PHYSICS

1. The escape velocity of a body

   (A) increases with increase in the mass of the body

   (B) decreases with increase in the mass of the body

   (C) is independent of the mass of the body

   (D) is independent of the mass of the earth

2. Wien's displacement law states that

   (A) $T + \lambda_m = \text{constant}$ (B) $\lambda_m T = \text{constant}$

   (C) $\frac{\lambda_m}{T} = \text{constant}$ (D) $T^4 / \lambda_m = \text{constant}$

3. A thin prism of angle 7° gives a deviation of 3.5°. The refractive index of the material of the prism is

   (A) 0.58 (B) 1.5

   (C) 2 (D) none of these

4. The quantity which has newton-second as unit is

   (A) energy (B) momentum

   (C) torque (D) Planck's constant

5. The resolving power of a telescope depends upon the

   (A) focal length of the eye lens (B) focal length of the object lens

   (C) length of the telescope (D) diameter of the object lens

6. When a *p-n* junction is forward biased, the flow of current across the junction is mainly due to

   (A) drift of charges

   (B) diffusion of charges

   (C) both drift and diffusion of charges

   (D) depends on the nature of the material

7. The total e.m.f of 'n' cells each of e.m.f E connected in parallel is

(A) nE (B) E

(C) E/n (D) $(n-1)E$

8. A particle of charge q moves in a circular path of radius R with velocity v. The magnetic moment associated with it is

(A) $qv\mathrm{R}$ (B) $qv\mathrm{R}^2$

(C) $\frac{qv\mathrm{R}}{2}$ (D) $\frac{qv\mathrm{R}^2}{2}$

9. The electric field intensity at a point due to an electric dipole of small length varies with distance 'r' as

(A) r^{-4} (B) r^4

(C) r^3 (D) r^{-3}

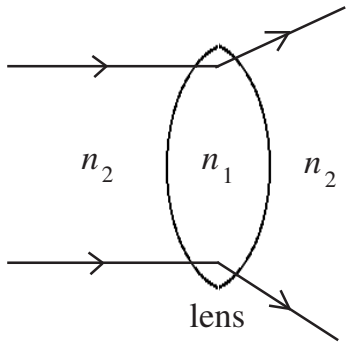
10. What is the relation between the refractive indices n_1 and n_2 if the behaviour of light ray is as shown in the figure ?

(A) $n_2 > n_1$

(B) $n_1 >> n_2$

(C) $n_1 > n_2$

(D) $n_1 = n_2$



11. What is the power dissipation in an a.c circuit in which voltage and current are given by $\mathrm{E} = 500\sin(wt + \frac{\pi}{2})$ and $\mathrm{I} = 6\sin wt$?

(A) 300 W (B) Zero

(C) 83.33 W (D) 1.8×10^4 W

12. The nucleus ${}_6\mathrm{C}^{12}$ absorbs an energetic neutron and emits a beta particle (β). The resulting nucleus is

(A) ${}_7\mathrm{N}^{14}$ (B) ${}_5\mathrm{B}^{13}$

(C) ${}_7\mathrm{N}^{13}$ (D) ${}_6\mathrm{C}^{13}$

13. When a dielectric slab of dielectric constant K wholly replaces the air between the plates of a capacitor, the capacitance

(A) increases K times (B) decreases K times

(C) remains the same (D) becomes zero

14. A hydraulic lift is designed to lift cars of maximum mass of 3000 kg. If the area of cross-section of the piston carrying the load is 4.25×10^{-2} m^2, the maximum pressure the smaller piston have to bear is

(A) 6.92×10^5 Nm^{-2} (B) 70.5 Nm^{-2}

(C) 14.2×10^2 Nm^{-2} (D) 13.76×10^{11} Nm^{-2}

15. Which of the following is not an example of perfectly inelastic collision ?

(A) A bullet fired into a block, if bullet gets embedded into it

(B) A ball bearing striking another ball bearing

(C) Capture of electrons by an atom

(D) A man jumping onto a moving boat

16. The number of electrons per second crossing any section of a wire to constitute a current of 1 ampere is

(A) 1.6×10^{-19} (B) 6.25×10^{-18}

(C) 6.25×10^{18} (D) 1.6×10^{19}

17. Two projectiles are fired from the same point with the same speed at angles of projection 60° and 30° respectively. Then their

