Objective Type Question

UNIT -1 **Bonding in Solids**

Crystallography and Crystal Structures

Choose the correct Answer

1. At equilibrium condition the atoms possess [ ]
   a) Maximum kinetic energy b) minimum potential energy
   c) Maximum potential energy d) maximum total energy

2. Primary bondings have bond energies in the range of [ ]
   a) 0.01 - 0.5 eV b) 10 -100 eV
   c) 0 - 0.01 eV d) 0.1 - 10 eV

3. Secondary bondings have bond energies in the range of [ ]
   a) 0.01 – 0.5 eV b) 10 – 100 Ev
   c) 0 – 0.01 eV d) 0.1 – 10 Ev

4. Among the following the strongest bond is [ ]
   a) hydrogen bond b) metallic bond
   c) covalent bond d) ionic bond

5. Primary bonds are formed by [ ]
   a) inter molecular forces b) inter atomic forces
   c) van der waal's forces d) none of the above

6. Bonding in diamond is [ ]
   a) covalent b) ionic
   c) dipole d) metallic

7. There are _____ basic crystal systems [ ]

   a) four b) five c) six d) seven

8. The only element exhibiting simple cubic structure is [ ]
   a) silver B) polonium c) zinc d) diamond

9. The relation between atomic radius r and lattice constant a in the case of simple cubic structure is [ ]
   a) a=2r b) a=r/2 c) a=4r/3 d) a=2 2r

10. Effective number of atoms belonging to the unit cell of BCC structure is

    a) 8 b) 1 c) 2 d) 9 [ ]

Fill in the blanks

11. The primary bonds are

    1) _____ 2) _____ 3) _____ 4) _____

12. A melt of a solid consists of _____ order that is not stable.

13. The repulsive forces between atoms become significant only if atoms are _____ from each other.

14. Born' s exponent is evaluated from the _____ studies in ionic crystals.

15. The compressibility of crystal is _____ proportional to the repulsive exponent.

16. The units of the lattice energy is _____

17. The alkali halides show absorption bonds in _____ region of the Electromagnetic spectrum.

18. Amorphous substances are formed by _____ cooling of the melts Of organic compounds.

19. A glass is _____ liquid.

20. A substance in amorphous state possesses _____ viscosity.

UNIT -2 X-Ray Diffraction
Defects in Crystals

Choose the correct Answer

1. X-ray are used for crystal diffraction studies because [ ]
   a) they have higher penetrating power
   b) crystals are transparent to x- rays
   c) the inter atomic spacing is of the order of x – ray wavelength
   d) they have high resolving power

2. According to Bragg ‘s law [ ]
   a) $2\lambda \sin\theta = nd$ b) $2 \sin \theta = nd \lambda$
   c) $2d \sin\theta = n \lambda$ d) $\sin \theta = nN \lambda$

3. Burgers vector is to indicate the magnitude of [ ]
   a) point defects b) line defects
   c) surface defects d) volume defect

4. If a foreign atom replaces a parent atom in the crystal, it is called
   a) Frenkel defect B) Schottky defect [ ]
   c) Substitutional impurity d) Electronic defect

5. In ionic crystals, an ion displaced from a regular site to an interstitial site is
   Called [ ]
   a) Frenkel defect b) schottky defect
   c) substitutional defect d) electronic defect

6. A pair of cation and anion missing from an ionic crystal leaving vacant ion
   Sites is called [ ]
   a) Frenkel defect b) schottky defect
   c) substitutional defect d) electronic defect

7. Twin boundary is a [ ]
   a) point defects b) line defects
   c) surface defects d) volume defect

8. When the composition of an ionic crystal does not corresponds to the exact
   stoichiometric formula, the _____ arise. [ ]
   a) Frenkel defect b) schottky defect
   c) substitutional defect d) electronic defect

9. Stacking fault is a [ ]

a) Frenkel defect b) schottky defect

c) substitutional defect d) electronic defect

10. Edge dislocation is a [ ]

a) Frenkel defect b) schottky defect

c) substitutional defect d) electronic defect

True/False

11. The defects like point defects or line defects are charged defects in ionic crystals [True/ False]

12. In a Laue method, mono chromatic X-ray are used for X-ray diffraction. [True/ False]

13. Laue method deals with a single crystal diffraction. [True/ False]

14. A nickel crystal gives X-ray diffraction pattern that is charactertic of bcc. [True/ False]

Fill in the blanks

15. A Schotlky defects is also called _____.

16. Impurities added deliberately to a metal crystal alter the _____ of the crystal.

17. The Frenkel defects do not change the _____ of a metal crystal.

18. Vacancies in ionic crystal are formed in _____.

19. In ionic crystals, the defects are _____ defects.

20. The Burgers vector of an edge dislocation is _____ to it.

Unit –III Elements of Statistical Mechanics
Principles of Quantum Mechanics

Choose the correct Answer

1. If a system has n distinguishable particles, total number of macrostates possible is [ ]
   (a). n (b) (n+1)
   (c) (n-1) (d) 2n

