

**Read all the Instructions Carefully before Answering**

**N.B.:** (1) PAGE 1–4 COMPRISE OF FOUR SETS OF QUESTIONS OF PAPER VIB (ORGANIC SPECTROSCOPY). AN EXAMINEE MUST HAVE TO ANSWER THE SET OF QUESTION ALLOTTED AGAINST HIS/HER ROLL NUMBER. NO EVALUATION WILL BE DONE IF IT IS NOT FOLLOWED.

(2) PAGE 5 COMPRISE OF QUESTION OF PAPER VIIB (PHYSICAL CHEMISTRY).

Prepare separate pdf files for Paper VIB and Paper VIIB and also upload it separately as per provisions in the uploading portal.

**Time: 2 hours for Full Marks 50 [Paper VIB (F.M. 25) + Paper VIIB (F.M. 25)]**

**SET 1 (Paper VIB)**

**for Roll Nos. 3551-51-0012, 3551-51-0013, 3551-51-0016,  
3551-51-0078, 3551-61-0003**

**2020**

**B.A./B.Sc. Part III Honours Examination**

**University of Calcutta**

**CHEMISTRY**

**Paper VI**

**Group B**

**F.M. 25**

**FAKIR CHAND COLLEGE CENTRE (551)**

*[Use A4 pages and black ink only for writing answers. Write Roll number and Registration number at the top and page number at the bottom of each page. Images of index of your LNB, answer scripts and admit card must be in a single pdf file.]*

1. Analysis of  $^1\text{H}$ -NMR spectra of 4-Aminobenzoic Acid shows peaks with  $\delta$  values 12.0, 7.7, 6.6, 5.9 ppm. Answer the followings:
  - a) Draw the structure of the molecule showing different types of hydrogen.
  - b) In a tabular form assign the given  $\delta$  values for different hydrogens, give the number of hydrogens for each  $\delta$  value (from the structure of the compound) and write the splitting pattern for each peak with explanation (pointwise explanation in a few lines. Avoid elaborative writing). 1+2+2+2+3+4 = 14
2. Analysis of FT-IR spectra of 4-Aminobenzoic Acid shows peaks with  $\bar{\nu}$  values 3460 and 3360, 2930 and 2860, 2700-2500, 1670  $\text{cm}^{-1}$ . Draw the structure of the molecule and assign the peaks in tabular form. 6
3. Internal Assessment (including LNB) 5  
(Attach image of the signed index page(s) of your LNB (Paper VIB) writing your University Roll number and Registration number on it)

**SET 2 (Paper VIB)**  
**for Roll Nos. 3551-51-0014, 3551-61-0004, 3551-61-0007**  
**3551-61-0012, 3551-61-0017**

**2020**  
**B.A./B.Sc. Part III Honours Examination**  
**University of Calcutta**  
**CHEMISTRY**  
**Paper VI**  
**Group B**  
**F.M. 25**

**FAKIR CHAND COLLEGE CENTRE (551)**

*[Use A4 pages and black ink only for writing answers. Write Roll number and Registration number at the top and page number at the bottom of each page. Images of index of your LNB, answer scripts and admit card must be in a single pdf file.]*

1. Analysis of  $^1\text{H}$ -NMR spectra of 4-Nitroaniline shows peaks with  $\delta$  values 7.94, 6.63, 6.4 ppm. Answer the followings:
  - a) Draw the structure of the molecule showing different types of hydrogen.
  - b) In a tabular form assign the given  $\delta$  values for different hydrogens, give the number of hydrogens for each  $\delta$  value (from the structure of the compound) and write the splitting pattern for each peak with explanation (pointwise explanation in a few lines. Avoid elaborative writing). 1+2+2+2+3+4 = 14
2. Analysis of FT-IR spectra of 4-Nitroaniline shows peaks with  $\bar{\nu}$  values 3500 and 3380, 3250, 1640 and 1470, 1490 and 1320  $\text{cm}^{-1}$ . Draw the structure of the molecule and assign the peaks in tabular form. 6
3. Internal Assessment (including LNB) 5  
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**SET 3 (Paper VIB)**  
**for Roll Nos. 3551-51-0015, 3551-61-0006, 3551-61-0008**  
**3551-61-0010, 3551-61-0014**

**2020**  
**B.A./B.Sc. Part III Honours Examination**  
**University of Calcutta**  
**CHEMISTRY**  
**Paper VI**  
**Group B**  
**F.M. 25**

**FAKIR CHAND COLLEGE CENTRE (551)**

*[Use A4 pages and black ink only for writing answers. Write Roll number and Registration number at the top and page number at the bottom of each page. Images of index of your LNB, answer scripts and admit card must be in a single pdf file.]*

