

Total No. of Questions : 12]

[Total No. of Printed Pages : 4

[3561]-202

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

APPLIED SCIENCE - II

(June 2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

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

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

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

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

$\pi = 3.142$



SECTION - I : CHEMISTRY

- Q.1) (A) Explain different types of Calorific Values of fuel. How is it determined using Bomb Calorimeter ? [07]
- (B) Write note on Distillation of Petroleum. [06]
- (C) 0.25 gm of a coal sample on burning in a combustion chamber in the current of pure oxygen was found to increase weight of U tube with anhydrous CaCl_2 by 0.075 gm and of KOH U tube by 0.52gm. Find C and H percentages in coal. [04]

OR

Q.2) (A) What is Rocket Propellant ? Explain different types of propellants used in rocket. [07]

(B) Explain production, properties and storage of Hydrogen gas. [06]

(C) Give merits and demerits of Power Alcohol. [04]

Q.3) (A) What is principle of Cathodic Protection ? Discuss the various types of Cathodic Protection. [07]

(B) Explain the factors affecting the Corrosion. [06]

(C) Explain corrosion due to following gases : [04]

(1) Oxygen

(2) Chlorine

OR

Q.4) (A) Define Corrosion. Explain the mechanism of Wet Corrosion. [07]

(B) Write note on : Hot Dipping. [06]

(C) Explain Blacodising. [04]

Q.5) (A) Explain zeolite process for Water Softening. [06]

(B) What are the main micro-constituents in Iron-carbon System ? State their particulars. [06]

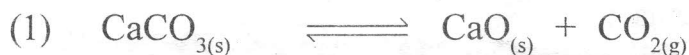
(C) 50 ml of an alkaline water sample requires 9.2 ml of N/50 HCl upto phenolphthalein end point and total 13.1 ml of the acid for complete neutralisation. Find the types and amounts of alkalinities in the water sample. [04]

OR

Q.6) (A) Draw and explain phase diagram of two component system. [06]

(B) What are the causes, preventive measures and disadvantages of scale and sludge formation in the boilers. [06]

- (C) Find the numbers of phases and numbers of components in the following : [04]



SECTION - II : PHYSICS

- Q.7)** (A) Derive Schroedinger's Time Independent Wave Equation. [06]

- (B) Derive an expression for the energy levels and wave function of a particle enclosed in infinite potential well. Give the graphical presentation of both the terms. [07]

- (C) Find the de Broglie's Wavelength Associated with Monoenergetic Electron Beam having momentum 10^{-23} kg m/s. [04]

OR

- Q.8)** (A) What is Wave Function Ψ ? Give its physical significance. [06]

- (B) State difference statements of Heisenberg's Uncertainty Principle. Give its experimental proof by an Electron Diffraction Method. [07]

- (C) Compare the lowest three energy states for an electron confined in an infinite potential well of width 10°A . [04]

- Q.9)** (A) Explain the construction and working of the He-Ne laser. Explain its energy level diagram also. [06]

- (B) Explain the phenomenon of superconductivity. Explain Type-I and Type-II superconductors. [06]

- (C) Define following terms : [04]

(1) Spontaneous Emission

(2) Stimulated Emission

(3) Pumping

(4) Population Inversion

OR

Q.10)(A) Explain construction and working and energy level diagram of Ruby Laser. [06]

(B) Explain the terms : [06]

(1) Meissner Effect

(2) Critical Magnetic Field

(C) Explain any one application of Laser in brief. [04]

Q.11)(A) Using the Fermi-Dirac probability distribution function, derive an expression for the position of fermi energy level in the intrinsic semiconductor. [07]

(B) Explain the optical and electrical properties of Nano Particles. [06]

(C) Calculate the mobility of charge carriers in a doped silicon whose conductivity is $100 \text{ } \Omega\text{-m}$ and the Hall Coefficient is $3.6 \times 10^{-4} \text{ m}^3 / \text{Coulomb}$. [04]

OR

Q.12)(A) What is Fermi Energy Level ? Explain the working of PN junction diode on the basis of Fermi Energy Level in forward biased mode. [06]

(B) Explain the construction and working of Solar Cell. Explain its characteristic curve. [06]

(C) Explain the synthesis of Metal Nano Particles by colloidal route. [05]