

This question paper contains 4 printed pages]

BR—367—2016

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2016

(CBCS Pattern)

CHEMISTRY

Paper IV (CH-414)

(Physical Methods in Chemistry-I)

(Wednesday, 23-11-2016)

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) Define and explain group, finite group and its subgroup.

(b) Explain algorithms for chemical concepts.

(c) Give an account of computer languages.

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

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

(ii) $(a - 3b \infty c)$

(e) Explain improper axis of rotation and centre of symmetry.

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

(a) Write a note on group multiplication table.

(b) Explain WINDOWS operating system.

P.T.O.

- (c) Calculate the interplanar spacing in picometer for NaCl crystal if the first order reflections for (111) plane occurs at an angle of 5.2° by using homogeneous X-rays of wavelength 1.5 \AA .
- (d) Explain the use of electron diffraction technique in the structural study of the compound.
- (e) Write a note on neutron diffraction.

3. Attempt the following :

8

- (a) What is operating system ? Describe in detail UNIX operating system.

Or

Write down programming steps for the evaluation of :

- (i) Lattice energy
- (ii) Bond length.
- (b) State GOT. How will you derive five rules from GOT for irreducible representation of a group.

7

Or

List the symmetry elements and locate them diagrammatically for :

- (i) CH_4
- (ii) HCN
- (iii) H_2

4. Attempt the following :

- (a) Explain :

8

- (i) Principles of programming
- (ii) Data processing.

Or

Derive Bragg's equation. Describe Bragg's method for the determination of crystal structure.

- (b) What is phase difference ? Explain the identification of scc, bcc and fcc from systematic absence in diffraction pattern. 7

Or

Explain the principle of electron diffraction. An electron beam was accelerated by an applied potential difference of 12000 volts to produce diffraction pattern. Calculate the wavelength of electron beam.

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

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

(i) Which of the following memory needs refresh ?

- (A) SRAM (B) DRAM
(C) ROM (D) All of these

(ii) C_2H_2 molecule with centre of symmetry belongs to :

- (A) D_{4h} (B) C_{2v}
(C) $D_{\infty h}$ (D) T_d

(iii) Neutron diffraction is caused by :

- (A) Magnetic scattering
(B) Nuclear scattering
(C) Both (a) and (b)
(D) None of the above

P.T.O.

(iv) Atomic and molecule coherent scattering of electrons is produced due to :

- (A) Elastic collision (B) Inelastic collision
(C) Both (a) and (b) (D) None of the above

(v) The ratios of interplanar spacing to identify a particular structure for fcc crystal is given by :

- (A) $1 : \sqrt{2} : \frac{1}{\sqrt{3}}$ (B) $1 : \frac{1}{\sqrt{2}} : \frac{1}{\sqrt{3}}$
(C) $1 : \frac{1}{\sqrt{2}} : \sqrt{3}$ (D) $1 : \frac{1}{\sqrt{2}} : \frac{2}{\sqrt{3}}$

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

10

- (i) Output devices
(ii) Ramchandran diagram
(iii) Magnetic scattering.