol
13. Aromatic compounds are:
 a) alkanes b) linear c) nonconjugated and cyclic d) conjugated and cyclic
14. How many π electrons exist in the cyclopentadienyl cation?
 a) two b) four c) six d) eight
15. Pyridine is aromatic because its nonbonding electrons
 a) are included in the π electron system.
 b) are unpaired.
 c) are removed from the molecule.
 d) are not included in the π electron system.
16. Among the following compounds, the strongest acid is:
 a) Phenol b) 2,4-dinitrophenol c) *p*-cyanophenol d) 3,4-dimethylphenol
17. Which one of the following electrophilic substitution reactions is not possible in pyridine?
 a) Friedel-Craft-acylation b) Nitration
 c) Sulphonation d) Bromination
18. Furan, pyrrole and thiophene undergo electrophilic substitution predominantly at _____ position.
 a) 1 b) 2 c) 3 d) 4
19. Electrophilic aromatic substitutions in quinoline takes place at _____ positions.
 a) 4 b) 2 c) 5 and 8 d) 2 and 4
20. Identify the heterocyclic ring in the structure of Atorvastatin which is a drug useful in cardio vascular disease.



Atorvastatin

- a) Imidazole b) Pyrrole c) Piperidine d) Purine

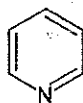
BACHELOR OF PHARMACY HONOURS - LEVEL 4 - 2020/21
BSU4340- PHARMACEUTICAL CHEMISTRY III
FINAL EXAMINATION

INDEX NO:

Part B – Answer all questions

(80 marks)

- 1.a) Explain why pyridine is less reactive towards electrophiles than benzene. (02 marks)
- b) Aryl amines/ N-substituted aryl amines do not undergo Friedel-Craft reactions. Explain. (02 marks)
- c) Would you expect 2-chloro-3-methylbutane to be a good alkylating agent in a Friedel-Crafts alkylation reaction? Explain your answer by providing a suitable mechanism. (03 marks)
- d) Which of the following compounds is more basic? Explain your answer. (03 marks)

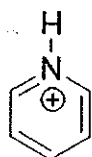


Pyridine

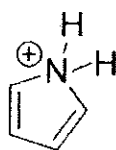


Pyrrolidine

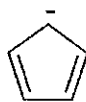
2. a) Assuming all the molecules given here are planar, deduce whether each of the following compounds is aromatic, anti-aromatic or non-aromatic by applying Hückel's rule. Provide reasons. (06 marks)



I)



II)

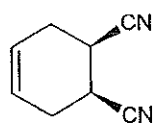


III)

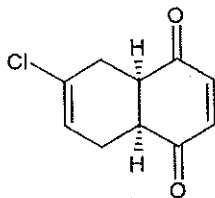
- b) One of the isomeric, conjugated dienes (**M**) does not react with any dienophiles in Diels-Alder reaction. The molecular formula of **M** is C_6H_8 . Deduce the structure of **M**. (03 marks)



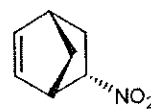
c) Identify dienes and dienophiles of the following Diels-Alder products. (06 marks)



I)

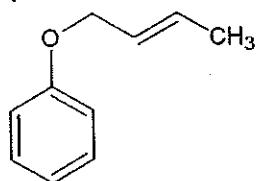


II)



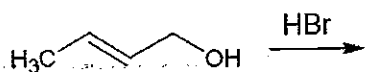
III)

3. a) Providing a suitable mechanism, predict the product of Claisen rearrangement of *trans*-2-butenyl phenyl ether. (04 marks)

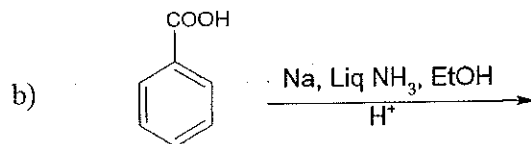
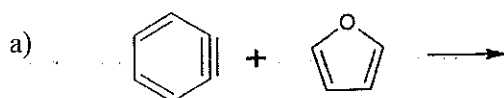


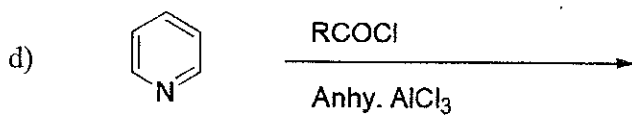
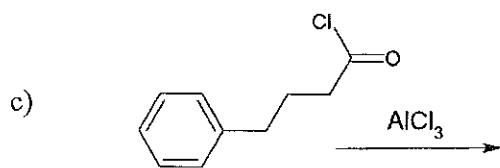
***trans*-2-butenyl phenyl ether**

b) Indicating the mechanism, predict the products of the following reaction. Which product is more stable? Explain your answer. (08 marks)

