B.E. Second Semester (C.B.C.S.)

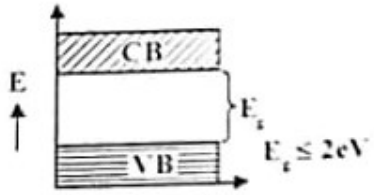
Question Bank

SUBJECT - ADVANCED ENGINEERING MATERIALS

Unit	Question Number	Questions with Options	Answer Key
Unit 1 **Band Theory of Solids**	1	In an energy band diagram of a solid, conduction band is located at a) Higher energy than that of valence band b) Lower energy than that valence band c) at same level as that of valence band d) in the energy gap	a)
	2	In N-type semiconductor, impurity atoms a) Accept electron from semiconductor atom. b) Donates electron to semiconductor atom. c) Accept holes from semiconductor atom. d) Donates holes to semiconductor atom.	b)
	3	Highest energy gap value is found in case of..... a) conductors b) semiconductors c) Insulators d) Germanium	c)
	4	Solids in which Energy between conduction band & valence band is $\leq 2eV$ are --------. a) semiconductors b) conductors c) Insulators d) Crystals	a)
	5	Energy region between bottom of conduction band and top of valance band in semiconductors is known as a) Energy gap b) Fermi energy c) Conduction band d) Valance band	a)
	6	In case of semiconductors, Fermi energy level is present in ..... a) conduction band b) valence band	c)

		c) energy gap d) above conduction band	
	7	Fermi function f(E) is expressed as a) $\frac{1}{1-e^{\frac{(E-E_f)}{2KT}}}$ b) $\frac{1}{1+e^{\frac{(E+E_f)}{2KT}}}$ c) $\frac{1}{e^{\frac{(E-E_f)}{2KT}}}$ d) $\frac{1}{1+e^{\frac{(E-E_F)}{KT}}}$	d)
	8	The mathematical function which gives probability of finding the electron in the given energy state having energy E is known as a) Fermi function b) Work function c) Energy function d) Wave function	a)
	9	Fermi function is dependent upon a) pressure b) forbidden gap c) temperature d) Mass of an electron	c)
	10	Electric current in Intrinsic semiconductor is mainly due to a) Large number of electrons b) Large number of holes c) Equal contribution of electrons and holes d) None of above	c)
	11	Electrons move from valance band to conduction band in Intrinsic semiconductors at temperature a) T = 0°K b) T< 0°K	c)

		c) T > 0°K d) Independent of temperature	
	12	Vacancy left behind in the valance band due to transition of electron to conduction band is called as a) hole b) proton c) photon d) positive ion	a)
	13	In case of Intrinsic semiconductor, Fermi level lies a) Closer to valance band b) Closer to conduction band c) Anywhere in energy gap d) At centre of energy gap	d)
	14	Semiconductors with added impurity are called as a) Intrinsic semiconductor b) Pure semiconductor c) Compound semiconductor d) Extrinsic semiconductor	d)
	15	Majority charge carriers in N-type semiconductor are a) holes b) electrons c) protons d) photons	b)
	16	At temperature T = ------, acceptor level is empty in P-type semiconductor. a) T = 0K b) T = 0°C c) T > 0K d) T< 0K	a)
	17	Identify following energy band diagram,	b)

		 a) Metal b) Semiconductor c) Insulator d) Mineral	
	18	According to Band theory of solids, free electron moves in a____ potential of lattice. (a) Periodic (b) Constant (c) Zero (d) None	a)
	19	Which of the following have donor level? (a) Intrinsic semiconductor (b) N-Type semiconductor (c) P-Type semiconductor (d) Conductor	b)
	20	At 0K, Semiconductors behave as a) Insulators b) Conductors c) Metals d) Superconductor	a)
	21	In semiconductors, conductivity _____with increase in temperature a) Remains constant b) Decreases c) Increases d) First decreases then increases	c)
	22	In semiconductors, conductivity _____with added impurity. a) Remains constant b) Decreases c) Does not change significantly d) Increases	d)
	23	Band theory of solids is based on _____ of electrons.	b)

		a) Particle nature b) Wave nature c) Quantum nature d) different nature	
	24	As per classical free electron theory, electrical conductivity of metals is expressed as (a) $\sigma\mu = ne$ (b) $\rho = ne\mu$ (c) $\sigma = ne\mu$ (d) $\mu = ne\sigma$	c)
	25	The quantity of electricity flowing per unit area per unit time at a constant potential gradient is known as: (a) Resistivity (b) Mobility of electrons (c) Conductivity (d) None	b)
	26	Resistance "R" of a conductor is directly proportional to __ & inversely proportional to _ (a) Area & Length (b) Length & breadth (c) Length & area (d) Area & conductivity	c)
	27	If the potential difference ' V' be applied across the length 'L' of solid. Then electric field 'E' produced is given by _____ a) E= V/I b) E = L/V c) E = V/L d) E =VL	c)
	28	Macroscopic form of Ohm's Law is _____ a) $R = \rho L/A$ b) $J = \sigma E$ c) I = V/R d) J =I/A	b)

	29	Velocity of electrons moving due to the action of electric field is called _____ a) drift velocity b) Angular velocity c) diffusion velocity d) constant velocity	a)
	30	Drift velocity per unit electric field is known as_____ a) Conductivity b) resistivity c) mobility d) Angular velocity	c)
	31	_____ is the highest filled Energy Level in a conductor at 0K. a) Fermi level b) energy gap c) band gap d) energy quantization	a)
	32	_____decides the distribution of electrons in various energy levels as a function of temperature. a) Fermi-Dirac function b) wave function c) Fermi level d) energy gap	a)
	33	At T = 0K, and for $E < E_F$, in conductors, the Fermi function is given by $\boldsymbol{f}(\boldsymbol{E})$ = a) 0 b) 1 c) indeterminate d) Infinity	b)
	34	The probability of occupancy of Fermi energy level in conductors at any temperature above 0K (T > 0K) is _____ a) 0.5 b) 1 c) 0 d) 0.4	a)
	35	On the basis of band structure, Solids are classified as (a) Conductors, Semiconductors, superconductors (b) Conductors, Semiconductors, Insulators	b)

		(c) Conductors & superconductors (d) Conductors, Insulators & superconductors	
	36	The splitting of outer empty energy levels of combining atoms form_____ band in a solid (a) Valence band (b) Conduction band (c) Energy gap (d) Fermi Energy	b)
	37	The conductivity of semiconductors is --------- that of conductors and insulators a) More than b) equal to c) between d) None of above	c)
	38	The units of mobility are a) $m^2/V.s$ b) Volts/m c) Ohm.m d) Ampere metre	a)
	39	According to classical free electron theory of solids, the conductivity of a solid is ---------- the concentration of charge carriers. a) directly proportional to b) indirectly proportional to c) greater than d) less than	a)
	40	P-type semiconductor is formed by addition of -------- impurity a) Pentavalent b) Trivalent c) Monovalent d) bivalent	b)
	41	------ are created when trivalent impurity is added to P-type semiconductors a) Tightly bound electrons b) Holes c) Free electrons	b)

