ENTRANCE EXAMINATION FOR ADMISSION, MAY 2013.

M.Sc. (PHYSICS)

COURSE CODE : 374

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 374

Time : 2 Hours Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each of the question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you –1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. The frequency of photon produced when an electron of 20 keV is brought to rest in one collision with a heavy nucleus is

(A) 4.84×10^{18} Hz (B) 4.84 Hz

(C) 4.84×10^{-18} Hz (D) 5.84×10^{-18} Hz

2. The wavelength of the second line of the Paschen series for hydrogen is

(A) 1282 Å (B) 1380 Å

(C) 12820 Å (D) 2820 Å

3. The ionization potential of positronium is ———— (use $R_\infty = = 1.09737 \times 10^{-3}/\text{Å}$)

(A) 5.8 eV (B) 6.8 eV (C) 4.8 eV (D) None

4. Suppose that an atom state is determined by a single electron. What are the possible values of the atom's total angular momentum in a P state

(A) $\frac{\sqrt{15}}{2}\hbar, \frac{\sqrt{3}}{2}\hbar$ (B) $\frac{\sqrt{3}}{2}\hbar, \frac{\sqrt{3}}{2}\hbar$ (C) $\frac{\sqrt{15}}{2}\hbar, -\frac{\sqrt{3}}{2}\hbar$ (D) None

5. The wavelength of the K_a line for Molybdenum (Z = 42) is

(A) 7.21 Å (B) 0.0721 Å (C) 0.721 Å (D) 0.972 Å

6. If υ is the velocity of sound in air and ρ is the density of air, then the intensity of sound I in $W.m^{-2}$ can be equated to pressure amplitude of sound in $N.m^{-2}$ using the relation

(A) $P = \sqrt{\rho \upsilon I}$ (B) $P = \sqrt{\frac{3\rho \upsilon I}{2}}$

(C) $I = \frac{5P^2}{3\rho \upsilon}$ (D) $P = \sqrt{2\rho \upsilon I}$

7. Sommerfeld explained the hydrogen fine structure by applying the

(A) Heisenberg's principle (B) Zeeman's effect

(C) Special theory of relativity (D) Compton Effect

8. In the case of an atom containing one single valence electron, if the applied magnetic field is greater than the internal fields due to the spin and orbital motion of the electron, we observe

(A) Zeeman effect (B) Paschen-Back effect

(C) Stark effect (D) Tyndall effect.

9. For an atom with two valence electrons, the interaction between the spin of each electron and its own orbit is greater than the interactions between the two spins and the two orbits respectively. This is known as

(A) j-j coupling
(B) L-S coupling
(C) Magnetic dipole
(D) Magnetic vector

10. The value of the Bohr magneton in erg/gauss is

(A) 0.918×10^{-22}
(B) 0.918×10^{-21}
(C) 0.918×10^{-20}
(D) None

11. Principle of superposition can be best represented by

(A) $y = y_1 / y_2$
(B) $y = y_1 y_2$
(C) $y = f(y_1, y_2;\ y \neq y_1 + y_2)$
(D) $y = y_1 + y_2$

12. The ratio of reflected intensity to the incident intensity at normal incidence from medium having refractive index n_1 to n_2 is

(A) $\left(\frac{(n_1 - n_2)}{(n_1 + n_2)}\right)^2$
(B) $\left(\frac{4n_1 n_2}{(n_1 - n_2)}\right)$
(C) $\left(\frac{(n_1 + n_2)}{(n_1 - n_2)}\right)^2$
(D) $\left(\frac{(n_1 + n_2)^2}{4n_1 n_2}\right)$

13. The phase change of π is observed on reflection from

(A) Denser to rarer medium
(B) Rarer to denser medium
(C) Both (A) and (B)
(D) None of these

14. Lasing in LASER is due to

(A) Spontaneous equation
(B) Stimulated emission
(C) Both (A) and (B)
(D) None of the above

15. Diffraction of light can be understood by

(A) Wave nature of light
(B) Particle nature of light
(C) Both (A) and (B)
(D) None of the above

