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312316-Electronic Materials & Components (Sem II)

As per MSBTE's K Scheme

DE / EJ / ET / EX / IE / MU

Unit 1

Electronic Material (16 Marks)

Q1.What is the process of producing electric dipoles inside the dielectric by an external electric field?

a) Polarisation

b) Dipole moment

c) Susceptibility

d) Magnetisation

Answer: a

Explanation: When an external magnetic field is applied to the dielectrics, the field exerts a force on each positive charges in its own direction while negative charges are pushed in the opposite direction. Consequently, an electric dipole is created in all the atoms. Thus the process of producing electric dipoles inside the dielectrics by an external electric field is called polarisation.

Q2. Which of the following easily adapt itself to store electrical energy?

a) Passive dielectric

b) Superconductor

c) Active dielectric

d) Polar molecules

Answer: c

Explanation: When a dielectric is subjected to an external electric field, if the dielectric actively accepts electricity, then they are termed as active dielectrics. Thus active dielectrics are the dielectrics which can easily adapt itself to store the electrical energy in it.

Q3. Which of the following restricts the flow of electrical energy?

a) Superconductors

b) Passive dielectrics

c) Polar molecules

d) Active dielectric

Answer: b

Explanation: Passive dielectric acts as an insulator; conduction will not take place through this dielectrics. Thus passive dielectrics are the dielectrics that restrict the flow of electrical energy in it.

Q4. For non-polar molecules, there is no absorption or emission in the range of infrared.

a) True

b) False

Answer: a

Explanation: These molecules possess centre of symmetry and hence the centres of positive and negative charges coincide. Therefore the net charges and net dipole moment of these molecules will be zero and hence these non-polar molecules will not posses any dipole moment in it. Hence there is no absorption or emission in the range of infrared.

Q5. How does ionic polarisation occur?

a) Splitting of ions

b) Passing magnetic field

c) Displacement of cations and anions

d) Never occurs

Answer: c

Explanation: Ionic polarisation occurs due to the displacement of cations and anions from its original position in the opposite directions, in the presence of an electric field.

Q6. . Polar molecules have permanent dipole moments even in the absence of an electric field.

a) False

b) True

Answer: b

Explanation: In the absence of an electric field the polar molecules posses some dipole moment. These dipoles are randomly arranged and they cancel each other. Hence the net dipole moment is very less.

Q7. Which of the following polarisations is very rapid?

a) Electronic polarisation

b) Ionic polarisation

c) Space charge polarisation

d) Orientation polarisation

Answer: a

Explanation: Electronic polarisation is very rapid and will complete at the instant the voltage is applied. The reason is that the electrons are very light particles. Therefore even for high frequency this kind of polarisation occurs.

Q8. Which of the following is the slowest polarisation method?

a) Ionic polarisation

b) Orientation polarisation

c) Electronic polarisation

d) Space charge polarisation

Answer: d

Explanation: Space charge polarisation is very slow because in this case, the ions have to diffuse over several interatomic distances. Also, this process occurs at a very low frequency.

Q9. When does a dielectric become a conductor?

a) At avalanche breakdown

b) At high temperature

c) At dielectric breakdown

d) In the presence of magnetic field

Answer: c

Explanation: When a dielectric is placed in an electric field and if the electric field is increased, when the electric field exceeds the critical field, the dielectric loses its insulating property and becomes conducting. This is called dielectric breakdown.

Q10. Which of the following breakdowns occur at a higher temperature?

a) Avalanche breakdown

b) Thermal breakdown

c) Electrochemical breakdown

d) Dielectric breakdown

Answer: b

Explanation: When a dielectric is subjected to an electric field, heat is generated. This generated heat is dissipated by the dielectric. In some cases, the generated heat will be very high compared to the heat dissipated. Under such conditions, the temperature inside the dielectric increases and heat may produce breakdown. This is thermal breakdown.

Q11. When mobility increases, insulation resistance decreases and dielectric becomes conducting.

a) True

b) False

Answer: a

Explanation: If the temperature is increased, the mobility of ions increases and hence electrochemical reaction may be induced to take place. Therefore when the mobility of ions is increased, insulation resistance decreases and hence dielectric becomes conducting.

Q12. Which of the following materials exhibit Ferro-electricity?

a) Iron

b) Platinum

c) Hydrogen

d) Rochelle salt

Answer: d

Explanation: When a dielectric exhibits electric polarisation even in the absence of an external field, it is known as ferro-elecricity and these materials are termed as Ferro-electrics. They are anisotropic crystals that exhibit spontaneous polarisation. Hence only Rochelle salt exhibits Ferro-electricity.

Q13. Calculate the electronic polarizability of an argon atom whose ε_r = 1.0024 at NTP and N = 2.7×10^{25} atoms/m^3.

a) 0.0024 Fm^2

b) 7.87×10^{-40} Fm^2

c) 7.87 Fm^2

d) 1.0024×10^{-40} Fm^2

Answer: b

Explanation: Electronic polarisabilty $\alpha_e = (\varepsilon_0 (\varepsilon_r-1))/N$

Electronic polarisability = 7.87×10^{-40} Fm^2.

Q14. Calculate the dielectric constant of a material which when inserted in parallel condenser of area 10mm × 10mm and distance of separation of 2mm, gives a capacitance of 10^{-9} F.

a) 8.854×10^{-12}

b) 100

c) 2259

d) 5354

Answer: c

Explanation: $C = (\varepsilon_r\ \varepsilon_0\ A)/d$

$\varepsilon_r = Cd/(\varepsilon_0\ A) = 2259.$

Q15. Find the capacitance of layer of $A1_2\ O_3$ that is 0.5μm thick and 2000mm^2 of square area $\varepsilon_r = 8$.

a) 1000μF

b) 0.283μF

c) 16μF

d) 2.83μF

Answer: b

Explanation: $C = (\varepsilon_r\ \varepsilon_0\ A)/d$

Capacitance = 0.283μF.

Q16. What are the two types of dielectrics?

a) Ferroelectric and Piezoelectric

b) Polar and Non-polar

c) Active and Non-active

d) Stable and Non-stable

Answer: b

Explanation: Dielectrics can be divided into two types- polar and non-polar. The ones with a dipole moment are polar dielectrics while others are non-polar dielectrics.

Q17. Which gas is used for insulation?

a) N_2

b) O_2

c) CO

d) CO_2

Answer: a

Explanation: Nitrogen and Sulphur hexafluoride (SF_6) are used for insulation. Nitrogen is used as an insulating medium while SF_6 is used in in high and medium voltage switchgears and circuit breakers.

Q18. CO is a polar dielectric.

a) True

b) False

Answer: a

Explanation: In CO, the atoms are aligned in a symmetric way. But there is a huge difference in the electronegativity of Carbon and oxygen atoms. Thus, it has a net dipole moment and is polar.

Q19. Dielectrics which show spontaneous polarization are called as _____

a) Pyroelectric

b) Piezoelectric

c) Ferroelectric

d) Centrosymmetric

Answer: d

Explanation: The Dielectric materials which exhibit spontaneous polarization, i.e., are polarized even in the absence of an applied electric field and whose polarization is reversible are called ferroelectric materials.

Q20. What is the relation between ε_r and χ?

a) $\varepsilon_r = \chi$

b) $\varepsilon_r = 1 + \chi$

c) $\varepsilon_r = 1 - \chi$

d) $\varepsilon_r = \chi - 1$

Answer: b

Explanation: The departure of the dielectric constant from unity, the value for vacuum, is equal to the electric susceptibility. The correct expression is: $\varepsilon_r = 1 + \chi$.

