Q1. In the absence of an external electric field on a di-polar substance, the electric dipoles are:
(A) parallel (B)alternatively anti-parallel (C) randomly oriented (D) none

Q2. Which Maxwell's equation can be used to derive equation of continuity?
a) Maxwell's 1st equation b) Maxwell's 2nd equation
c) Maxwell's 3rd equation d) Maxwell's 4th equation

Q3. The value of permittivity of free space is
(a) 8.85×10^{-12} F/m (b) 8.85×10^{-12} C/m (c) 8.85×10^{-12} J/m (d) 8.85×10^{-12} KJ/m

Q4. Maxwell's third equation is related to
(a) Gauss law for electricity (b) Gauss law for magnetism
(c) Ampere's law (d) Faraday's law of induction

Q5. Which of the following relation is true for Poisson's equation?

(a) $\nabla^2 V = \frac{\rho}{\epsilon_0}$

(b) $\nabla^2 V = -\frac{\rho}{\epsilon_0}$

(c) $\nabla^2 V = \frac{q}{\epsilon_0}$

(d) $\nabla^2 V = -\frac{q}{\epsilon_0}$

Q6. Which statement correctly defines the gauss divergence theorem

a. line integral of the field is equal to volume integral of that field

b. surface integral of a field is equal to the volume integral of divergence of that field

c. volume integral is equal to the surface integral of divergence of that field

d. None of above

Q7. How much Work will be done by 2coulomb charge moving under 20 V ?

a) 100 units b) 80 units c) 40 units d) 10 units

Q8. The Gaussian surface for a line charge will be

a) Sphere b) Cylinder c) Cube d) Cuboid

Q9. Which of the following equation signify that magnetic monopole does not exist.

a. $\vec{\nabla} \times \vec{B} = \mu \vec{J}$

b. $\vec{\nabla} . \vec{B} = 0$

c. $\vec{\nabla} . \vec{B} = \mu \vec{J}$

d. $\vec{\nabla} . \vec{E} = Q$

Q10. The reason for non existence of magnetic monopoles is
a) The magnetic field cannot be split
b) Due to permeability
c) Due to magnetization
d) Due to magnetostriction

Q11. The del operator is called as
a) Gradient
b) Curl
c) Divergence
d) Vector differential operator

Q12. If D is the displacement vector and ρ is the charge density of any closed surface than equation $\nabla . D = \rho$, is related with
(a) Maxwell 1st equation
(b) Maxwell 2nd equation
(c) Maxwell 3rd equation
(d) Maxwell 4th equation

Q13. Which of the following can be used in vibrational analysis of structure? ,
a) Maser
b) Quarts
c) Electrical waves
d) Laser

Q14. In population inversion
(a) The number of electrons in ground and higher energy states are same
(b) The number of electrons in ground energy sate is more than the higher energy state is more than the higher state
(c) The number of electrons in the higher energy state is more than the higher energy state
(d) None of these

the number of electrons in the higher energy state is larger than in the lower energy state

Q15. Einstein's coefficient of stimulated emission of radiation is denoted by

(a) A_{21} (b) B_{21}

(c) B_{12} (d) None of these

Q16. Hologram is the result of

(a) interference of object and reference beam (b) polarization of the object and reference beam

(c) diffraction of the object and reference beam (d) both (a) and (b)

Q17. The Einstein Co-efficient relation is

a. $(8\pi hc^3)/\nu^3$ b. $(8\pi h \nu^3)/c^3$ c. $(8\pi hc)/\nu^3$ d. $(8\pi hc)/\nu$

Q18. Pumping source preferred for gaseous lasers is

(A) optical pumping (B) electrical pumping

(C) chemical pumping (D) X-Ray pumping

Q19. Calculate the wavelength of light emitted in spontaneous emission with an energy gap of 2.8eV between the excited state and ground state.

(A) 2.8 nm (B) 3472 nm (C) 554 nm (D) 443 nm

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Q20. The ground state and the first excited state of Ruby are separated by 1.8 eV. Calculate the ratio of the number of atoms in the excited state to that in the ground state at room temperature. (use value of kT of 25.7 meV at room temperature.)