16. Which of the following is not a third order aberration?

(A) Astigmatism
(B) Coma
(C) Chromatic aberration
(D) Distortion of field

17. Half wave plate introduces a phase difference of ———— between ordinary and extra-ordinary waves.

(A) 180° (B) 90° (C) 270° (D) 360°

18. Linearly polarized light can be converted to circularly polarized light with the introduction of a

(A) Half wave plate (B) Quarter wave plate

(C) Attenuator (D) Polarizer

19. A 3MW laser beam ($\lambda_0 = 6\times10^{-5}$ m and beam width 2a = 1 cm) is incident on the lens of focal length of 5 cm, then, the intensity at focal plane of the lens is approximately

(A) 3.33×10^{-16} m^2/W (B) 3×10^{16} W/m^2

(C) 10^{-10} m^2/W (D) 10^{10} W/m^2

20. The divergence due to diffraction limited He-Ne laser (λ_0 = 0.6328 μm) having a Gaussian output of ω_0 = 5 μm is given as

(A) 2.3° (B) 23° (C) 2.4° (D) 46°

21. In Michelson interferometer, as you decrease the separation between the two mirrors

(A) Fringes appear collapsing

(B) Fringes appears expanding

(C) No change in fringe pattern

(D) Sometimes it collapses and sometimes it expands

22. Fraunhoffer diffraction can be observed for

(A) Source and screen are at finite distance

(B) Source and screen are at infinity

(C) Source is at finite and screen at infinity

(D) Source is at infinity and screen at finite distance

23. In the sun, helium is produced from hydrogen by one of the following processes

(A) radioactive decay (B) disintegration

(C) fission (D) fusion

24. The half-life of an isotope of an element is 5 days. The mass of a 10 gram sample of this isotope remaining after 20 days is

(A) 0.312 grams (B) 0.625 grams

(C) 1.25 grams (D) 2.50 grams

25. One of the following is a device that detects charged particles but does NOT show their tracks.
(A) spark chamber
(B) photographic plate
(C) scintillation counter
(D) bubble chamber

26. The emission of a positron from a radioactive atom is generally accompanied by the emission of one of the following.
(A) a meson
(B) a neutrino
(C) an antineutrino
(D) a baryon

27. When a fast charged particle traverses a dielectric medium at a velocity exceeding the velocity of light in that medium, radiation is emitted. This radiation is known as
(A) Cerenkov radiation
(B) Point radiation
(C) Synchrotron radiation
(D) Bremsstrahlung

28. An alpha particle colliding with an electron loses
(A) all of its energy
(B) half of its energy
(C) little of its energy
(D) none of its energy

29. Which of the following scientific instruments has the greatest resolving power?
(A) light microscope
(B) phase-contrast microscope
(C) centrifuge
(D) electron microscope

30. In Rutherford's experiment involving the deflection of alpha particles by atomic nuclei, the fact that some of the alpha particles bombarding the thin gold foil were back-scattered, led to one of the following conclusions. It was concluded that
(A) the charge of an electron is negative
(B) the nucleus of a gold atom carries all its charge
(C) most of the mass of a gold atom is in its nucleus
(D) the nucleus of a gold atom occupies nearly the entire space of the atom

31. Neutrinos are a subset of which of the following categories?
(A) photons (B) leptons (C) mesons (D) baryons

32. In the equation of a nuclear reaction, all but one of the following quantities are equal to each other on both sides of the equation. Which quantity is NOT conserved:
(A) the net electric charge
(B) the total mass-energy
(C) the number of protons
(D) the number of nucleons

33. A fast reactor uses
(A) an extremely short time to get to the maximum operating reactivity
(B) uranium-235 as fuel
(C) heavy water as a coolant
(D) essentially un-moderated neutrons

34. In the fission of U235, what is the average number of neutrons produced in the fission reaction?
(A) 1.5 (B) 2.5 (C) 3.5 (D) 4.5