Q21. If the dipole moment of a water drop is 4×10^{-30} m and radius is 1 mm, what is the polarization of the drop?

a) 5.6×10^{-13} m^{-2}

b) 7.4×10^{-13} m^{-2}

c) 8.4×10^{-13} m^{-2}

d) 9.4×10^{-13} m^{-2}

Answer: a

Explanation: Molecular mass of water = 18 gm

18 gm of water contains 6.023×10^{23} molecules

$18/10^3$ m^3 of water contains $6.023 \times 10^{26}/18$ molecules

Volume of water drop = $4\pi/3 \times (10^{-3})^3$ m^3

No of molecules in the drop, $N = 6.023 \times 10^{26} \times 4\pi \times 10^{-9}/18 \times 3$

$= 1.4 \times 10^{17}$ m^{-3}

Polarization, P = Np

$= 1.4 \times 10^{17}$ $m^{-3} \times 4 \times 10^{-30}$m

$= 5.6 \times 10^{-13}$ m^{-2}.

Q22. A material of thickness 0.5 mm and dielectric constant 2.5 is subjected to 220 V. What will be the polarization produced?

a) 2.78 X 10^{-6} C/m

b) 3.91 X 10^{-6} C/m

c) 4.12 X 10^{-6} C/m

d) 5.84 X 10^{-6} C/m

Answer: d

Explanation: We know, Polarization, P = $\varepsilon_o(\varepsilon_r - 1)E$

Here, $\varepsilon_r = 2.5$

E = V/d

= 220 / 0.5 X 10^{-3}

= 4.4 X 10^5 Vm

ε_o = 8.85 X 10^{-12} C/Vm

Hence, P = 8.85 X 10^{-12} X (2.5 – 1) X 4.4 X 10^5 C/m^2

= 5.84 X 10^{-6} C/m.

Q23. Electrical counterpart of bar magnets are called as _____

a) Ceramics

b) Electrical Magnets

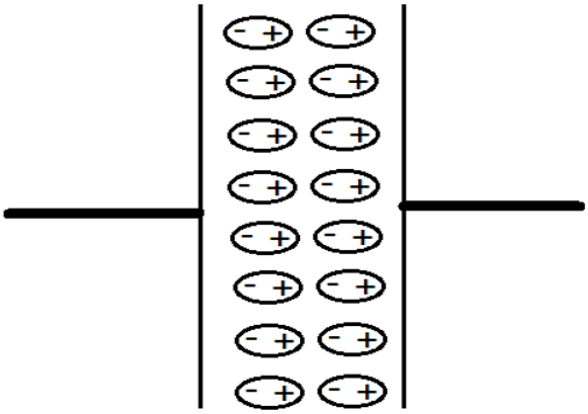
c) Electrets

d) Electrostriction

Answer: c

Explanation: Electrets are the electrical counterparts of bar magnets. It produces an electric field in the space around it. They are a bar of dipolar solids.

Q25. The following figure shows _____



a) A dielectric Capacitor

b) Piezoelectric Material

c) Ferroelectric Capacitor

d) Ceramics Capacitor

Answer: a

Explanation: The given figure is a dielectric capacitor. The dielectric produces its own electric field which helps in the movement of charge from one plate to the other in the capacitor.

Q26. Ceramics cannot be _____

a) Oxides

b) Sulfides

c) Nitrides

d) Carbides

Answer: b

Explanation: Ceramics are inorganic and nonmetallic elements such as oxides, nitrides and carbides. Their production involves firing the constituents at high temperatures.

Q27. The forbidden energy gap of dielectrics is _____

a) Less than 1.2 eV

b) Greater than or equal to 1.2 eV

c) Less than 3 eV

d) Greater than or equal to 3 eV

Answer: d

Explanation: Dielectrics are the materials devoid of free charges. An ideal dielectric is one which is completely devoid of charges. They have a forbidden energy gap of >=3eV.

Q28. Dipoles are created when dielectric is placed in _____

a) Magnetic Field

b) Electric field

c) Vacuum

d) Inert Environment

Answer: b

Explanation: When the dielectric is placed in an electric field, like between the parallel plates of a capacitor, the dipoles are created and they tend to align themselves parallel to the direction of the field.

Q29. CO_2 is a polar dielectric.

a) True

b) False

Answer: b

Explanation: In CO_2, the atoms are aligned in a symmetric way. Thus, the centers of positive and negative charge coincide and the molecule has no net charge and a zero dipole moment. Hence, it is a non-polar dielectric.

Q30. The torque induced on a dipole when placed in an electric field E is given by

_____

a) Esinθ

b) pEsinθ

c) Ecosθ

d) pEcosθ

Answer: b

Explanation: The torque on the dipole when it is placed in an electric field is given by: pEsinθ. It tends to align the dipole in the direction of the electric field.

Q31. The dipole is most stable when the angle between the dipole and the field is

_____

a) 0°

b) 45°

c) 90°

d) 180°

Answer: a

Explanation: The potential energy of a dipole is given by -pEcosθ. Thus the dipole would be most stable when potential energy would be minimum. Hence, when θ = 0, i.e., the dipole is aligned in the direction of the field, the dipole would be most stable.

Q32. What is the value of 1 Debye in cm?

a) $3.33 \text{ X } 10^{-28}$ cm

b) $3.33 \text{ X } 10^{-30}$ cm

c) $3.33 \text{ X } 10^{-32}$ cm

d) $3.33 \text{ X } 10^{-34}$ cm

Answer: b

Explanation: Debye is the unit in which the dipole moment of a dipole is calculated. The value of 1 Debye is equal to $3.33 \text{ X } 10^{-30}$ cm or $3.33 \text{ X } 10^{-32}$ m

Q33. Polarization is defined as the dipole moment _____

a) per unit length

b) per unit area

c) per unit volume

d) per unit time

Answer: c

Explanation: When a dipole is placed in an electric field, the positive charges appear near the negative electrode and negative charges near the positive electrode. This phenomenon is called polarization which is defined as Dipole moment per unit volume.

Q34. In a water drop of radius 1 mm all the molecular dipole points are in the same direction. If the dipole moment of a water molecule is 6 X 10^{-30} m, the polarization in the water drop is _____

