(Set-A_1)

B. Tech- 1
CHEMISTRY

Full Marks : 70

Time : 3 hours

Answer any six questions including Q.No.1 which is compulsory.

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2×10

   (*a*) Name the corresponding regions of following wavelength. (540 nm, 200 nm)

   (*b*) Calculate the stopping potential when a metal of work function 1.9 eV is irradiated by a light of 450 nm.

   (*c*) What is black body ?

   (*d*) If a conjugated pi-system is attached with a carbonyl group, then in which region the electronic spectrum appears.

   (*e*) Name the state variables which are used to define the state of a system.

(*Turn Over*)

(*f*) Name the phases which coexist in the triple point of S- system.

(*g*) Cementite exists in which structural form. What is the percentage of carbon in it ?

(*h*) Give an example of a reaction in which order is one but molecularity is two.

(*i*) What is single electrode potential ?

(*j*) What are smart materials ?

2. (*a*) What are eigenvalues and eigenfunctions ? Discuss the terms present in eigenvalue equation. 5

(*b*) What is infrared spectroscopy ? Explain why O_2 and H_2 molecules don't show IR spectroscopy. 5

3. (*a*) Comment on the statement 'Entropy of the Universe is always increasing'. 5

(*b*) Define chemical potential. Show that chemical potential of an ideal gas is independent on pressure. 5

4. (*a*) Explain the terms : component and degree of freedom with example. 5

(*b*) Derive the phase rule equation. 5

5. (*a*) How the pH of a solution is determined using hydrogen electrode ? Write two limitation of the use of H- electrode. 5

(*b*) Calculate the emf of a concentration cell at 25°C consisting of two Zinc electrodes immersed in solutions of Zn^{2+} ions of 0.1 M and 0.01 M concentration. 5

6. (*a*) Derive the kinetic equation of first order reaction. What is half life period ? 5

(*b*) The decomposition of $N_2O_5(g)$ is a first order reaction and rate constant of the reaction is $1.35 \times 10^{-4}\ s^{-1}$. If the initial concentration of $N_2O_5(g)$ is 0.03 mol/L, calculate its concentrations after 30 minutes. 5

7. (*a*) What is corrosion ? Discuss galvanic corrosion. 5

(*b*) Discuss three applications of nanomaterials. 5

8. Write short notes any *two* :

(*a*) Eutectic point 5

(*b*) Chain reaction 5

(*c*) Cooling curve 5