(A) $\approx 10^{-30}$
(B) 0.095
(C) $\approx 10^{-31}$
(D) None of the above

Q21. He-Ne laser produces a laser beam of wavelength

(A) 1064 nm (B) 532 nm (C) 632.8 nm (D) 694 nm

Q22. The key process behind the Lasing action is

(a) Spontaneous emission (b) Stimulated emission (c) Absorption (d) None of the above.

Q23. The population inversion process is observed due to the existence of
(a) Metastable state (b) Excited state (c) Ground state (d) All of these

Q24. In He-Ne laser the ratio of He-Ne gas molecules in the order
(a) 1 : 10 (b) 10 : 1 (c) 1 : 1 d) 1 : 2

Q25. Optical fibres are used in
a) Broadcast television b) Transmission c) Welding d) Both a and b

Q26. The speed of light is
a. 186,000 mi/h b. 300 mi/h c. 300,000 m/s d. 300,000,000 m/s

Q27. In the structure of fiber, the light is guided through the core due to total internal _____
a. reflection b. refraction c. diffraction d. dispersion

Q28. Which laser emits light in the visible range 400 to 700 nm?
a. Argon-ion b. Nitrogen c. Carbon-dioxide d. Neodymium-YAG

Q29. The principle used in the propagation of light in optical fiber is
(A) Interference (B) Diffraction
(C) Total internal reflection (D) Polarization

Q30. In an optical fiber, the propagation angle of the light must be equal to or less than

a) Acceptance angle b) Incident angle c) Critical angle d) Refractive angle

Q31. In an optical fiber, dispersion means

(a) Pulse broadening
(b) Pulse distortion
(c) Pulse rise time
(d) None of these

Q32. The normalized frequency also known as

(a) Special frequency (b) Resonant frequency (c) Threshold frequency (d)All of these

Q33. The bandwidth of optical fibre

a) 900M Hz b) 900 PHz c) 900 THz d) 900 EHz

Q34. Dispersion in optical fibers occur due to

(a) frequency dependent refractive index of fiber
(b) scattering of light by the molecules
(c) both a and b
(d) none of the above

Q35. In an optical fiber, dispersion means

(a) Pulse broadening
(b) Pulse excitation
(c) Pulse rise time
(d) None of these

Q36. Snell's law is related to

(a) Light reflection
(b) Light refraction
(c) Light absorption
(d) Light emission

Q37. Ψ (r,t) is the wave function associated with moving particle at the particular point_____ in space and_____ t.

a x,y,z ; temperature b. x,y,z ; time c. x ; time d. x, temperature

Q38. The wave function

a. does not give any property of the particle
b. describes the behavior of single particle or photon
c. only shows the direction of motion
d. None of the above

Q39. The de Broglie hypothesis is concerned with

a. wave nature of radiations
b. wave nature of electrons only
c. wave nature of photons only
d. wave nature of all material particles

Q40. De Broglie wavelength of an electron accelerated by a potential V is

a) $\sqrt{\frac{150}{V}}$ Å

b) $\sqrt{\frac{225}{V}}$ Å

c) $\sqrt{\frac{275}{V}}$ Å

d) $\sqrt{\frac{375}{V}}$ Å

Q41. de-Broglie proved that electron and proton will behave

a. only as a particle

b . only as a wave

c. both as particle and wave

d. none of these

Q42. In photoelectric effect, photocurrent depends upon

A). Frequency of incident light

B). Intensity of incident light

C). Both A & B

D). None of these

Q43. Which of the following expressions gives the energy E of a photon?

a) $E = mc^2/2$ b) $E = mv^2/2$ c) $E = hc$ d) $E = h\nu$

Q44. Wave function Ψ gives the idea for

a) Probability of finding the particle

b) Energy of the particle

c) Momentum of the particle

d) Energy and momentum of the particle

Q45. Uncertainty principle is applicable to

A. macroscopic particles

B. microscopic particles

C. heavier particles

D. both A and B

Q46. Which one of the following energy value of a particle in infinite potential well of length L is allowed

a. $\frac{n^2\pi^2\hbar^2}{2mL}$

b. $\frac{n^2\hbar^2}{2mL^2}$

c. $\frac{L^2\pi^2\hbar^2}{2mn^2}$

d. $\frac{n^2\pi^2\hbar^2}{2mL^2}$

Q47. Wave packets comprises a group of waves

A. of same velocity and same wavelength

B. of slightly different velocity and wavelength

C. both A and B

D. None

Q48. Which of the following photons has the greatest energy?
(A) Infrared (B) Blue light (C) Red light (D) Ultraviolet