		d) Valence electrons	
	42	A pentavalent impurity is a --------- type of impurity. a) Donor b) Acceptor c) Ionic impurity d) Bound impurity	a)
	43	Calculate the current density in copper wire of diameter 0.16 cm which carries a steady current of 20 A. a) 4.976×10^6 A/m^2 b) 4.976×10^7 A/m^2 c) 9.952×10^9A/m^2 d) 9.952×10^6 A/m^2	d)
	44	Calculate the drift velocity of the free electrons with a mobility of $4 \times 10^{-3}\ m^2/V.s$ in copper for an electric field strength of 0.5V m^{-1}. (Charge of electron =e $=1.602 \times 10^{-19}\ C$) a) 1×10^{-3} m/s b) 2×10^{-3} m/s c) 4×10^{-3} m/s d) 3×10^{-3} m/s	b)
	45	Find the mobility of electrons in copper assuming that each atom contributes one free electron for conductivity. (Resistivity of Copper = 1.7X10^{-6} Ω-cm, free electron concentration in Copper = 8.5 ×10^{28}/m^3, Charge of electron =e $=1.602 \times 10^{-19}\ C$). a) $4.32\times 10^{-3}\ m^2/V.s$ b) $4.32\times 10^{-5}\ m^2/V.s$ c) $4.32\times 10^{-1}\ m^2/V.s$ d) $4.32\times 10^{-7}\ m^2/V.s$	a)
	46	The conductivity of silver at 20°C is $6.8 \times 10^7 \Omega^{-1}$ m^{-1}. Calculate the mobility of electrons in silver assuming that there are 5.8×10^{28} conduction electrons /m^3.(Charge of electron =e $=1.602 \times 10^{-19}\ C$) a) $7.318\times 10^{-2}\ m^2/V.s$ b) $7.318\times 10^{-3}\ m^2/V.s$ c) $7.318\times 10^{-4}\ m^2/V.s$ d) $7.318\times 10^{-5}\ m^2/V.s$	b)
	47	What is the probability of occupancy of quantum state whose energy is 0.10 eV above Fermi energy at T equal to	a)

		800K? (Boltzmann constant k = 8.6 × 10^{-5}eV/K) a) 19% b) 81% c) 16% d) 84%	
	48	Use the Fermi distribution function to obtain the value of F(E) for E – E_F = 0.01 eV at 200K. (Boltzmann constant k = 8.6 × 10^{-5}eV/K) a) 0.4421 b) 0.4241 c) 0.3985 d) 0.3589	d)
	49	In a solid consider the energy level lying 0.01eV below Fermi level. What is the probability of this level not being occupied by an electron? (Boltzmann constant k = 8.6 × 10^{-5}eV/K) a) 0.405 b) 0.595 c) 0.684 d) 0.316	a)
	50	Evaluate the Fermi function for energy kT above the Fermi energy. a) 0.2689 b) 2.689 c) 0.02689 d) 26.89	a)

Unit	Question Number	Questions with Options	Answer Key
Unit 2 **Semiconductor Devices**	1	When a p n junction is formed ,---------- migrate from p –region to n- region a)Electrons b)Holes c)both a and b d)None	b
	2	The current due to migration of majority charge carriers from p to n region is called as -------- current a)Drift current b)Diffusion current c) Reverse saturation current	b

		d)Breakdown current	
	3	Forward biasing of p-n junction diode gives rise to a) Reduction in effective potential barrier across the junction b) Increase the depletion region c) Reduces the majority charge carriers crossing the junction d) Reduces the current flowing through the junction	A
	4	Choose the correct option regarding doping of Zenerdiode . a)High doping of p and n type materials b)Low doping of p and n materials c)High doping of p type and low doping of n type materials d) Low doping of p type and high doping of n type materials	A
	5	Which one of the following is incorrect statement for half wave rectifier? a)In half wave rectifier only half cycle of the input is used to get output b)only one diode is used for rectification c)Centre tap transformer is required for the circuit d)output contain only positive half cycles	C
	6	The advantage of bridge rectifier over full wave rectifier is a)We get unidirectional waves for each input b)The voltage developed across the load is unidirectional c)No special centre tap transformer is required d)None of these	c
	7	Zener diode is commonly operated in a)Reverse bias mode b)Forward bias mode c)Unbiased mode d) All of the above	a
	8	The tunnel diode works on the principle of a)Quantum tunnelling b)Classical tunnelling	a

		c)Fermi Dirac statistics d)Maxwell Boltzmannstatistics	
	9	In Tunnel Diode p and n type regions are a) Lightly doped b) Heavily doped c) Moderately doped d) Not doped	b
	10.	Which of the following statement is correct? a) Zener diode works only in reverse bias b) Zener diode works same as ordinary diode in reverse bias c) Zener diode does not work in forward bias d) Zener diode works similar to ordinary diode in forward bias but behaves differently in reverse bias	d
	11.	In tunnel diode the total current is due to --------- a) Tunnelling& diffusion of majority charge carriers. b) Tunnelling&diffusion of minority charge carriers c) Tunnelling only a) Tunnelling of electron from P region to N region	a
	12	The heavy doping in zener diode is required for----- a) Reduction in width of depletion region b) Increasing the width of depletion region c) Keeping the width of depletion region unchanged d) All of the above	a
	13	A photodiode ---- a) Converts sound into electrical energy b) Converts electrical energy into light energy c) Converts light energy into electrical energy d) None of these	c
	14	In photodiode the leakage current is obtained when a) Light is incident on depletion region b) No light is incident on depletion region c) Light is incident on P region only d) None of these	b

	15	In reverse bias the current flowing through the diode is due to --------- a) Minority charge carriers b) Majority charge carriers c) Due to both minority & majority d) Other	a
	16	In LED light is produced because of a) Generation of electron and hole pair b) Recombination of electron and holes c) Generation of internal potential barrier d) None of these	b
	17.	The light produced by LED is in the range of --------- a) X-rays b) Visible region c) IR region d) Both b & c	d
	18.	The intensity of emitted light in LED is significant only if a)large number of electrons jump from conduction band to valance band b)large number of holes move from valance band to conduction band c)depletion region is very large d) None of these	a
	19.	Transistor is a device which has a) Two terminals and two junctions b) Three terminals and one junction c) Three terminals and two junctions d) Two terminals and three junctions	c
	20.	In NPN transistor a) P type semiconductor is sandwiched between two N type semiconductors	a

		b) N type semiconductor is sandwiched between two P type semiconductors c) Emitter and base are N type and collector is P type d) None of these	
	21.	The arrow in the symbol of transistor indicates a)Position of emitter b) The type of transistor c)The direction of flow ofconventional current d) All of these	d
	22.	In a transistor the collector is a) Heavily doped b) Lightly doped c) Moderately doped d) Not doped	c
	23.	If the transistor is to be used in active mode a) EB junction is forward bias and CB junction is reverse bias b) CB junction is forward bias and EB junction is reverse bias c) EB and CB junctions are forward biased d) EB and CB junctions are reverse biased	a
	24.	The main function of base in a transistor is a) To supply the charge carriers b) To collect the charge carriers from emitter c) To collect the charge carriers from collector d) To transfer the charge carriers to collector without much loss	d
	25	In PNP transistor a) Holes are majority charge carriers in base b) Electrons are majority charge carriers in base c) Holes are minority charge carriers in emitter d) Holes are minority charge carriers in collector	b
	26	In case of a transistor,collector has maximum width amongst the three terminals because a) To dissipate the heat generated during the transfer of charge carriers	a

