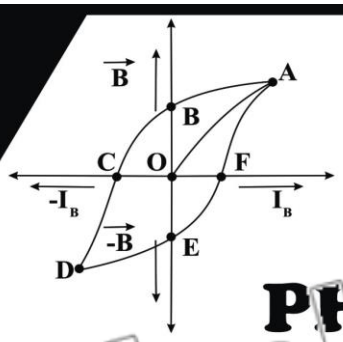

Chapter 17

PHYSICS OF SOLIDS

TOPICAL MULTIPLE CHOICE QUESTIONS

Topic 17.1:

Classification of Solids

(1) Solids are classified into
(a) 4 types **(b)** 3 types
(c) 2 types **(d)** 6 types

(2) The solids in which there is a regular arrangement is called
(a) Amorphous solids **(b)** crystalline solids
(c) glassy solids **(d)** polymeric solids

(3) Which solids are also called glassy solids
(a) amorphous solids **(b)** polymeric solids
(c) crystalline solids **(d)** both a and b

(4) The crystalline solids
(a) has no definite melting point **(b)** has definite melting point
(c) does not melt **(d)** has melting point

(5) Which of the following is example of crystalline solids
(a) plastics **(b)** glass
(c) rubbers **(d)** zirconia

(6) The branch of physics which is concerned with nature and properties of matter in solids is called
(a) Solid state physics **(b)** Atomic physics
(c) Nuclear physics **(d)** Particle physics

(7) The arrangement of molecules, atoms or ions in crystalline solids can be studied by
(a) infrared rays **(b)** ultraviolet rays
(c) X-rays. **(d)** light waves

(8) The word amorphous means
(a) a particular shape **(b)** without structure
(c) without form **(d)** both b and c

(9) Polymeric solids have _____ as compared with lightest metals
(a) high specific gravity **(b)** low specific gravity
(c) specific gravity equal to lightest metals **(d)** none of these

(10) Plastics and synthetic rubbers are
(a) polymeric solids **(b)** crystalline solids
(c) crystal lattice **(d)** amorphous solids

(11) The formula for the natural rubber is
(a) $(C_4H_6)_n$ **(b)** $(C_6H_4)_n$
(c) $(C_5H_6)_n$ **(d)** $(C_3H_6)_n$

(12) Polymers can be classified as partially or poorly
(a) amorphous solids **(b)** glassy solids
(c) crystalline solids **(d)** crystal lattice

(13) The atoms of molecules in a crystalline solids are held together by
(a) Cohesive forces **(b)** Gravitational forces
(c) Adhesive forces **(d)** Attractive forces

(14) The structure of NaCl is
(a) Hexagonal **(b)** Octagonal
(c) Cubical **(d)** Tetrahedral

(15) The whole structure obtaining by the repetition of unit cell is called
(a) crystal lattice **(b)** polythene
(c) cubical lattice **(d)** parabolic lattice

(16) Glass is known as
(a) solid gas **(b)** solid liquid
(c) liquid gas **(d)** all of these

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(17) Which one of the following is a polymeric solid GRW-2019 (G-II)
(a) glass **(b)** nylon
(c) copper **(d)** zinc

(18) A solid having regular arrangement of molecules throughout its structure is called SGD-2017 (G-I)
(a) amorphous solid **(b)** polymeric solid
(c) glassy solid **(d)** crystalline solid

(19) The number of crystal systems are SWL-2017, LHR-2022 (G-I)
(a) three **(b)** five
(c) seven **(d)** fifteen

(20) In cubical crystal, all the sides meet at: LHR-2022 (G-II)
(a) Acute angle **(b)** Abtuse angle
(c) Right angle **(d)** 45°

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(21) Which of the following is an amorphous solid?
(a) Glass **(b)** Diamond
(c) Salt **(d)** Sugar

Topic 17.2:

Mechanical Properties of Solids

(22) The force applied on a unit area to produce any change in shape, volume or length of a body is called
(a) tensile strain **(b)** stress
(c) tensile stress **(d)** strain

(23) The measure of deformation of a solid when stress is applied to it is called
(a) strain **(b)** stress
(c) tensile stress **(d)** shear stress

(24) When the stress changes the length it is called
(a) strain **(b)** stress
(c) tensile stress **(d)** shear stress

(25) The unit of stress is
(a) Nm^{-2} **(b)** Nm
(c) Nm^{-1} **(d)** no unit

(26) The stress is expressed by a symbol of

(a) ε **(b)** σ
(c) G **(d)** ω

(27) The fractional change in length is called
(a) tensile strain **(b)** shear strain
(c) tensile stress **(d)** shear stress

(28) The dimension of strain is
(a) $[MLT^{-2}]$ **(b)** $[ML^{-1}T^{-2}]$
(c) $[ML^{2}T^{-1}]$ **(d)** Dimensionless

(29) The tensile strain is produced due to
(a) shear strain **(b)** volumetric stress
(c) tensile stress **(d)** shear stress

(30) The volumetric strain can be expressed as
(a) $\frac{\Delta V}{V_o}$ **(b)** $\frac{\Delta l}{l_o}$
(c) $\Delta V \times V_o$ **(d)** $\frac{F}{A}$

(31) Modulus of elasticity is expressed as
(a) $\frac{stress}{strain}$ **(b)** $\frac{strain}{stress}$
(c) $stress \times strain$ **(d)** $\frac{1}{stress \times strain}$

(32) The unit of Modulus of elasticity
(a) joule **(b)** newton
(c) no unit **(d)** pascal

(33) The ratio of applied stress to volumetric strain is called
(a) Young's modulus **(b)** shear modulus
(c) Bulk modulus **(d)** compressive modulus

(34) Mathematically shear modulus is given by
(a) $G = \frac{F/A}{strain}$ **(b)** $Y = \frac{F/A}{\Delta l/l}$
(c) $G = \frac{F/A}{\Delta V/V}$ **(d)** $G = \frac{F/A}{\tan\theta}$

