

PD – 265 CV-19
(532) M.Sc. CHEMISTRY (SECOND SEMESTER)

Examination JUNE 2021

Compulsory/ Optional

Group-

Paper- IV

Name/Title of Paper- SPECTROSCOPY & COMPUTER FOR CHEMISTS

Time: Three hours

Maximum Marks-80

Minimum Passing Marks-29

Note: Answer From Both the Section as Directed. The Figures in the right-hand margin indicate marks.

Section-A

1. Answer the following questions: 1x10=10

- a) Which electronic state is to be expected of lowest energy in d^2 case?
- b) Write the mathematical formula for the calculation of number of microstates?
- c) Write the name of element which mostly gives photoelectric effect?
- d) Identify different types of hydrogen in toluene with reference to NMR spectroscopy?
- e) Who invented photo acoustic spectroscopy?
- f) How the lattice spacing (d) is connected to cell edge (a) for simple cubic lattice?
- g) Processing is done in which part of computer?
- h) How many digits is present in Binary systems?
- i) What is the name of first menu of MS-Excel?
- j) Who is the father of 'C' Language?

2. Answer the following questions: 2x5=10

- a) In a hydrogen atom, an electron jumps from a third orbit to the first orbit. Find out the frequency of the spectral fine?
- b) Write four complications in NMR analysis?
- c) The intercept ratios of a crystal plane are $a:b:\infty c$. Calculate the Miller indices of the plane?
- d) Write short notes on Algorithm & Flow chart?
- e) Explain how you can prepare a graph and chart by using MS-Excel?

Section-B

Answer all questions:- 12x5=60

3. Describe scheme of vector coupling of orbital angular momentum and spin angular momentum and hence total angular momentum for $p^n d^n$ configuration?

Or

Discuss the basic principles, classifications and instrumentation of photo electronic spectroscopy?

4. (a) Explain the factors affecting the chemical shift in NMR spectroscopy?

(b) Discuss the instrumentation for photo acoustic spectroscopy?

Or

(a) Which of the following system will show Electron spin Resonance spectroscopy and why:-

O_2 , O_2^+ , O_2^- , NO, CH_3 radical and Co_2

(b) Explain the instrumentation and applications of Nuclear Quadruple Resonance spectroscopy?

5. (a) Derive Bragg's equation?

(b) The interplanar spacing of a crystal was found to be 1.85 \AA . If the first order reflection takes place at an angle of 30° find out the wavelength of X-rays?
[Given $\sin 30^\circ = 0.5$]

Or

(a) Explain Ramchandran diagram of protein?

(b) Discuss Laue's method of X-ray structural analysis of crystal?

6. (a) Explain constants and variable used in "c" programming?

(b) Write short notes on "pointers"?

Or

What are operating systems? Discuss in detail the salient features of any one of the operating systems that are prescribed in your syllabus?

7. Write a program in "c" to execute results for calculation of:-

(a) pH Titration

(b) Secular equation

Or

Describe the facilities available in word processor? Write the salient features and uses of M.S.-Word?