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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 Å. 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 determinating 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 reflaction from highly polised 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.