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## **CHE-504**

### **Spectroscopy, Computers and Mathematics/Biology**

M. Sc. CHEMISTRY (MSCCH-12/13/16)

First Year, Examination, 2017

**Time : 3 Hours**

**Max. Marks : 70**

**Note :** This paper is of **seventy (70)** marks containing **three (03)** sections A, B and C. Attempt the questions contained in these sections according to the detailed instructions given therein.

#### **Section-A**

##### **(Long Answer Type Questions)**

**Note :** Section 'A' contains four (04) long answer type questions of fifteen (15) marks each. Learners are required to answer *two* (02) questions only.

1. Write any *five* of the following : 3 each
  - (a) Raman effect
  - (b) Chromophores
  - (c) Overtone and hot band
  - (d) Woodward rule for diene absorption in UV spectra
  - (e) Shielding constant
  - (f) Glycogen metabolism

2. (a) What is zero point energy ? How do you calculate the zero point energy of an anharmonic oscillator ? 5
- (b) Explain why cis- and trans-isomers differ in their infrared absorption. 5
- (c) How are the computers classified ? What are the differences between various types of computers ? 5
3. (a) Discuss in detail applications of NMR spectroscopy. 5
- (b) What is nucleotide ? Discuss the functions of nucleic acids in cell. 5
- (c) Write down a 'C' program to find the maximum among three numbers. 5
4. (a) What is the biological significance of amino sugars ? 5
- (b) Calculate the distance between the two points P ( $x_1$   $y_1$ ) and ( $x_2$   $y_2$ ). 5
- (c) How do microwave spectra differ from infrared spectra ? 5

### Section-B

#### (Short Answer Type Questions)

**Note :** Section 'B' contains eight (08) short answer type questions of five (05) marks each. Learners are required to answer *six* (06) questions only.

1. Identify a compound which gives the following data :
- UV : 280 nm,  $E_{\max}$  6600
- IR : 3460 (v, sh), 3035 (m), 1605 (m), 1585 (m), 1510 (s), 1360 (s), 1225 (s),  $740\text{ cm}^{-1}$
- NMR : 2.51 (S, 1H) and unsymmetrical pattern 2.61—2.75 (4 h).

2. Write a note on K, B and R bands.
3. Describe in brief application of Ultraviolet Spectroscopy.
4. Explain Hooke's law. What is the selection rule for harmonic and anharmonic oscillators ?
5. What is an algorithm and flowchart ? Draw a flow-chart to find the maximum among three members.
6. What are the different levels of structural organization of protein ? Explain with suitable example.
7. Describe the selection rules and application of vibrational rotational Raman spectroscopy.
8. Solve :

$$\frac{d^2 z}{dx^2} - 2 \frac{dz}{dx} + \frac{dz}{dy} = 0$$

by the method of separation of variables.

### Section-C

#### (Objective Type Questions)

**Note :** Section 'C' contains ten (10) objective type questions of one (1) mark each. All the questions of this section are compulsory.

Choose the correct alternative.

1. Which of the following is a temporary memory ?
  - (a) RAM
  - (b) ROM
  - (c) Both RAM and ROM
  - (d) None of the above

2. The equation of a line through  $(2, -3)$  parallel to y-axis is :
- (a)  $y = -3$
  - (b)  $y = 2$
  - (c)  $x = 2$
  - (d)  $x = -3$
3.  $\frac{x^2}{a^2} = \frac{y^2}{b^2} = 1$  is the equation of :
- (a) Hyperbola
  - (b) Circle
  - (c) Straight line
  - (d) None of the above
4. Who is consider as Power house of cell ?
- (a) Ribosome
  - (b) Lysosomes
  - (c) Mitochondria
  - (d) Chloroplasts
5. Which enzyme is present in the mouth ?
- (a) amylase
  - (b) sucrose
  - (c) invertase
  - (d) maltose
6. Structure of DNA was elucidated by :
- (a) Hargovind Khurana
  - (b) Watson and Crick
  - (c) Embden-Meyer
  - (d) None of the above

7. Wavelength range of IR is :
- (a) 2.5  $\mu\text{m}$  to 100  $\mu\text{m}$
  - (b) 100  $\mu\text{m}$  to 1 cm
  - (c) 2.5  $\mu\text{m}$  to 400  $\mu\text{m}$
  - (d) 100 nm to 2.5  $\mu\text{m}$
8. Red shift stands for :
- (a) Bathochromic shift
  - (b) Hypsochromic shift
  - (c) Hyperchromic shift
  - (d) Hypochromic shift
9. The first NMR signals were independently observed by :
- (a) Hansen and Packard
  - (b) Bloch and Purall
  - (c) C. V. Raman
  - (d) None of the above
10. The first commenced  $^1\text{H}$  NMR spectrometer was produced in :
- (a) 1970
  - (b) 1958
  - (c) 1953
  - (d) 1980