		b) To emit the charge carriers c) To transfer charge carriers to base d) To transfer the charge carriers to emitter	
	27.	Transistor can be connected in ------ a) Common collector configuration b) Common base configuration c) Common emitter configuration d) All of the above	d
	28.	If a piece of semiconductor carrying current is placed in transverse uniform magnetic field then electric field induced is a) Perpendicular to direction of both current and magnetic field b) Parallel to direction of both current and magnetic field c) Perpendicular to the direction of current and parallel to the direction of magnetic field d) Parallel to the direction of current and perpendicular to the direction of magnetic field	a
	29.	The correct equation for hall voltage is a) $V_H = \frac{WpJ}{Be}$ b) $V_H = \frac{WBJ}{pt}$ c) $V_H = \frac{WBJ}{pe}$ d) $V_H = \frac{WBJ}{At}$	c
	30.	The value of Hall coefficient for p type sample is a) Negative b) Positive c) Very large d) Very small	b
	31.	The mobility of charge carriers in Hall effect depends on a) Hall coefficient and conductivity b) Hall coefficient and electric field c) Current density and resistivity d) Width of the material and resistivity	a
	32.	Hall effect can be used for a) Determination of carrier concentration b) Measurement of magnetic field	d

		c) Determination of carrier mobility d) All of these	
	33	The voltage at which very large current starts flowing in reverse bias mode of a diode is called as--------- a) Cut-in voltage b) Break down voltage c) Threshold voltage d) Biasing voltage	b
	34	The n- side of the depletion region contains positive ions, so it is at ------- potential than the p-side of the depletion region a) Higher b) Lower c) Both a& b d) None of these	a
	35	The Fermi level in both p& n regions in equilibrium condition is at the --------level a) Same b) Different c) In p –side it is towards conduction band d) In n- side it is towards valance band	a
	36	Biasing a p-n junction diode means a) connecting the positive terminal of the battery to p – type and the negative terminal to the n-type materials b) connecting the negative terminal of the battery to p-type and positive terminal of the battery to n-type materials c) a or b d) Diode is not connected to the battery	c
	37	A rectifier is a device that a) Converts alternating current into direct current b) Converts direct current into alternating current c) Amplify input voltage d) None of these	a
	38	Width of P region in LED is smaller to ensure loss of	

		intensity by a) absorption b) reflection c) diffraction d) transmission	a
	39	During forward bias, the width of depletion region in p-n junction diode a) Increases b) Decreases c) No change d) None of these	b
	40	The current flowing through the p-n junction diode is ---------- during forward bias a) Low b) High c) Zero d) All of these	b
	41	The reverse current that exists when no light is incident at the junction of a photo diode is known as a) Dead current b) Dark current c) Break down current d) None of the above	b
	42	Asymmetrical doping in LED is required for----- a) unidirectional emission of light b) forward bias c) reverse bias d) to minimise recombination	a
	43	The following diode emits light a) LED b) Zener diode c) Photo diode d) Tunnel diode	a
	44	Calculate the Hall angle for a semiconductor if the Hall coefficient is 3.66×10^{-4} m^3/C,resistivity is 8.3×10^{-3}ohm meter	c

		and flux density is 0.5Wb/m^2. .(Charge of electron =e =$1.602 \times 10^{-19}\ C$) a) 0.0205^0 b) 1.17^0 c) 1.26^0 d) 3.5^0	
	45	A Semiconducting specimen of 5 mm width and 0.2 x 10^{-3}m thickness carries a current of 10^{-3}A along its length. When the magnetic field of 1 Wb/m^2 is applied perpendicular to its length and its width, Hall potential developed is found to be 10 mV. Determine the number of charge carriers per unit volume. .(Charge of electron =e =$1.602 \times 10^{-19}\ C$) a) 3.12 x 10^{21} / m^3 b) 3.12 x 10^{20} / m^3 c) 3.204 x 10^{-21} /m^3 d) 12.4 x 10^{16} /cm^3	a
	46	An n-type germanium sample has a donor density of 10^{21} / m^3. It is arranged in Hall experiment having magnetic field of 0.5 T and the current density is 500 A/m^2. Find the Hall voltage if the sample is 3 mm wide. .(Charge of electron =e =$1.602 \times 10^{-19}\ C$) a) 47 mV b) 4.7 x 10^{-3} V c) 0.2127 mV d) 4.7 V	b
	47	An electric field of 100 V/m is applied to n-type semiconductor. If Hall coefficient is 0.0125 m^3/C, find current density in the sample if electron mobility in the semiconductor is 0.36 m^3/V.s. .(Charge of electron =e =$1.602 \times 10^{-19}\ C$) a) 3.4722x 10^{-4}A/m^2 b) 28.08 A/m^2 c) 28.80 A/m^2 d) 2880 A/m^2	d
	48	In a NPN transistor circuit, the emitter current is 2mA & base current is 20μA.What is the value of collector current? a) 1.998 mA	~~a~~

		b) 0.78 mA c) 0.999mA d) 15.78 mA	a
	49	If the emitter current is 6mA and the collector current is 5.75 mA, what is the value of α_{dc} a) 95.8 b) 1.04 c) 10.4 d) 0.958	d
	50	A transistor has a β_{dc} of150. If the collector current is 45mA, what is the base current? a) 3.33 mA b) 4.5 mA c) 0.3 mA d) 45.3 mA	c
Unit	**Question Number**	**Questions with Options**	**Answer key**
Unit3 Magnetic Materials	1.	The origin of basic source of magnetism is ---------- A. Neutral particles alone B.Movement of charged particles(electrons) C.Magnetic dipoles D.Magnetic domains	B
	2.	The unit of Magnetic permeability is ---------- A. Tesla B. Henry C. Tesla / m D. Henry / m	D
	3.	The unit of Magnetic field strength is ---------- A. Wb / m^2 B. Wb / A.m C. A / m D. Tesla / m	C
	4.	Magnetic materials are classified on the basis of Hysteresis curve are known as	D

		A. Non-magnetic materials B. Hard magnetic materials C. Soft magnetic materials D. Both B and C	
	5.	Which of the following material repels magnetic field lines? A. Paramagnetic materials B. Ferrimagnetic materials C. Diamagnetic materials D. Antiferromagnetic materials	C
	6.	The susceptibility of ferromagnetic material is --------- A.Negative B.Smalland positive C. Large and Positive D. None of above	C
	7.	Materials in which magnetization present even after the field has been removed are called _____ A. Diamagnetic B. Paramagnetic C. Soft Ferro magnets D. Hard Ferro magnets	D
	8.	_____ is a measure of the degree to which the field lines penetrate or permeate (pass) through the material. It is the ratio of magnetic induction (B) to the magnetizing field (H). a) Absolute permeability (μ) b) Magnetic Susceptibility (χ) c) Relative permeability (μ_r) d) none	A
	9.	The value of B at H=0 in a Hysteresis curve is called _____ A. Remanence/ Retentivity B. Coercivity C. Magnetization D. Porosity	A
	10.	The number of magnetic field lines passing per unit area of cross-section is called _____ A. Flux B. Density C. Magnetic field strength	D