35. The value of coefficient of cubical expansion of a gas at constant pressure has a value equal to
(A) Latent heat of it during its condensation as liquid
(B) Coefficient of linear expansion
(C) Boiling point of mercury
(D) Coefficient cubical expansion of a gas at constant volume

36. Concealed Liquid nitrogen warms up from 80 K to 120 K in 20 sec. Its warming up from 200 K to 240 K will take
(A) 20 sec (B) 120 sec
(C) More than 20 sec (D) Less than 20 sec

37. Water exists in liquid state even at 255°C
(A) when it is kept in a double walled container
(B) it is highly pressurized and kept in a cylinder
(C) it cannot exist so
(D) when a large quantity of it is taken in a container

38. The product of molecular weight (M) and characteristic gas constant (R) is
(A) More for lighter gas (B) More for heavy gases
(C) Less for heavy gases (D) Constant

39. Work done during expansion of a gas in an isobaric process due to heating from temperature T_1 to T_2 is
(A) C_p/C_v (B) $R(V_1 - V_2)$
(C) $C_p - C_v$ (D) $R(T_1 - T_2)$

40. The law of ———— equi-partition of energy was postulated by
(A) Maxwell (B) Boltzmann
(C) Stefan (D) Wein

41. Chlorine gas is kept tightly sealed in a cylinder. The number of degrees of freedom available for chlorine molecules is
(A) Zero (B) Two (C) Four (D) Five

42. Which one of the following thermometers can measure a long range of temperature?
(A) Thermocouple (B) Platinum resistance thermometer
(C) Gas thermometer (D) Liquid thermometer

43. Some gas is kept in a cylinder. It is tested for the velocity of the molecule in a laboratory. Its value is determined as1930 m/sec. The gas should be

(A) Hydrogen (B) Chlorine

(C) Fluorine (D) Oxygen

44. Thermal conduction is a process in which heat energy is transported through a solid as there is a temperature difference between points. It is so because of the law of

(A) increase of entropy (B) law of continuity

(C) diffusion (D) effusion

45. When we stand under the sun light, we feel warm even if the air surrounding us remains cold because

(A) the air has infinite heat capacity

(B) the air is in large amount

(C) sun is hotter than us

(D) the heat is transported by radiation from the sun

46. Entropy increase of universal systems is not signified by

(A) Irreversible changes

(B) It suggests arrow of time

(C) Limiting the amount of work a system can do

(D) Perpetual motion

47. Which of the following function qualifies to be a wave function of a quantum particle moving in one dimension along x-axis?

(A) $\exp(x)$ (B) $\exp(-x$

(C) $\sin^{-1}(x)$ (D) $\exp(-x^2)$

48. Number of nodes of an nth energy eigen function of one dimensional linear harmonic oscillator is

(A) $n+1$ (B) $n-1$ (C) n^2 (D) n

49. The wave function of a particle in a one dimensional box $[0, L]$ is

$$\psi_n(x) = N \sin\frac{n\pi}{L}x$$

What is N, if the wave function is normalized?

(A) $\frac{2}{L}$ (B) $\frac{L}{2}$

(C) $\sqrt{\frac{L}{2}}$ (D) $\sqrt{\frac{2}{L}}$

50. A free particle of energy E and de Broglie wavelength λ enters in to a region of constant potential V = 0.75 E. What is the de Broglie wavelength of the particle is this region?

(A) 2λ (B) 3λ (C) $\lambda/2$ (D) $\lambda/3$

51. The ground state energy of hydrogen atom is –13.6 eV. What is the kinetic energy of the electron in this state?

(A) –13.6 eV (B) –27.2 eV (C) 0 eV (D) 13.6 eV

52. Which of the following operators is not Hermitian?

(A) x (B) p (C) xp (D) xpx

53. In an oil drop experiment (Millikan's) an oil drop carrying a charge Q is held stationary between the plates by applying a potential difference of 400 V.To keep another drop of half the radius stationary, the potential difference had to be increased to 600 V. The charge on the second drop is

(A) $Q/24$ (B) $Q/12$ (C) $3Q/2$ (D) $2Q/3$

54. If the energy eigen functions of a system are either even or odd functions, the Hamiltonian of the system is invariant under which of the following operation?

