University of Tanta
Faculty of Pharmacy
Depart. of Pharm. Chemistry
Pharmaceutical Organic Chemistry (3)
Final Exam
First Semester, Second year
Time allowed: 120 min - Date: 21-1-2015

This Exam Booklet contains (..٩..) different pages

All questions are to be attempted. (50 Points for all)

PART ONE (30 Points)

Q # I Choose the correct answer:- (10 Points)

No	a	b	c	d	No	a	b	c	d
1					6				
2					7				
3					8				
4					9				
5					10				

1- Which statement below is *correct*?
(A)pyrrole has acidic properties.
(B)pyrrole readily protonates on the N atom.
(C) pyrrole is a stronger base than triethylamine.
(D)none of the above.

2- Which of the following statements is *correct*?
(A) pyridine is a tertiary amine.
(B) pyrrole is a strong base.
(C) pyrrole has less aromatic character than furan. (C)
(D) pyridine is less aromatic than benzene

3- In pyrrole and pyridine, the number of electrons that the N atom contributes to the π-system is:
(A) pyrrole, 2; pyridine 2.
(B)pyrrole, 1; pyridine 2
(C)pyrrole, 2; pyridine 0.
(D)pyrrole, 1; pyridine 1

4- Electrophilic substitution in furan usually occurs at:
(A)the C(3) atom.
(B)the O atom.
(C)the C(2) atom.
(D)both the C(2) and C(3) atoms.

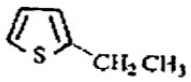
5- Nitration of pyrrole is best carried out using:

(A)concentrated nitric and sulfuric acids.
(B)ammonium nitrate.
(C)nitric acid.
(D)none of the above.

6- If you wanted to carry out an electrophilic substitution in pyridine, an initial step could be to react pyridine with H_2O_2 in acetic acid. What happens in this step?

(A)Pyridine-*N*-oxide is formed.
(B)2-Hydroxypyridine is formed.
(C)1,4-Dihydropyridine is formed.
(D)2-Pyridone is formed.

7- The following compound is named



(A) 1-ethylpyrrole. **(C)** 5-ethylpyrrole.

(B) 2-ethylfuran. **(D)** 2-ethylthiophene.

8- During Knorr pyrrole synthesis a substituted pyrrole is produced from the reaction of

(A) a ketone and an aldehyde.

(B) an α-amino ketone and a ketone.

(C) a β-ketoester and an alcohol.

(D) None of the above.

9- Acetic anhydride reacts with indole to give:

a- 2- acetyl indole.
b- 3- acetyl indole .
c- N-acetylindole.
d- 2 and 3.

10- Consider the benzo and pyrido rings that make up quinoline and then decide which of the following statements is true.

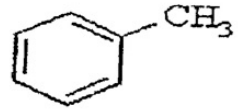
(A) The benzo ring is more reactive towards nucleophiles than the pyrido ring.

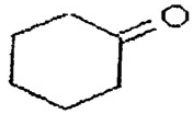
(B) The pyrido ring is more reactive towards nucleophiles than the benzo ring.

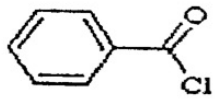
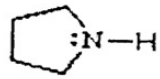
(C) Neither ring is reactive towards nucleophiles.

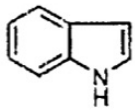
(D) The pyrido ring is reactive towards both electrophiles and nucleophiles

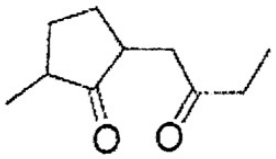
Q # II Complete the following:- (8 Points)

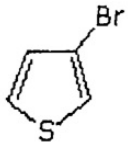
1-  1. HNO_3 / H_2SO_4 ; 2. Sn / HCl → .....

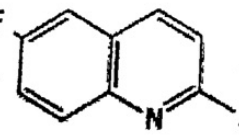
2-  1. $NH(CH_3)_2$; 2. H_2 / Pd → .....

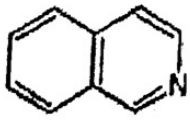
3-  +  pyridine → .....

4- ? + ? → 

5-  NH_3 ; H^+ cat. → C ($C_{10}H_{15}N$)

6-  HNO_3 / $(CH_3CO)_2O$ → .....

7-  $MeO^{\ominus}$ → ? .....

8-  $NaNH_2$ / NH_3 → .....

Q # III (12 Points)

A- The N-oxide is activated to attack by electrophiles at both 2- and 4-position. Explain.