		D. Magnetic flux density/ Magnetic Induction	
	11.	The magnetic field can be produced by ---------- A. Using a permanent magnet B. Electric current C. Using a Core D. both A and B	D
	12.	The Magnetic Field lines move from _____outside the magnet. A. North to south B. South to north C. West to east D. East to west	A
	13.	_____is the process of converting a non-magnetic material into a magnetic material. A. Magnetic induction B. Magnetization C. Magnetic field strength/intensity D. Hysterisis	B
	14.	Relation between B and H is given by_____ a) $B = \mu /H$ b) $B = \mu H$ c) $B = H/ \mu$ d) $H = \mu B$	B
	15.	Which of the following equations is correct? a) $\mu_r = (1-\chi)$ b) $\mu_r = (1+\chi)$ c) $\mu_r+1= \chi$ d) $\chi + 1 = \mu_r$	B
	16.	The magnetic field (H) at which residual magnetism of the material is reduced to zero, called as ---------- A. Retentivity B. Coercivity C. Magneton D. Switching off the magnetic field	B
	17.	Which of the following material do not possess atomic magnetic dipole moment? A. Diamagnetic material B. Paramagnetic material C. Ferromagnetic material D. Ferrimagnetic material	A

	18.	Which of the following is a weak magnet? A. Ferromagnetic material B. Ferrimagnetic C. Hard Ferrite D. Paramagnetic	D
	19.	If a material is paramagnetic, what will be the value of susceptibility χ? A. Negative B. Small and positive C. Large and Positive D. None of above	B
	20.	Which of the following is the correct expression for Curie's law? A. $\chi = C\mu_0 T$ B $\chi = C / T$ C. $\mu_0 = C \chi T$ D. $\mu_0 = C \chi / T$	B
	21.	Materials with large area of hysteresis loop are called _____ A. Paramagnetic materials B. Diamagnetic materials C. Hard magnetic materials D. Soft magnetic materials	C
	22.	_____exhibit negative magnetic susceptibility. a) paramagnetic materials b) Diamagnetic materials c) ferromagnetic materials d) ferrimagnetic materials	B
	23.	Find the relative permeability of the ferromagnetic material if a magnetic field of strength of 220 A/m produces magnetization of 3300 A/m in it. A. 16 B. 10 C.41 D. 32	A
	24	 The ratio of absolute permeability of the material to the permeability of the free space is called as_____ a) Magnetic field(H)	C

		b) Magnetic Susceptibility (χ) c) relative permeability (μ_r) d) Magnetic Induction (B)	
	25.	In which of the following material, the magnetic moments align themselves parallel to each other in each domain without applying external magnetic field? A. Paramagnetic material B. Ferromagnetic material C. Antiferromagnetic material D. Diamagnetic material	B
	26.	Magnetic induction(B) varies non-linearly with magnetic field strength(H) in _____ A. Paramagnetic material B. Ferromagnetic material C. Diamagnetic material D. None of the above	B
	27.	Antiferromagnetic materials have orientation of neighbouring dipoles such that they are A. Opposite in direction and equal magnitudes B. Opposite in direction and unequal magnitudes C. Same direction and unequal magnitudes D. same direction and equal magnitudes	A
	28.	The ratio of magnetization to the magnetic field strength is known as A. Flux density B. Susceptibility C. Relative permeability D. None of the above	**B**
	29.	In Paramagnetic materials, Magnetic susceptibility is _____temperature a) independent of b) directly proportional to c) inversely proportional to d) none of above	C
	30.	The magnetic field strength in aluminium is 10^4 A/m. If the magnetic susceptibility is -0.25×10^{-4}, calculate the magnetization.	D

		A) -2.5x 10^2 A/m B) 2.5x 10^2 A/m C) -2.5 A/m D) -0.25 A/m	
	31.	The susceptibility of paramagnetic $FeCl_3$ is 3.7 $\times 10^{-3}$ at 27^0 C. What will be the susceptibility at 200K? A) 15.5 $\times 10^{-3}$ B) 18.5 $\times 10^{-3}$ C) 5.5 $\times 10^{-3}$ D) 29 $\times 10^{-3}$	C
	32.	The magnetic flux density within a bar of some material is 5 Tesla at an magnetic field H of 5 X 10^4 A/m. Compute the magnetic permeability for this material. A) 100 H/m B) 10 H/m C) 1x10^4 H/m D) 1x10^{-4} H/m	D
	33.	_____ is a product of pole strength and distance between the poles. a) Magnetic Susceptibility (χ) b) Magnetic dipole moment c) Magnetic induction(B) d) Magnetic permeability (μ)	B
	34.	Which of the following material has random dipole magnetic moments in absence of applied magnetic field? A. Ferrimagnetic material B. Antiferromagnetic material C. Paramagnetic material D. All of the above	C
	35.	The bar magnet has A. Dipole moment B. Monopole moment	A

		C. Both A and B D. None of the above	
	36.	The space around a magnet where its magnetic influence is experienced is known as _____ a) Magnetic induction b) Magnetic flux density c) Magnetic field (H) d) Monopole moment	C
	37.	The magnetic susceptibility of silicon is -0.4×10^{-5}. Calculate the flux density when magnetic field of intensity 4×10^4 A/m is applied.(Given $\mu_0 = 4\pi \times 10^{-7}$ H/m) A. 0.502 Wb/m^2 B) 5.02 Wb/m^2 C) 0.0502 Wb/m^2 D) 5.02 x $10^2 Wb/m^2$	C
	38.	In _____, the magnetization M is directed opposite to the direction of applied magnetic field a) paramagnetic materials b)Diamagnetic materials c) ferromagnetic materials d)ferrimagnetic material	B
	39.	Susceptibility is positive for A)Non-magnetic substances B)Diamagnetic substances C)Ferromagnetic substances D)None of the above	C
	40.	The magnetic materials exhibit the property of magnetization because of A. Orbital motion of electrons B. Spin of electrons C. Temperature D. Both A & B	D

	41.	In ---------- materials the magnetic moments of the two neighbouring atoms are antiparallel to each other and not of equal magnitudes. A. Ferrimagnetic materials B. Paramagnetic materials C. Diamagnetic materials D. Antiferromagnetic materials	A
	42.	The magnetic susceptibility of a paramagnetic material is A. Less than zero B. Small & positive C. Less than one & negative D. Equal to zero	B
	43.	---------- is the unit for expressing the magnetic moment of an electron caused by either of its orbital or spin angular momentum. A. Bohr Magneton B. Planks Constant C. Paramagnetic material D. Curie Law	A
	44.	The diamagnetic water is subjected to an external magnetic field of 10^5 A/m and gets magnetized to -5 A/m. The susceptibility is found to be …….. A. $-5x10^{-5}$ B. $5x10^{-5}$ C. $3x10^{-5}$ D. $5x10^{-3}$	A
	45.	The magnetic field intensity in a piece of a magnetic material is 10^5 A/m. If the susceptibility of the material at room temperature is 1.5 X 10^{-2}, calculate magnetization of material. A. 1500 A/m B. 150 A/m C. 15000 A/m D. None of above	A
	46.	The phenomena of spontaneous magnetization occurs in A. Paramagnetic material B. Diamagnetic material C. Ferromagnetic material D. None of above	C
	47.	Above the curie temperature, ferromagnetic material gets converted to --------- material. A. Diamagnetic B. Paramagnetic	B