2. If a system has n distinguishable particles, total number of microstates possible is [ ]
   (a). n (b) (n+1)
   (c) (n-1) (d) None

3. The statistics which deals with identical particle which are distinguishable
   Is [ ]
   (a) Fermi – Dirac (b) Bose – Einstein
   (c) Maxwell – Boltzmann (d) Fermi – Boltzmann

4. Statistics dealing with particle with half integral spin is [ ]
   (a) Fermi – Dirac (b) Bose – Einstein
   (c) Maxwell – Boltzmann (d) None

5. Example for Bose – Eintein statistics is [ ]
   (a) gas molecule (b) electrons
   (c) protons (d) photons

6. Velocity of matter wave is always [ ]
   (a) lesser than velocity of light (b) equal to velocity of light
   (c) greater than velocity of light (d) none of these

7. Existence of matter wave was experimental first demonstratd by
   (a) Newton (b) Planck [ ]
   (c) Davisson and Gerner (d) de Broglie

8. When an electron is accelerated, if de Broglie wavelength is 1 A, then the wavelength associated with electron is [ ]

(a) 15 volts (b) 12 volts
(c) 500 volts (d) 150 volts

9. In G.P. Thomson experiment for diffraction, the sample used for diffraction is [ ]
   (a) NaCl crystal (b) any one crystal
   (c) thin film of matter such as gold (d) none
10. Wave nature and particle nature called dual nature is exhibiting by
    (a) particles only (b) waves only [ ]
    (c) photons only (d) by particle and waves

Fill in the blanks

11. The MB distribution function is Expressed as _____.
12. Particles with intergral spin are called _____.
13. particles with odd half-integral spins are called _____.
14. Phonons are the particles that follow _____ statistics.
15. Wien's displacements law is given as _____.
16. Electrical conduction in metals is explained by _____ theory.
17. Conduction electrons in a simple metal are known as ____ electrons.
18. The wavelength of the waves associated with particles is given by the relation _____.
19. The diffraction of electrons was demonstrated for the first time by _____.
20. The eigen values of the particle are also called _____ states.

Unit-IV Band theory of Solids

Choose the correct Answer

1. Drude and Lorentz developed [ ]
   (a) classical free electron theory (b) quantum free electron theory
   (c) zone theory (d) corpuscular theory
2. Sommerfeld developed [ ]
   (a) classical free electron theory (b) quantum free electron theory
   (c) zone theory (d) corpuscular theory

3. Zone theory of metals was developed by [ ]
   (a) Drude and Lorentz (b) Sommerfeld
   (c) Bloch (d) Newton

4. The steady drift velocity per unit electric field is called [ ]
   (a) mobility of the electron (b) random velocity
   (c) mean free path (d) none of these

5. The classical free electron theory was developed by [ ]
   (a) Sommerfeld (b) Bloch
   (c) Drude and Lorentz (d) Planck

6. The quantum free electron theory was developed by [ ]
   (a) Sommerfeld (b) Bloch
   (c) Drude and Lorentz (d) Planck

7. The zone theory of electron was developed by [ ]
   (a) Sommerfeld (b) Bloch
   (c) Drude and Lorentz (d) Planck

8. The periodicity of the lattice is given by [ ]
   (a) Bloch theorem (b) planck theorem
   (c) Drude and Lorentz (d) None of these

9. When the band gap is in the order of 1eV in a solid, it behaves as a
   (a) conductor (b) semiconductor [ ]
   (c) insulator (d) metal

10. When the scattering power of the potential barrier is zero, the electron is
    (a) Completely bound (b) partly bound and partly free [ ]
    (c) Completely free (d) lost due to recombination

Fill in the blanks

11. The nature and quantity of conductivity differences between insulators and
Conductors can be explained by _____ theory.