1. Analysis of  $^1\text{H}$ -NMR spectra of *trans*-Cinnamic Acid shows peaks with  $\delta$  values 7.8, 7.56, 7.42, 6.45 ppm. Answer the followings:
  - a) Draw the structure of the molecule showing different types of hydrogen.
  - b) In a tabular form assign the given  $\delta$  values for different hydrogens, give the number of hydrogens for each  $\delta$  value (from the structure of the compound) and write the splitting pattern for each peak with explanation (pointwise explanation in a few lines. Avoid elaborative writing). 1+2+2+2+3+4 = 14
2. Analysis of FT-IR spectra of *trans*-Cinnamic Acid shows peaks with  $\bar{\nu}$  values 3070-2520, 3000, 1680, 1630 and 1430  $\text{cm}^{-1}$ . Draw the structure of the molecule and assign the peaks in tabular form. 6
3. Internal Assessment (including LNB) 5  
(Attach image of the signed index page(s) of your LNB (Paper VIB) writing your University Roll number and Registration number on it)

**SET 4 (Paper VIB)**  
**for Roll Nos. 3551-61-0005, 3551-61-0009, 3551-61-0011**  
**3551-61-0013, 3551-61-0016**

**2020**  
**B.A./B.Sc. Part III Honours Examination**  
**University of Calcutta**  
**CHEMISTRY**  
**Paper VI**  
**Group B**  
**F.M. 25**

**FAKIR CHAND COLLEGE CENTRE (551)**

*[Use A4 pages and black ink only for writing answers. Write Roll number and Registration number at the top and page number at the bottom of each page. Images of index of your LNB, answer scripts and admit card must be in a single pdf file.]*

1. Analysis of  $^1\text{H}$ -NMR spectra of 2-Hydroxybenzaldehyde shows peaks with  $\delta$  values 10.1, 7.6, 7.47, 6.95 ppm. Answer the followings:
  - a) Draw the structure of the molecule showing different types of hydrogen.
  - b) In a tabular form assign the given  $\delta$  values for different hydrogens, give the number of hydrogens for each  $\delta$  value (from the structure of the compound) and write the splitting pattern for each peak with explanation (pointwise explanation in a few lines. Avoid elaborative writing). 1+2+2+2+3+4 = 14
2. Analysis of FT-IR spectra of 2-Hydroxybenzaldehyde shows peaks with  $\bar{\nu}$  values 3280-3140, 3070, 2840 and 2750, 1670  $\text{cm}^{-1}$ . Draw the structure of the molecule and assign the peaks in tabular form. 6
3. Internal Assessment (including LNB) 5  
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**2020**  
**B.Sc. Part-III Hons (1+1+1, -09 & New) Practical Examination**  
**University of Calcutta**  
**CHEMISTRY**  
**Paper VII B, Module 35a**  
**F.M. 25**

**FAKIR CHAND COLLEGE CENTRE (551)**

*[Use A4 pages and black ink only for writing answers. Write Roll number and Registration number at the top and page number at the bottom in each page. Images of index of your LNB, answer scripts and admit card must be in a single pdf file.]*

1. a) Write down the theory for “**determination of solubility of the supplied (1:1) sparingly soluble salt in water and in an electrolyte solution**” covering the following points:

i) Define the solubility and activity solubility product of a solute. [2+2]

ii) Write down the effect of temperature on the solubility of a solute in a solvent. [1]

- b) The following data were obtained when **25 ml** of the filtrates of two bottles containing, 2 gm of (1:1) sparingly soluble salt in 100ml water (bottle 1) and 2 gm of the same sparingly soluble salt in an 100 ml electrolyte solution (bottle 2) were titrated against a **1.0185 (N/20) NaOH** solution.

Burette readings for Bottle 1: **20.1 ml, 20.2 ml and 20.2 ml**

Burette readings for Bottle 2: **24.7 ml, 24.7 ml**

Represent the data in proper tabular forms. [2+2]

- c) Show the necessary calculations for each bottle. [2+2]
- d) Determine the solubility of the supplied (1:1) sparingly soluble salt in two bottles in gm-moles/lit and also in gm/lit. (Given that **M.W. of Salt = 188**). [2+1]×2
- e) Write down the conclusion that you can draw regarding the nature of the electrolyte solution. [1]

2. **Laboratory Notebook / Internal Assessment** [5]

*(Attach image of the signed index/indexes of your LNB (paper VII B) writing your University Roll number and Registration number on it)*