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AI—304—2017

FACULTY OF SCIENCE

M.Sc. (First Semester) EXAMINATION

MARCH/APRIL, 2017

(CBCS Pattern)

CHEMISTRY

(Paper IV CH-414)

(Physical Methods in Chemistry-I)

(Thursday, 27-4-2017)

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

Time— Three 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) Explain conjugacy relation and classes.

(b) Explain flow chart for chemical concept.

(c) Explain high level and low level languages.

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

(i) $(a, -2b, \infty c)$ and

(ii) $\left(-a, \frac{1}{2}b, \infty c\right)$.

(e) Give an account of Ramchandran diagram.

P.T.O.

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

- (a) Define group, subgroup and order of group. Give the relation between groups and its subgroups.
- (b) Explain secondary storage devices.
- (c) In X-ray analysis of NaCl crystal, for (110) plane the first order reflection was found at 8.4° , for X-rays of wavelength 1.54 \AA . Calculate the interplanar spacing in picometer.
- (d) Give an account of Wierl equation.
- (e) Explain the measurement technique used for neutron diffraction. Give the advantages of neutron diffraction.

3. Attempt the following :

- (a) Explain the principles of programming. Give the algorithm steps for the evaluation of pH. 8

Or

Give the programming steps for :

- (i) radioactive decay
 - (ii) $\left(p + \frac{a}{V^2}\right)(V - b) = RT$.
- (b) Define symmetry operations and symmetry elements. Explain proper axis of rotation. 7

Or

Describe the matrix representation for :

- (i) C_2h
- (ii) C_{3v} point groups.

4. Attempt the following :

- (a) Explain the different types of commands used in DOS operating system. 8

Or

Derive $n\lambda = 2d \sin \theta$. Explain the Laue method for determining of crystal structure.

- (b) Give an account of structure of simple lattices and X-ray intensities. Explain the factors affecting X-ray intensities. 7

Or

Give an account of scattering intensity. What would be the wavelength of an electron beam accelerated by an applied potential difference of 30.000 Volts to produce diffraction pattern ?

($h = 6.62 \times 10^{-34}$ Js, $m_e = 9.1 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ coulomb).

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

(i) MICR stands for :

- (a) Magnetic ink character reader
(b) Magnetic ink code reader
(c) Magnetic ink cases reader
(d) None of the above

(ii) CH_4 belongs to :

- (a) C_{2V} (b) C_{3V}
(c) C_{4h} (d) T_d

(iii) The total intensity for a molecule consisting of a number of atoms is given by :

- (a) de-Broglie's equation (b) Debye equation
(c) Planck's equation (d) Wierl equation

P.T.O.

- (iv) Monochromatic neutron beam can be produced by :
- (a) reflection from crystal
 - (b) total reflection from highly polished surfaces
 - (c) Both (a) and (b)
 - (d) None of the above
- (v) X-ray are electromagnetic radiation with wavelength of the order :
- (a) 10 m
 - (b) 10^{10} m
 - (c) 10^{-10} m
 - (d) $\frac{1}{10}$ m

(B) Write short notes on any *two* of the following : 10

- (i) Data processing
- (ii) Reducible and irreducible representation
- (iii) Scattering of neutron by solids and liquids.