



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours Part-II Examination, 2020

CHEMISTRY

PAPER: CEMA-III

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

GROUP-A

CEMAT-23-IA

Answer any one question from the following

1. (a) Arrange the hydrides of halogen in the order of increasing acid strength. Give explanation. 3
- (b) Explain with reason: 4
 - (i) AlCl_3 is covalent whereas AlF_3 is ionic.
 - (ii) $(\text{CH}_3)_3\text{N}$ is basic but $(\text{SiH}_3)_3\text{N}$ has no basic character.
- (c) Draw M.O. diagram of O_2 and predict the bond order. 4
- (d) How will you distinguish between – 2
$$[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4 \text{ and } [\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$$
2. (a) Hydrazine can exhibit both oxidizing and reducing properties. Justify with suitable examples. 4
- (b) LiI is soluble in water but LiF is insoluble – Explain. 2
- (c) What is meant by ambidentate ligand? Elucidate with an example. 3
- (d) Give the IUPAC name of $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]\text{Br}_2$ 2
- (e) Give the structures of the possible isomers of $[\text{Pt}(\text{NH}_3)(\text{PPh}_3)(\text{Cl})(\text{Br})]$. 2

CEMAT-23-IB

Answer any one question from the following

3. (a) How will you prepare borazine? What happens when borazine is treated with HCl ? 3
- (b) What are freons? Discuss the role of Freon in ozone layer depletion. 3
- (c) Distinguish between comproportionation and disproportionation. Explain why Cu(I) is not stable in aqueous solution? 3

$$[E^\circ_{\text{Cu}^{2+}/\text{Cu}^+} = +0.15 \text{ V}, E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}]$$

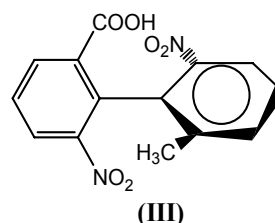
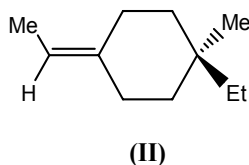
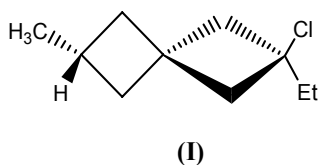
- (d) Aqueous Fe^{3+} oxidizes I^- to liberate iodine, but the reaction is prevented in presence of excess NH_4HF_2 . Explain. 3
4. (a) Discuss the structure of XeF_6 and state the hybridization of 'Xe' in it. 3
- (b) H_2O_2 behaves as both oxidant and reductant. Give one example for each case and establish the fact with half reactions. 3
- (c) Discuss the solubility product principle. Explain how this principle is utilized in the precipitation of Group IIIB cations? 4
- (d) How does BDS act as redox indicator during titration of Fe^{2+} solution by standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution in concentrated H_2SO_4 medium? 2

GROUP-B

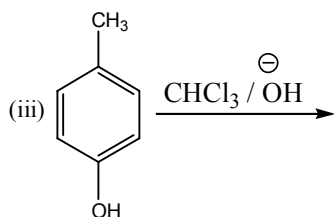
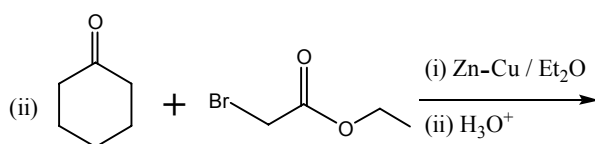
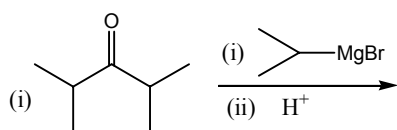
CEMAT 23-OA

Answer any *one* question from the following

5. (a) Explain the following observations: (any *two*). $2 \times 2 = 4$
- (i) Not all the nuclei among ^2D , ^{14}N , ^{13}C , ^{16}O are NMR active.
- (ii) Acetic anhydride shows two carbonyl stretching frequencies in IR.
- (iii) In acidic solution the absorption maximum of aniline drops down from 280 to nearly 203 nm.
- (b) Assign the descriptors as R/S for the following compounds: (any *two*). $2 \times 2 = 4$

