

2020

## CHEMISTRY (Honours)

Paper Code : IX-A & B

[New Syllabus]

Full Marks : 65

Time : Three Hours

### Important Instructions for Multiple Choice Question (MCQ)

- Write Subject Name and Code, Registration number, Session and Roll number in the space provided on the Answer Script.

**Example** : Such as for Paper III-A (MCQ) and III-B (Descriptive).

Subject Code : 

III	A	&	B
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Subject Name : 

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- Candidates are required to attempt all questions (MCQ). Below each question, four alternatives are given [i.e. (A), (B), (C), (D)]. Only one of these alternatives is 'CORRECT' answer. The candidate has to write the Correct Alternative [i.e. (A)/(B)/(C)/(D)] against each Question No. in the Answer Script.

**Example** — If alternative A of 1 is correct, then write :

1. — A

- There is no negative marking for wrong answer.

## মাল্টিপল চয়েস প্রশ্নের (MCQ) জন্য জরুরী নির্দেশাবলী

- উত্তরপত্রে নির্দেশিত স্থানে বিষয়ের (Subject) নাম এবং কোড, রেজিস্ট্রেশন নম্বর, সেশন এবং রোল নম্বর লিখতে হবে।

উদাহরণ — যেমন Paper III-A (MCQ) এবং III-B (Descriptive)।

Subject Code : 

III	A	&	B
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Subject Name :

- পরীক্ষার্থীদের সবগুলি প্রশ্নের (MCQ) উত্তর দিতে হবে। প্রতিটি প্রশ্নে চারটি করে সম্ভাব্য উত্তর, যথাক্রমে (A), (B), (C) এবং (D) করে দেওয়া আছে। পরীক্ষার্থীকে তার উত্তরের স্বপক্ষে (A) / (B) / (C) / (D) সঠিক বিকল্পটিকে প্রশ্ন নম্বর উল্লেখসহ উত্তরপত্রে লিখতে হবে।

উদাহরণ — যদি 1 নম্বর প্রশ্নের সঠিক উত্তর A হয় তবে লিখতে হবে :

1. – A

- ভুল উত্তরের জন্য কোন নেগেটিভ মার্কিং নেই।

**Paper Code : IX-A**

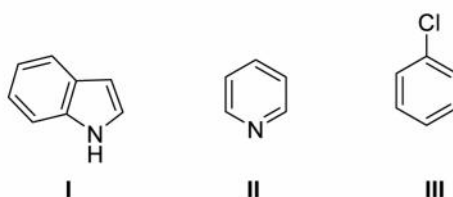
Full Marks : 15

Time : Thirty Minutes

Choose the correct answer.

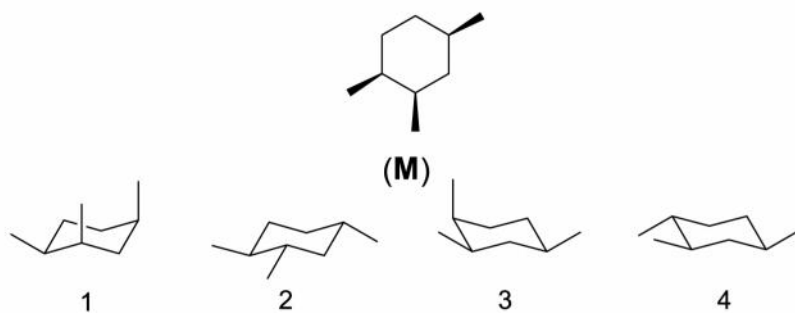
Each question carries 1 mark.

1. The correct order for the rates of electrophilic aromatic substitution for the following set of compounds is –



- (A) I>II>III
- (B) II> I>III
- (C) III> II>I
- (D) I> III> II

2. Among the structures given below, the most stable conformation for the compound (M) is-



- (A) 1
- (B) 2
- (C) 3
- (D) 4

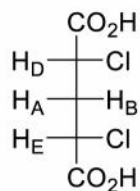
3. Find out the correct statement in the context of  $^1\text{H}$  NMR spectroscopy:

- (A) Arene C-H chemical shift ( $\delta$ ) values are greater than simple alkenes C-H chemical shift values because of the aromatic ring current.
- (B) Arene C-H chemical shift ( $\delta$ ) values are smaller than simple alkenes C-H chemical shift values because of the aromatic ring current.
- (C) Arene C-H signals are always multiplets.
- (D) Arene C-H signals are always singlets.