a) 6.4 X 10^{-13} m^{-2}

b) 7.4 X 10^{-13} m^{-2}

c) 8.4 X 10^{-13} m^{-2}

d) 9.4 X 10^{-13} m^{-2}

Answer: c

Explanation: Molecular mass of water = 18 gm

18 gm of water contains 6.023 X 10^{23} molecules

18/10^3 m^3 of water contains 6.023 X 10^{26}/18 molecules

Volume of water drop = 4π/3 X $(10^{-3})^3$ m^3

No of molecules in the drop, N = 6.023 X 10^{26} X 4π X 10^{-9}/18 X 3

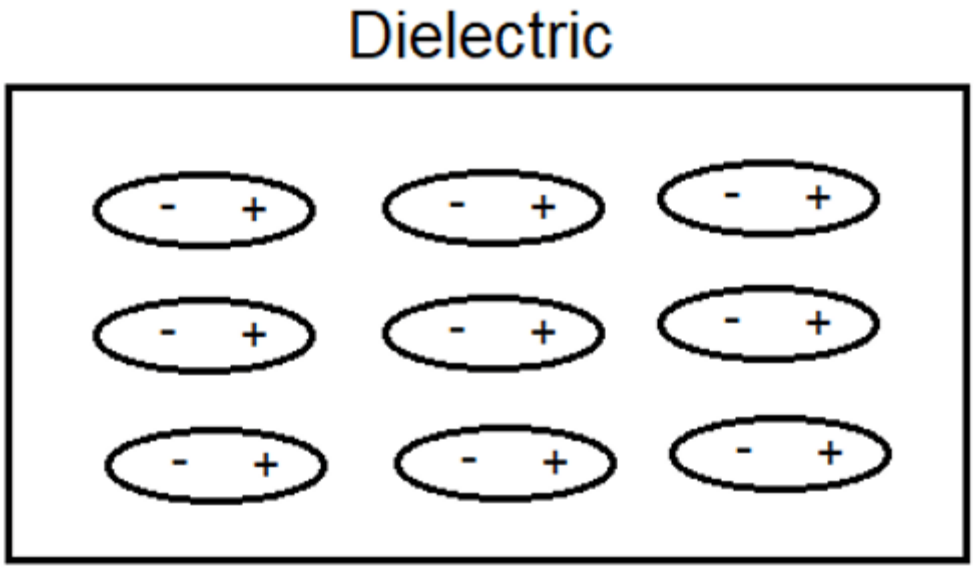
= 1.4 X 10^{17} m^{-3}

Polarization, P = Np

= 1.4 X 10^{17} m^{-3} X 6 X 10^{-30} m

= 8.4 X 10^{-13} m^{-2}.

Q35. What is the direction of electric field?



a) Right to Left

b) Up to Down

c) Down to Up

d) Left to Right

Answer: d

Explanation: As seen in the figure, the dipoles are arranged in such a way that the positive charge is on the right and negative charge on the left. Thus, the electric field is from left to right.

Q36. In the formula, $P = \chi_e E$, what is χ_e called?

a) Electric constant

b) Polarizing constant

c) Electric susceptibility

d) Polarizing susceptibility

Answer: c

Explanation: In the given expression, χ_e is a constant characteristic of the dielectric and is known as the electric susceptibility of the dielectric medium.

Q37. H_2O is a polar dielectric.

a) True

b) False

Answer: a

Explanation: In H_2O, the atoms are aligned in a symmetric way. However, as the electronegativity of oxygen is higher than hydrogen, it pulls the electronic cloud towards itself and it results in a net dipole moment.

Q38. What is the new capacitance of the plates, when a slab of Dielectric Constant K and thickness one-fourth of the separation of plate is inserted between the plates?

a) $4KC_o/K + 2$

b) $4KC_o/1 + 2K$

c) $4KC_o/K + 3$

d) $4KC_o/1 + 3K$

Answer: d

Explanation: As the slab is inserted between the plates,

$V = E_0(d/4)/K + E_o(3d/4)$

$= E_od\ (1/4K + 3/4)$

$= V_o(1+3K)/4K$

Now we know, $C = Q_o/V$

$= 4KC_o/(1 + 3K)$.

Q39. The expression for electric susceptibility is _____

a) ε_oE

b) ε_oEK

c) $\varepsilon_oE\ (K + 1)$

d) $\varepsilon_oE\ (K – 1)$

Answer: c

Explanation: Electric susceptibility of a dielectric medium is a constant characteristic of the dielectric. The electric susceptibility is given by $\varepsilon_oE\ (K – 1)$.

Q40. The relative dielectric constant of polystyrene is 2.5. What is the polarization produced when 0.5 mm thick sheet of polystyrene is subjected to 220 V?

a) 2.78 X 10^{-6} C/m

b) 3.91 X 10^{-6} C/m

c) 4.12 X 10^{-6} C/m

d) 5.84 X 10^{-6} C/m

Answer: d

Explanation: We know, Polarization, $P = \varepsilon_o(\varepsilon_r - 1)E$

Here, $\varepsilon_r = 2.5$

$E = V/d$

$= 220 / 0.5 \text{ X } 10^{-3}$

$= 4.4 \text{ X } 10^5$ Vm

$\varepsilon_o = 8.85 \text{ X } 10^{-12}$ C/Vm

Hence, $P = 8.85 \text{ X } 10^{-12} \text{ X } (2.5 - 1) \text{ X } 4.4 \text{ X } 10^5$ C/m^2

$= 5.84 \text{ X } 10^{-6}$ C/m.

Q41.In which type of molecule positive and negative charges coincide with each other?

a) Polar

b) Unipolar

c) Non-polar

d) Bipolar

Answer: c

Explanation: A molecule in which the centre of mass of positive and negative charges collide with each other is called a non-polar molecule. They normally have zero dipole moment. They have symmetrical shapes.

Q42. What is the ratio of the polarization to ε_o times the electric field called?

a) Polarisation density

b) Electric susceptibility

c) Dielectric strength

d) Dielectric susceptibility

Answer: b

Explanation: The ratio of the polarization to ε_o times the electric field is called the electric susceptibility of the dielectric. It describes the electrical behaviour of a dielectric.

Q43. Which of the following is an example of a molecule whose centre of mass of positive and negative charges coincide each other?

a) CO_2

b) CO

c) CH_3OH

d) NH_3

Answer: a

Explanation: CO_2 is a molecule in which the centre of mass of positive and negative charges collide with each other and is called a non-polar molecule. They normally have zero dipole moment. They have symmetrical shapes.

Q44. What is the induced dipole moment developed per unit volume of a dielectric when placed in an external electric field called?

a) Relative permittivity

b) Polarisation susceptibility

c) Electric susceptibility

d) Polarisation density

Answer: d

Explanation: The induced dipole moment developed per unit volume of a dielectric when placed in an external electric field is called polarization density. It may be defined as the charge induced per unit surface area.

Q45. In which type of molecule positive and negative charges does not coincide with each other?

a) Isentropic

b) Equipotential

c) Polar

d) Non-polar

Answer: c

Explanation: A molecule in which the centre of mass of positive and negative charges does not collide with each other is called a polar molecule. They have a permanent dipole moment. They have unsymmetrical shapes.

Q46. The molecules of a polar dielectric have no dipole moment. State true or false.

a) True

b) False

Answer: b

Explanation: The molecules of a polar dielectric have permanent dipole moments. In the absence of an external electric field, the dipole moments of different molecules are randomly oriented due to thermal agitation in the material.

Q47. 'X' is a substance which does not allow the flow of charges through it but permits them to exert electrostatic forces on one another through it. Identify X.

a) Polar molecule

b) Dielectric

c) Non-polar molecule

d) Equipotential

Answer: b

Explanation: A dielectric is a substance which does not allow the flow of charges through it but permits them to exert electrostatic forces on one another through it. A dielectric is essentially an insulator which can be polarized through small localized displacements of its charges.

Q48. Which of the following is an example of a molecule whose centre of mass of positive and negative charges does not coincide each other?

a) NH_3

b) H_2

c) CH_4

d) CO_2

Answer: a

Explanation: NH_3 is a molecule in which the centre of mass of positive and negative charges does not collide with each other and is called a polar molecule. They have a permanent dipole moment. They have unsymmetrical shapes.

