

Total No. of Questions : 12]

[Total No. of Printed Pages : 4

[3761]-102

F. E. (Semester - I) Examination - 2010

APPLIED SCIENCE - I

(June 2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- (1) Answer **any three** questions from each section.
- (2) Answers to the **two sections** should be written in **separate books**.
- (3) Black figures to the right indicate full marks.
- (4) Neat diagrams must be drawn wherever necessary.
- (5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (6) Assume suitable data, if necessary.

Constants : $h = 6.63 \times 10^{-34}$ J.sec.

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

$e = 1.6 \times 10^{-19}$ C

$c = 3 \times 10^8$ m/sec.

SECTION - I

- Q.1)** (A) What are the types of Symmetries in crystal ? Discuss them with respect to cubic crystal. [07]
- (B) Explain the line defects in metallic crystals. State the effects of line defects on the properties of metals. [06]
- (C) X-ray of Wavelength $1.6 \text{ \AA}$ are diffracted by a Bragg's crystal spectrometer at angle 14.2° in the first order. What is the spacing of atomic layer in the crystal ? [04]

OR

- Q.2)** (A) What is meant by atomic packing factor ? Calculate atomic packing factor for SC, BCC and FCC Structure. [07]
- (B) Explain the Mesomorphic Phase. Give the types and applications of mesomorphic phase of solids. [06]

- (C) Define :
 (1) Unit Cell
 (2) Co-ordination Number
 (3) Anisotropy
 (4) Crystallography [04]
- Q.3)** (A) Explain the Titration Curve and calculation of pH for 0.1N HCl and 0.1N NaOH. When indicator can be used for this titration ? [07]
- (B) What is the oxidizing and reducing agent ? Give the types of redox titration and explain any one type of titration. [06]
- (C) 10 ml H_3PO_4 solution on titration against 0.1N NaOH from burette requires 7.6 ml of NaOH for neutralization using Methyl Orange Indicator. Find the normality and strength of H_3PO_4 solution. [04]

OR

- Q.4)** (A) (1) 50 ml of NaCl solution requires 38.6 ml of M/50 AgNO_3 in Mohr's Method. Calculate amount of chloride ion per litre of NaCl solution. [04]
- (2) 25 ml of a solution containing Ca^{++} is titrated against 0.03M disodium EDTA from burette to get the end point 14.8ml in the complexometric titration. Calculate the amount of Ca^{++} ions per litre of the solution. [03]
- (B) What is the Mohr's Method for precipitation titration ? Give its procedure and formula for calculation. [06]
- (C) Define the terms :
 (1) Equivalence Point
 (2) Titration
 (3) Normality
 (4) Molarity [04]
- Q.5)** (A) Give the Polymerization Reaction, Properties and Applications **any two** of the following : [06]
- (1) Polystyrene
 (2) Phenol - Formaldehyde Resin
 (3) Silicon Rubber

(B) What is the Vulcanization of Rubber ? Give the structural changes taking place on vulcanization. State the effects on properties of rubber on vulcanization. [06]

(C) Distinguish between thermosoftening and thermosetting resins. [04]

OR

Q.6) (A) Account shortly on average molecular weight of polymers and any one method to determine it. [04]

(B) Give the cationic mechanism of Polymerisation. [04]

(C) What is a Glass transition temperature ? What are the factors affecting on it. State its importance. [04]

(D) Write a note on **any one** of the following : [04]

(1) Conducting Polymer

(2) Polymer Composite

SECTION - II

Q.7) (A) With the help of neat labelled diagram explain the principle, construction and working of Michelson's Interferometer. Discuss the types of fringes. [07]

(B) Explain the Motion of Electron when it is : [06]

(1) Parallel to Electric Field and

(2) Perpendicular to Electric Field

(C) In Newton's Ring Experiment the diameter of 4th and 12th dark rings are 0.400 cm and 0.700 cm respectively. Deduce the diameter of 20th ring. [04]

OR

Q.8) (A) Explain with a neat diagram the principle, construction and working of Bainbridge Mass Spectrograph. [07]

(B) Derive an expression for condition of maxima and minima for reflected light in case of thin transparent film of uniform thickness. [06]

(C) Electrons Accelerated by a Potential of 150 volt enter in an electric field at an angle of 50° with the normal to the interface of the higher potential and get refracted at an angle of 35° with the normal find the potential difference between the two regions. [04]

- Q.9)** (A) Explain the Fraunhofer Diffraction at a single slit and obtain the condition for principal maximum and minima. Draw the Intensity Distribution Curve. [07]
- (B) What is Piezo-Electric Effect ? Draw a neat diagram and explain the Piezo-Electric Generator for the Production of Ultrasonic Waves. [06]
- (C) What is the highest order spectrum that is visible with light of wavelength $6000\text{\AA}$ by means of a grating having 5000 lines per cm. [04]

OR

- Q.10)** (A) Explaining the Principle of Echo Sounding. Describe any two applications of Ultrasonic Waves. Where this principle is used ? [07]
- (B) Obtain an expression for the Resolving Power of Grating. On what factors does it depend ? [06]
- (C) Calculate the Natural Frequency of Cast Iron Rod of 2.6 cm in length. [04]
- (Given : Density of Rod = $7.23 \times 10^3 \text{ kg/m}^3$,
Young's Modulus = $1.16 \times 10^{11} \text{ N/m}^2$)

- Q.11)** (A) Explain the term Double Refraction and hence explain in the phenomenon of it on the basis of Huygen's Wave Theory. [06]
- (B) With the help of a neat labelled diagram explain the construction and working of a Cyclotron. Obtain the expression for the cyclotron frequency and the maximum energy of the particle. [06]
- (C) A Q.W.P. of thickness $2.275 \times 10^{-3} \text{ cm}$ is cut with its faces parallel to optic axis. The emergent beam of light is elliptically polarized. Find the wavelength of the monochromatic light made incident normally on the plate. [04]
- (Given : $\mu_o = 1.586$, $\mu_e = 1.592$)

OR

- Q.12)** (A) Explain the principle, construction and working of Betatron. [06]
- (B) Distinguish between Polarized and Unpolarized Light. Describe the process of production and detection of Circularly Polarized Light. [06]
- (C) If the frequency of the A.C. Potential applied to the dees of a Cyclotron is 9 MHz calculate the Magnetic Flux density to accelerate α particles. [04]
- (Given : Mass of α Particle = $6.643 \times 10^{-27} \text{ kg}$)