4. Which of the compound will have multiplets in their NMR spectra?

- (A) 2-methyl propene
- (B) 2-chloropropene
- (C) Cyclohexane
- (D) Methyl chloride

5. Find out the correct statement for the following structure



- (A)  $\text{H}_\text{D}$  &  $\text{H}_\text{E}$  are enantiotopic while  $\text{H}_\text{A}$  &  $\text{H}_\text{B}$  are diastereotopic
- (B)  $\text{H}_\text{D}$  &  $\text{H}_\text{E}$  are diastereotopic while  $\text{H}_\text{A}$  &  $\text{H}_\text{B}$  are enantiotopic
- (C)  $\text{H}_\text{D}$  &  $\text{H}_\text{A}$  are enantiotopic while  $\text{H}_\text{E}$  &  $\text{H}_\text{B}$  are diastereotopic
- (D)  $\text{H}_\text{D}$  &  $\text{H}_\text{A}$  are diastereotopic while  $\text{H}_\text{E}$  &  $\text{H}_\text{B}$  are enantiotopic

6. In which region of the infrared spectrum would you expect to find a peak characteristic of a triple bond stretch?

- (A)  $4000 - 3000\text{cm}^{-1}$
- (B)  $2500 - 2000\text{cm}^{-1}$
- (C)  $2000 - 1500\text{cm}^{-1}$
- (D)  $1500 - 750\text{cm}^{-1}$

*Turn Over*

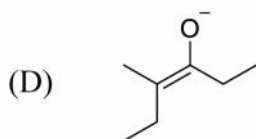
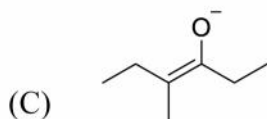
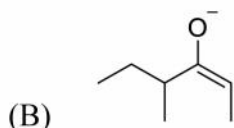
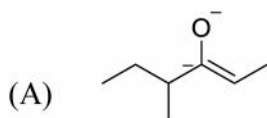
7. Amino acids with aromatic side chain are

- (A) Tryptophan, asparagine, tyrosine
- (B) Tryptophan, threonine, tyrosine
- (C) Phenylalanine, tryptophan, serine
- (D) Phenylalanine, tryptophan, tyrosine

8. Which of the following is an example of C-4 Epimers?

- (A) Glucose and Ribose
- (B) Glucose and Galactose
- (C) Galactose, Mannose and Glucose
- (D) Glucose, Ribose and Mannose

9. Which of the following is the most stable enolate derived from 4-methylhexan-3-one?



10. Aldoses and ketoses are differentiated by

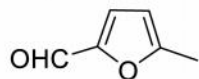
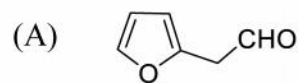
- (A) Tollen's Reagent
- (B) Fehling's solution
- (C) Bromine water
- (D) Periodic Acid

11. Which of the following is an example of basic dye?

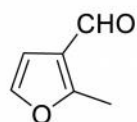
- (A) Alizarin
- (B) Malachite Green
- (C) Indigo
- (D) Orange -I

*Turn Over*

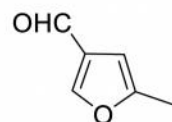
12. Reaction of 2-Methyl Furan with DMF/ $\text{POCl}_3$  produces-



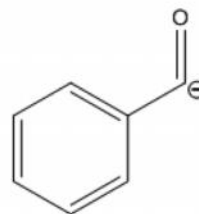
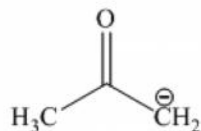
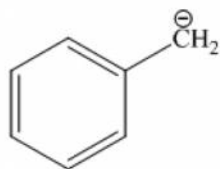
(B)



(D)



13. Which of the following synthons is an example of Umpolung?

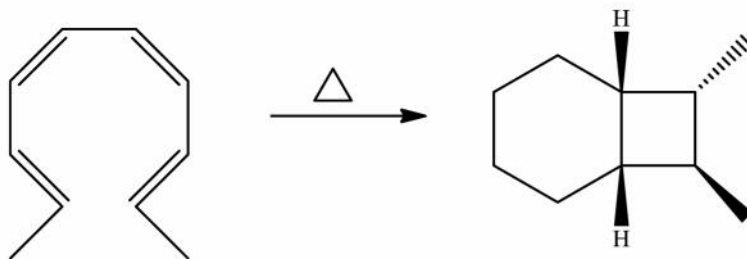


- (A) Structure A  
(B) Structure B  
(C) Structure C  
(D) Structure D

14. Ethyl acetoacetate is prepared from ethyl acetate by the

- (A) Benzoin condensation  
(B) Aldol condensation  
(C) Claisen condensation  
(D) Dieckmann condensation