(35) The relation for the Bulk modulus is expressed as
(a) $G = \frac{F/A}{\tan\theta}$ **(b)** $Y = \frac{F/A}{V/\Delta V}$
(c) $K = \frac{F \times V}{A \times \Delta V}$ **(d)** $K = \frac{F \times A}{V \times \Delta V}$

(36) The ratio of shear stress and shear strain is called
(a) Young's modulus **(b)** shear modulus
(c) Bulk modulus **(d)** compressive modulus

(37) The greatest stress that a material can endure without losing straight line proportionality between stress and strain is called
(a) proportional stress **(b)** UTS
(c) elastic stress **(d)** fracture stress

(38) The maximum stress which a body can bear is called
(a) yield stress **(b)** elastic limit
(c) plasticity **(d)** UTS

(39) If the stress is increased beyond the yield stress and the specimen does not recover its original shape, this kind of behavior is called
(a) proportional limit **(b)** elastic limit
(c) plasticity **(d)** UTS

(40) The substances undergoing plastic deformation until they break are known as
(a) brittle substances **(b)** ductile substances
(c) elastic substances **(d)** plastic substances

(41) Which one is the example of ductile substances
(a) copper **(b)** wrought iron
(c) lead **(d)** all of these

(42) The substances which break just after the elastic limit are called
(a) brittle substances **(b)** ductile substances
(c) elastic substances **(d)** plastic substances

(43) The example of brittle substances is
(a) lead **(b)** glass
(c) high carbon steel **(d)** both b and c

(44) Nm^{-2} is called
(a) Ohm **(b)** Pascal
(c) Volt **(d)** Ampere

(45) The UTS is denoted by
(a) σ_m **(b)** σ_p
(c) ε_m **(d)** ε_p

(46) When a force is applied on a wire of length 'l' which results in an increase in length then the stress is known as
(a) tensile stress **(b)** tensile deformation
(c) shear stress **(d)** volumetric stress

(47) By applying stress, when the shape of body is changed then the stress is said to be
(a) tensile stress **(b)** volumetric stress
(c) compressional stress **(d)** shear stress

(48) The permanent deformation is called
(a) elastic deformation **(b)** tensile deformation
(c) plastic deformation **(d)** compressive deformation

(49) The strain energy can be obtained by considering area under
(a) force – energy graph **(b)** stress – strain graph
(c) force-stress graph **(d)** force-extension graph

(50) The value of Young's Modulus for water
(a) $80 \times 10^9\ Nm^{-2}$ **(b)** zero
(c) $70 \times 10^9\ Nm^{-2}$ **(d)** $2.2 \times 10^9\ Nm^{-2}$

(51) Young's modulus for copper is
(a) $110 \times 10^9 Nm^{-2}$ **(b)** $200 \times 10^9 Nm^{-2}$
(c) $70 \times 10^9 Nm^{-2}$ **(d)** 0

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(52) Dimensions of strain are same as that of. GRW-2022 (G-I)
(a) Stress **(b)** Pressure

(c) Young's modulus **(d)** Relative permittivity

(53) Which are the substance called _____ which undergo plastic deformation until they break. **MTN-2019 (G-I), SGD-2022 (G-II)**

(a) brittle **(b)** ductile
(c) amorphous **(d)** polymeric

(54) Which one is not a ductile material: **BWP-2017 (G-I)**

(a) lead **(b)** steel
(c) copper **(d)** wrought iron

(55) The Young's Modulus of Mercury is: **BWP-2019 (G-II)**

(a) 70×10^{9} Nm^{-2} **(b)** 15×10^{9} Nm^{-2}
(c) zero **(d)** 91×10^{9} Nm^{-2}

(56) The crystalline structure of NaCl is. **MTN-2022 (G-I)**

(a) tetragonal **(b)** cubical
(c) hexagonal **(d)** trigonal

(57) Example of a ductile material is. **BWP-2022 (G-I)**

(a) Glass **(b)** Wood
(c) Lead **(d)** Diamond

(58) Which one is not a ductile material?

(a) lead **(b)** copper **RWP-2022 (G-II)**
(c) steel **(d)** iron

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(59) Product of stress and strain is equal to

(a) Energy density **(b)** Twice of energy density
(c) Half of energy density **(d)** Reciprocal of energy density

(60) Which of given is not correct for strain energy per unit volume stored in a deformed material

(a) $\frac{1}{2}\text{Stress}\times\text{Strain}$ **(b)** $\frac{1}{2}\times y\times(\text{Strain})^{2}$

(c) $\frac{1}{2}\times y\times(\text{Stress})^{2}$ **(d)** None of these

(61) For a perfectly rigid body Young's modulus is

(a) 0 **(b)** 1 **(c)** Infinity **(d)** Minimum

Topic 17.3:

Electrical Properties Of Solids

(62) Those substances which have valence electrons tightly bound to their atoms are called

(a) conductors **(b)** insulators
(c) super conductors **(d)** semi conductors

(63) Those substances which have intermediate range of conductivities are called

(a) conductors **(b)** insulators
(c) super conductors **(d)** semi conductors

(64) The insulators have conductivities range in between

(a) 10^{-1} and 10^{-20} $(\Omega m)^{-1}$ **(b)** 10^{-10} and 10^{-20} $(\Omega m)^{-1}$
(c) 10^{-6} and 10^{-4} $(\Omega m)^{-1}$ **(d)** 10^{7} and 10^{-1} $(\Omega m)^{-1}$

(65) The conductors have the conductivities of the order of

(a) 10^{-1} $(\Omega m)^{-1}$ **(b)** 10^{7} $(\Omega m)^{-1}$
(c) 10^{6} $(\Omega m)^{-1}$ **(d)** 10^{3} $(\Omega m)^{-1}$