		C. Ferrimagnetic D. Antiferromagnetic	
	48.	Above the Neel temperature, the material which gets converted to paramagnetic is ---------- A. Ferromagnetic B. Ferrites C. Antiferromagnetic D. Diamagnetic	C
	49.	Ferrimagnetic materials are ceramic materials which are ---------- A. Electrical insulators B. Electrical conductor C. Superconductor D. None of above	A
	50.	The materials used in high frequency applications are -------- A. Paramagnetic B. Diamagnetic C. Ferromagnetic D. Ferrimagnetic	D

Unit	Question Number	Questions with Options	Answer Key
Unit 4 **Superconductors**	1	A material that can conduct electricity without resistance is known as a_____ a) Superconductor. b) Conductor c) Insulator d) Magnetic material	a)
	2	_____is the phenomenon in which electrical resistance of materials suddenly disappears below certain temperature a) Magnetism b) Superconductivity c) Resistivity d) None of the above	b)
	3	The temperature at which a normal material changes into superconductor is called as _____ e) Persistent temperature f) Curietemperature	d)

		g) Neel temperature h) transition/critical temperature	
	4	At room temperature, Superconductors are ____conductorsof electric current. a) Good b) poor c) Very good d) None of the above	b)
	5	The susceptibility of a superconductor is a) positive and small b) positive and unity c) negative and less than one d) negative and unity	d)
	6	Materials which can display superconductivity are in _____state. a) Crystalline b) Polycrystalline c) Amorphous d) All of the above	d)
	7	A superconductor is characterized by ____electrical resistivity. a) zero b) infinite c) high d)All of the above	a)
	8	A steady current, which flows without diminishing in strength,around the loop of superconducting material even after removal of applied magnetic field, and continues to keep flowing, as long as the loop is held below the critical temperature is called as_____ a) Persistent current. b) Diffusion current c) Eddy current d) Hall current	a)
	9	Material in superconducting state goes into normal state above ---------- a)critical Electric field b) critical magnetic field c) critical pressure	b)

		d) None of the above	
	10	Superconducting state depends on_____ a) the strength of the magnetic field in which the materialisplaced b) An electric current flowing through thematerial c) Temperature of the material d) All of the above	d)
	11	As the current increases to a critical valueI_C, the associated magnetic field _____to H_C and the superconductivity disappears. a) Decreases b) Increases c)Lesser d) None of the above	b)
	12	If a ring of radius R of a superconductor loses its superconductivity at Hc, then critical currentIc is given by a) $H_c/2\pi R$ b) $2\pi R/H_c$ c) $2\pi RH_c$ d) $2\pi / RH_c$	c)
	13	When the temperature of superconductor isincreased, at $T = T_C$ and the material returns to the normal state and the magnetic flux suddenly_____ the material. a) vanishesthrough b) penetratesthrough c) becomes minimum through d) disappears through	b)
	14	If a superconductor is cooled below the critical temperature in presence of magnetic field, then the magnetic field lines are pushed out from the interior of the specimen. This phenomenon in superconductor is known as_____ a) suspension effect b) Silsbee effect c) Levitation effect. d) Meissner Effect	d)
	15	Meissner effect shows that in the superconductor the value of magnetic induction B is ____ a) 1 b) 0 c) Infinite	b)

		d) 2	
	16	The state in whichmagnetization(M) cancels the external magnetic field(H) completely is referredto as_____ a) perfect paramagnetism b) perfect diamagnetism c) perfect ferrimagnetism d) perfect ferromagnetism	b)
	17	If a small chip of superconducting material hangs on to a bigger magnet due toan effect which is known as _____ a)Levitation effect. b) Meissner Effect c)suspension effect d)Silsbee effect	c)
	18	A magnet repelled by a superconducting material when floats in the air , this effect is known as _____ a) Levitation effect b) Meissner Effect c)suspension effect d)Silsbee effect	a)
	19	London penetration depth is the distance from the surface of the superconductor to a point inside the material at which the intensity of magnetic field is _____ times the magnetic field at surface. a)1/c b) e c)1/h d) 1/e	d)
	20	According toLondon theory, the applied magnetic field strength _____from surface to the center . a) decreases linearly b) decreases exponentially c) Increases linearly d) Increases exponentially	b)
	21	_____is the effective depth to which a magnetic field penetrates the superconductor. a) Meissner penetration depth b) London penetration depth c)Bardeen penetration depth	b)

		d) Cooper penetration depth	
	22	The critical magnetic field at 5 K is 2×10^3 A/m in a superconductor ring of radius 0.02 m. Find the value of critical current. a) 651.4 A b) 951.4 A c) 251.4 A d) 601.4 A	c)
	23	The property shown by superconductors is____ a) Zero resistance b) Critical temperature c) Persistent current d) All of the above	d)
	24	Critical magnetic field a) does not depend on temperature b) increases with temperature c) decreases with increase in temperature d) does not depend on superconducting transition temperature	c)
	25	The transition temperature for Pb is 7.2 K. However, at 5 K it loses the superconducting property if subjected to magnetic field of 3.3×10^4A/m. Find the maximum value of H which will allow the metal to retain its superconductivity at 0 K. a) 9.37 $X10^4$ A/m b) 11.37 $X10^4$ A/m c) 6.37 $X10^4$ A/m d) 9.79 $X10^4$ A/m	c)
	26	The critical magnetic field at 3^0K is 4 X 10^3 A/m in a superconductor ring of radius 0.03m.Find the value of critical current a) 753.6 A b) 953.6 A c) 453.6 A d) 853.6 A	a)
	27	The superconductor materials whose superconductivity gets suddenly destroyed at a critical value of applied magnetic field(H_c) are known as	a)

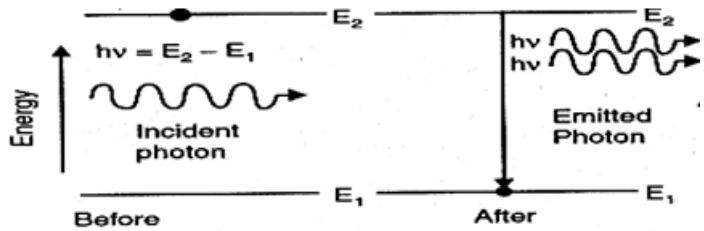
		a) Type I super conductors b) Type IIsuperconductors c) hard Magnetic materials a) d) Normal conductors	
	28	Find the critical magnetic field at 4^0K if the value of critical current is 251.4 A flowing through a superconductor ring of radius 0.02m. a) 5001.5923 A/m b) 2001.5923 A/m c) 8001.5923 A/m D) 7001.5923 A/m	b)
	29	In type II superconductors, magnetic field lines start entering the material when applied magnetic field is ------- a) between Hc1 and Hc2 b) less than Hc1 c) zero d) None of above	a)
	30	A superconducting material when placed in Magnetic field below critical temperature will a) Attract the magnetic field towards its centre b) Repel all magnetic field lines passing through it c) Attract the magnetic field but transfer it into concentrated zone d) Not influence the magnetic field	b)
	31	A superconducting material has a critical temperature of 4.9^0K, and a magnetic field of 0.459 Tesla at 0^0K. Find the critical field at 3^0K. a) 0.78694 A/m b) 0.98694 A/m c) 0.28694 A/m d) 0.78694 A/m	c)
	32	Type I superconductors are a) Paramagnetic materials b) Hard superconductors	c)

