



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED CHEMISTRY

ORGANIC CHEMISTRY II FOR TTE STUDENTS ONLY

SCH 1202

First Semester Examination Paper

January 2015

This examination paper consists of 5 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Graph Paper (on request)

Examiner's Name: DR C T PAREKH

INSTRUCTIONS

- 1. Answer all questions from Section A and any three from Section B. Section A carries 40 marks and each question in Section B carries 20 marks.**
- 2. Start each question on a new page. (not each part of a question).**
- 3. Show mechanism, chemical steps or synthesis by means of curved arrows.**

MARK ALLOCATION

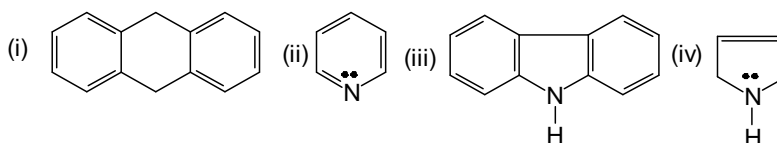
QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
TOTAL	100

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SCH 1202

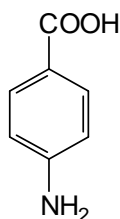
SECTION A:

1. (a) Suggest four criteria which indicate that benzene is very stable compound. (4 Marks)
- (b) Draw isomeric structures for the molecular formula C_7H_7OH and give IUPAC names. (4 Marks)
- (c) Explain Huckel's rule in your own words. (4 Marks)
- (d) State whether the following compounds are aromatic or non-aromatic and also indicate the number of pi electrons present in the compounds.



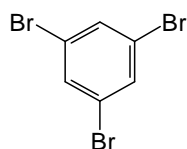
(8 Marks)

- (e) *trans*-(*e,e*)-1,4-dichloro cyclohexane is more stable than its *trans*-(*a,a*)-isomer. Explain this observation with an appropriate chair conformations. (4 Marks)
- (f) Explain with the aid of chemical equations, why phenyl amine is less basic than ethylamine. (4 Marks)
- (g) Show how carbonyl compounds can exist in the enol-form and as an enolate ion which leads to alpha (α) substitution reaction. (4 Marks)
- (h) *p*-amino benzoic acid (PABA) is widely used as a sunscreen agent. Propose a synthesis of PABA starting from benzene. Use reagents of your choice.



(4 Marks)

- (i) Propose the synthesis for the following compound from phenylamine. (No mechanism required)



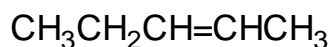
(4 Marks)

- (j) With an appropriate example, explain what is an α -amino acid? (4 Marks)

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SECTION B:

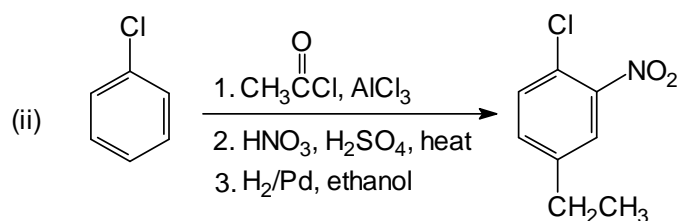
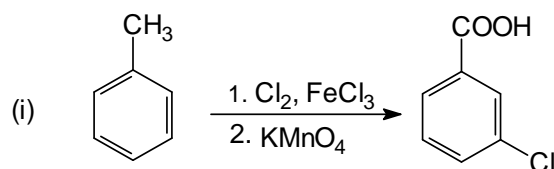
2. (a) What carbonyl compound and what phosphorus ylide might you use to prepare the following compound?



Outline the possible synthesis of ylide starting from triphenyl phosphine and halide of your choice. Write the mechanism of this Wittig reaction.