(66) The semi-conductors have the conductivities of the order of
(a) 10^{-1} and 10^{-20} $(\Omega m)^{-1}$ **(b)** 10^{-10} and 10^{-20} $(\Omega m)^{-1}$
(c) 10^{-6} and 10^{-4} $(\Omega m)^{-1}$ **(d)** 10^{7} and 10^{-1} $(\Omega m)^{-1}$

(67) Which theory explain the electrical properties of material
(a) Rutherford atomic model theory **(b)** Energy band theory
(c) Bohr atomic model theory **(d)** de Broglie theory

(68) The number of bands necessary for electrical conduction
(a) 2 **(b)** 4
(c) 5 **(d)** 3

(69) There is large number of energy states between valance and conduction bands
(a) which can occupied by electrons **(b)** which cannot be occupied by electrons
(c) which can occupied by neutrons **(d)** which occupied by protons

(70) A single crystal of silicon formed after the addition of pentavalent substance is called
(a) n-type substance **(b)** p-type substance
(c) p-n type substances **(d)** n-p-n substances

(71) P-type substances formed after
(a) addition of pentavalent substance **(b)** addition of divalent substances
(c) addition of trivalent substance **(d)** addition of mono-valet substance

(72) In which materials the valence electrons are bound very tightly to their atoms and are not free
(a) n-type semiconductors **(b)** conductors
(c) p-type semiconductors **(d)** insulators

(73) Conductors are those which have
(a) plenty of free electrons **(b)** plenty of free protons
(c) large number of free neutrons **(d)** all of these

(74) The band below the forbidden gap is called
(a) conduction band **(b)** valence band.
(c) empty band **(d)** insulation band

(75) In a solid the valance band of an atom
(a) is always filled with electrons **(b)** is always empty
(c) is never empty **(d)** none of these

(76) In semiconductors, at which temperature there are no electrons in the conductions band
(a) 0 K **(b)** 373 K
(c) 273 K **(d)** 310 K

(77) Semi conductors are those materials which at room temperature have
(a) completely filled valence band **(b)** very thick forbidden gap
(c) partially filed conduction band **(d)** all of these

(78) The forbidden gap in semiconductors is of the order of
(a) 5 eV **(b)** 1 eV
(c) 50 ev **(d)** 10 eV

(79) At 0K the silicon becomes a
(a) conductor **(b)** p-type semiconductor
(c) perfect insulator **(d)** n-type semiconductor

(80) The conduction band lies
(a) between valance band and forbidden gap **(b)** below the valance band
(c) above the forbidden gap **(d)** below the forbidden gap

(81) In insulators the energy gap is
(a) very large **(b)** very narrow

(c) moderate **(d)** does not present

(82) The Si and Ge lies in the _____ group of periodic table
(a) 3^{rd} **(b)** 4^{th}
(c) 5^{th} **(d)** 1^{st}

(83) A semiconductor in its extremely pure form is called
(a) intrinsic semi-conductors **(b)** extrinsic insulators
(c) extrinsic semi-conductors **(d)** intrinsic conductors

(84) The process of adding a small amount of impurity into the pure semiconductors material is called
(a) Hooping **(b)** doping
(c) mixing **(d)** saturating

(85) The doped semi-conductors materials are called
(a) intrinsic semi-conductors **(b)** extrinsic insulators
(c) extrinsic semi-conductors **(d)** intrinsic conductors

(86) The ratio of doping atoms to the semiconductor atom is
(a) $1:10^6$ **(b)** $1:10^9$
(c) $10^6:1$ **(d)** $10^8:1$

(87) The pure Si and Ge at room temperature are called
(a) intrinsic semi-conductors **(b)** extrinsic insulators
(c) extrinsic semi-conductors **(d)** intrinsic conductors

(88) The intrinsic semi-conductor elements have atoms with
(a) 3 valance electrons **(b)** 8 valence electrons
(c) 4 valence electrons **(d)** 5 valence electrons

(89) Which of the following is the Pentavalent elements?
(a) arsenic **(b)** antimony
(c) phosphorous **(d)** all of these

(90) Conductivity of semi-conductor rises due to
(a) rise in temperature **(b)** decrease in temperature
(c) constant temperature **(d)** none of these

(91) Which element is trivalent
(a) arsenic **(b)** boron
(c) phosphorous **(d)** antimony

(92) In n-type semiconductors the majority charge carriers are
(a) holes **(b)** free electrons.
(c) diodes **(d)** protons

(93) The p-type semi-conductor is obtained by doping with
(a) trivalent impurity **(b)** hexavalent impurity
(c) divalent impurity **(d)** pentavalent impurity

(94) When a battery is connected to a semi-conductor it establishes
(a) an electric field **(b)** gravitational field
(c) magnetic field **(d)** all of these

(95) In semiconductors, the current flows due to
(a) holes **(b)** electrons
(c) both a & b **(d)** none of these

(96) The kinds of charge carriers in semi-conductors are
(a) 1 **(b)** 3
(c) 4 **(d)** 2

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(97) At 0 K, semi conductors are: LHR-2017 (G-I)

(a) conductor **(b)** insulators
(c) perfect conductors **(d)** perfect insulators

(98) In n-type material, minority charge carriers are: LHR-2017 (G-I)
(a) free electrons **(b)** holes
(c) protons **(d)** mesons

(99) In extrinsic semi-conductors, doping is of the order of: DGK-2017 (G-II), GRW-2019 (G-I), MTN-2019 (G-II)
(a) 1 atom to 10^4 **(b)** 1 atom to 10^8
(c) 1 atom to 10^{16} **(d)** 1 atom to 10^6

(100) In P-type substances, the minority charge carries are GRW-2019 (G-II)
(a) holes **(b)** protons
(c) electrons **(d)** neutrons