Q49. When sound waves passes from air into water, it changes direction. This phenomenon is known as
(a) Refraction (b) Reflection (c) Diffraction (d) Polarization.

Q50. Which is the frequency range of infrasonic waves?
a) > 20 KHz b) < 20 KHz c) = 20 KHz d) None of these

Q51. If force frequency is equalized with the natural frequency of the system, then it is known as
(a) Soure freqceuency only (b) objects frequency only
(c) resonance frequency only (d) None of these

Q52. The Converse Piezoelectric effect is the principle behind the production of which types of waves
a) Subsonic waves b) Infrasonic waves
c) Sonic waves d) Ultrasonic waves

Q53. Which of the following frequencies lies in the range of ultrasonic waves
a. 10 kHz b. 5 kHz c. 1 kHz d. 1 MHz

Q54. Which of the following is example of transverse wave
a) sound wave b) ultrasonic wave c) light wave d) both a & b

Q55. Superposition of crest and trough results in

A. Destructive interference
B. Constructive interference
C. Diffraction
D. Polarization

Q56. Infrasonic sound can be heard by

a. Human being b. Bat c. Rhinoceros d. Dog

Q57. For destructive interference, path difference is

(a) odd number of half wavelengths
(b) even number of half wavelengths
(c) whole number of wavelengths
(d) even whole number of wavelengths

Q58. Magnetostriction Effect does not depend on

a. Strength of the magnetic field
b. Property of the material
c. Direction of the magnetic field
d. None of the above

Q59. What will be the wavelength of ultrasonic waves in air (velocity 330 m/s), if the frequency of the waves is 20 kHz?

(A) 2.65 cm (B) 1.65 cm (C) 0.65 cm (D) 11.65 cm

Q60. Which of the following effects can be used to produce ultrasonic waves?

a) Magnetostriction effect b) Doppler Effect c) Magnetic effect d) Sound effect

Q61. The resistance of a straight conductor does not depend on its

a) temperature
b) length
c) material
d) shape of cross section

Q62. Flow of electrons is affected by the following:

a) Thermal vibrations
b) Impurity atoms
c) Crystal defects
d) All of these

Q63. Addition of trivalent atom of group III to semiconductor results into

a. N- type semiconductors
b. P-type semiconductors
c. Both (a) and (b)
d. None of these

Q64. Hall coefficient is given by

a) 1/ n q
b) -1/nq
c) q/ne
d) 1/q

Q65. For a p-type semiconductor

A. Silicon is doped with Silver
B. Silicon is doped with Aluminium
C. Silicon is doped with Antimony
D. None of these

Q66. Considering that there are 5.2×10^{28} electrons/m^3 in copper. What will be the value of Hall coefficient?

a) 1.2×10^{-10} m^3/C
b) 5.2×10^{-10} C
c) 3.4×10^{-10} m^3/C
d) 1.2×10^{-11} m^3/C

Q67. In intrinsic semiconductors, number of electrons

(A) Equal to number of holes
(B) Greater than number of holes
(C) Less than number of holes
(D) Can not define

Q68. Assertion (A): Germanium is less efficient in the emission of photons.
Reason (R): Germanium is an indirect bandgap semiconductor.

(a) Both A and R are true and R is the correct reason for A
(b) Both A and R are true but R is not the correct reason for A
(c) A is true but R is false
(d) A is false but R is true

Q69. Recombination takes place when
(a) an electron falls into a hole
(b) a positive and a negative ion bond together
(c) a valence electron becomes a conduction
(d) a crystal is formed

Q70. In p-type semiconductor_____are the minority carriers
(a) electrons
(b) holes
(c) photons
(d) phonon

-- End of Question Paper --