(A) Rotation (B) Translation

(C) Parity (D) Time Translation

55. Let $|n_1, n_2\rangle$ be an energy eigen state of a particle in two dimensional box. If the particle is in state

$$|\alpha\rangle = \frac{1}{\sqrt{3}}|2,1\rangle + \sqrt{\frac{2}{3}}|2,2\rangle$$

what is the probability that the energy of the first particle is E_2??

(A) 1 (B) 2/3 (C) 1/3 (D) 0

56. What is the degeneracy of n^{th} excited state of two dimensional isotropic harmonic oscillator?

(A) $2n$ (B) n (C) $n+1$ (D) n^2

57. A pipe open at both ends resonates at a fundamental frequency f_{open}. When one end is covered and the pipe is again made to resonate, the fundamental frequency observed is f_{closed}. Then, the relation between them is

(A) $f_{open} = \frac{1}{2} f_{closed}$ (B) $f_{closed} = \frac{3}{2} f_{open}$

(C) $f_{closed} = \frac{2}{3} f_{open}$ (D) $f_{closed} = \frac{1}{2} f_{open}$

58. The function $f(x)=\sqrt{(x)}$ is

(A) Uniformly continuous on [0, 1] but not on $[0,\infty)$

(B) Uniformly continuous on $[0,\infty)$

(C) Uniformly continuous on [0, 1)

(D) Uniformly continuous on [0, 1]

59. Consider the integral

$$\int_0^{\infty} \frac{dx}{x^{p'}}$$

This integral

(A) Converges if $p > 1$ and diverges if $p < 1$.

(B) Converges if $p < 1$ and diverges if $p > 1$.

(C) Diverges for any value of p

(D) Converges for any value of p

60. Let $f(x,y)$ and $g(x,y)$ be two homogeneous functions of degree m and n, where $m \neq 0$. Let $h=f+g$ and $x\frac{\partial h}{\partial x}+y\frac{\partial h}{\partial y}=0$

Then

(A) f is not proportional to g (B) $f=\alpha g$ where α is a scalar

(C) $\frac{f}{g}=\frac{n}{m}$ (D) $\frac{f}{g}=\frac{m}{n}$

61. Find the volume of the solid in the first octant bounded by the paraboloid $z=36-4x^2-9y^2$

(A) $V=27\pi$ (B) $V=\frac{16}{9}$ (C) $V=27$ (D) $V=\frac{16}{9}\pi$

62. Consider the matrix,

$$\begin{pmatrix} \mu & -1 & 0 & 0 \\ 0 & \mu & -1 & 0 \\ 0 & 0 & \mu & -1 \\ -6 & 11 & -6 & 1 \end{pmatrix}$$

where μ is a scalar, not necessarily an integer. Determine the possible values of μ such that the rank of the matrix is 3

(A) $0<\mu<4$ (B) $1<\mu<3$

(C) μ can have values 1, 2 or 3 only (D) $\mu=3$ only

63. Consider a 3×3 matrix,

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

Then A^{50} is given by

(A) $A^{50} = \begin{pmatrix} 50 & 0 & 0 \\ 50 & 0 & 50 \\ 0 & 50 & 0 \end{pmatrix}$

(B) $A^{50} = \begin{pmatrix} 25 & 0 & 0 \\ 25 & 0 & 25 \\ 0 & 25 & 0 \end{pmatrix}$

(C) $A^{50} = \begin{pmatrix} 1 & 0 & 0 \\ 25 & 1 & 0 \\ 25 & 0 & 1 \end{pmatrix}$

(D) $A^{50} = A$

64. The matrix

$$A = \begin{pmatrix} 1 & -1 & -1 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{pmatrix}$$

has the following properties

(A) It has eigen values $(-1, i, -i)$ and the matrix is diagonalizable

(B) It has eigenvalues $(-1, i, -i)$ and the matrix is not diagonalizable

(C) It has eigenvalues $(-1, -i, -i)$ and the matrix is diagonalizable

(D) It has eigenvalues $(1, i, -i)$ and the matrix is diagonalizable.