(101) Good conductors have conductivities of the order of: LHR-2019 (G-II)
(a) $10^{-7}\,(\Omega m)^{-1}$ **(b)** $10^{7}\,(\Omega m)^{-1}$
(c) $10^{2}\,(\Omega m)^{-1}$ **(d)** $10^{-2}\,(\Omega m)^{-1}$

(102) Which one of the following is not semiconductor? GRW-2022 (G-II)
(a) Germanium **(b)** Silicon
(c) Aluminium **(d)** Gallium arsenide

(103) Which one belongs to trivalent group? RWP-2019 (G-I)
(a) Aluminium **(b)** Antimoney
(c) Phosphorous **(d)** Arsenic

(104) A semiconductor will behave as an insulator at temperature BWP-2022 (G-II), RWP-2022 (G-I)
(a) 0 K **(b)** 0^oC
(c) 10 K **(d)** 10^oC

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(105) At absolute zero temperature a crystal of pure Germanium
(a) Behave as perfect conductor **(b)** Contains no electron
(c) Behave as perfect insulator **(d)** Behaves as superconductor

(106) A completely filled band is called:
(a) Conduction band **(b)** Valence band
(c) Forbidden band **(d)** Core band

Topic 17.4:

Superconductors

(107) The materials whose resistivity becomes zero at certain temperature are called
(a) conductors **(b)** insulators
(c) superconductors **(d)** semiconductors

(108) The first superconductor was discovered in
(a) 1902 **(b)** 1964
(c) 1911 **(d)** 1916

(109) The critical temperature of tin is
(a) 3.27K **(b)** 7.2K
(c) 1.18K **(d)** 4.56K

(110) 7.2K is the critical temperature of
(a) tin **(b)** aluminium
(c) lead **(d)** nickel

(111) The practical use of superconductors
(a) fast computer chips

(b) magnetic resonance levitation trains (MRI)
(c) powerful but small electric motors
(d) all of these

(112) The formula for Yttrium barium copper oxide is
(a) $Y_2Ba_2Cu_3O_7$ **(b)** $YBa_2Cu_3O_7$
(c) $YBa_3Cu_2O_7$ **(d)** $Y_2Ba_2Cu_3O_6$

(113) The $YBa_2Cu_3O_7$ becomes superconductor at
(a) 180°C **(b)** –110°C
(c) 163 K **(d)** both b and c

(114) Yttrium barium copper oxide reported to become superconductor by
(a) Ching Pyoung **(b)** Prof: Yao Lian's Lee.
(c) Prof. Yuan Lee **(d)** Prof: Ping Yun Lee

(115) The temperature 77K is the
(a) melting point of nitrogen **(b)** boiling point of nitrogen
(c) boiling point of hydrogen **(d)** melting point of hydrogen

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(116) The critical temperature of mercury is: LHR-2021 (G-I)
(a) 1.18 K **(b)** 4.2 K
(c) 3.72 K **(d)** 7.2 K

(117) Technological application of super conductor is. MTN-2022 (G-II)
(a) microwave oven **(b)** MRI
(c) logic gates **(d)** transistors

(118) Curie temperature for iron is DGK-2022 (G-I, II)
(a) 1153K **(b)** 1023 K
(c) 750 K **(d)** 700 K

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(119) Magnetism in substances is caused by
(a) Orbital motion of electrons only **(b)** Spin and orbital motion of electrons
(c) Spin motion of electrons only **(d)** Hidden magnets

(120) In MRI _____ are used.
(a) Semi conductor **(b)** Super conductor
(c) Conductor **(d)** Insulators

Topic 17.5:

Magnetic Properties of Solids

(121) A substance in which the magnetic field produced by the orbital and spin motion of electrons add up to zero is called
(a) ferromagnetic substances **(b)** diamagnetic substances.
(c) paramagnetic substances **(d)** nonmagnetic substances

(122) Cobalt is an example of
(a) ferromagnetic substances **(b)** diamagnetic substances
(c) paramagnetic substances **(d)** nonmagnetic substances

(123) A substance in which the atoms cooperate with each other in such a way to exhibit a strong magnetic field is called
(a) ferromagnetic substances **(b)** diamagnetic substances
(c) paramagnetic substances **(d)** nonmagnetic substances

(124) An atom in which there is a resultant magnetic field, behaves like a tiny magnet is called
(a) magnetic tripole **(b)** magnetic dipole.

(c) electric dipole **(d)** dipole

(125) The small regions exist due to magnetic co-operation of atoms in ferromagnetic substance are called

(a) ranges **(b)** functions

(c) poles **(d)** domains

(126) The curie temperature of iron is

(a) 720°C **(b)** 750°C

(c) 890K **(d)** 650K

(127) Which of the following is not example of diamagnetic substances

(a) nickel **(b)** copper

(c) water **(d)** bismuth

(128) Within each domain the magnetic fields of all the spinning electrons are

(a) perpendicular to each other **(b)** opposite to each other

(c) parallel to each other **(d)** at rest

(129) In unmagnified iron the domains are oriented in a disorderly fashion, hence net magnetic effect of a sizeable specimen is

(a) maximum **(b)** zero

(c) minimum **(d)** remain constant

(130) Ferromagnetic materials preserve the orderliness at

(a) high temperature **(b)** very low temperature

(c) ordinary temperature. **(d)** absolute temperature

(131) Above the curie temperature the iron behaves like

(a) electromagnet **(b)** ferromagnetic

(c) diamagnetic **(d)** paramagnet.