		c) Soft superconductors d) None of the above	
	33	Type II superconductors are a) Magnetic materials b) Hard superconductors c) Soft superconductors d) None of the above	b)
	34	According to London theory, the value of critical magnetic field for superconducting surface, is maximum at a) 0 K b) transition temperature c) room temperature d) none of these	a)
	35	Find the penetration depth of lead at 5.2 ^{0}K if the London penetration depth at 0 ^{0}Kis 44nm.The Critical temperature of lead is 7.193^{0}K. a) 51.6122 nm b) 81.6122 nm c) 10.6122 nm d) 21.6122 nm	a)
	36	Critical temperature $T_c$and Critical Field H_c for superconductor state is related as a) $H_c(T)= H_c(0) [1 + (T/T_c)^2]$ b) $H_c(T)= H_c(0) [1 + (Tc /T)^2]$ c) $H_c(T)= H_c(0) [1 - (Tc /T)^2]$ d) $H_c(T)= H_c(0) [1 – (T/T_c)^2]$	d)
	37	The critical temperature of mercury is 4.2 ^{0}K.Calculate the energy gap in Joules at 0^{0}K.(Given: Boltzmann constant=k=1.38x10^{-23}J/K) a) 30.40192x10^{-23}J b) 20.40192x10^{-23}J c) 40.40192x10^{-23}J d) 50.40192x10^{-23}J	b)
	38	For Hard superconductors which of the following is correct option? a) High critical field and transition temperature b) Incomplete Meissner effect c) Both a and b d) None of the above	c)

	39	Calculate the critical magnetic field for a wire of lead having a diameter of 1 mm at 4.2 K. The critical temperature for lead is 7.18 K and $H_C(0) = 6.5 \times 10^4$A/m. a) $8.28x10^4$A/m. b) $9.28x10^4$A/m. c) $4.28x10^4$A/m. d) $14.28x10^4$A/m.	c)
	40	According to BCS theory, if the energy gap is more between ground state and excited state the superconductor will be_____ a) unstable b) more stable c) no change in stability d) All of the above	b)
	41	In case of superconductors, Cooper pairs are formed in the material a) Below critical temperature as the thermal energy is not sufficient to disrupt the binding b) At high temperature as the thermal energy issufficient to form cooper pair c) None of these d) Both (a) and (b)	a)
	42	According to BCS theory, Magnetic flux enclosed by superconducting ring is _____ a) of any arbitrary value b) quantized c) Both (a) and (b) d) None of the above	b)
	43	A pair of free electrons coupled through a phonon is called a _____ a) phonon pair b) proton pair c) Cooper pair d) None of the above	c)
	44	The superconducting materials which lose superconductivity gradually with change in applied critical magnetic field from Hc1 to Hc2 are known as a) Type I	b)

		b) Type II c) Paramagnetic materials d) None of above	
	45	The mixed or intermediate state is not present in _____ a) Type I Superconductors b) Type II Superconductors c) Both (a) and (b) d) None of the above	a)
	46	Classification of superconductors is based on pattern of transition of superconducting state to normal state on application of_____ a) Hc b) Tc c) pressure c) All of above	a)
	47	The energy gap between cooper pair band (lower energy) and normal electron band (of higher energy) is maximum at___ a) T= T_c b) T=0 K c) T= Room temperature d) None of the above	b)
	48	Maglev train works on principle of a) Magnetism b) Magnetic levitation c) Attraction between two strong magnets d) All of the above	b)
	49	Identify correct statement from the following a) Good conductors of electricity when cooled down below Tc need not behave as superconductors. b) Every good conductor when cooled down below Tc is converted into superconductor. c) All good conductors of electricity aboveTcare converted into superconductors. d) Temperature does not play any role in superconductivity.	a)
	50	The value of critical magnetic field (H_c) is very low in a) Type I superconductors b) Type II superconductors c) Both (a) and (b) d) None of the above	a)

Unit	Question Number	Questions with Options	Answer Key
Unit 5 LASERS	**1**	The process of forced photon emission by an excited atom under the influence of external agent is called _____ a) Spontaneous Emission b) Stimulated Emission c) Induced absorption d) amplified Emission	**b**
	2	The population of various energy levels of a system in thermal equilibrium is given by a) Boltzmann distribution b) Einstein relation c) Planks law d) Beers Law	**a**
	3	The number of stimulated emission transitions taking place in the material medium is proportional to _____ a) the number density of atoms (N_1) in the lower state E_1 and incident photon density Q b) the number density of atoms (N_2) in the upper state $E_2$and incident photon density Q c) the number density of atoms (N_1) in the lower state E_1 d) the number density of atoms (N_2) in the upper state $E_2$and the number density of atoms (N_1) in the lower state E_1	**b**
	4	Optical resonance cavity is not required in a) Ruby laser b) He-Ne laser c) Co_2 laser d) Semiconductor laser	**a**
	5	Laser output is continuous when _____level pumping scheme is used a) Three level b) Four level c) Two level d) Any of the above	**b**
	6	In He- Ne laser the ratio of He and Ne is : a) 1:10 b)1:1 c) 100 : 1 d) 10:1	**d**
	7	According to Boltzmann distribution law a) $N_2/ N_1 = \exp \frac{\Delta E}{kT}$	**b**

		b) $N_2/ N_1 = \exp\frac{-\Delta E}{kT}$ c) $N_2/ N_{12} = \exp\frac{\Delta E}{T}$ d) $N_2/ N_1 = \exp\frac{-\Delta E}{kT}$	
	8	Optical pumping is used in: a) He- Ne laser b) Ruby laser c) semiconductor laser d) CO2 laser	**b**
	9	Population inversion is achieved by electric discharge method in: a) He- Ne laser b) Ruby laser c) semiconductor laser d) CO2 laser	**a**
	10	What is the full form of LASER? a) Light Absorbent and Stimulated Emission of Radiations b) Light Absorbing Solar Energy Resource c) Light Amplification by Stimulated Emission of Radiation. d) Light Amplification of Singular Emission of Radiations	**c**
	11	Which of the following is not a characteristic of LASERS? a) Monochromatic b) Coherent c) Highly Divergent d) Intense	**c**
	12	Compute the coherence length of yellow light with 5893 Å in 10^{-12} sec pulse duration. Also find the band width. a) l_{coh}=3 x 10^{-6} m and $\Delta\lambda$= 13.57 Å b) l_{coh} =3 x 10^{-4} m and $\Delta\lambda$= 11.57 Å c) l_{coh} =3 x 10^{-8} m and $\Delta\lambda$= 15.57 Å d) None	**b**
	13	The following graph is pictorial representation of _____  a) Spontaneous emission b) Spontaneous Absorption c) Stimulated emission d) Stimulated Absorption	**c**
	14	White light has frequency range from 0.4 x 10^{15} Hz to 0.7 x	**b**