65. The integrating factor of the differential equation $(5x^3 + 12x^2 + 6y^2)\,dx + 6xy\,dy = 0$ is given by

(A) $\log_{10} x$ (B) x (C) $\ln x$ (D) $\exp(\log_{10} x)$

66. Suppose we want to calculate the probability of obtaining at least two "six" in rolling a fair die (having six faces) four times. What probability distribution should be used to solve the problem and what would be the probability?

(A) Binomial distribution to be used and the probability is 4/6

(B) Poisson distribution to be used and the probability is 12.3%

(C) Binomial distribution to be used and the probability is 0.0132

(D) Binomial distribution to be used and the probability is 13.2%

67. Two masses m_1 and m_2 are connected by an inextensible cord through a smooth pulley as shown in the figure. Calculate the tension in the cord, N. (Here g is the acceleration due to gravity.)

(A) $N = \frac{2m_1m_2}{m_1 + m_2}$ (B) $N = g\frac{m_1m_2}{m_1 + m_2}$

(C) $N = g\frac{2m_1m_2}{m_1 + m_2}$ (D) $N = \frac{m_1m_2g}{2(m_1 + m_2)}$

68. A particle is experiencing a force $F = 3x^2i + 4j$. Calculate the work done on the particle as it moves from a point (2, 3) to another point (3, 0). Take the units of force as Newton and coordinates in meters.

(A) 7 J (B) 19 J (C) 12 J (D) 31 J

69. One kilowatt-hour is equivalent to

(A) 360 MJ (B) 3.60 mJ

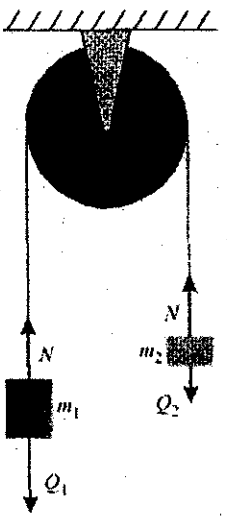
(C) 3.6×10^5 J (D) 2.247×10^{25} eV

70. Three masses $m_1 = 1.2$ kg, $m_2 = 2.5$ kg and $m_3 = 3.4$ kg form an equilateral triangle of edge length $a = 140$ cm. What is the center of mass (x, y) of this three-particle system?

(A) (83 cm, 58 cm) (B) (58 cm, 83 cm)

(C) (8.3 cm, 5.8 cm) (D) (5.8 cm, 8.3 cm)

71. A uniform solid cylindrical disk, of mass $M = 1.4$ kg and radius $R = 8.5$ cm rolls smoothly across a horizontal table at a speed of 15 cm/s . Calculate the kinetic energy.



(A) 0.1575 J (B) 15.75 mJ (C) 24 mJ (D) 0.24 J

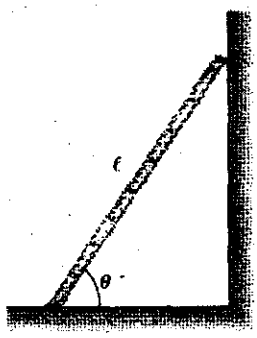
72. A steel rod has a radius $R = 9.5$ mm and a length $L = 81$ cm. A force of 62 kN on the steel rod elongates its length. What is the percentage elongation of the steel rod?

(A) 0.89 % (B) 1.1 % (C) 2.2 % (D) 0.11 %

73. According to SI units definition, one second is the time taken by 9192631770 oscillations of the light of a specified wavelength emitted by a _____ atom.

(A) Quartz (B) Cesium-133 (C) Rubidium (D) Xenon-136

74. See the ladder figure.

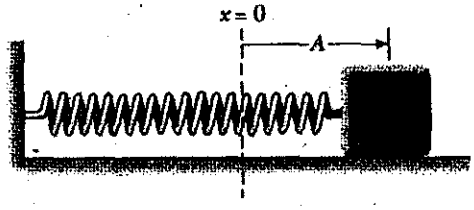


A uniform ladder of length l and weight rests against a smooth, vertical wall as shown in the figure. If the coefficient of static friction μ_s between ladder and the ground is 0.40, calculate the minimum angle θ_{min} at which the ladder does not slip.