(132) To investigate the ferromagnetic material, a bar of that material such as iron is placed in

(a) alternating current toroid **(b)** direct current solenoid

(c) direct current toroid **(d)** alternating current solenoid

(133) When the magnetic flux density increased from zero and reaches to a maximum value, then this stage is called

(a) retentivity **(b)** coercivity

(c) saturation **(d)** hysteresis loss

(134) The coercivity of iron is

(a) less than steel **(b)** more than copper

(c) equal to steel **(d)** less than copper

(135) Large area of hysteresis loop shows the

(a) gain in energy **(b)** large wastage of energy

(c) small wastage of energy **(d)** no wastage of energy

(136) The suitable material to make permanent magnet is

(a) copper **(b)** steel

(c) iron **(d)** lead

(137) During magnetization the energy dissipated per cycle of AC for iron is

(a) less than steel **(b)** greater than steel

(c) equal to steel **(d)** none of these

(138) The phenomenon in which magnetization reduce to zero by reversing the magnetizing current is called

(a) saturation **(b)** coercivity
(c) retentivity **(d)** hysteresis loss

(139) The value of reverse current which is required by a substance for its demagnetization is called

(a) hysteresis loss **(b)** coercive current.
(c) remancive current **(d)** retentive current

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(140) Very weak magnetic field produced by brain can be detected by: LHR-2021 (G-I)

(a) Compass **(b)** Metallic needle
(c) Squid **(d)** Liquid

(141) The most suitable metal for making permanent magnetic is SGD-2017 (G-II)

(a) iron **(b)** steel
(c) copper **(d)** aluminium

(142) A single domain in paramagnetic substance contains nearly: FSD-2019 (G-I)

(a) $10^8 - 10^{10}$ atoms **(b)** $10^{15} - 10^{20}$ atoms
(c) $10^{12} - 10^{20}$ atoms **(d)** $10^{12} - 10^{16}$ atoms

(143) A device used to detect very weak magnetic fields produced by brain is named as: SGD-2022 (G-I)

(a) MRI **(b)** CAT scanner
(c) SQUIDS **(d)** CRO

(144) The substances in which the atoms do not form magnetic dipoles are called DGK-2017 (G-I)

(a) diamagnetic **(b)** paramagnetic
(c) ferromagnetic **(d)** crystals

ENTRY TEST MCQS

(145) Iron is preferred in the core of transformers because it

(a) Is soft magnetic material (b) Has less hysteresis loss
(c) Both a and b (d) Is hard magnetic material

(146) When ferromagnetic material is heated

(a) It becomes paramagnetic above curie temperature
(b) Thermal motion is decreased
(c) Orderliness is attained
(d) All of these

ANSWER KEY

(Topical Multiple Choice Questions)

(Kips Exercise)

1	B	21	A	41	D	61	C	81	A	101	B	121	D	141	B
2	B	22	B	42	A	62	B	82	B	102	C	122	A	142	D
3	A	23	A	43	D	63	D	83	A	103	A	123	A	143	C
4	B	24	C	44	B	64	B	84	B	104	A	124	B	144	A
5	D	25	A	45	A	65	B	85	C	105	C	125	D	145	C
6	A	26	B	46	A	66	C	86	A	106	D	126	B	146	A
7	C	27	A	47	D	67	B	87	A	107	C	127	A	147	

8	D	28	D	48	C	68	A	88	C	108	C	128	C	148	
9	B	29	C	49	B	69	B	89	D	109	A	129	B	149	
10	A	30	A	50	B	70	A	90	A	110	C	130	C	150	
11	C	31	A	51	A	71	C	91	B	111	D	131	D		
12	C	32	D	52	D	72	D	92	B	112	B	132	D		
13	A	33	C	53	B	73	A	93	A	113	D	133	C		
14	C	34	D	54	B	74	B	94	A	114	B	134	A		
15	A	35	C	55	C	75	C	95	C	115	B	135	B		
16	B	36	B	56	B	76	A	96	D	116	B	136	B		
17	B	37	A	57	C	77	C	97	B	117	B	137	A		
18	D	38	D	58	C	78	B	98	B	118	B	138	B		
19	C	39	C	59	B	79	C	99	D	119	B	139	B		
20	C	40	B	60	C	80	C	100	C	120	B	140	C		

KIPS TOPICAL SHORT QUESTIONS

17.1 CLASSIFICATION OF SOLIDS

(1) Why glass is also known as solid liquid?

Ans: Glass is known as solid liquid because its molecules are irregularly arranged as in a liquid but fixed in their relative positions.

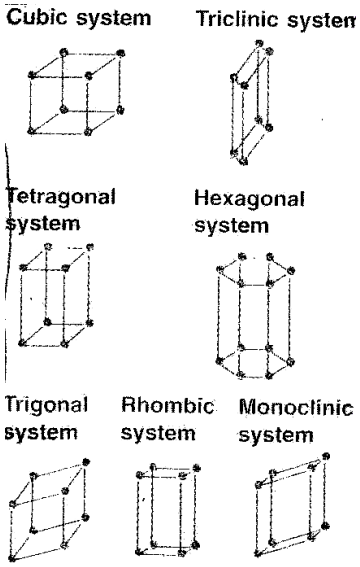
(2) Define unit cell and give the number of basic crystal system.

Ans: **Unit Cell:** A crystalline solid consists of three dimensional basic pattern that repeats itself over & over again in that material. This smallest basic three dimensional structure is called unit cell." The whole structure obtained by the repetition of unit cell is known as Crystal Lattice.

Basic Crystal Systems: There are seven different crystal systems based on the geometrical arrangement of atoms of crystalline solids. These systems are known as

(i) Cubic **(ii)** Triclinic **(iii)** Tetragonal **(iv)** Hexagonal

(v) Trigonal **(vi)** Rhombic **(vii)** Monoclinic systems



(3) What are glassy solids? Do they possess property of flow?

Ans: **Glassy Solids:** "These are in fact amorphous solids having no definite and repetitive pattern of arrangement of atoms."

In them, atoms are randomly arranged like in liquids, but that random pattern is frozen. Ordinary glass is an example of glassy solids.

Property of Flow: Glassy solids do not flow like liquids, but over an extended period of time, their molecules show movement. For example, glass window becomes thicker at the bottom if it remains vertical for a long time.