(A) range will be same (B) maximum height will be same

(C) landing velocity will be same (D) time of flight will be same

18. In a cyclotron, acceleration of a positive ion takes place

(A) inside the dee (B) in the gap between the dees

(C) both (A) and (B) (D) none of these

19. In a telephonic communication system, the frequency range of speech signals is

(A) 20 Hz to 20 kHz (B) 300 Hz to 3100 Hz

(C) 896 MHz to 901 MHz (D) 88 MHz to 108 MHz

20. The expression relating polarising angle and refractive index is

(A) $\mu \sin p = 1$ (B) $\mu \cot p = 1$

(C) $\mu \tan p = 1$ (D) $\mu \cos p = 1$

21. The working of an a.c.dynamo is based on the principle of

(A) heating effect of current (B) magnetic effect of current

(C) chemical effect of current (D) electromagnetic induction

22. If the different planets have the same density but different radii, then the acceleration due to gravity on the surface of the planet is related to the radius (R) of the planet as

(A) $g \propto R^2$ (B) $g \propto R$

(C) $g \propto \frac{1}{R^2}$ (D) $g \propto \frac{1}{R}$

23. Which of these is/are used as moderator in a nuclear reactor ?

(i) Boron (ii) Heavy water (iii) Graphite (iv) Cadmium

(A) (i) only (B) (ii) and (iii)

(C) (i) and (iii) (D) (iv) only

24. If the kinetic energy of a free electron doubles, its de-Broglie wavelength changes by the factor

(A) 2 (B) $\sqrt{2}$

(C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$

25. How many significant figures are there in the number 30500 ?

(A) 2 (B) 3

(C) 4 (D) 5

26. A spherical mirror forms a diminished virtual image of magnification $\frac{1}{3}$. If the focal length is 18 *cm*, then the distance of the object is

(A) 18 *cm* (B) 36 *cm*

(C) 48 *cm* (D) infinite

27. A material used for making permanent magnets should possess

(A) high retentivity and high coercivity

(B) low retentivity and high coercivity

(C) high retentivity and low coercivity

(D) low retentivity and low coercivity

28. Which of the following functions of time represents Simple Harmonic Motion ?

(A) $\sin wt + \cos wt$ (B) $\sin^5 wt$

(C) $1 + t + wt^2 + w^2t^3$ (D) e^{w^2t}

29. In a pressure cooker, cooking is faster because the increase in vapour pressure

(A) increases specific heat (B) decreases specific heat

(C) increases boiling point (D) decreases boiling point

30. A body goes 20 km north and then 10 km due east. The displacement of the body from its starting point is

(A) 30 km (B) 22.36 km

(C) 25.2 km (D) 10 km

31. With rise in temperature, conductivity of a semiconductor

(A) increases (B) decreases

(C) remains constant (D) none of these

32. A prism splits a beam of white light into its seven constituent colours. This is so, because

(A) phase of different colours is different

(B) amplitude of different colours is different

(C) energy of different colours is different

(D) velocity of different colours is different

33. If $\frac{v}{2L}$ is the fundamental frequency of standing wave in a string fixed at both ends, the frequency of the second, third and fourth modes of vibration will be

(A) $\frac{3v}{2L}, \frac{5v}{2L}, \frac{7v}{2L}$ (B) $\frac{v}{L}, \frac{2v}{L}, \frac{3v}{L}$

(C) $\frac{v}{L}, \frac{3v}{2L}, \frac{2v}{L}$ (D) $\frac{v}{2L}, \frac{v}{L}, \frac{3v}{2L}$