(A) $\theta_{min} = \frac{1}{2}\tan^{-1}(1.25)$ (B) $\theta_{min} = 39^\circ$

(C) $\theta_{min} = 51^\circ$ (D) $\theta_{min} = \sin^{-1}(1.25)$

75. A block with a mass of 200 g is connected to a light spring for which the force constant is 5.00 N/m and is free to oscillate on a horizontal, frictionless surface. The block is displaced 5.00 cm from equilibrium and released from rest, as shown in figure.

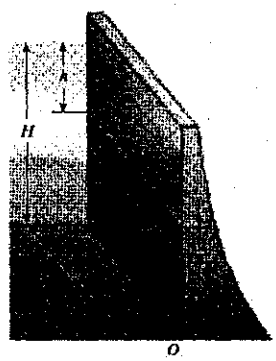


The acceleration of the mass is given by

(A) $a = (-1.25\ m/s^2)\cos(5t)$ (B) $a = (1.25\,m/s^2)\cos(5t)$

(C) $a = (-1.25\ m/s^2)\sin(5t)$ (D) $a = (0.05\,m/s^2)\cos(5t)$

76. See Fig.



Water having a density ρ is filled to a height H behind a dam of width w as shown in the figure. Determine the resultant force exerted by the water on the dam. (Here g is the acceleration due to gravity.)

(A) $F = \frac{1}{2}\rho g H$ (B) $F = \rho g w H^2$

(C) $F = \frac{1}{2}\rho g w^2 H$ (D) $F = \frac{1}{2}\rho g w H^2$

77. Electric field E at the center of a uniformly charged conductor is

(A) Infinite (B) $\frac{q}{4\pi\varepsilon_0 R^2}$ (C) $\frac{qr}{4\pi\varepsilon_0 R^3}$ (D) Zero

78. The Laplace's equation is

(A) $\nabla^2 V = \frac{\rho}{\epsilon_0}$ (B) $\nabla^2 V = 0$ (C) $\vec{\nabla}\cdot\vec{E} = \frac{\rho}{\varepsilon}$ (D) $\vec{\nabla}\cdot\vec{B} = 0$

79. Standing waves are formed from the superposition of two sinusoidal waves having the same frequency, amplitude, and wavelength but traveling in opposite directions. Choose the wrong statement.

(A) The points of zero amplitudes are called nodes and they occur at $x = \frac{n\lambda}{2}$, where $n = 0, 1, 2, ...$

(B) The maximum amplitude points are called antinodes and they occur at $x = \frac{n\lambda}{4}$, where, $n = 1, 3, 5$

(C) The points of zero amplitudes are called antinodes and they occur at $x = \frac{n\lambda}{2}$, where, $n = 0, 1, 2, ...$

(D) The maximum amplitude points are called antinodes and they occur at $x = \frac{n\lambda}{4}$, where $n = 1, 2, 3$

80. An electromagnetic wave travels along Z-axis. Which of the following pair of space and time varying fields would generate such a wave?

(A) E_x, B_y (B) E_y, B_x (C) E_z, B_x (D) E_y, B_z

81. "The work done on the charges by the electromagnetic force is equal to the decrease in energy stored in the field, less the energy which flowed out through the surface" is the statement of

(A) Gauss's theorem (B) Stoke's theorem

(C) Gauss's divergence theorem (D) Poynting theorem

82. The radius R of a loop carrying a current I is doubled, while the current is halved. The magnetic moment M of the current loop will become

(A) M (B) 2M (C) M/2 (D) 4M

83. The pointing theorem is a mathematical statement of the conservation of

(A) Electromagnetic energy (B) Charge

(C) Momentum (D) States

84. The polarization state of wave with electric field vector $\vec{E} = E_0 e^{j(\omega t + \beta z)}\left(\hat{a}_x + \hat{a}_y\right)$ is

