# PHYSICS

1. A galvanometer having a resistance of 8 Ω is shunted by a wire of resistance 2 Ω. If the total current is 1A, the part of the current passing through the shunt will be

   (A) 1.2 A
   (B) 0.8 A
   (C) 0.5 A
   (D) 0.3 A

2. If two soap bubbles of different radii are connected by a tube, then

   (A) air flows from bigger to smaller bubble till the size becomes equal

   (B) air flows from bigger to smaller bubble till the sizes are interchanged

   (C) air flows from smaller to bigger bubble

   (D) there is no flow of air

3. If a body starts from rest and travels 1.2 m in the 8th second, its acceleration is

   (A) 0.20 ms^{-2}
   (B) 0.16 ms^{-2}
   (C) 0.16 cms^{-2}
   (D) 0.08 ms^{-2}

4. With rise in temperature, the resistance offered by semiconductor

   (A) decreases
   (B) increases
   (C) first decrease and then increase
   (D) remains constant

5. The depletion layer of a p-n junction has thickness of the order of

   (A) 10^{-12} m
   (B) 10^{-13}m
   (C) 10^{-4}m
   (D) 10^{-6} m

6. To which logic gate does the truth table given below correspond ?

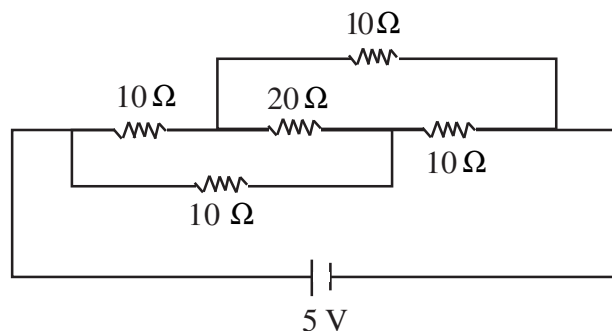 | A | B | X |
   |---|---|---|
   | 0 | 0 | 1 |
   | 1 | 0 | 1 |
   | 0 | 1 | 1 |
   | 1 | 1 | 0 |

   (A) OR
   (B) AND
   (C) NOR
   (D) NAND

7. The peak and virtual value of an a.c. are related as

   (A) $I_v = \dfrac{2}{\pi} I_o$ (B) $I_v = \dfrac{\pi}{2} I_o$

   (C) $I_v = \sqrt{2} I_o$ (D) $I_v = \dfrac{1}{\sqrt{2}} I_o$

8. For transistor action, which of the following statement is true ?

   (A) The base region must be thin and lightly doped

   (B) The emitter is always reversed biased and collector is forward biased

   (C) Base, emitter and collector regions should have similar size and doping concentrations

   (D) Both the emitter as well as collector junction are forward biased

9. The width of diffraction fringes varies

   (A) directly as the distance between the slit and screen

   (B) inversely as the wavelength of light

   (C) directly as the width of the slit

   (D) none of the above

10. Cadmium are used as control rods in nuclear reactor because

    (A) they have high cross section for neutron absorption

    (B) they can reduce energy of neutrons

    (C) they can easily release neutrons

    (D) they are transuranic elements

11. The total capacitance of the system of capacitors in the figure between A and B is
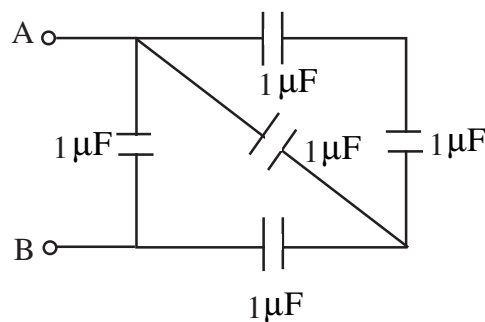
    (A) $1 \mu F$

    (B) $\dfrac{8}{5} \mu F$

    (C) $\dfrac{5}{8} \mu F$

    (D) $5 \mu F$

12. The most penetrating radiation out of the following are

(A) β- rays   (B) γ- rays

(C) α - rays   (D) X - rays

13. The S.I. unit of angular momentum is

(A) kg^2ms^{-1} (B) $kgm^{-2}s^{-1}$

(C) kgm^2s^{-1} (D) $kgm^{-1}s^2$

14. A magnetic field of flux density 10 T acts normal to a coil of 50 turns having 100 cm^2 area. If the coil is removed from the magnetic field in 0.1 s, induced emf is

