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AY—238—2018

FACULTY OF SCIENCE

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

MARCH/APRIL, 2018

(CBCS Pattern)

CHEMISTRY

Paper IV (CH-414)

(Physical Methods in Chemistry—I)

(Tuesday, 17-4-2018)

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

Time—3 Hours

Maximum Marks—75

N.B. :— (i) Attempt All questions.

(ii) Figures to the right indicate full marks.

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

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

(a) Give an account of conjugacy relation and classes.

(b) Explain RAM and ROM.

(c) Give an account of output devices.

(d) Determine the Miller indices for the plane having intercepts to the crystal axes as :

(i) $(a, -3b, \infty)$

(ii) $(-2a, -b, c)$.

(e) Define group and subgroups with suitable examples.

2. Solve any *three* of the following : 15

(a) Give the group multiplication table for H₂O molecule.

(b) Write down the computer programming for determination of Van der Waals constants.

P.T.O.

- (c) The X-rays scattered from a crystal have the first order diffraction peak at an angle $\theta = 15^\circ$. At what angle will the second order peak will appear ?
- (d) What is the principle of electron diffraction ? Explain the measurement technique.
- (e) How is the neutron diffraction technique used to elucidate the structure of magnetically ordered unit cell ?
3. Attempt the following :
- (a) Explain the windows operating system. Write down the programming steps for the determination of rate constant of a reaction. 8
- Or*
- Describe in detail the use of algorithm and flow-chart. 8
- (b) State and explain GOT. How can the different rules be derived from GOT for irreducible representation of a group. 7
- Or*
- Describe matrix representations for the following symmetry elements, σ_{yz} , S_n , E. 7
4. Solve the following :
- (a) Explain the various commands in DOS operating system. Give an account of computer languages. 8
- Or*
- Explain Ramchandran diagram. Describe Laue method for the determination of crystal structure. 8
- (b) What is phase difference ? Explain structure factor and its relation to intensity and electron density. 7

Or

What is scattering intensity and scattering angle ? Calculate the wavelength of electron beam accelerated by potential difference 14500 volts to produce a diffraction pattern : 7

$$h = 6.625 \times 10^{-34} \text{ J.s.}$$

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

$$\text{Charge of electron} = 1.6 \times 10^{-19} \text{ coulombs.} \quad 7$$

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

(i) H_3BO_3 belongs to point group :

(a) C_n

(b) C_{2h}

(c) C_{3h}

(d) D_4

(ii) is the inner most part of UNIX operating system.

(a) Kernel

(b) Shell

(c) Utilities

(d) Mouse

(iii) The structure of CsCl is :

(a) SCC

(b) FCC

(c) BCC

(d) hKI

P.T.O.

- (iv) Incoherent scattering is produced due to collisions when a beam of electron strikes the jet of molecules.
- (a) elastic
 - (b) inelastic
 - (c) acoustics
 - (d) elastic and inelastic
- (v) Nuclear scattering occurs due to interaction of neutrons with :
- (a) Orbital electron
 - (b) Atomic nuclei
 - (c) Magnetic moment of atoms
 - (d) Magnetic moment of ions
- (B) Write short notes on any *two* of the following : 10
- (i) Input devices
 - (ii) Measurement technique in neutron diffraction
 - (iii) Character table.