34. Fusion reactions take place at high temperature because

(A) atoms are ionised at high temperature

(B) molecules break up at high temperature

(C) nuclei break up at high temperature

(D) kinetic energy is high enough to overcome repulsion between the nuclei

35. A cell of unknown e.m.f is balanced by 60 cm of a potentiometer wire while a 3 V cell gives a balance with 45cm of the wire. The value of unknown e.m.f will be

(A) 2.25 V (B) 3 V

(C) 4 V (D) 4.5 V

36. When an object is placed between the focus F and the optical centre O of a convex lens, the image formed will be

(A) real, inverted and enlarged (B) virtual, erect and enlarged

(C) real, inverted and diminished (D) virtual,erect and diminished

37. In a Young's double slit experiment the angular width of a fringe formed on a distant screen is 2.1×10^{-3} rad. If the wavelength of light used is 4800 $\mathring{A}$, the distance between the slits is

(A) 4.4×10^{3} m (B) 2.29×10^{-4} m

(C) 4.4×10^{5} m (D) 2.29×10^{-5} m

38. The degree of freedom of a tri-atomic gas molecule is

(A) 3 (B) 5

(C) 6 (D) 8

39. The dimensional formula of the Universal Gravitational constant G is given as $\left[M^{a}L^{3}T^{-2}\right]$. The value of '$a$' is

(A) 1 (B) -1

(C) 2 (D) -2

40. Decrease of which one of the following quantities enables us to transport even a heavy barrel by rolling across the road ?

(A) Static friction (B) Normal friction

(C) Limiting friction (D) Coefficient of friction

41. A bullet of mass 200 g is fired with a velocity of 30 m/s from a gun of mass 100 kg. The recoil velocity of the gun is

(A) 10 m/s (B) 5 m/s

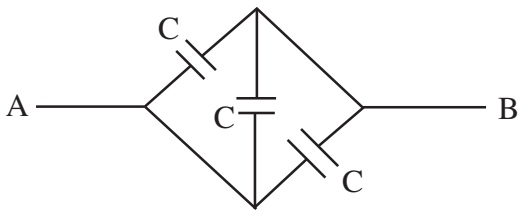
(C) 0.06 m/s (D) 0.03 m/s

42. The moment of inertia of a circular ring about one of its diameter is I. What will be its moment of inertia about a tangent parallel to the diameter ?

(A) 4 I (B) 2 I

(C) $\frac{3}{2}$ I (D) 3 I

43. The equivalent capacitance between A and B in the given figure is



(A) $\frac{2C}{3}$ (B) $\frac{3C}{2}$

(C) 3C (D) $\frac{C}{3}$

44. If Young's double slit experiment is performed in water instead of air

(A) the fringe width will decrease

(B) the fringe width will increase

(C) the fringe width will remain unchanged

(D) there will be no fringe

45. In elastic collision, 100 % energy transfer takes place when

(A) $m_1 > m_2$ (B) $m_1 = 2m_2$

(C) $m_1 = m_2$ (D) $m_1 < m_2$

46. In a sky wave propagation, the radiowaves from the transmitting antenna reach the receiving antenna after reflection from the

(A) troposphere (B) ionosphere

(C) mesosphere (D) stratosphere

47. A plane wave of wavelength 6250 $\mathring{A}$ is incident normally on a slit of width 2×10^{-2} cm. The width of the central maximum on a screen at a distance 50 cm will be

(A) 3.125×10^{-7} cm (B) 312.5×10^{-7} cm

(C) 3.125×10^{-6} cm (D) 31.25×10^{-2} cm

48. The current sensitivity of a moving coil galvanometer can be increased by

(A) increasing the number of turns of coil

(B) decreasing the magnetic field strength

(C) decreasing the area of the coil

(D) increasing the current in the coil

49. The truth table of NAND gate is

(A)

A	B	y
0	0	0
1	0	1
0	1	1
1	1	1

(B)

A	B	y
0	0	0
1	0	0
0	1	0
1	1	1

(C)

A	B	y
0	0	1
1	0	1
0	1	1
1	1	0

(D)

