

- 37) Equal size spherical balls when packed together will yield maximum theoretical packing of
- a) 52% b) 68% c) 74% d) 86%
- 38) Steel containing 0.8% carbon cooled under equilibrium conditions from molten state to room temperature is soft, because it consists of lamellae of
- a) Ferrite and cementite c) Ferrite and bainite
b) Ferrite and austenite d) Ferrite and martensite
- 39) Line broadening in X-ray diffraction pattern occurs on account of
- a) Coarse crystallite size c) Multiplicity of phases
b) Residual stresses d) Coring of crystallites
- 40) Inter-granular corrosion of austenitic stainless steel is promoted by
- a) Fine grained microstructure c) Soaking steel at 700°C in air
b) Coarse grained microstructure d) Quenching from 1000°C
- 41) Ferrites are preferred materials for use in high frequency applications (GHz range) as opposed to other ferromagnetic materials because ferrites also have
- a) High permeability c) High saturation magnetization
b) High electrical resistivity d) Low coercivity
- 42) During indirect intra-band transition, electrons undergo
- a) Change in energy and momentum
b) Change in momentum but no change in energy
c) Change neither in energy nor in momentum
d) Change in energy but no change in momentum
- 43) A material has a band gap of 2.4 eV. Which of the following wavelengths of light will it absorb?
- a) 700 nm b) 550 nm c) 650 nm d) 400 nm
- 44) Thermal conductivity of a material at a temperature greater than Debye temperature
- a) is independent of temperature
b) decreases inversely with temperature
c) increases linearly with temperature
d) increases exponentially with temperature
- 45) Match the following classes of materials given in Column I with the electron spin alignments in atoms shown in Column II.

	Column I		Column II
P	Ferromagnetic	1.	↑↓↑↓
Q	Anti-ferromagnetic	2.	→ ↗ ↘ ↙ ↖ ←
R	Ferrimagnetic	3.	↑↑↑↑
S	Paramagnetic	4.	↓↓↓
		5.	↑↑

- a) P-3, Q-1, R-4, S-5 b) P-4, Q-2, R-5, S-3 c) P-3, Q-1, R-5, S-2 d) P-3, Q-2, R-4, S-1

46) Match the following experimental techniques given in Column I with applications given in Column II.

	Column I		Column II
P	Differential Scanning Calorimetry	1.	Dislocation studies
Q	Atomic Absorption Spectroscopy	2.	Surface Topography
R	Scanning Electron Microscopy	3.	Electrical Conductivity
S	Transmission Electron Microscopy	4.	Trace Element Analysis
		5.	Phase Transformation

- a) P-5, Q-4, R-2, S-1 b) P-5, Q-1, R-3, S-2 c) P-2, Q-5, R-3, S-1 d) P-1, Q-5, R-4, S-2

47) Match the following materials given in Column I with their applications given in Column II.

	Column I		Column II
P	Nylon	1.	Electrical switch housing
Q	Urea formaldehyde	2.	Conducting polymers
R	Polyaniline	3.	Heating Element
S	Alumina	4.	Gears for toys
		5.	Polishing material

- a) P-2, Q-4, R-3, S-5 b) P-4, Q-1, R-2, S-5 c) P-3, Q-4, R-2, S-1 d) P-4, Q-5, R-3, S-2

48) Match the following materials given in Column I with their applications given in Column II.

	Column I		Column II
P	Silicon carbide fibre	1.	Fibre glass boat
Q	Polyester fibre	2.	Heating element
R	Thoria doped tungsten	3.	Magnetic material
S	Nichrome	4.	Electric bulb filament
		5.	Armour material

- a) P-5, Q-1, R-3, S-2 b) P-1, Q-5, R-4, S-2 c) P-5, Q-3, R-2, S-1 d) P-5, Q-1, R-4, S-2