		10^{15} Hz. Find the coherence time. a) t_{coh} =3.33 x 10^{-18} sec. b) t_{coh} =3.33 x 10^{-15} sec. c) t_{coh} =3.83 x 10^{-15} sec. d) t_{coh} =3.66 x 10^{-15} sec.	
	15	If light of 6600A^0 wavelength has wave train 20 λ long, what will be its coherence length? a) **1.32 x 10^{-5}** m b) **9.32 x 10^{-5}** m c) **6.32 x 10^{-5}** m **d) 1.32 x 10^{-10}** m	**a**
	16	He-Ne laser is a a) three level laser b) four level laser c) two level laser d) five level laser	**b**
	17	High energy is required to obtain population inversion when____is involved in Lasing action (a) Excited state (b) Meta stable state (c) Ground state (d) None of the above	**c**
	18	The reason for narrow tube in He-Ne laser is to (a) bring Ne atoms to ground state by collision with tube wall (b) Increase stimulated emission (c) there is no effect of narrow tube on He-Ne Laser (d) atomic collision with tube wall constant	**a**
	19	The active centres in He-Ne laser is (a) He (b) Ne (c) He-Ne (d) All are correct	**b**
	20	The role of He in He-Ne laser is (a) He is an active medium (b) population inversion takes place in He (c) Stimulated emission takes place in He (d) to excite Ne atoms by colliding with it	**d**
	21	Metastable state has life time approximately---------- (a) 10^{-3} s to 10^{-6} s (b) 10^{-8} s to 10^{-12} s (c) 10^{-10} s to 10^{-14} s (d) 10^{-12} s to 10^{-15} s	**a**
	22	An excited state(except metastable state)has life time about (a) 10^{-3} s (b) 10^{-8} s (c) 10^{-15} s	**b**

		(d) 10^{-20} s	
	23	Population inversion in laser means (a) number of atoms in ground state are more than number of atoms in excited state (b) number of atoms in ground state are less than number of atoms in excited state (c) number of atoms in ground state is equal to number of atoms in excited state (d) none	**b**
	24	A typical He-Ne Laser emits radiation of wavelength 6328 Å. How many photons per second would be emitted by one milli - Watt He-Ne Laser? a) N =9.18x 10^{15}/sec b) N =3.18x 10^{15}/sec c) N =1.18x 10^{15}/sec d) N =1.08x 10^{15}/sec	**B**
	25	Example of solid state laser is (a) He-Ne Laser (b) CO_2 Laser (c) Ruby Laser (d) Dye Laser	**C**
	26	If the half-width of a CO_2 laser is 60 MHz, calculate the coherence length of the laser. a) 5m b)10 m c) 15 d) 20m	**A**
	27	The number of stimulated / Induced absorption transitions taking place in the material medium is proportional to a) the number density of atoms (N2) in the upper state E2 b) the number density of atoms (N1) in the lower state E1 and incident photon density Q c) the number density of atoms (N2) in the upper state E2 and the incident photon density Q **d)** the number density of atoms (N1) in the lower state E1 and the number density of atoms (N2) in the upper state E2	**B**
	28	Ruby laser is a _____ level laser. a) Three b) Four c) Five d) Two	**A**
	29	The process of supplying energy to the medium to achieve the state of population inversion is known as ------ a) stimulated or induced absorption	**b**

		b) pumping c) spontaneous emission d) stimulated emission	
	30	What is the output in wavelength of Helium-Neon laser? a) 6943 Å b) 6328 Å c) 5400 Å d) 8000 Å	**B**
	31	What is the output in wavelength of Ruby laser? a) 6943 Å b) 6328 Å c) 5400 Å d) 8000 Å	**A**
	32	The characteristics of Laser are a) Monochromaticity b) Coherence c) high directionality d) all of the above	**D**
	33	In ruby Laser which ions give rise to laser action? a) Al_2O_3 b) Cr^{3+} c) Al^{3+} d) O-	**B**
	34	The material in which the population inversion is achieved is called as a) Active medium b) metastable state c) passive medium d) stable states	**A**
	35	Output of Ruby laser is a) Continuous b) polychromatic c) pulsating d) All of the above	**C**
	36	Output of the He – Ne laser is a) Continuous b) polychromatic c) pulsating d) All of the above	**A**
	37	Role of optical resonance cavity is to_____ . a) Impart monochromaticity b) Impart high collimation c) Increase intensity d) All of the above	**D**
	38	A negative temperature state is referred to as a state of (a) Population inversion (b) Pumping (c) Excitation	**A**

		(d) None.	
	39	The requirements for getting a LASER are (a) Population inversion, (b) Resonance cavity (c) High power pumping (d) All of the above	**d**
	40	The de-excitation of Ne-atoms to the ground state by collision with tube wall in He-Ne laser can be achieved by (a) reducing wall diameter (b) increasing wall diameter (c) maintaining He-Ne at different pressures (d) Spontaneous emission	**A**
	41	Incoherent light is due to (a) stimulated emission (b) spontaneous emission (c) stimulated Absorption (d) pumping	**B**
	42	Compute the coherence length of light with wavelength 6328Å in 10^{-9} sec pulse duration. a) 0.2 m b) 0.3 m c) 0.4 m d) 0.5 m	**B**
	43	The light from a laser source is monochromatic because all the photons a) have same wavelength b) are in phase c) have same amplitude d) are in the same direction	**A**
	44	Calculate the population ratio of two states in a laser that produces light of wavelength 7000Å at 27^0 C. a) $N_2/N_1 = 1.6046 \times 10^{-30}$ b) $N_2/N_1 = 7.6042 \times 10^{-30}$ c) $N_2/N_1 = 10.6042 \times 10^{-30}$ d) $N_2/N_1 = 9.6042 \times 10^{-30}$	**A**
	45	If coherence length increases _____ increases. a) Spatial coherence b) Temporal Coherence c) Divergence d) Intensity	**B**
	46	Optical cavity resonator consists of a hollow tube fitted with two end mirrors and _____side walls. a) Opaque b) Wooden c) transparent d) pumping	**C**
	47	Laser light is intense because a) it has very less number of Photons that in phase	**c**

		b)it has very less number of Photons that are not in phase c) it has very large number of Photons that are in phase d) it has very large number of Photons that are not in phase	
	48	When two or more waves are in phase with each other at a fixed point in the space at different time intervals is known as_____ a) Temporal coherence b) Spatial coherence (c) None of the above d) both a) and b)	**A**
	49	When two or more waves are in phase with each other at different points in the space at a fixed time interval is known as_____ a) Temporal coherence b) Spatial coherence c) None of the above d) none of these.	**B**
	50	_____means the coordinated motion of several waves maintaining a fixed and predictable phase relationship with each other. a) Coherence b) Divergence c) Monochromaticity d) directionality	**A**