Q48. What is the value of dielectric constant of free space?

a) $8.854 * 10^{-9}$ F m^{-1}

b) $8.854 * 10^{-12}$ F $^{-1}$

c) $8.854 * 10^{-15}$ F $^{-1}$

d) $8.854 * 10^{-6}$ F $^{-1}$

Answer: b

Explanation: The dielectric constant is that value which designates the capacity of a material to store electrical energy. It is denoted by and has a value of $8.854 * 10^{-12}$ F m-1. Dielectric constant is denoted as Farad per meter.

Q49. What is the unit of polarization?

a) Cm

b) Vm^{-1}

c) Cm^{-2}

d) Fm^2

Answer: c

Explanation: The unit of Polarization (P) and the Saturation Polarization (Ps) is given as coulomb per square meter (Cm^{-2}). Coulomb meter (Cm) is used to denote the dipole moment, whereas farad meter square (Fm^2) is used to denote electronic polarizability.

Q50. How is the dielectric strength denoted as?

a) s^{-1}

b) Vm^{-1}

c) Fm^{2}

d) CV^{-1}

Answer: b

Explanation: The dielectric strength of a material is defined as the maximum amount of electric field that it can withstand without a fracture. It is denoted as volt per meter (Vm^{-1}) or newton per coulomb (NC^{-1}). Dielectric strength can alternatively be referred to as electric field strength (E).

Q51. What is the charge of an electron?

a) $1.602 * 10^{-16}$

b) $1.602 * 10^{-17}$

c) $1.602 * 10^{-18}$

d) $1.602 * 10^{-19}$

Answer: d

Explanation: An electron is a negatively charged subatomic particle having a mass of 9.1 * 10-31. It has an electronic charge of 1.602 * 10-19 C which is denoted by e or e-.

Q52. Which of the following factors are relevant for change in dielectric strength?

a) Decreases with a decrease in thickness

b) Decreases with a decrease in temperature

c) Decreases with an increase in humidity

d) Decreases with a decrease in frequency

Answer: c

Explanation: Dielectric strength is defined as the minimum applied voltage that would result in a fracture. The dielectric strength decreases with increase in thickness of the sample, operating temperature, and the frequency. Increased humidity decreases the dielectric strength in case of gases and air.

Q53. What is the dielectric constant of free space?

a) $\frac{D}{\epsilon_r}$ b) $\frac{D}{E}$ c) $\frac{D}{\epsilon_r E}$ d) $\frac{1}{\epsilon_r E}$

Answer: c

Explanation: The dielectric constant is that value which denotes the capacity of a material to store electrical energy. It is denoted by $\epsilon_o = \frac{D}{\epsilon_r E} = \frac{Cm^{-2}}{Vm^{-1}} = Fm^{-1}$. It has a constant value of $8.854 * 10^{-12}$ Fm^{-1}.

Q54. What is the electric polarizability of helium?

a) $0.18 * 10^{-40}$ Fm^2

b) $0.35 * 10^{-40}$ Fm^2

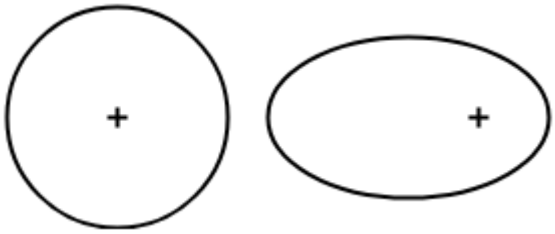
c) $1.43 * 10^{-40}$ Fm^2

d) $3.54 * 10^{-40}$ Fm^2

Answer: a

Explanation: The constant of proportionality of electric dipole moment is defined as electric polarizability. The polarizability increases with increasing volume of the atom. The electric polarizability of helium is $0.18 * 10^{-40}$ Fm^2 and has the value of $0.35 * 10^{-40}$, Fm^2 $1.43 * 10^{-40}$ Fm^2, and $3.54 * 10^{-40}$ Fm^2 for neon, argon, and xenon in that order.

Q55. Which polarization process does this figure represent?



a) Ionic

b) Electronic

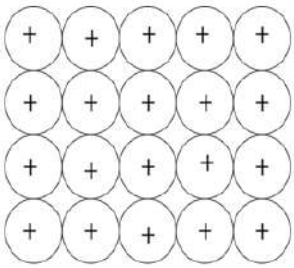
c) Orientation

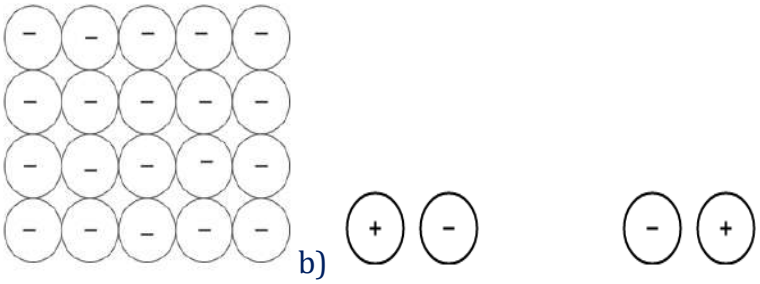
d) Space charge

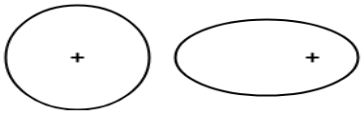
Answer: b

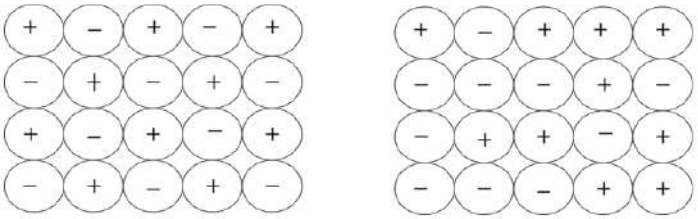
Explanation: Atoms require an excess charge (either positive or negative) during chemical bonding. When an electric field is passed for this, the cations and anions may get displaced. The displacement for this electronic polarization is illustrated in the figure.

Q56. Which if the following shows space charge polarization?

a) 

b) 

c) 

d) 

Answer: d

Explanation: In some instances, the materials begin to accumulate the charges at the electrode or interface. The diffusion of ions occurs over a distance, which causes a rearrangement or the dielectric medium. Such a reorganization is seen as the space charge polarization.

Q58. Polarization occurring due to magnetic moment is known as _____

a) Ionic

b) Electronic

c) Orientation

d) Space charge

Answer: c

Explanation: When an electric field is applied to molecules having a dipole moment, they tend to rearrange themselves. This is due to the effect of applied magnetic field, which gives rise to paramagnetism.

Q59. What is the dielectric strength of mica?

a) $10 * 10^6$ Vm^{-1}

b) $100 * 10^6$ Vm^{-1}

c) $25 * 10^6$ Vm^{-1}

d) $15 * 10^6$ Vm^{-1}

Answer: b

Explanation: Dielectric strength is defined as the least amount of applied voltage that would result in a rupture. Mica is an important dielectric material having a dielectric strength of $100 * 10^6$ Vm^{-1} and a dielectric constant of 8 at 60 Hz. The dielectric strength of fused silica, vulcanized rubber, and Bakelite are $10 * 10^6$ Vm^{-1}, $25 * 10^6$ Vm^{-1}, and $15 * 10^6$ Vm^{-1} correspondingly.

