

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025***Second Semester**Chemical Engineering***PH3258 / UPHT24207 - Physics of Materials***Regulations – 2021 & 2024**Duration : 3 Hrs**Maximum: 100 Marks***PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)**

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	How does the Gibbs phase rule help determine the number of variables in a multi-component system?	L2	1	2
2.	Compare Physical Vapor Deposition (PVD) and Chemical Vapor Deposition (CVD) in terms of their deposition processes and typical applications.	L4	1	2
3.	Infer the term quantum tunneling, and why is it significant in thin insulating materials?	L1	2	2
4.	Describe the Meissner effect and its significance in superconductors.	L1	2	2
5.	The conductivity of germanium at 20°C is $2 \Omega^{-1} \text{ m}^{-1}$ what is its conductivity at 40°C. $E_g = 0.72 \text{ eV}$.	L3	3	2
6.	Why do we prefer Si for Transistors and Ga As for LASER diodes?	L2	3	2
7.	Find the capacitance of layer of Al_2O_3 that is $0.5 \mu\text{m}$ thick and 2000 mm^2 of square area $\epsilon_r = 8$. ($\epsilon_0 = 8.854 \times 10^{-12}$).	L3	4	2
8.	Define Bohr magneton.	L1	4	2
9.	Ceramics are stronger in compression than in tension. Reason out.	L4	5	2
10.	Why is hydroxyapatite commonly used in bone implants?	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a Compare eutectic and peritectic reactions in terms of phase changes and the compositions involved. How does each reaction affect the microstructure of the material?	L3	1	16
	Or			
	b Evaluate the benefits and challenges of each nanomaterial synthesis method-wet chemical, solvothermal, and sol-gel. How does each method affect the properties and applications of the resulting nanomaterials?	L3	1	16
12.	a i Using the expression for the density of states, how would you calculate the number of available energy states in a given energy range for electrons in a metal?	L3	2	12
	ii The fermi energy of silver is 5.51 eV. What is the average energy of a free electron at 0 K.	L3	2	4
	Or			
	b i How would you identify a high-Tc superconductor based on its critical temperature? Provide an example.	L3	2	10
	ii How would you use superconductors to achieve magnetic levitation in transportation systems?	L3	2	6

13.	a	i	Obtain an expression for intrinsic carrier concentration in an intrinsic semiconductor.	L3	3	10
		ii	How will you determine the energy gap of an intrinsic semiconductor?	L3	3	6
			Or			
	b	i	Correlate the implications of the Hall Effect for determining the type of charge carriers in a material and also the types of semiconductors.	L3	3	12
		ii	The donor density of an n-type germanium sample is $10^{21} / \text{m}^3$. The sample is arranged in a Hall experiment having magnetic field of 0.5 tesla and the current density is 500 Ampere / m^2 . Find the Hall voltage if the sample is 3mm wide.	L3	3	4
14.	a		Derive an expression for local field in a dielectric material. Deduce Clausius – Mosotti equation.	L2	4	16
			Or			
	b	i	Give the classification of magnetic materials on the basis of magnetic susceptibility. Briefly discuss the domain theory of ferromagnetism.	L2	4	10
		ii	Distinguish between soft and hard magnetic materials.	L2	4	6
15.	a	i	Discuss the classification of composites. Give detailed study of fiber reinforced plastics (FRP).	L2	5	10
		ii	Mention the applications of ceramics materials.	L2	5	6
			Or			
	b	i	Explain the preparation and properties of metallic glasses.	L2	5	10
		ii	Recite the properties of Ni-Ti alloy.	L2	5	6