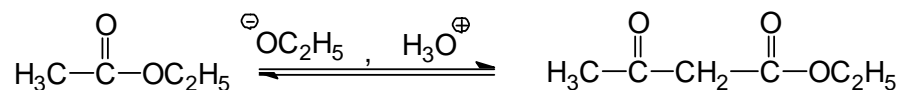
(10 Marks)

- (b) As written, the following syntheses have certain flaws. What is wrong with each one? Suggest the correct steps to produce the products. (No mechanism required).



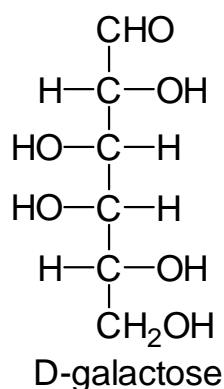
(10 Marks)

3. (a) Suggest the mechanism for the following Claisen condensation reaction.



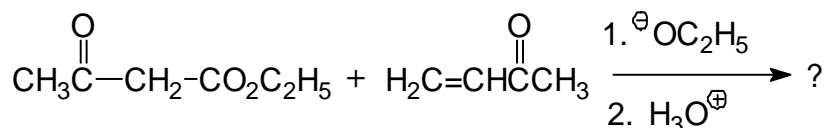
(5 Marks)

(b) You are given the following monosachharide:



- (i) Draw Fischer projection. (1 Mark)
- (ii) Draw Haworth projection and indicate the type of reaction involved. (3 Marks)
- (iii) Write Kiliani-Fischer synthesis (chain lengthening) for D-galactose. For this reaction you may need HCN, acidic solution and reducing agent. (No mechanism required). (3 Marks)
- (iv) What will be the products when D-galactose reacts with (I) reducing agent such as sodium borohydride and (II) oxidizing agent such as nitric acid. (2 Marks)

(c) Write reaction mechanism for the following Michael reaction.



(6 Marks)

4. (a) You are given the following list of substituents:

-CHO; -Cl; -OH; -NO₂; -OCH₃; -COOH; -Br; -NHCOCH₃; -SO₃H, -C₆H₅

Indicate the substituents which are

- (i) o/p directing with activation
- (ii) o/p directing with deactivation
- (iii) m-directing with deactivation

With respect to electrophilic substitution reactions in benzene derivatives.
(Mark will be deducted for the wrong answer).

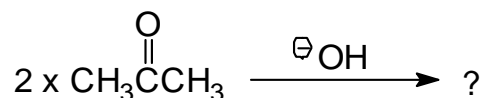
(10 Marks)

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(b) Why is $-\text{NHCOCH}_3$ group substituted to benzene ring found to be moderately *o*- and *p*- directing compared to $-\text{NH}_2$ group substituted to benzene ring which is highly reactive and forms 2,4,6- substituted product.

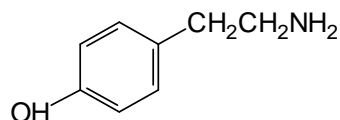
(5 Marks)

(c) Write reaction mechanism for the following reaction and suggest the type of reaction that has taken place.



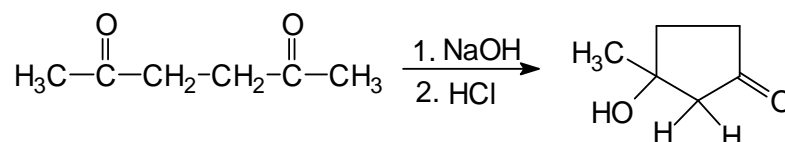
(5 Marks)

5. (a) Tyramine is an alkaloid found, among other places, in mistletoe and ripe cheese. How would you synthesise tyramine from benzene. You are provided with the following reagents; AlCl_3 , CH_3Cl , $\text{SO}_3/\text{H}_2\text{SO}_4$, NaOH solution, acidic solution, Bromine, NaCN , reducing agent such as LiAlH_4 , H_2O , peroxide or UV radiation lamp and any other reagents you may need. (No mechanism required).



(7 marks)

(b) Write reaction mechanism for the following reaction.



(5 Marks)

(c) Friedel-Crafts alkylation has limitations. State them and give one example of each.

(8 Marks)

*****END OF PAPER*****