Q60. What is the dielectric constant of Nylon 6, 6 at 60 Hz?

a) 3.5

b) 4

c) 7

d) 8

Answer: b

Explanation: The dielectric constant is that value which denotes the ability of a material to accumulate electrical energy. Nylon 6, 6 is an important dielectric material having a dielectric strength of 15 * 106 Vm^{-1} and a dielectric constant of 8 at 60 Hz, or 3.5 at 106 Hz. The dielectric constants of plasticized polyvinyl chloride and mica are 7 and 8 respectively.

Q61. The electrical response of a crystal is known as _____

a) Dielectric strength

b) Dielectric constant

c) Piezoelectric effect

d) Hysteresis

Answer: c

Explanation: The mechanical response of a ferroelectric crystal on the application of an electric field is known as the piezoelectric effect. The piezoelectric effect can be seen in ferroelectric crystals. $BaTiO_3$ is a common ferroelectric crystal, which is used for its piezoelectric properties in microphones, strain gauges, and sonar devices.

Q62.How is the magnetic induction of material defined?

a) Wb m^{-2}

b) A m^2

c) A m^{-2}

d) H m^{-1}

Answer: a

Explanation: Electromagnetic induction is the production of a voltage in an electrical conductor having a varying magnetic field. It is defined as Weber per square meter or Tesla (T). Saturation induction Ba and residual induction BT are also given by the same unit.

Q63. The measure of the capacity of a material to produce its own magnetic field is defined as _____

a) Magnetic induction

b) Magnetization

c) Permeability

d) Magnetic moment

Answer: c

Explanation: Permeability in electromagnetism is defined as its ability of formation of a magnetic field in itself. Magnetic permeability is given as Henry per meter (H m-1) and is denoted by the symbol.

Q64. How is the magnetic field strength defined?

a) Wb m^{-2}

b) A m^{2}

c) A m^{-2}

d) H m^{-1}

Answer: c

Explanation: The strength of a magnetic field produced as a result of moving charges and dipoles is known as magnetic field strength (H). Mathematically, it is denoted by with its SI units given in ampere per meter (A m-1).

Q65.What is the permeability of free space?

a) $4 * 10^{-6}$

b) $4 * 10^{-7}$

c) $4 * 10^{-8}$

d) $4 * 10^{-9}$

Answer: b

Explanation: Permeability is defined as the ability of a material to form a magnetic field within itself. The permeability of free space is denoted by and has a constant value of $4 * 10^{-7}$ H m^{-1}.

Q66. How is magnetic moment determined?

a) Planck unit

b) Bohr magneton

c) Eddington number

d) Sommerfield number

Answer: b

Explanation: The magnetic moment is the amount of torque produced in a magnetic field. This is expressed in terms of the constant known as Bohr magneton.

Q67. What is the formula for Bohr magneton?

a) $\frac{eh}{2m_e}$ b) $\frac{h}{2m_e}$ c) $\frac{e}{m_e}$ d) $\frac{1}{2m_e}$

Answer: a

Explanation: Bohr magneton is defined as that constant which is used to express the magnetic moment of an electron. It is mathematically defined by $\frac{eh}{2m_e}$ in SI units and $\frac{eh}{2m_e c}$ in CGS units. It has a constant value of $9.273 * 10^{-24}$ A m^2 in case of SI units and $9.273 * 10^{-21}$ A m^2 in case of CGS units.

Q68. The measure of a material which helps to determine whether it is attracted to or repelled from a magnetic field is known as _____

a) Magnetization

b) Permeability

c) Frequency

d) Susceptibility

Answer: d

Explanation: In electromagnetism, susceptibility is defined as a measure which is used to identify whether a material is attracted to or repelled on the application of a magnetic field. It is denoted by X and is mathematically defined as.

Q69. _____ is a weak magnetizing effect in which magnetic lines of force are repelled.

a) Diamagnetism

b) Ferromagnetism

c) Paramagnetism

d) Ferrimagnetism

Answer: a

Explanation: Diamagnetism is caused due to the modifications of motion of electrons which produces an opposing magnetic field. The magnetic lines of force are repelled, which results in weak force and low susceptibility. Copper, mercury, and gold are common examples of diamagnetic materials.

Q70. Which material is considered as perfectly diamagnetic?

a) Copper

b) Gold

c) Superconductor

d) Water

Answer: c

Explanation: Superconductors are considered as perfect diamagnets due to their ability to eject magnetic force in all directions. This principle is based on the well known Meissner effect. Superconductors have a susceptibility of $-1 * 10^5$.

Q71____ is a weak magnetizing effect in which the material is attracted due to the application of magnetic force.

a) Diamagnetism

b) Ferromagnetism

c) Paramagnetism

d) Ferrimagnetism

Answer: c

Explanation: The phenomenon by which the magnetic moments of atoms of material get aligned in the direction of the magnetic field is known as paramagnetism. This force is usually small, thereby producing a weak effect.

Q72 What is the temperature at which a phase transition from ferromagnetic to paramagnetic occurs?

a) Weiss

b) Curie

c) Neel

d) Debye

Answer: b

Explanation: Curie temperature is defined as that temperature at which materials lose their permanent magnetic properties. In other words, a transition from a ferromagnetic state to paramagnetic phase occurs. This is otherwise also known as Curie point, named after Pierre Curie.

Q73. What is the temperature at which a change from the anti-ferromagnetic phase to paramagnetic phase occurs?

a) Weiss

b) Curie

c) Neel

d) Debye

Answer: b

Explanation: Neel temperature is defined as that temperature at which materials lose their magnetic ordering due to large thermal energy. In other words, a transition from the anti-ferromagnetic state to paramagnetic phase occurs. This is otherwise also known as magnetic ordering temperature and is named after Louis Neel.

Q74. What is the property of magnetic materials?

a) Resistivity

b) Conductivity

c) Permeability

d) Ductility

Answer: c

Explanation: There are many properties of magnetic materials, and permeability is one among them. The other 3 properties are related to other materials like conducting and insulating materials

Q75. What is the property of permeability in magnetic materials?

a) how easily the magnetic flux is broken/clear

b) how easily the magnetic flux is set up

c) how long the magnetic flux takes to form

d) how long the magnetic flux takes to clear

Answer: b

Explanation: The basic operation of magnetic material is to form magnetic flux. Permeability is the ability of the material to determine how easily the magnetic flux is set up.

Q76. What is the representation of permeability?

a) coercivity/retentivity

b) flux/flux density

c) magnetic force/magnetic flux density

d) magnetic flux density/magnetic force

Answer: d

Explanation: Permeability is the property which deals, with the relationship with magnetic flux density and magnetic force. Magnetic force/Magnetic flux density deals with the reciprocal of permeability. Coercivity/Retentivity deals with the terms of B-H curve.

Q77.How should the permeability and number of ampere turns for good magnetic materials be?

a) high permeability, high ampere turns

b) high permeability, low ampere turns

c) low permeability, low ampere turns

d) low permeability, high ampere turns

Answer: b

Explanation: High permeability is always required in magnetic materials for its good operation. At the same time high permeability leads to less ampere turns in the materials.

Q78. Is retentivity associated with B-H curve?

a) Yes

b) No

Answer: a

Explanation: B-H curve deals with the concepts of retentivity and coercivity. The property of retentivity can be shown in the B-H curve by an increasing curve in the curve.

Q79. What is the property of retentivity in magnetic materials?

a) After removal of external magnetic fields, magnetization exists

b) After removal of external magnetic fields, magnetization doesn't exist

c) After removal of internal magnetic fields, magnetization exists

d) After removal of internal magnetic fields, magnetization doesn't exist

Answer: a

Explanation: Magnetic materials have the property of retentivity in which the magnetic flux produced acts according to the external magnetic field. When the external field is removed, the magnetization in the materials doesn't deform immediately.