A	B	y
0	0	1
1	0	0
0	1	0
1	1	0

50. The force required to increase the length by 0.5 *mm* of a steel wire of length 2 *m* and area of cross section 2 mm^2 is (Y for steel = 2.2×10^{11} Nm^{-2})

(A) 1.1×10^5 N (B) 1.1×10^{11} N

(C) 17.6×10^8 N (D) 1.1×10^2 N

51. A charge q is enclosed by a spherical surface of radius r. If the radius is doubled, the total electric flux through the surface will

(A) be increased four times (B) be reduced to half

(C) remain the same (D) be doubled

52. If a car at rest accelerates uniformly to a speed of 144 km/h in 20 s, it covers a distance of

(A) 20 m (B) 400 m

(C) 1,440 m (D) 2,980 m

53. Two bodies are moving in opposite direction with a speed v. What is the magnitude of their relative velocity ?

(A) 0 (B) v

(C) $\frac{v}{2}$ (D) $2v$

54. Which molecule will have greater root mean square velocity ; hydrogen or oxygen ?

(A) hydrogen (B) oxygen

(C) they have same rms velocity (D) cannot be compared

55. Gravitational force of attraction between two masses 1 kg each separated by 1 m will be

(A) 6.67×10^{-9} N (B) 6.67×10^{-11} N

(C) 6.67×10^{-13} N (D) Zero

56. Which of the following is a paramagnetic substance ?

(A) Alnico (B) Cobalt

(C) Manganese (D) Silver

57. The speed of an electron having a wavelength of 10^{-10} m is

(A) 7.25×10^{6} m s^{-1} (B) 6.26×10^{6} m s^{-1}

(C) 5.25×10^{6} m s^{-1} (D) 4.24×10^{6} m s^{-1}

58. A charge q is moved from point A to B across an equipotential surface. The work done is

(A) zero (B) $q(V_A - V_B)$

(C) $\frac{q}{(V_B - V_A)}$ (D) $\frac{(V_B - V_A)}{q}$

59. A point object is placed at a distance of 30 cm from a convex mirror of focal length 30 cm. The image will form at

(A) infinity (B) pole

(C) 15cm behind the mirror (D) no image will be formed

60. A ball is whirled around a circular path of radius 2 m. If it makes 5 revolutions in 8 seconds, the centripetal acceleration of the ball is

(A) 36.25 m/s^2 (B) 30.87 m/s^2

(C) 32.25 m/s^2 (D) 34.20 m/s^2

61. In an *n*-type semiconductor, which of the following statements is true ?

(A) Electrons are majority carriers and trivalent atoms are the dopants

(B) Electrons are minority carriers and pentavalent atoms are the dopants

(C) Holes are majority carriers and trivalent atoms are the dopants

(D) Holes are minority carriers and pentavalent atoms are the dopants

62. The self inductance of a straight conductor is

(A) zero (B) infinity

(C) very small (D) very large

63. The time period of a satellite of earth is 5 hours. If the separation between the earth and the satellite is increased to 4 times the previous value, the new time period will become

(A) 10 hours (B) 80 hours

(C) 40 hours (D) 20 hours

64. Resultant of two equal forces acting at right angles to each other is 1,414 dyne. Then the magnitude of each force is

(A) 1,100 dyne (B) 1,200 dyne

(C) 1,000 dyne (D) 1,414 dyne

65. Which of the following is not true for an adiabatic process ?

(A) Compression or expansion should take place slowly

(B) There is change in temperature

(C) The cylinder should have insulating walls

(D) No heat enters or leaves the system

66. The Boolean expression for the NOR gate is

(A) $Y = A + B$ (B) $Y = \overline{A + B}$

(C) $Y = A \bullet B$ (D) $Y = \overline{A \bullet B}$

67. An overhead power line carries current in North to South direction. The direction of magnetic field at a point directly below it is

(A) vertically downwards (B) vertically upwards

(C) towards the east (D) towards the west

68. The quantity $\frac{PV}{kT}$ represents

(A) mass of the gas

(B) number of molecules of the gas

(C) number of moles of the gas

(D) Avogadro's number

69. The force between two charges $+3\mu C$ and $-8\mu C$ is F. If a charge $+5\mu C$ is added to each of the charges, the force between them will be