(4) Distinguish between elasticity and plasticity.

Ans: **Elasticity** is the property of solid by which material returns to its original shape on removal of stress on it."

Plasticity is the property of material by which material does not return to its original shape on removal of stress on it.

(5) Define until cell and crystal lattice.

Ans: The minimum number of particles arranged in three dimensional pattern that repeats itself over & over again, that represents the structure of entire crystal is called unit cell. The whole structure obtained by the repetition of unit cell is called crystal lattice. e.g.

NaCl is cubical. In a cubic crystal all the sides meet at right angles.

(6) Define polymeric solids and give example.

Ans: If the structure lies between crystalline solids and amorphous solids, then it is called polymers. These are partially or poorly crystalline solids.

Polymers are made from synthetic or naturally occurring materials. e.g.

Synthetic rubbers, nylons & plastics are the polymers. They are formed by polymerization reaction.

PAST PAPER SHORT QUESTION

(7) What are polymeric solids? Give an example. **LHR-2017 (G-I)**
(8) Define (i) crystal lattice or solid (ii) unit cell. **SGD-2017 (G-II)**
(9) What are crystalline solids? **MIRPUR (AJK) 2017**
(10) Define until cell and crystal lattice. **DGK-2017 (G-I)**
(11) Define polymeric solids and give example **DGK-2017 (G-II)**
(12) What are crystallite solids? Give few examples of crystallite solids. **BWP-2019 (G-II)**
(13) Distinguish between crystalline and amorphous solid. **DGK-2022 (G-I), FSD-2022 (G-II)**
(14) What is Crystal Lattice? What is its significance? **BWP-2022 (G-I)**
(15) Distinguish between Amorphous and polymeric solids. **BWP-2022 (G-II)**

17.2 MECHANICAL PROPERTIES OF SOLIDS

(16) How energy is stored in a deformed materials?

Ans: When a material in the form of wire is stretched, atoms of the material are displaced against the cohesive force i.e work is being done against the cohesive force which is stored as strain energy in the deformed materials.

(17) Which is more elastic, steel or rubber? Why?

Ans: Elasticity is measured as the ratio of stress to strain. For a given stress, strain is much smaller in steel than rubber, which results high elasticity of steel.

(18) Differentiate between brittle and ductile substances.

Ans: **Brittle substances:** The substances which break just after the elastic limit is reached are known as brittle substances. Glass and high carbon steel are brittle.

Ductile substances: Substances which undergo plastic deformation until they break, are known as ductile substances. Lead, copper and wrought iron are ductile.

(19) Differentiate between tensile and volumetric strain.

Ans: **Tensile Strain:** "It is the change in the length per unit original length, denoted by the symbol ε, and has no dimensions."

$$\therefore \qquad \varepsilon = \frac{\Delta l}{l}$$

Tensile strain is also called one dimensional strain that occurs in wire.

Volumetric Strain: It is the change in volume per unit original volume, and has no dimensions."

$$\therefore \qquad \text{volumetric strain} = \frac{\Delta V}{V_o}$$

Volumetric strain is also called three dimensional strain that occurs in bulk material.

Thus

"Both tensile and volumetric strains represent change in shape of material under stress, and has no dimensions."

(20) What are ductile and brittle substances? Give an example of each.

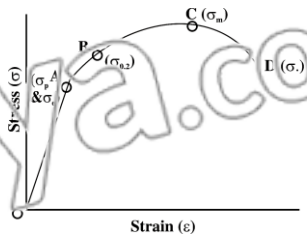
Ans: **Brittle substances:**

The substances which break just after the elastic limit is reached are called brittle e.g. glass and high carbon steel.

Ductile substances:

The Substances which undergo plastic deformation until they break are called ductile e.g. lead and copper.

(21) Describe difference between proportional limit and elastic limit.



Ans: In initial stage of deformation, stress increases linearly with strain till we reach point A on the curve. This is called proportional limit (σ_p)

Hook's law is obeyed in this region OA.

From A to B, stress and strain are not proportional, but if load is removed at any point between O & B, the curve will be retraced and the material returns to its original length.

The point B is called yield point and the value of stress at this point B is called elastic limit (σ_e)

PAST PAPER SHORT QUESTION

(22) Differentiate between ductile and brittle substances. Give an example of each. **LHR-2019 (G-II)**

(23) Define stress and strain, what are their SI units. **MIRPUR (AJK) 2017, LHR-2019 (G-II)**

(24) Distinguish between elastic deformation and plastic deformation. **GRW-2019 (G-II)**

(25) Differentiate between young modulus Y and bulk modulus K. **BWP-2019 (G-II), LHR-2021 (G-I), FSD-2022 (G-II)**

(26) Define Bulk modulus and give its units. **SGD-2017 (G-II)**

(27) Differentiate between ductile and brittle substances. Give an example of each. **SGD-2017 (G-II), RWP-2019 (G-I), LRH-2022 (G-II)**

(28) Differentiate between ductile and Brittle substances. **SWL-2017, MTN-2019 (G-I & II)**

(29) Which is more elastic, steel or rubble? Why? **MTN-2019 (G-II)**

(30) Draw a stress-strain curve for a ductile material and then define the terms:
(i) Elastic limit. (ii) Ultimate tensile stress. **LRH-2022 (G-I)**

(31) Show that units of modulus of elasticity and stress are the same. **LRH-2022 (G-II)**

(32) Define elastic limit and yield point. **DGK-2022 (G-I)**

(33) Define modulus of elasticity. Write down its three kinds. **RWP-2022 (G-II)**

(34) Define the term yield point and ultimate tensile stress. **FSD-2022 (G-I)**

(35) What is meant by strain energy. **FSD-2022 (G-II)**

17.3 ELECTRICAL PROPERTIES OF SOLIDS

(36) Discuss the nature of energy gap between a conduction and valance band in semi-conductors?