Q 80. What is coercivity force in magnetic materials?

a) The force required to add upon the existing magnetization

b) The force required to remove the existing magnetization

c) The force required to produce magnetic flux

d) The force required to break magnetic flux

Answer: b

Explanation: Magnetic materials generally have the property of retaining magnetization, even if the external magnetic field is removed. So, coercive force is the force that is required to reduce the magnetization.

Q81. What are magnetic hard materials?

a) High retentivity, low coercivity

b) High retentivity, high coercivity

c) Low retentivity, low coercivity

d) Low retentivity, high coercivity

Answer: b

Explanation: High retentivity is required for protecting the magnetic materials from losing its magnetic property. High coercivity is required to reduce the effect of retentivity to protect the material.

Q82. What is reluctance in magnetic materials?

a) Allows the buildup of magnetic flux

b) Reduces the buildup of magnetic flux

c) Resists the buildup of magnetic flux

d) Increases the buildup of magnetic flux

Answer: c

Explanation: Reluctance, as the name suggests, is something which is reluctant or hesitant to do. As per the magnetic terms it resists the building up of magnetic flux in the materials.

Q83. High Reluctance affects the performance of magnetic materials.

a) True

b) False

Answer: a

Explanation: High reluctance means the materials resist in building up the magnetic flux to a higher extent. So, for the proper functioning the reluctance values should be as low as possible.

Q84. What is the unit of reluctance in magnetic materials?

a) Henry/m

b) Weber/m^2

c) Ampere-turns/Weber

d) Ampere-turns/m

Answer: c

Explanation: Henry/m deals with the unit of permeability. Weber/m^2 deals with the unit of magnetic field. Reluctance is the opposite of permeance.

Q85. How many classifications of magnetic materials are present?

a) 3

b) 4

c) 5

d) 6

Answer: c

Explanation: There are basically 4 properties in magnetic materials and 5 classifications. They are diamagnetic, paramagnetic, ferromagnetic, antiferromagnetic, ferrimagnetic.

Q86. What is the property of ferromagnetic materials?

a) Negative magnetization

b) Magnetization slightly less than 1

c) Magnetization slightly greater than 1

d) Magnetization very much higher than 1

Answer: d

Explanation: Negative magnetization denotes the property of Diamagnetic materials. Magnetization slightly greater than 1 denotes the property of Paramagnetic materials. Ferromagnetic materials have magnetization in the range of 1000+.

Q87. What is the example of diamagnetic materials?

a) Quartz

b) Pyrite

c) Montmorillonite

d) Biotite

Answer: a

Explanation: The other 3 materials are paramagnetic in nature, which means magnetization is slightly above 1. Quartz is a diamagnetic material in which the magnetization is negative.

Q88. What is the example of ferromagnetic materials is?

a) Magnetite

b) Hematite

c) Nickel

d) Biotite

Answer: a

Explanation: Hematite denotes the example of antiferromagnetic materials. Nickel denotes an example of ferromagnetic materials. Biotite denotes the example of paramagnetic materials.

Q89 Material is ferromagnetic, what shall be the value of χ?

a) Negative

b) Small and positive

c) Large and Positive

d) Insufficient information

Answer: c

Explanation: When a material is ferromagnetic, the magnetic susceptibility, χ, is large and positive. For a diamagnetic material it is negative and for a paramagnetic material, it is small and positive.

Q90. Which of the following is a diamagnetic material?

a) Sodium

b) Calcium

c) Oxygen (at STP)

d) Nitrogen (at STP)

Answer: d

Explanation: Nitrogen (at STP) is a diamagnetic material. Sodium, Calcium and Oxygen (at STP) are paramagnetic in nature.

Q91. Which of the following is the correct expression for Curie's law?

a) $\chi = C\mu_0 T$

b) $\chi = C\mu_0/T$

c) $\mu_0 = C\,\chi\,T$

d) $\mu_0 = C\,\chi\,/T$

Answer: b

Explanation: The expression, $\chi = C\mu_0/T$, is the correct expression for the Curie's law. It shows that, for a paramagnetic material, both χ and μ depend not only on the material, but also on the sample temperature.

Q92 Curie's law is applicable at every point on a Paramagnetic Material.

a) True

b) False

Answer: b

Explanation: As the field is increased or the temperature is lowered, the magnetization increases until it reaches the saturation value, at which point all the dipoles are perfectly aligned with the field. Beyond this, Curie's law is no longer valid.

Q93. The phenomenon of perfect diamagnetism is called _____

a) Superconductivity

b) Diamagnetic Effect

c) Zero Kelvin Effect

d) Meissner Effect

Answer: d

Explanation: The phenomenon of perfect diamagnetism in superconductors is called the Meissner effect, after the name of its discoverer. It is used to magnetically levitate superfast trains.

Q95 Materials in which magnetization persists even after the field has been removed are called _____

a) Diamagnetic

b) Paramagnetic

c) Soft Ferro magnets

d) Hard Ferro magnets

Answer: d

Explanation: In Hard Ferro magnets, even after the magnetic field has been removed, the magnetization persists. Alnico is one such material.

Q96. Superconductors are diamagnetic materials.

a) True

b) False

Answer: a

Explanation: Diamagnetic materials cooled to very low temperatures exhibits both perfect conductivity and perfect diamagnetism. Here the field lines are completely expelled. They are called superconductors.

Q98. Which of the following is not a constituent of Alnico?

a) Iron

b) Aluminum

c) Magnesium

d) Copper

Answer: c

Explanation: Alnico is a hard Ferro magnet. The magnetization in it persists even after the field has been removed. It consists of iron, aluminum, cobalt, nickel and copper.

Q 99. At high temperature a Ferro magnet becomes _____

a) Diamagnetic

b) Paramagnetic

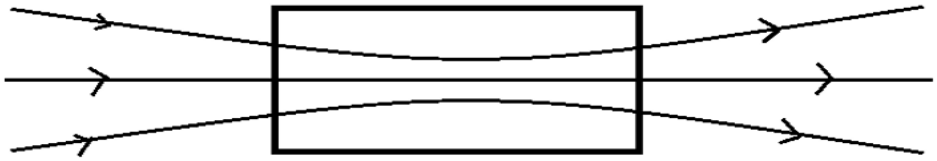
c) Hard Ferro magnet

d) Soft Ferro Magnet

Answer: b

Explanation: The properties of a Ferro-magnet are depended on temperature. When they are heated up to a high temperature, it loses its Ferro magnetic properties and become a paramagnet. This transition occurs at a specific temperature, called the transition point.

100. Which material is shown in the figure?



a) Diamagnetic Material

b) Paramagnetic Material

c) Ferromagnetic Material

d) Non-Magnetic Material

Answer: b

Explanation: The material shown in the figure is a paramagnetic material. Paramagnetic materials have a tendency to move from a region of weak magnetic field to strong magnetic field, i.e., they get weakly attracted to a magnet.

101. The value of B at H=0 in a Hysteresis curve is called _____

a) Remanence

b) Coercivity

c) Magnetization

d) Porosity

Answer: a

Explanation: The value of B at H = 0 is called the retentivity or the remanence of the material. It shows the capability of a material to hold the magnetization.