(A) F + 5 (B) F − 5

(C) F (D) cannot be found

70. The length and cross sectional area of three different copper wires are (l, A), ($2l$, A/2), (l/2, 2A). The resistance is minimum in

(A) wire (l, A)

(B) wire ($2l$, A/2)

(C) wire (l/2, 2A)

(D) resistance is same in all three wires

71. In an LCR circuit, capacitance is changed from C to 2C. For the resonant frequency to remain unchanged, the inductance should be changed from L to

(A) 4L (B) 2L

(C) $\frac{L}{2}$ (D) $\frac{L}{4}$

72. The separation between carbon and oxygen molecules in CO is 0.12 nm. What is the distance of the centre of mass from the carbon atom ?

(A) 0.03 nm (B) 0.04 nm

(C) 0.05 nm (D) 0.07 nm

73. What is the frequency of a travelling wave given by the equation

$y = 10^{-4} \sin(600t - 2x + \frac{\pi}{3})$?

(A) $\frac{300}{\pi}$ Hz (B) 300π Hz

(C) $\frac{\pi}{3}$ Hz (D) 10^{-4} Hz

74. The ionization energy of hydrogen atom is 13.6 eV. Following Bohr's theory, the energy corresponding to a transition between 3^{rd} and 4^{th} orbit is

(A) 2.36 eV (B) 1.51 eV

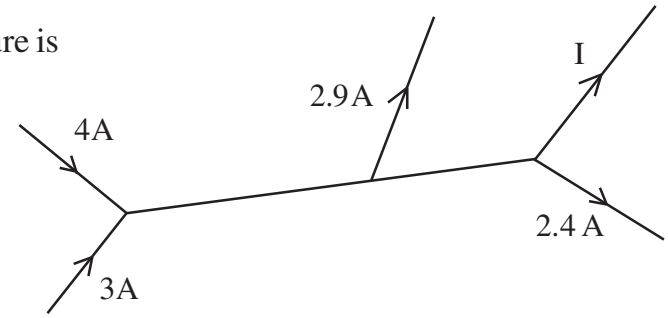
(C) 0.85 eV (D) 0.66 eV

75. The unit of power in S.I (watt) is equivalent to

(A) $kg\ m\ s^{-2}$ (B) $kg\ m^2\ s^{-2}$

(C) $kg\ m^2\ s^{-3}$ (D) none of these

76. The value of I in the given figure is



(A) 5.3 A

(B) 1.7 A

(C) 4.1 A

(D) 0.5 A

77. A transformer is used to light a 100 W - 110 V lamp from a 220 V mains. If the main current is 0.5A, the efficiency of the transformer is approximately

(A) 10% (B) 91%

(C) 30% (D) 50%

78. Which of the following electromagnetic waves have the longest wavelength ?

(A) Heat waves (B) Light waves

(C) Radio waves (D) Ultraviolet waves

79. The radius of curvature of the convex face of a plano-convex lens is 15 cm and the refractive index of the material is 1.4. Then the power of the lens in dioptre is

(A) 21 (B) 1.66

(C) 0.026 (D) 2.66

80. The cause of potential barrier in a junction diode is

(A) depletion of positive charges near the junction

(B) concentration of positive charges near the junction

(C) depletion of negative charges near the junction

(D) concentration of positive and negative charges near the junction

81. Dimensional formula of magnetic flux is

(A) $ML^2T^{-2}A^{-1}$ (B) $ML^2T^2A^{-1}$

(C) $MLT^{-2}A^{-1}$ (D) $ML^2T^{-3}A^{-1}$

82. The unit of angular momentum is

(A) Nm (B) $kgm^{-1}s^{-1}$

(C) $kg\ m^2s^{-1}$ (D) $kg^2m^2s^{-1}$

83. A carbon resistor is marked with colored bands of black, brown and black. The value of its resistance is

(A) $100\,\Omega \pm 20\%$ (B) $10\,\Omega \pm 20\%$

(C) $100\,\Omega \pm 10\%$ (D) $1\,\Omega \pm 20\%$

84. A man's near point is 0.5 *m* and far point is 3 *m*. Power of the spectacle lenses prepared for seeing distant objects is