Units	**Question Number**	**Questions with Options**	**Answer Key**
Unit VI Nanoscience and Nanomaterials	**1**	Which of the following method is an example of Top- down approach? a) Sol gel method b) Ball Mill method c) Both a and b d) None of these	**b)**
	2	Properties of Nanomaterials and bulk materials are drastically____ a) Same b) Different c) Both (a) and (b) d) None of these	**b)**
	3	Which of the following method is an example of Bottom up approach? a) Sol gel method b) Ball Mill method c) Both a and b d) None of these	**(a)**
	4	Sol gel method is a ----------process for preparation of nanomaterials . a) Chemical synthesis b) Physical synthesis c)Pulsed laser d)Microwave irradiation	**(a)**
	5	Nanomaterials are classified on the basis of ------	**(b)**

		a) range b) number of dimensions c) material d) nature of material	
	6	Starting material in sol gel method is called _____. a) sol b) gel c) sol gel d) colloidal suspension	**(a)**
	7	In sol gel method, suspension in the colloidal solution that keeps its shape is called _____. a) sol b) gel c) sol gel d) Colloidal	**(b)**
	8	In sol gel method, precursor is activated by addition of ---------- a) Acid b) Base c) Both (a) and (b) d) self activated	**(c)**
	9	What's the order of size in nanomaterials? a) 10^{-1}m b)10^{-7}m c) 10^{-9}m d) 10^{-8}m	**(c)**
	10	The framework of zeolite have ---------- structure. a) octahedral b) polyhedral c) tetrahedral d) none of above	**(c)**
	11	Drastic changes in properties of nanomaterials compared to bulk materials are due to_____ a) Increase in surface area to volume ratio b) Quantum confinement c) Decrease in surface to volume ratio d) Both (a) and (b)	**(d)**
	12	In nano materials separation between allowed energy levels is _____ a) Same as that of isolated atom b) Greater than that of isolated atom c) Same as that in solids d) Intermediate between isolated atom and solids	**(d)**
	13	Graphene is a ---------- layer of carbon atoms densely packed into benzene ring structure. a) double b) Triple c) Single	**(c)**

		d) None of above	
	14	Perfect graphene consists of …….cells. a) Tetragonal b) Hexagonal c)Pentagonal d) Octagonal	**(b)**
	15	Optical properties and electronic properties are mainly altered due to- a) Quantum confinement b) Zeolite c) Catalysation d) All of these	**(a)**
	16	_____is an example of three dimensional nanomaterials. a) Polycrystalline b) Nanowire c) Quantum dots d) Nanorod	**(a)**
	17	The crystalline solids having micropores in it and the structure is well defined are called as_____. a) Graphene b) Zeolite c) Quantum d) Zinotic	**(b)**
	18	Nanoscale materials have_____ surface to volume ratio making them ideal. a) Very low b) Very high c) Constant d) Lowest	**(b)**
	19	Due to increased surface area at nanoscale____ a) Interatomic distance changes b) Interatomic distance remains unchanged c) Interatomic distance changes occasionally d) None of these	**a)**
	20	Which method is used for synthesis of nanomaterials? a) Bottom- up approach b) Top- down approach c) Bottom top approach d) Both a and b	**(d)**
	21	In ball mill method the cylinder rotates around which axis? a) vertical axis b) horizontal axis c) frontal axis d) transverse axis	**(b)**
	22	Ball mill is used for _____. a) crushing	**(c)**

		b) coarse grinding c) fine grinding d) attrition	
	23	Lighter and stronger materials are useful in manufacturing _____ a) Aircraft b) Computer c) T.V. d) All of The Above	**(d)**
	24	Macroscopic and microscopic properties can be varied at the nanoscale of the material without changing _____composition a) Chemical b) Physical c) Both d) None	**(a)**
	25	Due to nanotechnology electronic circuit can be_____ and _____. a) Smaller and slower b) Smaller and faster c) Larger and faster d) Larger and slower	**(b)**
	26	When a material is reduced to nanoscale the following change is observed in its magnetic properties. a) Only one domain is formed in ferromagnetic materials b) Lowering of magnetic Coercivity c)Both a & b d)None of these	**(c)**
	27	Which of the following are examples of one dimensional nanomaterials? a) Nanowire b) Nanotubes c) Nanosheet d)both a and b	**(d)**
	28	Advantage of sol gel is very _____production cost. a) High b) Medium c) Low d) None	**(c)**
	29	Zeolite are crystalline solids having ---------- in it and its structure is well defined. a) microparticles b) micropores c) nanoparticles d) none of above	**(b)**
	30	In conducting materials, as the size of the material reduces its -	**(b)**

		---------- a) conductivity decreases b) conductivity increases c) crystal defects increases d) impurity in the crystal increases	
	31	Which of the following sentence is true? a) Physical state changes at nanoscale for some metals b) Physical state can't be changed at nanoscale for any material c) Transition temperature remain same for all nanomaterials d) Mechanical properties of nanomaterials are same as that of bulk materials	**(a)**
	32	Which of the following process is used in sol gel method? a) Gelation b) Precipitation c)Hydrothermal d) All of the above	**(d)**
	33	What is the structure of Zeolite? a) Non-porous b) Porous c) Rigid d) none of the above	**(b)**
	34	The only difference between colloidal and polymeric sol gel method is_____. a) Use of different precursor b) Use of different starting material c) Both (a) and (b) d) None of above	**(c)**
	35	In nanomaterials ,due to Quantum confinement effect, energy gap ------- a) Increases compared to solids b) decreases compared to solids c) does not change d) none of above	**a)**
	36	Chemical reactivity of nanomaterials _____compared to bulk materials a) Increases b) decreases c) Remain unchanged d) None of the above	**(a)**
	37	When semiconductors are reduced to nanomaterials they become _____. a) Pure conductors b) Insulators c) Poor conductors d) Semiconductors	**(b)**

	38	Which factor makes nanomaterial ideal for chemical energy storage, reacting system, etc.? a) High surface area to volume ratio b) Low surface area to volume ratio c) Their large structure d) None of these	**(a)**
	39	Change in melting point of material as it reduces from bulk to nano-size is due to a) large surface to volume ratio b) Quantum confinement c) low pressure d) low temperature	**a)**
	40	The change in electron energy levels due to very small particle size which is of the order of an electron wavelength is known as___ a) Quantum confinement b) Intermediate confinement c) Macroparticles confinement d) None of above	**(a)**
	41	Nanomaterials are used in which of the following fields a) Textile b) Optics c) Electronics d) All of these	**(d)**
	42	Use of nanomaterials in the field of computers _____the storage density of Hard disk . a) Increases b) Decreases c) Reamains same d) none of above	**(a)**
	43	In ball mill method when cylinder rotates ---------- force is produced a) Centripetal b) Centrifugal c) Frictional d) Magnetic	**(b)**
	44	Which of the following properties are altered at nanoscale? a) Electrical b) Mechanical c) Optical d) All of the above	**(d)**
	45	Which of the following is a good example of zero -dimensional nano materials? a) Quantum dots b) Fullerenes c) Nanosphere d) All of these	**(d)**

	46	What is/are the advantages of sol gel method? a) Produces ultra high purity material b) Very low production cost c) Low temperature for processing d) All of the above	**(d)**
	47	What is the property of Graphene? a) Chemically less reactive b) Electrical conductivity Is low c) Its very soft d) It is perfect thermal Conductor.	**(d)**
	48	What are the major applications of zeolite? a) Petrochemical cracking b) Separation of gases and solvents c) Softening and purification d) All of the above	**(d)**
	49	Which of the following is the property of zeolite? a) Chemical most reactive thermal b) Conductor Perfect c) Catalysis d) None of the above	**(c)**
	50	When material is reduced to the nanoscale, no. of atoms available on the surface area/unit volume____ a) Increases b) Decreases c) Both a and b d) None of the above	**(a)**