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AI—238—2017
FACULTY OF SCIENCE
M.Sc. (First Year) (First Semester) EXAMINATION
NOVEMBER/DECEMBER, 2017
(CBCS Pattern)
CHEMISTRY

Paper IV (CH-414)

(Physical Methods in Chemistry—I)

(Friday, 17-11-2017)   **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 point symmetry groups.

    (b) Give an account of computer languages.

    (c) Explain algorithm for chemical concepts.

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

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

        (ii) $(-2a \; 3b \; c)$.

    (e) State and explain great orthogonality theorem.

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

    (a) Give the group multiplication table for C_{3V}.

    (b) Write down the computer programming for kinetics of first order reaction.

    (c) Calculate the wavelength of X-rays scattered from the sodium chloride crystal with the interplanar spacing 2.82 A° that gives first order reflection at an angle of 20°.

    (d) Enumerate the principle of electron diffraction. Give an account of the use of electron diffraction technique for structure determination of the compound.

    (e) Give an account of scattering of neutrons by solids and liquids.

P.T.O.

3. Attempt the following :

(a) What is data processing ? Write down programming steps for the evaluation of lattice energy. 8

Or

Describe in detail DOS operating system. 8

(b) Describe matrix representations for the following symmetry elements : 7

$$\sigma_{xy}, C_n, i.$$

Or

Construct the character table for C_{2V} point group. 7

4. Attempt the following :

(a) Explain the structural features UNIX operating system. Explain RAM and ROM. 8

Or

Derive Bragg's equation. Describe Debye-Scherrer method for the determination of crystal structure. 8

(b) Explain scattering factors. Give an account of identification of unit cells from systematic absences in diffraction pattern. 7

Or

Give the principle involved in electron diffraction. Calculate the wavelength of electron beam accelerated by potential difference 16 kilovolts to produce a diffraction pattern (h = 6.626 × 10^{-34} Js, m_e = 9.1 × 10^{-31} kg, charge on electron = 1.6 × 10^{-19} coulombs).

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

(i) The order of the groups C_{40}, D_{40} and S_{40} are respectively.

(a) 40, 80, 40   (b) 40, 40, 40

(c) 80, 40, 40   (d) 40, 40, 80

(ii) Which of the following are components of Central Processing Unit (CPU) ?

(a) Arithmetic logic unit, mouse

(b) Arithmetic logic unit, control unit

(c) Arithmetic logic unit, integrated circuits

(d) Control unit, monitor

(iii) For FCC crystals the ratio of lattice spacing for different planes is ....

(a) $1 : \dfrac{1}{\sqrt{2}} : \dfrac{1}{\sqrt{3}}$ (b) $1 : \dfrac{1}{\sqrt{2}} : \dfrac{2}{\sqrt{3}}$

(c) $1 : \dfrac{2}{\sqrt{2}} : \dfrac{2}{\sqrt{3}}$ (d) $1 : \dfrac{2}{\sqrt{2}} : \dfrac{3}{\sqrt{3}}$

(iv) Electron diffraction technique is useful in the evaluation :
(a) Bond length (b) Nuclei of atom
(c) Gases (d) Both (a) and (b)

(v) The wavelength of Neutron's that have reached the thermal equilibrium with their surroundings at 373 K is :
(a) 125 pm (b) 226 pm
(c) 300 pm (d) None of these

(B) Write notes on any two of the following : 10
(i) Output devices
(ii) Schoenflies symbol
(iii) Ramchandran diagram.