(A) + 3 D (B) – 3 D

(C) – 0.33 D (D) + 0.33 D

85. If a source of sound of frequency υ moves towards a stationary listener with a velocity half of the velocity of the sound, the apparent frequency of the sound will be

(A) $\frac{\upsilon}{2}$ (B) 2υ

(C) $\frac{2\upsilon}{3}$ (D) $\frac{3\upsilon}{2}$

86. If the vector $2\hat{i}+3\hat{j}+8\hat{k}$ is perpendicular to the vector $4\hat{i}-4\hat{j}+a\hat{k}$, then the value of *a* is

(A) 1 (B) –1

(C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

87. An *n-p-n* transistor conducts when

(A) both collector and emitter are positive w.r.t the base

(B) both collector and emitter are negative w.r.t the base

(C) collector is positive and emitter is negative w.r.t the base

(D) collector is positive and emitter is at same potential as the base

88. A 100 W bulb is connected to a 200 V supply. The current in the circuit is

(A) 0.5A (B) 2A

(C) 1A (D) 20A

89. For liquids which wet a surface, the angle of contact

(A) is zero only (B) lies between 0^0 and 90^0

(C) lies between 90^0 and 180^0 (D) None of these

90. The relative velocity of two parallel layers of water is 8 cms^{-1}. If the perpendicular distance between the layers is 0.1cm, then velocity gradient will be

(A) 40 s^{-1} (B) 50 s^{-1}

(C) 60 s^{-1} (D) 80 s^{-1}

91. The energy equivalent of one atomic mass unit is

(A) 1.6×10^{-19} J (B) 6.02×10^{-23} J

(C) 931.5 MeV (D) 931.5 J

92. In photoelectric effect, the electrons are ejected from metals if the incident light has a certain minimum

(A) wavelength (B) amplitude

(C) frequency (D) angle of incidence

93. The kinetic energy of a molecule of hydrogen at 0° C is

(Given : $k = 1.381 \times 10^{-23}$ $Jmolecule^{-1}K^{-1}$; $R = 8.31$ $Jmole^{-1}K^{-1}$)

(A) 5.65×10^{-21} J (B) 3.402×10^{3} J

(C) 3.402×10^{-3} J (D) 5.65×10^{20} J

94. An electric dipole placed in a uniform electric field does not experience torque when

(A) it is aligned perpendicular to the direction of electric field

(B) it is aligned parallel to the direction of electric field

(C) it is at an angle 45° to the direction of field

(D) it always experiences torque for any alignment

95. Two straight conductors each of length 4 cm and carrying current 10 A are placed parallel to each other at a distance of 2 cm. The magnitude of force between them will be

(A) 10^3 N (B) 10^{-5} N

(C) 10^5 N (D) 4×10^{-5} N

96. In an a.c circuit containing only capacitor, the current

(A) leads voltage by 180^o (B) leads voltage by 90^o

(C) lags voltage by 90^o (D) remains in phase with voltage

97. The angular velocity of second's hand in a watch is

(A) 0.82 rad/s (B) 0.105 rad/s

(C) 0.21 rad/s (D) 0.052 rad/s

98. The magnifying power of an astronomical telescope in normal adjustment is 10 and the focal length of its eye-piece is 20 cm. The focal length of its objective will be

(A) 200 cm (B) 2 cm

(C) 0.5 cm (D) 0.5×10^{-2} cm

99. A heat engine works at source temperature $100^{\circ}C$ and sink temperature $-23^{0}C$. Its efficiency will be

(A) 0.77 (B) 1.23

(C) 0.329 (D) 0.206

100. When a particle executing simple harmonic motion is at the mean position, its kinetic energy is

(A) zero (B) maximum

(C) greater than zero but not maximum (D) equal to its potential energy