15. The following reaction occurs through



- a. Conrotatory electrocyclic ring closure followed by disrotatory electrocyclic ring closure.
- b. Disrotatory electrocyclic ring closure followed by conrotatory electrocyclic ring closure.
- c. Two successive Disrotatory electrocyclic ring closure
- d. Two successive conrotatory electrocyclic ring closure

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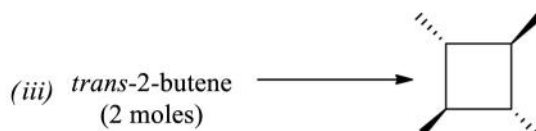
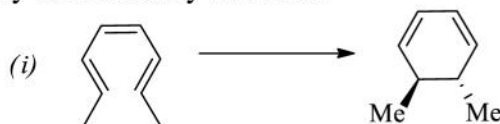
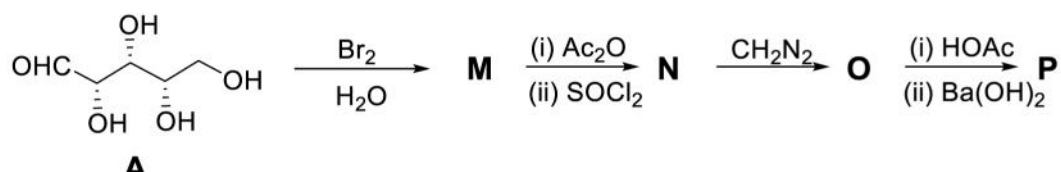
**CHEMISTRY (Honours)**

Paper Code : IX-B

[New Syllabus]

Full Marks : 50

Time : Two Hours Thirty Minutes

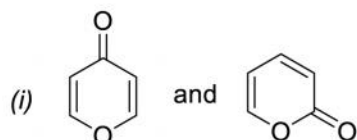
*The figures in the margin indicate full marks.*Answer any *five* questions taking at least *two* questions from each group.**Group - A**1. a. Applying Woodward Hofmann's Rule for FMO approach check whether the following reactions are photochemically or thermally allowed? 3b. Construct orbital correlation diagram for conrotatory ring opening of cyclobutene and hence find out whether the process is thermally allowed or photochemically allowed. 4c. Homoannular dienes absorb at higher wavelength than heteroannular dienes in UV spectroscopy. Explain. What is end absorption? 2+12.a. Identify the structures **M**, **N**, **O** and **P** from the following reaction sequence: 4*Turn Over*



Indicate whether the compound 'A' belongs to D-series or L-series and accordingly assign the commercial name of the final product 'P'.

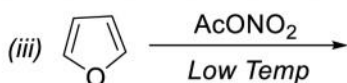
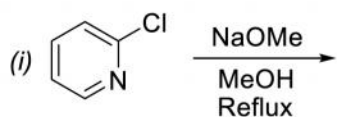
b. *N,N*-dimethyl aniline and *N,N*,2,6-tetramethyl aniline show a large difference in UV spectra. Explain. 2

c. How would you distinguish between members of each of the following pairs by IR-spectroscopy? 2+2



(ii)  $\text{PhOCOCH}_3$  and  $\text{PhCOOCH}_3$

3.a. What are the products in the following reactions and how are they formed? (*Any Two*) 2+2



b. A compound of molecular formula  $\text{C}_4\text{H}_8\text{O}$  gives the following spectral data: 3

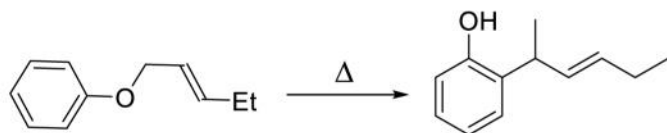
UV (ethanol):  $\lambda_{\text{max}}$ : 193nm

IR (NEAT):  $\nu_{\text{max}}$ :  $1700\text{cm}^{-1}$

$^1\text{H NMR}$ :  $\delta$ : 1.02 (t, 3H,  $J$  7Hz); 2.06 (s, 3H) and 2.39 (q, 2H,  $J$  7Hz).

Identify the compound and assign the  $\delta$  values of corresponding protons.