Ans: In semi-conductors valance band and conduction band has very small energy gap. At room temperature, electors jump from valance to conduction band. This energy is supplied by room temperature.

(37) What is meant by valance band and conduction band?

Ans: Valance Band

A band occupied by valance electrons is known as valance band. It may be completely or partially filled.

Conduction Band

A band which lies above the valance band. It may be partially filled or empty.

(38) How the conductivity of Semiconductor can be raised?

Ans: Conductivity of semiconductor can be raised by the process of doping i.e. by adding suitable atoms in controlled amount, in the intrinsic semiconductor. Moreover, conductivity of a semiconductor can also be increased by the effect of temperature.

(39) What is the difference between intrinsic and extrinsic semiconductors?

Ans: **Intrinsic Semiconductor**

A semiconductor in its purest form is called intrinsic semiconductor.

Example. Pure Si & Ge are intrinsic semiconductors.

Extrinsic Semiconductor

If impurity is added to the semiconductor, then it is called extrinsic semiconductor.

There are two types:

(a) n – type

(b) p – type

(40) Give the order of conductivity of (i) conductors (ii) semiconductors.

Ans: **(i) Conductors** have conductivities of the order of $10^{7}\,(\Omega m)^{-1}$

(ii) Semiconductors have conductivities of the order of 10^{-6} to $10^{-4}\,(\Omega m)^{-1}$.

(41) How the conductivity of a conductor can be raised?

Ans: As the temperature of the conductor decreases, the amplitude of vibration of the atoms in the lattice decreases. The probability of their collisions with free electrons also decreases and hence conductivity increases.

(42) What is meant by energy band theory?

Ans: The theory based in the wave mechanical model which explain the vast diversity in the electrical behavior of insulator, semiconductor and conductors is called energy band theory.

(43) Distinguish a donor atom from an acceptor atom.

Ans: **Donor atoms:** If we add the impurity atoms from the 5^{th} group of elements in an intrinsic semiconductor, then the four electrons of the impurity atom combines with the holes of semiconductor, and one electron is left free. So that it can donate an electron. Such an impurity is known as donor impurity and the atom is called donor atom.

Accepter atom: If we add the impurity with the 3^{rd} group of elements then the three electrons of impurity atom combines with the three holes and one hole is left which can accept an electron such impurity is known as acceptor impurity and the atom is called acceptor atom.

(44) Describe briefly the formation of energy bands in semi-conductors.

Ans: Semiconductors are those materials which at room temperature have

(i) partially filled conduction band (ii) partially filled valence band (iii) a very narrow forbidden energy gap (of the order of about 1 eV) between the conduction and valence bands.

PAST PAPER SHORT QUESTION

(45) Distinguish between intrinsic and extrinsic semi-conductors. How would you obtain n-type and p-type materials from pure silicon?

LHR-2017 (G-I), GRW-2019 (G-II)

(46) Why charge carriers are not present in the depletion region? **LHR-2021 (G-I)**

(47) Differentiate between N-type and P-type substances. **LHR-2021 (G-II)**

(48) Distinguish between a valence and conduction band. **SGD-2017 (G-I)**

(49) What is mechanism of electrical conduction by holes and electrons in a pure semiconductor element? **FSD-2019 (G-I)**

(50) Distinguish between intrinsic and extrinsic semiconductors? **DGK-2017 (G-II), BWP-2022 (G-I), RWP-2022 (G-I)**

(51) How would you obtain N-type and P-type material from pure silicon? Illiterate it by schematic diagram **SWL-2019**

(52) Describe energy band picture of insulator? **LHR-2022 (G-I)**

(53) What is doping? Why intrinsic semiconductors are doped? **DGK-2022 (G-II)**

17.4 SUPERCONDUCTORS

(54) What do you mean by curie temperature?

Ans: Such a temperature at which domains of ferromagnetic material start losing their orderliness is called curie temperature. At the temperature above the curie temperature the material is para magnetic. For example, iron has curie temperature of 750°C.

(55) What do you mean by high temperature super conductor?

Ans: Any super conductor with a critical temperature above 77K, the boiling point of liquid nitrogen, is referred as a high temperature super conductor.

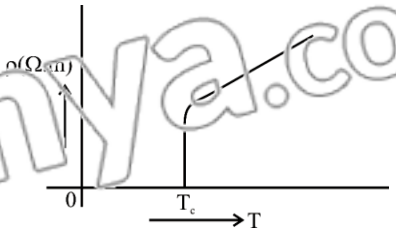
(56) Why Si or Ge show semiconductor behavior at room temperature?

Ans: At 0K, there are no electrons in the conduction band of pure Ge and Si materials and their valance band are completely filled. It means that, at 0K a piece of Ge and Si is a perfect insulator. However, with increase in temperature, some electrons possess sufficient energy to jump across small energy gap from valance to conduction band. This transfers some free electrons in the conduction band. The vacancy of electron in the valance band is known as a hole. It behave like positive charge. Thus at room temperature, Ge and Si becomes a semiconductor.

(57) What are superconductors? Define their critical temperature.

Ans: **Super Conductors:** "These are the solid materials whose resistivity is exactly equal to zero. Below a certain temperature"

Critical Temperature: "The temperature of a conductor at which its resistivity drops to exactly zero and becomes a superconductor is called critical temperature, as shown below in graph.



T_c = 1.18 K for aluminium

T_c = 3.72 K for tin.

T_c = 163 K for complex crystalline structure known as yttrium Barium copper oxide ($YBa_2Cu_3O_7$)

(58) Define super conductors. Write down its two technological applications.

Ans: "The materials, whose resistivity is zero below a certain temperature are called super conductor".

(i) **Magnetic Resonance Imaging (MRI)**. Magnetic resonance Imaging (MRI) uses strong magnetic field produce by super conducting material for scanning. Computer processing produces the image identifying tumors and inflamed tissues.