12. In metals, there is an over lapping of _____ and _____ bands.

13. The band theory of solids deals with electron motion in a _____ field of a crystal.

14. Near the bottom of band, the effective mass of the electron is _____ in sign.

15. Semi metals posses_____ bands.

16. The number of energy states in a band is equal to the _____ of states.

17. The upper most band is filled with _____ electrons.

18. If an element has odd number of electrons, the upper most band will be _____ filled.

19. The width of the allowed band _____ with increasing binding energy of the electrons.

20. A hole near the top of an allowed band has _____ effective mass.

Unit-VI Dielectric Properties
Magnetic Properties
Choose the correct Answer

1. Electronic polarization [ ]
   (a) decreases with increase of temperature
   (b) increase of temperature
   (c) may decreases or increase of temperature
   (d) is independent of temperature

2. Ionic polarization [ ]
   (a) decreases with increase of temperature
   (b) increase of temperature
   (c) may decreases or increase of temperature
   (d) is independent of temperature

3. Orientational polarization [ ]
   (a) decreases with increase of temperature
   (b) increase of temperature
   (c) may decreases or increase of temperature
   (d) is independent of temperature

4. At normal temperatures, the polarizations which are independent of temperature are [ ]
   (a) electronic and ionic (b) ionic and orientational
   (c) orientational and space charge (d) space charge and electronic

5. Dielectrics are [ ]
   (a) solids (b) metals
   (c) semiconductors (d) insulators

6. Diamagnetic materials possess [ ]
   (a) permanent magnetic dipoles (b) no permanent magnetic dipoles
   (c) induced dipoles along field direction
   (d) no induced diploes even when external field is applied

7. Materials do not having permanent magnetic dipoles are [ ]
   (a) paramagnetic (b) ferromagnetic
   (c) ferrimagnetic (d) diamagnetic

8. Diamagnetic susceptibility is [ ]
   (a) large , negative (b) small , positive
   (b) small , negative (d) large , positive

9. The magnetization of a superconductor is [ ]
   (a) 0 (b) H (c) 1 (d) –H

10. Theory which explains superconductivity is [ ]
   (a) lattice theory (b) Lorentz theory
   (c) BCS theory (d) sommerfeld theory

Fill in the blanks

11. The polarization density P in a dielectric medium is proportional directly to
   The _____.

12. The polarizability of a dielectric is the ratio of ____ and the _____.
13. The units of D, the electric displacement, are _____.
14. Gauss law in electrostatics is _____.
15. The ionic polarization in an ionic solid is unaffected by the variations in ___.
16. In case of diamagnectic substances, the susceptibility is _____.
17. The SI unit of magnetic moment is _____.
18. The ratio of magnetic moment to the angular momentum of an electron is Called _____.
19. The exchange integral is positive for _____ substance.
20. The exchange integral is negative for _____.

Unit-VII Laser
Fiber Optics

Choose the correct Answer

1. The population of the various energy levels of a system in thermal equilibrium is given by [ ]
(a) Boltzmann distribution law (b) Einstein relations
(c) Planck's law (d) Beer's law

2. T.Maiman invented [ ]
(a) He-Ne laser (b) CO2 laser
(c) Ruby laser (d) Nd: YAG laser

3. The colour of the laser output from a Ruby laser is [ ]
(a) green (b) blue (c) red (d) violet

4. In He-Ne lasers, the ratio of He-Ne is in the order [ ]
(a) 1:10 (b) 1:1 (c) 100:1 (d) 10:1

5. Laser radiation is [ ]
(a) monochromatic (b) highly directional
(c) coherent and stimulated
(d) highly directional, monochromatic , coherent and stimulated

6. Propagation of light through fiber core is due to [ ]
(a) diffraction (b) interference (c) refraction
(d) total internal reflection

7. Step index fiber can be a [ ]
(a) monomode fiber only (b) multimode fiber only
(c) monomode as well as multimode fiber
(d) either monomode or multimode

8. The process of mixing the signal with the carrier is called [ ]
(a) dispersion (b) attenuation (c) modulation
(d) demodulation

9. To overcome the problem of inter model dispersion one has to use
(a) multimode fiber (b) step index fiber [ ]
(c) graded index fiber (d) plastic fiber

10. The attenuation in an optical fiber is a function of [ ]
(a) fiber material only (b) wavelength of light pnly
(c) length of the fiber only (d) all the above

Fill in the blanks

11. A laser source is a quantum _____.

12. Generally, the laser that are used in holography are _____ laser.

13. The pumping process that is used in He-Ne lasers source is _____.

14. In He-Ne laser system, _____ ions give metastable levels.

15. Semi conductor diode gives out radiation as a results of ____ emission.

16. In a single mode fiber, there is _____.

17. In multi mode fibers, the core diameter is _____.

18. _____ fiber is a multimode fiber.

