

ASSIGNMENT BOOKLET

Bachelor's Degree Programme (B.Sc.)

SPECTROSCOPY

(Valid from 1st January, 2013 to 31st December, 2013)

Please Note

- You can take electives (56 to 64 credits) from a minimum of TWO and a maximum of FOUR science disciplines, viz. Physics, Chemistry, Life Sciences and Mathematics.
- You can opt for elective courses worth a MINIMUM OF 8 CREDITS and a MAXIMUM OF 48 CREDITS from any of these four disciplines.
- At least 25% of the total credits that you register for in the elective courses from Life Sciences, Chemistry and Physics disciplines must be from the laboratory courses. For example, if you opt for a total of 64 credits of electives in these 3 disciplines, at least 16 credits should be from lab courses.
- You cannot appear in the Term-End Examination of any course without registering for the course. Otherwise, your result will not be declared and the onus will be on you.



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Maidan Garhi, New Delhi-110068
(2013)

Dear Student,

We hope, you are familiar with the system of evaluation to be followed for the Bachelor's Degree Programme. At this stage you may probably like to re-read the section on assignments in the Programme Guide that we sent you after your enrolment. A weightage of 30 percent, as you are aware, has been earmarked for continuous evaluation, which would consist of one tutor-marked assignment. The assignment is based on Blocks 1, 2, 3 and 4.

Instructions for Formatting Your Assignments

Before attempting the assignments, please read the following instructions carefully.

- 1 On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLMENT NO:.....

NAME:.....

ADDRESS:.....

.....

.....

COURSE CODE :

COURSE TITLE :

ASSIGNMENT NO.:

STUDY CENTRE :
(NAME AND CODE) DATE:.....

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2 Use only foolscap size writing paper (but not of very thin variety) for writing your answers.
- 3 Leave 4 cm margin on the left, top and bottom of your answer sheet.
- 4 Your answers should be precise.
- 5 While writing answers, clearly indicate the Question No. and part of the question being solved.
- 6 Please note that:
 - (i) The Assignment is valid from 1st January, 2013 to 31st December, 2013.
 - (ii) The response to this assignment is to be submitted to the Study Centre Coordinator within eight weeks of the receipt of this booklet in order to get the feedback and comments on the evaluated assignment.
 - (iii) In any case, you have to submit the assignment response before appearing in the term end examination.
7. **We strongly suggest that you should retain a copy of your assignment responses.**

Wishing you all good luck.

Tutor Marked Assignment

Course Code: CHE - 10
Assignment Code: CHE-10/TMA/2013
Maximum Marks: 100

- Note:**
- * This assignment is based on the entire course.
 - * All questions are compulsory. Marks for the questions are shown within brackets on the right hand side.
 - * Please answer in your **own words**; do not copy from the course material.
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- Q.1 What is Rydberg constant? Calculate its theoretical value. Why is the theoretical value different from the experimental value? (5)
- Q.2 Briefly explain the principle of X-ray fluorescence spectroscopy. (5)
- Q.3 Draw and explain various elements of symmetry present in chloroform molecule. (5)
- Q.4 Write the shapes and the point groups of the following molecules:
i) CH₄
ii) NH₃
iii) SF₆
iv) H₂O
v) PCl₅ (5)
- Q.5 Compare the energy levels of a rigid rotor and a non-rigid rotor using a suitable diagram. (5)
- Q.6 Discuss the factors on which the population of an energy state depends in the rotational spectra. (5)
- Q.7 i) Explain zero point energy. (2)
ii) If HCl molecule absorbs at 2886 cm⁻¹ in IR spectra, calculate the frequency of absorption for DCl molecule. (3)
- Q.8 Discuss various bands appearing in the IR spectrum of water molecule. (5)
- Q.9 Describe various absorptions occurring in the 4000-2500 cm⁻¹ region of IR spectra of organic compounds. (5)
- Q.10 State mutual exclusion principle. Illustrate it with a simple example. (5)
- Q.11 What are the differences between IR and Raman spectra? (5)
- Q.12 State the selection rules for the electronic transitions of the diatomic molecules. (5)
- Q.13 Draw the orbital energy diagram of ethylene molecule. Explain various electronic transitions possible in this molecule. (5)
- Q.14 Using suitable diagram, explain the differences between fluorescence and phosphorescence. (5)
- Q.15 Draw the block diagram of an IR spectrometer. What is the difference between the functioning of a single beam and a double beam spectrometer? (5)

Q.16 Explain the following terms:

- i) Chemical shift
- ii) Chemical exchange (5)

Q.17 Using suitable diagrams, explain the origin of different peaks in the ESR spectrum of deuterium. (5)

Q.18 How would you differentiate between the isomeric hexane and 2-methylpentane using mass spectrum? (5)

Q.19 Discuss the nmr spectrum of 1,1,2-trichloroethane. (5)

Q.20 What signals will appear in the different spectra of C_4H_8O ? Explain. (5)