(ii) **Magnetic levitation Trains**: A bullet train is lifted above the rails due to magnetic effect, thus friction is reduced to minimum and speed can be increased up to 500 kmh^{-1}.

PAST PAPER SHORT QUESTION

(59) Write a note on superconductors. **LHR-2021 (G-II), RWP-2022 (G-I)**

(60) Define super conductor and critical temperature. **MIRPUR (AJK) 2017**

(61) What do you mean by Curie temperature? Writ the Curie temperature of iron **SWL-2019, RWP-2022 (G-I)**

(62) What are conductors and super conductors? Give one example for each. **BWP-2019 (G-II)**

(63) What are super conductors? Give two uses of super conductors. **BWP-2022 (G-I)**

(64) Define critical temperature and curie temperature. **BWP-2022 (G-II)**

17.5 MAGNETIC PROPERTIES OF SOLIDS

(65) **How domains are formed in ferromagnetic materials?**

Ans: There are some materials F_e, Co, Ni, chromium dioxide and Alnico called ferromagnetic materials. In these substances there are small regions in which atoms cooperate with each other in such a way so as to exhibit a strong magnetic effect. These regions are called domains. The domains are of macroscopic size of the order of millimeters or less but large enough to contain 10^{12} to 10^{16}.

(66) **Define coercivity.**

Ans: To demagnetize the material, the magnetizing current is reversed. Current increase till magnetization reduces to zero. This reverse current is called coercive current represented by C on the curve.

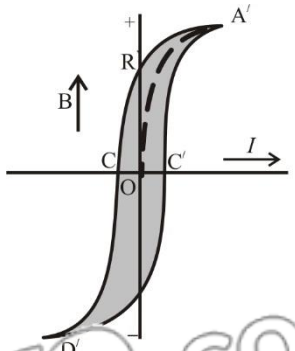
(67) **Define saturation and remanence of hysteresis loop.**

Ans: **Saturation**

The magnetic flux density increases from zero & reaches a maximum value. Now material is magnetically saturated. It is shown by point A on graph.

Remanence or Retantivity

When the current is reduced to zero, the material still remains strongly magnetized shown by the point R. It is due to the tendency of domains to stay partly in line, once they have been aligned.



(b) Hysteresis loop of soft iron

(68) **What is meant by hysteresis loop?**

Ans: **Hysteresis Loop:** "It is a graph of magnetic flux density B for a material versus the magnetizing current, and is in the form of a closed loop". It is show below Area of this loop is a measure of the energy needed to magnetize and demagnetize the specimen during one cycle of magnetizing current I.

(69) **What is meant by magnetic resonance imaging (MRI)?**

Ans: It is technique in which strong magnetic field is produced by super conducting material for scanning computer processing. This scanning produces the image identifying tumors and inflamed tissues.

(70) **What is meant by hysteresis loss?**

Ans: The area of the hysteresis loop measures the energy required to magnetize & demagnetize the substance in each cycle. This energy is required to do work against internal friction of the domains. This energy appears as heat dissipated and is called hysteresis loss.

(71) What is meant by coercive current?

Ans: The reverse current which is need to demagnetize a material is know as coercive current.

(72) Coercivity of steel is more than iron? Why?

Ans: Because more current is need to magnetize steel than iron, when the material becomes magnet, magnetization curve never passes through the origin.

(73) Energy dissipated per cycle for steel is more as compared to iron. Why?

Ans: Steel is difficult to magnetize or demagnetize Hence, area of loop is large for steel while energy loss per cycle for iron is small.

(74) What are soft magnetic material and why?

Ans: Iron is a soft magnetic material because its domain can arranged easily.

(75) What is meant by domain?

Ans: A small region of a substance, where 10^{12} to 10^{16} atoms are present in lmm portion is called domain. Each domain acts like a separate magnet.

(76) What is squid and where is it used?

Ans: Squids (or super conducting quantum interference devices) are used to detect very weak magnetic field such as produced by the brain.

(77) With reference to energy, distinguish between orbital electrons and free electrons.

Ans: The electron that revolve in an orbit about the nucleus of an atom is called orbital electron.

When a valence electron of a metal gets energy at room temperature then it can freely move in lattice called free electron.

(78) What are ferromagnetic substances?

Ans: **Ferromagnetic Substances:** "These are the substances whose magnetic dipole moments are fully aligned parallel to each other." Examples are: Fe, Co, Ni, Alnico, Chromium oxide.

(i) They exhibit large magnetism as compared to all other substances.

(ii) They preserve the orderliness of their dipole moments at ordinary temperatures.

(79) What are the responsible factors for production of magnetic field in an atom?

GWR 2014

Ans: Spinning and orbital motion of an electron in an atom generates magnetic field. The charged nucleus itself spin giving rise to a magnetic field but it is much weaker than orbital electrons.

PAST PAPER SHORT QUESTION

(80) What is meant by hysteresis loss? Explain briefly. **LHR-2017 (G-I)**

(81) Distinguish between elastic deformation and plastic deformation. **GRW-2019 (G-II)**

(82) What is meant by para, dia and ferromagnetic substances? **LHR-2021 (G-I)**

(83) What is meant by hysteresis loss? How is its used in the construction of a transformer? **LHR-2021 (G-II)**

(84) Define and explain the term of 'coercivity'. **DGK-2017 (G-I)**

(85) What do you mean by hysteresis and hysteresis loss? How it is used in construction transformer. **DGK-2017 (G-I), SWL-2017, 2019, FSD-2022 (G-I)**

(86) Distinguish between soft and hard magnetic material with examples.
MTN-2019 (G-II), BWP-2022 (G-II), FSD-2022 (G-I)

(87) What is meant by hysteresis loss? **BWP-2022 (G-II), LHR-2022 (G-II), DGK-2022 (G-I)**