19. A glass fiber consists of a _____ glass surrounded by a _____ made Of slightly of lower refractive index.

20. Single mode fibers transmit single ray _____ the axis of the fiber.

Unit-VIII Acoustics of Buildings and Acoustic Quieting Nanotechnology

Choose the correct Answer

1. Optomum reverberation time for music is [ ]
   (a) 0.5 to 1 second (b) 0 to 1 second
   (c) 1 to 2 second (d) above 5 second

2. Two square meter of a fiber board absorbs sound energy as that of unit area of an open window. The absorption coefficient of fiber board is [ ]
   (a) 0.50 (b) 0.2 (c) 2 (d) 0.0825

3. The wall of a halls built for music concerns should [ ]
   (a) amplify sound (b) reflect sound
   (c) transmit sound (d) absorb sound

4. Which one of the following has maximum absorbtion coefficient.
   (a) marble (b) carpet (c) human body (d) glass [ ]

5. Which one of the following has minimum absorbtion coefficient.[ ]
   (a) glass (b) felt (c) open window (d) wooden floor

6. Diameter of one carbon atom is [ ]
   (a) 0.5nm (b) 0.05 nm (c) 0.15 nm (d) 5 nm

7. In nanomaterials with decrease of size the interatomic spacing
   (a) Increase (b) Decreases [ ]
   (c) remains constant (d) first increase and then decrease

8. In nanomaterials with decrease of size, the melting point
   (a) Increase (b) remains constant [ ]
   (b) Decreases (d) first decrease and then increase

9. Gold nanospheres of 100nm appear [ ]
   (a) red in colour (b) blue in colour
   (c) orange in colour (d) violet in colour

10. Young's modulus value of single walled nonatubes is about
    (a) 1 Kilopascal (b) 1 Millpascal [ ]
    (c) 1 Terapascal (d) 1 Gigapascal

Fill in the blanks

11. The unit of absorption coefficient is _____-.

12. The audible sounds have a frequency range ____ Hz to ____ Hz.

13. Erying formula for reverberation tine T is _____.
14. The unit of sound noise is _____.

15. The total absorption in a room is expressed in _____.

16. Fabric panels in a hall reflecting walls, cause _____ in a hall.

17. Nano materials are catalysts, because their enhanced _____ activity.

18. Aerogel is _____ nano crystalline.

19. Quantum dots are _____ materials.

20. The lifetime of a satellites increase by using _____ materials.

Unit-V: Semiconductor Physics, Physics of Semiconductor Devices

I. Fill in the blanks.

1. In semiconductors, the valance band is---------- and the Conduction band is ---------- at low temperatures.
2. The conductivity of p- type silicon is 4 ohm^{-1}, the mobility of holes is 0.05m^2/V-S. Then the density of impurities is (atoms / m^3) ----------
3. Fermi energy is the ---------- energy that can be possessed by an electron at 0 K
4. When forward biased, the forward current increases ---------- with forward bias.
5. The concentration of charge carriers in an intrinsic semiconductor is proportional to ----------.
6. p-n junction diode, when forward biased behaves likes a ----------
7. The mobility of electron is ---------- than that of a hole.
8. In an intrinsic semiconductor at a temperature T, the product electron and hole densities is given by the relation ----------, where E_g, is the forbidden gap, and A, is a constant.
9. The position of the Fermi- level in an impurity doped semiconductor depend on ---- ---------- and the concentration of ----------.
10. The diffusion hole current (Jp) in a semiconductor is proportional to the ----------.

II. Choose correct one

11. At 0K pure silicon is

    (a) an intrinsic semiconductor (b) extrinsic semiconductor

    (C) insulator (d) superconductor.

12. the majority carriers in p- type Ge are

    (a) free electrons (b) holes

    (c) ions (d) conductions electrons

13. The electric current in a pure semiconductor when voltage is applied is due to

    (a) electrons (b) holes

    (c) ions (d) holes and electrons

14. In an intrinsic semiconductor at 0 K, the Fermi level lies

(a) at the centre of top of the valence band and bottom of the conduction band

(b) at the centre of donor level and intrinsic Fermi level

(c) at the centre of donor level and bottom of the conduction band

(d) at the centre of acceptor level and top of the valence band

15. The density of charge cxarriers in a pure semiconductor is proportional to

(a) $\exp(-E_g / kT)$ (b) $\exp(-2E_g / kT)$

(c) $\exp(-E_g / kT^2)$ (d) $\exp(-E_g / 2kT)$

16. The thickness of depletion region is in the order of

(a) 6×10^{-3} cm (b) 6×10^{-9} cm

(c) 6×10^{-6} cm (d) 6×10^{-12} cm

17. In a LED, if E_g is the band gap, the wavelength of emission is given by

(a) $\lambda = E_g / h\upsilon$ (b) $\lambda = h\upsilon / E_g$

(c) $\lambda = E_g / hc$ (d) $\lambda = hc / E_g$

18. Response time of LEDs in the order of

(a) 10^{-3} s (b) 10^{-6} s

(c) 10^{-9} s (d) 10^{-12} s

19. Life time of LEDs is about

(a) 10^2 hours (b) 10^3 hours

(c) 10^4 hours (d) 10^5 hours

20. LCD stands for

(a) light cavity display (b) light control display

(c) liquid crystal diode (d) liquid crystal display