May - June 2009

Total No. of Questions : 12] [Total No. of Printed Pages : 4

[3561]-102

F. E. (Semester - I) Examination - 2009

APPLIED SCIENCE - I

(June 2008 Pattern)

Time : 3 Hours] [Max. Marks : 100

Instructions :

*(1) Answer any **three** questions from each section.*

*(2) Answer to the **two sections** should be written in **separate answer-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 is meant by Atomic Packing Factor ? Calculate APF for SC, BCC and FCC Structure. **[07]**

(B) What are Crystal Imperfections and how they affect properties of Crystals ? Explain point defect. **[06]**

(C) How ZnS acts as luminiscent ? Explain. **[04]**

OR

Q.2) (A) What is Crystallography ? Explain various elements of symmetries in a perfect Cube. **[07]**

(B) Explain the Mesomorphic Phase. Give types and applications of Mesomorphic Phase of Solids. **[06]**

(C) Derive Bragg's Law of Diffraction. **[04]**

Q.3) (A) How are the pH of titration mixture calculated at various stages during strong acid - weak base titration ? [06]

(B) Calculate equivalent weights of $KMnO_4$ in acidic, basic and neutral medium. [06]

(C) The given chloride ion solution is diluted with distilled water to 250 ml volume. 50 ml of this diluted solution is titrated by Fajan's Method against M/50 $AgNO_3$ to get end point at 15.2 ml. Calculate amount of Cl^- ions in the given chloride ion solution. [04]

OR

Q.4) (A) What is Complexometric Titration ? Explain Direct Titration with EDTA. [06]

(B) Explain Ostwald's Theory of Acid-base Indicators. [06]

(C) Calculate Molarity and Normality of a solution containing 0.5 gm NaOH dissolved in 500 ml solution. [04]

Q.5) (A) What is the Vulcanisation of Rubber ? Give the structural changes taking place on vulcanisation. State the effects on properties of rubber on vulcanisation. [07]

(B) Distinguish between : [06]

(1) Thermosetting and Thermosoftening Resins

(2) LDPE and HDPE

(C) Give the free radical mechanism of polymerisation with suitable example. [04]

OR

Q.6) (A) Give the preparation reaction, properties and applications of : [07]

(1) Phenol-Fermaldehyde Resins

(2) ABS Plastic

(B) What are Plastics ? Give the compounding of plastics with purposes of compounding of each constituent. [06]

(C) What are Polymer Composites ? Give in brief properties and applications of Polymer Composites. [04]

SECTION - II

Q.7) (A) Show with necessary theory, how Michelson's Interferometer can be used to measure the wavelength of the given monochromatic source of light. [07]

(B) Explain the principle and working of Bainbridge Mass Spectrograph. [06]

(C) A parallel beam of sodium light of wavelength 5890×10^{-8} cm is incident on a thin glass plate of refractive index 1.5, such that the angle of refraction into the plate is 60°. Calculate the smallest thickness of the plate which will make it appear dark by reflection. [04]

OR

Q.8) (A) Explain the motion of an electron in a perpendicular electric field. [06]

(B) Explain how the phenomenon of interference is utilised in :

(1) testing the planeness of a surface

(2) anti-reflection Coating [07]

(C) An electron is accelerated by a Potential difference of 5000V. It then enters uniform magnetic field of 4×10^{-3} wb/m^2 perpendicular to its direction. Determine the radius of the path of the electrons. [04]

Q.9) (A) Define the resolving power of an optical instrument. Derive an expression for the resolving power of a grating. [06]

(B) Explain the principle of the following :

(1) Magnetostriction Effect

(2) Peizo-electric Effect [06]

(C) Light of wavelength 5.8×10^{-7}m is incident on a slit having a width of 0.3×10^{-3} m. The viewing screen is 2.00 m from the slit. Find the position of the first dark fringes and the width of the central bright fringe. What happens to the diffraction pattern if the slit width is increased. [05]

OR

Q.10) (A) Explaining the principle of echo sounding describe any two applications of ultrasonic waves where this principle is used. **[07]**

(B) Explain how the velocity of ultrasonic waves are determined by ultrasonic interferometer ? **[06]**

(C) Monochromatic light from a helium-neon laser ($\lambda = 623.8$ nm) is incident normally on a diffraction grating containing 6000 lines/cm. Find the angles at which the first and second order maxtima are obtained. **[04]**

Q.11) (A) Distinguish between Polarised and Unpolarised Light. Describe the process of production and detection of elliptically polarised light. **[06]**

(B) Describe the Theory of Cyclotron and obtain an expression for the maximum energy of the particle accelerated. **[06]**

(C) Calculate the thickness of :

(1) Quarter Wave Plate

(2) Half Wave Plate

Given, $\mu_e = 1.553$, $\mu_0 = 1.544$, $\lambda = 5000$ A°. **[04]**

OR

Q.12) (A) What is meant by Chair Reaction ? How is a Chain Reaction produced in natural uranium. **[06]**

(B) Explain the terms :

(1) Optical Activity

(2) Pile of Plates **[06]**

(C) In a betatron the maximum magnetic field at the electron orbit is 0.5 wb/m^2. The diameter of the stable orbit is 1.5 m. If the frequency of the alternating current through the electromagnetic coils is 50 Hz, calculate for the electrons –

(1) Final energy.

(2) Average Energy gained per revolution. **[04]**