102. When a ferromagnetic rod is placed in a solenoid with current, what happens to the rod?

a) Retentivity increases

b) Coercivity Increases

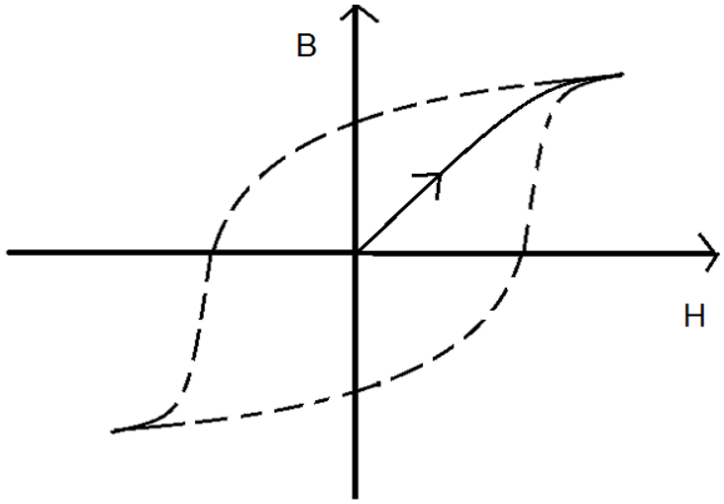
c) Permanently Magnetized

d) Nothing

Answer: c

Explanation: When a ferromagnetic material is placed inside a solenoid and a current is passed, the magnetic field of the solenoid magnetizes the rod and it becomes a permanent magnet.

103. What does the following curve show?



a) Magnetization curve

b) Hysteresis curve

c) Polarizing curve

d) Coercive Curve

Answer: b

Explanation: The given figure is the diagram of a hysteresis curve. It shows that for a given value of H, B is not unique but depends on the previous history of the sample. This phenomenon is called hysteresis.

104. If the number of atoms in the domain in ferromagnetic iron, in the form of a cube of side length 1μm, is 8.65 X 10^{10} atoms and dipole moment of each iron atom is 9.27 X 10^{-24} Am^2, what is the maximum Magnetization of the domain?

a) 6 X 10^5 A/m

b) 7 X 10^5 A/m

c) 8 X 10^5 A/m

d) 9 X 10^5 A/m

Answer: c

Explanation: Now, we know the maximum dipole moment = N X m

M_{max} = 8.65 X 10^{10} X 9.27 X 10^{-24}

= 8 X 10^{-13} Am^2

Volume = $(10^{-6})^3$ = 10^{-18} m^3

Therefore, Magnetization = M_{max}/ Volume

= 8 X 10^{-13} $Am^2/10^{-18}$ m^3

= 8 X 10^5 A/m.

105. Which of the following conditions are desired in the core of an electromagnet?

a) High permeability and High retentivity

b) Low permeability and High retentivity

c) High permeability and Low retentivity

d) Low permeability and Low retentivity

Answer: c

Explanation: Ferromagnetic materials have high permeability and low retentivity. Due to these properties, the core of electromagnets is made up of ferromagnetic materials.

106. If a material is ferromagnetic, what shall be the value of χ?

a) Negative

b) Small and positive

c) Large and Positive

d) Insufficient information

Answer: c

Explanation: When a material is ferromagnetic, the magnetic susceptibility, χ, is large and positive. For a diamagnetic material it is negative and for a paramagnetic material, it is small and positive.

107. Which of the following is a diamagnetic material?

a) Sodium

b) Calcium

c) Oxygen (at STP)

d) Nitrogen (at STP)

Answer: d

Explanation: Nitrogen (at STP) is a diamagnetic material. Sodium, Calcium and Oxygen (at STP) are paramagnetic in nature.

108. Which of the following is the correct expression for Curie's law?

a) $\chi = C\mu_0 T$

b) $\chi = C\mu_0/T$

c) $\mu_0 = C\ \chi\ T$

d) $\mu_0 = C\ \chi\ /T$

Answer: b

Explanation: The expression, $\chi = C\mu_0/T$, is the correct expression for the Curie's law. It shows that, for a paramagnetic material, both χ and μ depend not only on the material, but also on the sample temperature.

109.Curie's law is applicable at every point on a Paramagnetic Material.

a) True

b) False

Answer: b

Explanation: As the field is increased or the temperature is lowered, the magnetization increases until it reaches the saturation value, at which point all the dipoles are perfectly aligned with the field. Beyond this, Curie's law is no longer valid.

110. The phenomenon of perfect diamagnetism is called _____

a) Superconductivity

b) Diamagnetic Effect

c) Zero Kelvin Effect

d) Meissner Effect

Answer: d

Explanation: The phenomenon of perfect diamagnetism in superconductors is called the Meissner effect, after the name of its discoverer. It is used to magnetically levitate superfast trains.

111. Materials in which magnetization persists even after the field has been removed are called _____

a) Diamagnetic

b) Paramagnetic

c) Soft Ferro magnets

d) Hard Ferro magnets

Answer: d

Explanation: In Hard Ferro magnets, even after the magnetic field has been removed, the magnetization persists. Alnico is one such material.

112. Superconductors are diamagnetic materials.

a) True

b) False

Answer: a

Explanation: Diamagnetic materials cooled to very low temperatures exhibits both perfect conductivity and perfect diamagnetism. Here the field lines are completely expelled. They are called superconductors.

113. Which of the following is not a constituent of Alnico?

a) Iron

b) Aluminum

c) Magnesium

d) Copper

Answer: c

Explanation: Alnico is a hard Ferro magnet. The magnetization in it persists even after the field has been removed. It consists of iron, aluminum, cobalt, nickel and copper.

114. At high temperature a Ferro magnet becomes _____

a) Diamagnetic

b) Paramagnetic

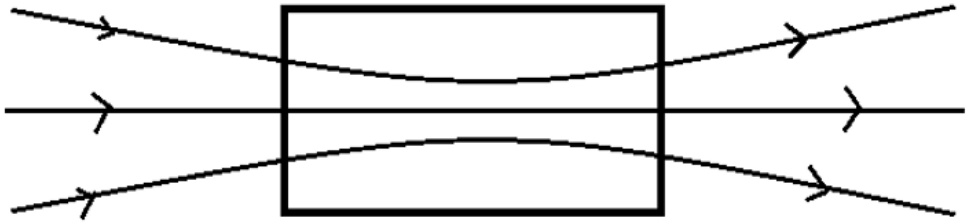
c) Hard Ferro magnet

d) Soft Ferro Magnet

Answer: b

Explanation: The properties of a Ferro-magnet are depended on temperature. When they are heated up to a high temperature, it loses its Ferro magnetic properties and become a paramagnet. This transition occurs at a specific temperature, called the transition point.

115. Which material is shown in the figure?



a) Diamagnetic Material

b) Paramagnetic Material

c) Ferromagnetic Material

d) Non-Magnetic Material

Answer: b

Explanation: The material shown in the figure is a paramagnetic material. Paramagnetic materials have a tendency to move from a region of weak magnetic field to strong magnetic field, i.e., they get weakly attracted to a magnet.

116. The value of B at H=0 in a Hysteresis curve is called _____

a) Remanence

b) Coercivity

c) Magnetization

d) Porosity

Answer: a

Explanation: The value of B at H = 0 is called the retentivity or the remanence of the material. It shows the capability of a material to hold the magnetization.

