

This question paper contains 4 printed pages]

AG—238—2018

FACULTY OF SCIENCE

M.Sc. (First Year) (First Semester) EXAMINATION

NOVEMBER/DECEMBER, 2018

(CBCS Pattern)

CHEMISTRY

Paper-IV (CH-414)

(Physical Methods in Chemistry-I)

(Monday, 3-12-2018)

Time : 10.00 a.m. to 1.00 p.m.

Time—3 Hours

Maximum Marks—75

N.B. :— (i) Attempt All questions.

(ii) Use of calculator and logarithm table is allowed.

1. Attempt any *three* of the following : 15

(a) List the symmetry elements and show them diagrammatically for the following molecules :



(b) Give an account of input devices.

(c) Explain the various features of UNIX operating system.

(d) Determine the Miller indices for the following crystal planes :

(i) $a : -b : \infty c$

(ii) $\frac{1}{2}a : \frac{1}{4}b : -2c$

(e) Define group and give the various postulates of the group.

P.T.O.

2. Solve any *three* of the following : 15
- (a) Give the group multiplication table for C_{2v} .
 - (b) Write down a computer program for the radioactive decay.
 - (c) The value of ' d ' for the utilised reflecting plane of Lithium fluoride crystal is 2.014 Å. Calculate the wavelength of second order diffracted line which has a value of 50.1° .
 - (d) Give an account of Wierl equation.
 - (e) Write a note on measurement technique used in neutron diffraction.
3. Answer the following :
- (a) Explain the principles of Programming. Write down the programming steps for Acid-Base titration using pH-meter. 8
- Or*
- Give an account of secondary storage devices.
- (b) Explain reducible and irreducible representations and state the rules that govern irreducible representations. 7
- Or*
- Describe the matrix representation for the following symmetry elements :
- σ_{xz} , C_n and i .
4. Attempt the following :
- (a) Explain : 8
- (i) Data processing
 - (ii) Computer languages.
- Or*
- Derive $n\lambda = 2d \sin \theta$. Describe Bragg's method for the determination of crystal structure of NaCl.

- (b) (i) Explain the scattering factor. Give the relation between scattering factor and electron density.
- (ii) How will you determine Miller indices ? 7

Or

- (i) Calculate the wavelength of electron beam accelerated by an applied potential difference of 12,000 V to produce diffraction pattern :

$$h = 6.62 \times 10^{-34} \text{ Js}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{Charge of electron} = 1.6 \times 10^{-19} \text{ coulombs.}$$

- (ii) Write a note on scattering intensity and scattering angle.

5. (A) Select the *correct* alternatives of the following : 5

- (1) is the output device.

- (a) Mouse
 (b) Scanner
 (c) Printer
 (d) CD

- (2) NH_3 molecule belongs to the point group.

- (a) C_{2v}
 (b) D_{3h}
 (c) D_{3d}
 (d) C_{3v}

P.T.O.

- (3) The structure of potassium chloride is
- (a) scc
 - (b) bcc
 - (c) fcc
 - (d) hkl
- (4) Coherent scattering is produced due to collisions when a beam of electron strikes the jet of molecules.
- (a) Elastic
 - (b) Inelastic
 - (c) Acoustic
 - (d) Both (a) and (b)
- (5) won the Nobel prize for the invention of Neutron-diffraction technique.
- (a) Bragg and De Broglie
 - (b) Debye and Scherrer
 - (c) Shull and Brockhouse
 - (d) Wierl and Curie
- (B) Write notes on any *two* of the following :
- (a) Principle of Neutron diffraction
 - (b) Conjugacy relation and classes
 - (c) Algorithms and flowchart.

10