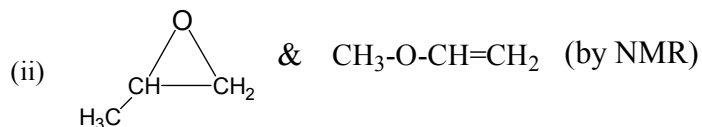
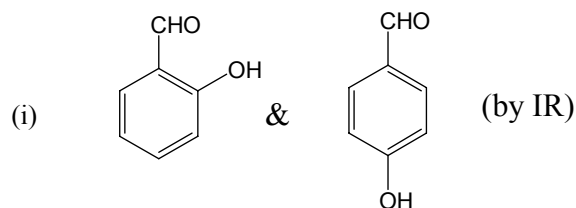


- (c) Predict the products with plausible mechanism: (any *two*) $2 \times 2 = 4$

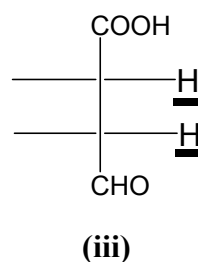
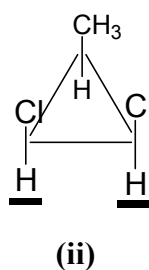
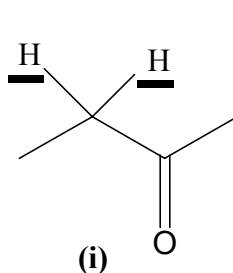


- (d) Apart from CDCl_3 , mention another solvent that is used in recording NMR. 1

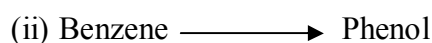
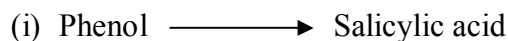
6. (a) How could you distinguish the following pairs of compounds with the help of spectral analysis mentioned there in? (Any *two*) 3



- (b) Identify the topic relationship between the marked atoms in the following: 3



- (c) How would you carry out the following conversions? Give plausible mechanism. 2×2 = 4



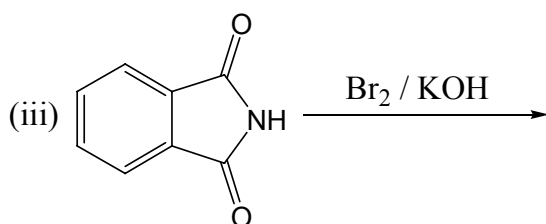
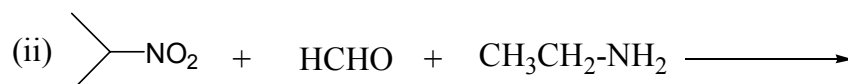
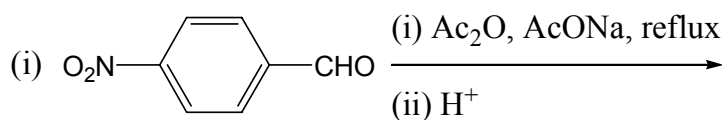
- (d) What is metastable peak observed in Mass spectrometry? Explain with a suitable example. 2

- (e) How many peaks are observable in $^1\text{H-NMR}$ of *p*-xylene? 1

CEMAT 23-OB

Answer any *one* question from the following

7. (a) Predict the products formed in the following and give the mechanism involved. 2×3 = 6



- (b) What happens when CH_3COCH_3 and $\text{CH}_3(\text{CO})\text{CH}_2(\text{CO})\text{CH}_3$ are separately heated with iodine in KOH? Explain with plausible mechanisms. 3
- (c) How could you determine whether alkyl or acyl cleavage has been taken place for an acid initiated ester hydrolysis? Explain with suitable examples. 3

8. (a) Explain the following observations: 2×3 = 6

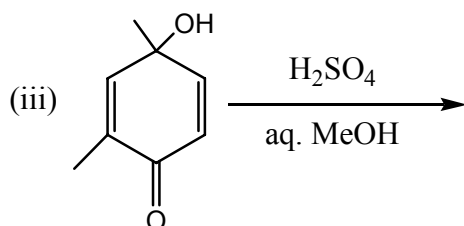
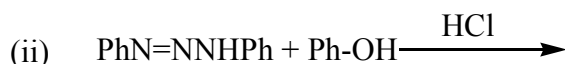
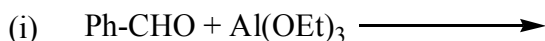
(i) Cyclopropanone reacts faster than cyclohexanone when treated with HCN

(ii) Acetals are stable in alkaline solution but not in acidic medium

(iii) *t*-butylamine cannot be prepared by Gabriel's synthesis

(b) What are the other products that are formed during acid chloride formation from a carboxylic acid in reaction with thionyl chloride? Give the mechanism of their formation. 2

(c) Predict the products with plausible mechanism: (any *two*) 2×2 = 4



N.B. : Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

—×—