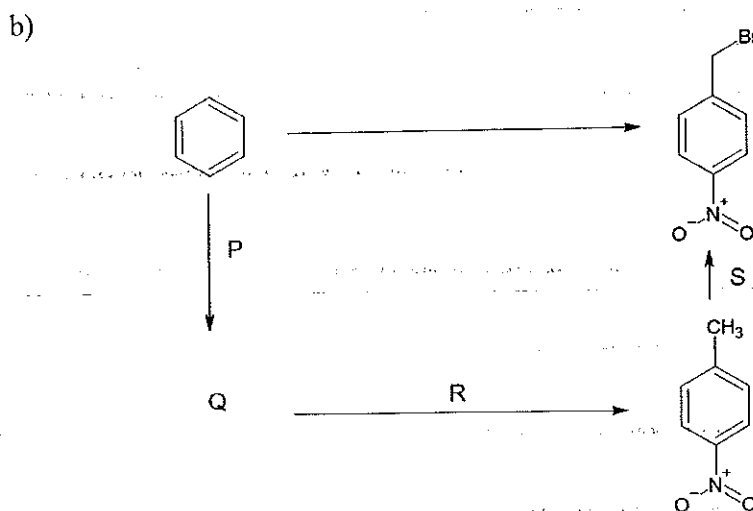
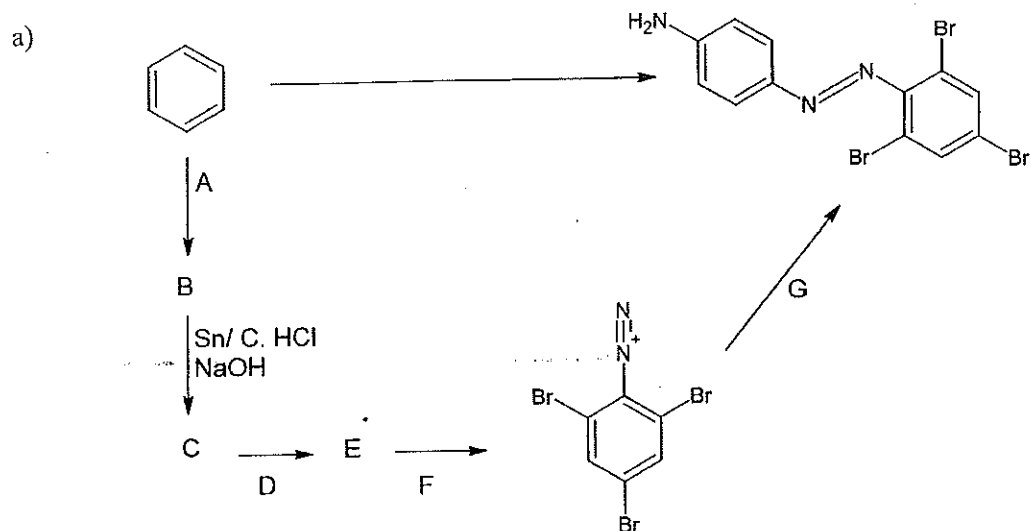


4. Give the structures of the major products of the following reactions. (10 marks)

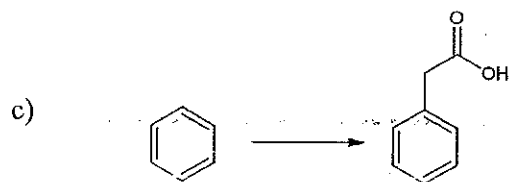
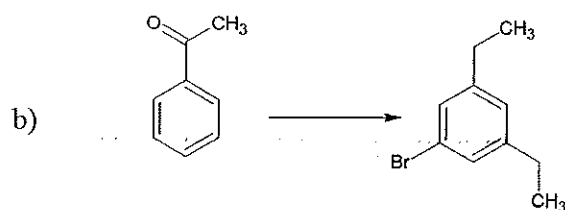
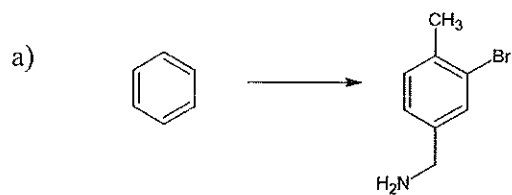




5. Complete the following reaction sequence giving structures of missing products, reagents, and conditions (A-G and P-S). (12 marks)



6. Giving necessary reagents and conditions, show how you would carry out the following multistep transformations. (21 marks)



END