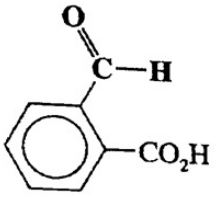
B- How to separate the mixture of 1^{o}, 2^{o} and 3^{o} amines?

C- Gabriel`s phthalimide syntheses

D- Hofmann degradation of amides

Part (2), (20 marks): Answer the following questions in (4) pages in (50) min., only in the provided space and do not use pencil.

1) Write the IUPAC name for each of the following compounds: (2 marks)

a) 

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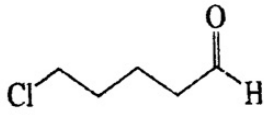
b) 

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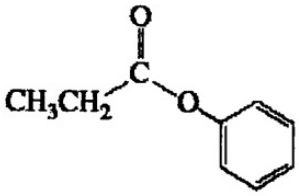
c) 

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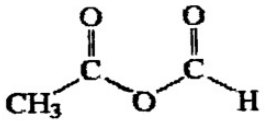
d) 

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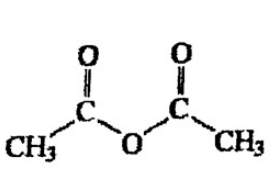
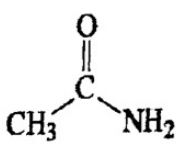
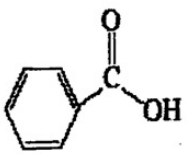
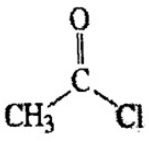
2) Arrange the following compounds in an increasing order of acidity? (1 mark)

$CH_3CH_2CH_2COOH$, $BrCH_2COOH$, CH_3OH, FCH_2COOH, $ClCH_2COOH$

(A) (B) (C) (D) (E)

Answer: .....<.....<.....<.....<.....

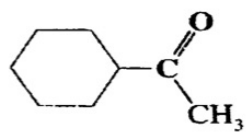
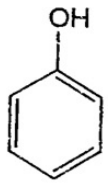
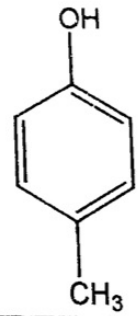
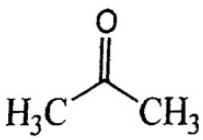
3) Arrange the following compounds in an increasing order of reactivity towards nucleophilic substitution reacrion? (1 mark)

   $CH_3C{\equiv}N$ 

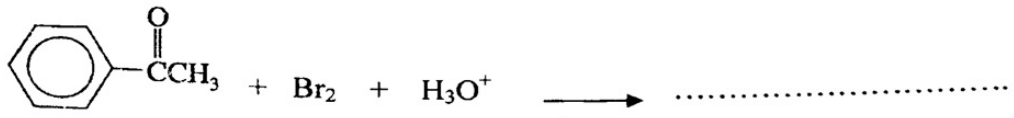
(A) (B) (C) (D) (E)

Answer: .....<.....<.....<.....<.....

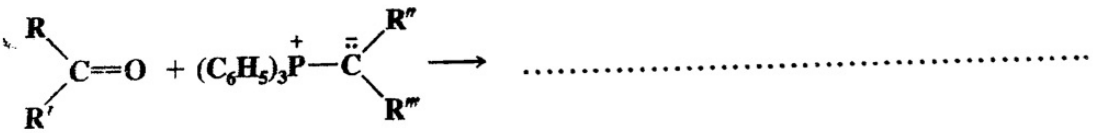
4) Complete the following table by drawing chemical structures of reactants, reagents or products as indicated in each case only in the provided space? (6 marks)

Reactants	Reagents/condition	Products
CH_3CH_2OH	.....	CH_3CHO
CH_3CN	1) C_2H_5MgBr 2) H_3O^+	.....
..... + $(CH_3)_2CuLi$	Et_2O/ -78^oC	 +.....+.....
	1) $(CH_3CO)_2O/CH_3CO_2Na$ 2) $AlCl_3$	..... + ...
	1) ..... 2)	
 + HCN	1) H^+ 2) H_2O	.....

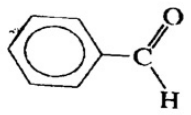
5) **Complete** the following equations and **write the mechanism** of each reaction? (6 marks)



Mechanism



Mechanism



+ NaOH ⟶ .....

Mechanism

6) By means of chemical structures and equations, convert each of the following compounds to the corresponding products: (4 marks)

a) Bromobenzene ⟶ benzoic acid

b) Phenol ⟶ o-allylphenol