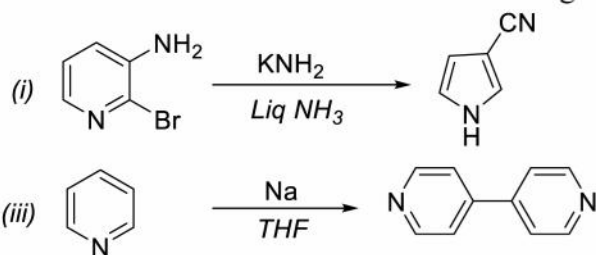
c. Rationalise the following reaction in terms of pericyclic processes involved therein. 2



d. What is inversion of cane sugar? 1

4.a. Write down the mechanism for the following reactions: (any one)

2



b. The structural formulae for two isomeric esters are as follows:

3



- (i) Predict the number of signals in the  $^1\text{H-NMR}$  spectrum of each ester.  
(ii) Predict the ratio of areas of the signals in each of these two spectrums  
(iii) How would you distinguish between these two isomers on the basis of chemical shift?

c. Electrophilic substitution occurs more readily at 3-position of indole but at 2-position of pyrrole. Explain.

3

d. How can you prove that fructose contains keto-group at C-2?

2

### Group-B

5.a. Outline the synthesis of ( $\pm$ ) tryptophan from acetamidomalonic ester.

3

b. Write down the preparation and one use each of paracetamol and metronidazole.

4

c. What happens when L-alanine is heated with acetic anhydride in pyridine? Give the mechanism and comment on the configuration of the product.

2+1

6.a. Rationalise the fact that on treatment with a base *cis*-diastereomer of 2,5-dimethylcyclohexanone undergoes a smooth changeover to the corresponding *trans*-diastereomer.

3

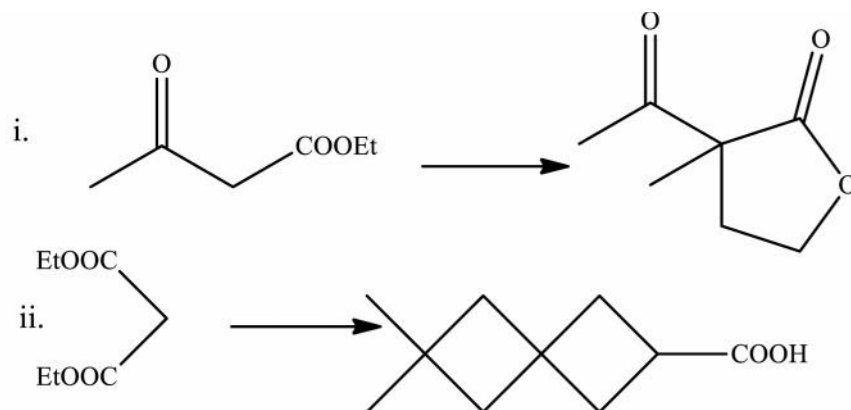
b. How can you synthesise Ala-phe-gly using Merrifield protocol?

3

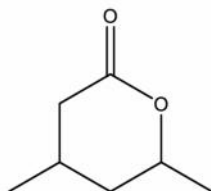
c. How will you accomplish the following transformations?

2+2

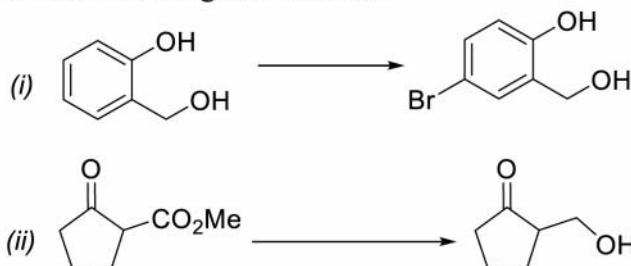
*Turn Over*



7.a. Propose synthesis of the following compound, explaining your choice of reagents and how the necessary selectivity is achieved. 4

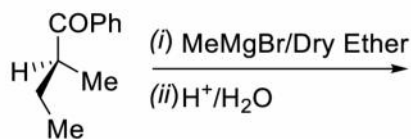


b. How can you accomplish the following conversions: 2+2



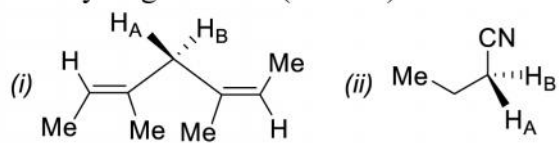
c. A tripeptide **X** on hydrolysis gives two amino acids *Glu* (2eq) and *Ala* (1eq). **X** does not react with 2,4-dinitrofluorobenzene. *Ala* released first when **X** is incubated with carboxypeptidase. Deduce the structure for **X**. 2

8.a Using Felkin-Anh model explain the formation of the major product in the following reaction: 3



Turn Over

b. Identify the *pro*-R and *pro*-S hydrogen atoms (marked) in the following compounds. 2



c. The calculated dipole moment of *trans*- and *cis*- 1,2- dibromocyclohexane is 3.09D. But observed dipole moment of two isomers are 2.11D and 3.14D respectively Explain the fact. 3

d. Explain the term FGI with an example. 2

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