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B.Sc. RNLKWC-/DSE-1T/22

2022

Chemistry

B.Sc. Fifth Semester End Examination - 2022

PAPER - DSE-1T

Full Marks : 40

Time : 2 hours

*The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own
words as far as practicable.
Illustrate the answers wherever necessary.*

Group-A

Answer any five from the following : 5×2=10

1. (a) What is Debye characteristic temperature?
- (b) Define ensemble.
- (c) Write down the different types of Bravais lattice of Rhombic Crystal.
- (d) Why the Debye- T^3 law is not valid at very low temperature?

(Turn Over)

(2)

- (e) Show that the weight average molar mass of a polymer is generally greater than the number average molar mass.
- (f) Define meant tri-block copolymer.
- (g) If stirling approximation is valid. Show that $n_i \sim (n_i/e)^{n_i}$.
- (h) The density of Li-metal is 0.53 gm/cm^3 and separation of 100 planes of the metal is 350 pm. determine whatever the lattice is f.c.c or b.c.c (Molar mass of Li=6.941 gm/mole)

Group - B

2. Answer any four from the following : $4 \times 5 = 20$
- (a) Lowering internal energy (μ) is favour for the formation of crystal – Explain. $2\frac{1}{2}$
- (b) Calculate number of edge, face for a Hexagonal crystal system. $2\frac{1}{2}$
3. (a) Derive Einstein equation for heat capacity of solids.
- (b) Hence show the Dulong-Petir law is a special case of Einstein equation.

(3)

4. (a) Write a short Note on chain polymerization. 3
- (b) Write different types of conducting polymer. 2
5. (a) Show that $\beta = \frac{1}{KT}$
- (b) Draw an S vs W graph when $S = k/nw$ 2
6. (a) Explain the term microstate and phase space. 2
- (b) Using the probability concept derive a suitable relation to solve the problem :

A sample of $\text{H}_2(\text{g})$ is confined to a cylinder fitted with a piston of 50 cm^2 cross section. It occupies 500 ml at 25°C at a pressure of $Z \text{ atm}$. What is change in entropy when the piston is isothermally lifted through 10 cm?

7. (a) Differentiate between boson and fermions. 3
- (b) Calculate ratio of planes for simple cubic crystal. 2

(4)

Group - C

Answer any one from the following.

1×10=10

8. (a) Calculate the value of $\ln 5!$, $\ln 10!$ and $\ln 15!$ with and without stirling's approximation and show that stirling's approximation is more and more applicable for higher values of n . 4

(b) Calculate the relative number of microstates in water with respect to ice at 0°C given $\Delta H_{\text{fus}} = 1440 \text{ cal/mole}$. 3

(c) Derive arometric distribution formula from Boltzman distribution of energy. 3

9. (a) Consider a system of six distinguishable particles. One of the macrostates has the following distribution of particles :

Energy	0	ϵ	2ϵ	3ϵ	4ϵ
No. of particles	0	0	2	2	2

(b) For identical experimental conditions the first Bragg-reflection from a plane of a cubic crystal come up at 5.7° and 5.85° respectively at 20°C and 50°C . Calculate the coefficient of cubic expansion of the solid. 4

(c) Calculate % occupied by FCC crystal. 4