(A) Linear (B) Elliptical

(C) Left head circular (D) Right head circular

85. A circular loop of radius r carrying current i_0 in counter clockwise direction is placed in a magnetic field B pointing outwards to the plane of conductor. The force on point P due to small length dl of the coil will be

(A) Parallel to B (B) Radially inwards

(C) Tangential at P (D) Radially outwards

86. The internal resistance of an ideal voltage source is ———— Ω and that of an ideal current source is ———— Ω

(A) zero, zero (B) zero, infinity

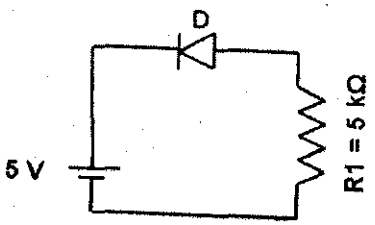
(C) infinity, zero (D) infinity, infinity

87. A Zener diode is specially designed to operate in ———— bias and is mainly used for

(A) Forward, amplification (B) Forward, voltage regulation

(C) Reverse, voltage regulation (D) Reverse, amplification

88. See the circuit.



The voltage drop across the diode D is ———————— and in the power delivered to this diode is

(A) 0.7 V, 0.7 mW (B) 0 V, 0 W

(C) 5 V, 5 mW (D) 5 V, 0 W

89. The resistivity of Al is 2.7 $\mu\,\Omega$-cm and the density of free electrons is 10^{22} cm^{-3}. Then the mobility of Al is ———————— $cm^2/V.s$

(A) 2.7 (B) 240.4 (C) 270 (D) 370.4

90. A transistor (BJT) is operated in linear region. Then its base-emitter junction is ———————— biased and the emitter-collector junction is ———————— biased.

(A) Forward, forward (B) Forward, reverse

(C) Reverse, forward (D) Reverse, reverse

91. Lissajous figure obtained by combining $x = A\sin\omega t$ and $y = A\sin(wt + \pi/4)$ will be

(A) An ellipse (B) A circle

(C) A straight line (D) A parabola

92. The magnetic lines of force inside a bar magnet

(A) do not exist

(B) depend upon area of cross section of magnet

(C) are from S to N pole of magnet

(D) are from N to S pole of magnet

93. Curie temperature is the temperature above which

(A) A paramagnetic material becomes diamagnetic

(B) A ferromagnetic material becomes diamagnetic

(C) A paramagnetic material becomes ferromagnetic

(D) A ferromagnetic material becomes paramagnetic

94. When sound travels from air to water the quantity that remains unchanged is

(A) Speed (B) Frequency (C) Intensity (D) Wavelength

95. A magnetic needle is kept in a uniform magnetic field. It experiences

(A) Neither a force nor torque (B) A force but no torque

(C) No torque (D) No force but a torque

96. Which one is not produced by sound waves in air?

(A) Polarization (B) Diffraction (C) Refraction (D) Reflection

97. Which of the following is an electromagnetic wave?

(A) β – rays (B) Sound waves (C) γ – rays (D) α – rays

98. For a wavelength around 600 nm and around pupil diameter of 2 mm, the angular resolution of human eye, due to diffraction effects would be approximately be equal to

(A) 3×10^{-4} rad (B) 15×10^{-4} rad (C) 6×10^{4} rad (D) 3×10^{4} rad

99. It is possible to measure ———— coherence using the Michelson interferometer.

(A) Spatial (B) Temporal

(C) Both (A) and (B) (D) None of the above

100. In double slit interference experiment one of the slit is covered by thin mica sheet whose refractive index is 1.58. Separation between two slit is 0.1 cm and the distance from the screen is 50 cm. Because of mica sheet, the central fringe shifts by 0.2 cm. The thickness of mica sheet is

(A) 6.7×10^{-4} cm (B) 1.6×10^{5} m^{-1}

(C) 1.6×10^{5} m (D) 6.7×10^{-4} cm^{-1}

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