117. When a ferromagnetic rod is placed in a solenoid with current, what happens to the rod?

a) Retentivity increases

b) Coercivity Increases

c) Permanently Magnetized

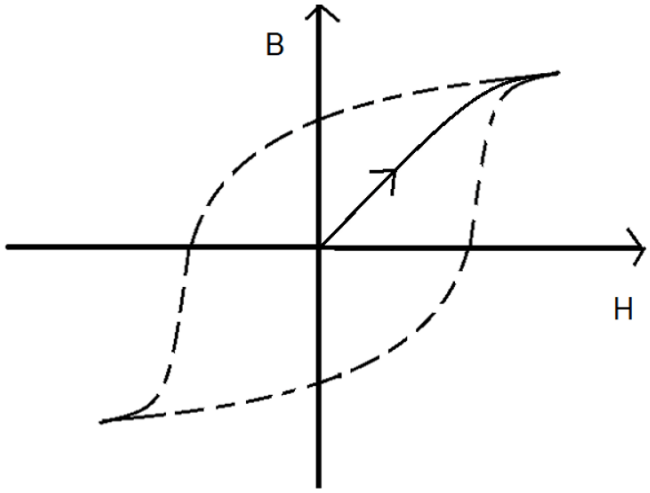
d) Nothing

Answer: c

Explanation: When a ferromagnetic material is placed inside a solenoid and a current is

passed, the magnetic field of the solenoid magnetizes the rod and it becomes a permanent magnet.

118. What does the following curve show?



a) Magnetization curve

b) Hysteresis curve

c) Polarizing curve

d) Coercive Curve

Answer: b

Explanation: The given figure is the diagram of a hysteresis curve. It shows that for a given value of H, B is not unique but depends on the previous history of the sample. This phenomenon is called hysteresis.

119. If the number of atoms in the domain in ferromagnetic iron, in the form of a cube of side length 1μm, is 8.65 X 10^{10} atoms and dipole moment of each iron atom is 9.27 X 10^{-24} Am^2, what is the maximum Magnetization of the domain?

a) 6 X 10^5 A/m

b) 7 X 10^5 A/m

c) 8 X 10^5 A/m

d) 9 X 10^5 A/m

Answer: c

Explanation: Now, we know the maximum dipole moment = N X m

M_{max} = 8.65 X 10^{10} X 9.27 X 10^{-24}

= 8 X 10^{-13} Am^2

Volume = $(10^{-6})^3 = 10^{-18}$ m^3

Therefore, Magnetization = M_{max}/ Volume

= 8 X 10^{-13} $Am^2/10^{-18}$ m^3

= 8 X 10^5 A/m.

120. Which of the following conditions are desired in the core of an electromagnet?

a) High permeability and High retentivity

b) Low permeability and High retentivity

c) High permeability and Low retentivity

d) Low permeability and Low retentivity

Answer: c

Explanation: Ferromagnetic materials have high permeability and low retentivity. Due to these properties, the core of electromagnets is made up of ferromagnetic materials.

121. In which of the following the magnetic moments align themselves parallel to each other?

a) Paramagnetic material

b) Ferromagnetic material

c) Ferrimagnetic material

d) Diamagnetic material

Answer: b

Explanation: In a ferromagnetic material, the number of unpaired electrons is more. Most of these spin magnetic moments point in one direction. Hence even in the absence of an external field, the magnetic moments align themselves parallel to each other and give rise to a magnetic field.

122. Which of the following is a strong magnet?

a) Diamagnetic material

b) Paramagnetic material

c) Antiferromagnetic material

d) Ferromagnetic material

Answer: d

Explanation: The ferromagnetic materials have a permanent dipole moment. So they act as strong magnets.

123. Which of the following exhibits spontaneous magnetisation?

a) Paramagnetic material

b) Ferrimagnetic material

c) Diamagnetic material

d) Ferromagnetic material

Answer: d

Explanation: The ferromagnetic materials exhibit magnetisation even in the absence of an external field. This property is called spontaneous magnetisation. Hence ferromagnets exhibit spontaneous magnetisation.

124. When does a ferromagnetic material become paramagnetic material?

a) At Curie temperature

b) Below Curie temperature

c) Above Curies temperature

d) Never

Answer: c

Explanation: Curie temperature is the temperature at which the magnetic properties of a material change. When the temperature is greater than curie temperature, ferromagnetic material becomes paramagnetic material.

125. Which of the following materials have a permanent magnetic moment?

a) Ferromagnetic material

b) Ferrimagnetic material

c) Diamagnetic material

d) Paramagnetic material

Answer: a

Explanation: In a ferromagnetic material, there will be a large number of unequal electron spins and hence there exists an enormous amount of permanent magnetic moment.

126.In which of the following increases and then decreases?

a) Ferromagnetic material

b) Antiferromagnetic material

c) Paramagnetic material

d) Diamagnetic material

Answer: b

Explanation: The susceptibility is very small and is positive. It is given by, susceptibility = $C/(T+\theta)$ for $T>T_N$. Where T_N is the Neel temperature.

Initially, the susceptibility increases slightly as the temperature increases and beyond a particular temperature, known as Neel temperature, the susceptibility decreases with temperature.

127. What is the material used in two port device?

a) Ferromagnets

b) Ferrites

c) Antiferromagnets

d) Paramagnets

Answer: b

Explanation: The ferrites have low hysteresis loss and eddy current loss. Hence they are used in two port devices such as gyrator, circulator and isolator.

128. A paramagnetic material had a magnetic field intensity of 10^4 A/m. If the susceptibility of the material at room temperature is 3.7×10^{-3}, calculate the magnetisation.

a) 37A/m

b) 3.7A/m

c) 370A/m

d) 0

Answer: a

Explanation: Susceptibility = I/H

Intensity of magnetisation I = Susceptibility × H

Intensity of magnetisation = 37A/m.

129. A paramagnetic material had a magnetic field intensity of 10^4 A/m. If the susceptibility of the material at room temperature is 3.7×10^{-3}, calculate the flux density in the material.

a) 37Wb/m^2

b) 3.725Wb/m^2

c) 0.012612Wb/m^2

d) 0

Answer: c

Explanation: Flux density B = μ_0[H+I]

B = 0.012612Wb/m^2.

130. A piece of ferric oxide with magnetic field intensity 10^6 A/m and susceptibility is 1.5×10^{-3}. Find the magnetisation of the material.

a) 15A/m

b) 150A/m

c) 1.5A/m

d) 1500A/m

Answer: d

Explanation: I = Susceptibility × H

I = 1500A/m.

131. Permeability of free space is also known as _____

a) Magnetic constant

b) Electric constant

c) Electrostatic constant

d) Magnetostatic constant

Answer: a

Explanation: The permeability of free space is also known as the magnetic constant. The permittivity of free space is the electrostatic constant.

132. A substance whose permeability is less than the permeability of free space is?

a) Diamagnetic

b) Paramagnetic

c) Ferromagnetic

d) Not a magnetic substance

Answer: a

Explanation: A diamagnetic material creates a magnetic field opposing that of the external magnetic field and it repels the external magnetic field. Hence its permeability is less than that of free space.

133. Which, among the following, have negative susceptibility?

a) Diamagnetic

b) Paramagnetic

c) Ferromagnetic

d) Not a magnetic substance

Answer: a

Explanation: Magnetic susceptibility is the degree of magnetisation of a material in response to the external magnetic field. Diamagnetic substances repel the magnetic field and hence have negative susceptibility.

Thank You

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