(A) 40 V   (B) 50 V

(C) 100 V   (D) 500 V

15. What is the energy possessed by an electron while revolving in the orbit n = 3 ?

(A) − 0.85 eV   (B) − 1.51 eV

(C) − 3.4 eV   (D) − 2.5 eV

16. In simple harmonic motion, the acceleration of the particle is zero, when velocity is

(A) zero   (B) half of its maximum value

(C) maximum   (D) None of these

17. What will be the current drawn by the following circuit from the 5 V source ?

(A) 2 A

(B) 0.5 A

(C) 50 A

(D) None of the above

18. What is de-Broglie wavelength of a 1000 g object moving with a speed of 1 m/s ?

(A) 6.62×10^{-31} m   (B) 6.62×10^{-32} m

(C) 6.62×10^{-34} m   (D) zero

19. Sticking of paint to the wall is an example of

   (A) Adhesion (B) Capillarity

   (C) Cohesion (D) None of these

20. The pressure exerted by a liquid column at a point does not depend upon

   (A) Height of the liquid column above it

   (B) Shape of the vessel containing the liquid

   (C) Density of the liquid

   (D) Both (B) and (C)

21. The angle of a prism is 6° and its refractive index for green light is 1.5. If a green ray passes through it, the deviation will be

   (A) 30° (B) 15°

   (C) 3° (D) 0°

22. Scent sprayer is based on

   (A) Charle's Law (B) Avogadro's Law

   (C) Boyle's Law (D) Bernoulli's Theorem

23. Heat is transferred from one end to the other end of a solid by the process of

   (A) Convection (B) Conduction

   (C) Radiation (D) Thermal expansion

24. The loss of power in a signal as it travels is called

   (A) Noise (B) Modulation

   (C) Demodulation (D) Attenuation

25. The core of transformers are laminated so as to

   (A) prevent rusting

   (B) reduce energy loss due to eddy currents

   (C) make it robust and strong

   (D) increase secondary voltage

26. In a closed organ pipe, the fundamental frequency is v. What will be the ratio of the frequencies of the next three overtones ?

   (A) 2 : 3 : 4   (B) 3 : 4 : 5

   (C) 3 : 7 : 11   (D) 3 : 5 : 7

27. The acceleration due to gravity 'g' increases if

   (A) we go up from the surface of the earth

   (B) we go down from the surface towards the centre

   (C) we go from poles towards equator

   (D) None of the above

28. The dot product of vector A with itself is

   (A) zero   (B) 1

   (C) A   (D) A^2

29. The speed of sound in air is 330 m/s. If the apparent frequency of the sound increases by 50%, the source is moving towards the listener with a speed of

   (A) 110 m/s   (B) 165 m/s

   (C) 220 m/s   (D) 330 m/s

30. What is X in the given circuit, when no current flows through the $5\,\Omega$ resistor ?

   (A) $6\,\Omega$

   (B) $0.67\,\Omega$

   (C) $0.13\,\Omega$

   (D) None of the above
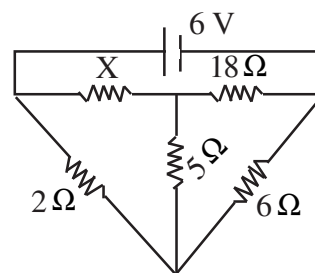
31. When torque acting upon a system is zero, which of the following will be constant ?

   (A) Linear momentum   (B) Angular momentum

   (C) Force   (D) Energy

32. Two lenses of power +12D and – 2D are combined together. Their equivalent focal length will be

    (A) 10 cm
    (B) 12.5 cm
    (C) 16.6 cm
    (D) 8.33 cm

33. Displacement of a progressive wave is represented by $y = 0.25 \sin (500t – 0.025x)$, where y, t and x are in metre, second and metre respectively. What is the wavelength of the wave ?

    (A) 20π m
    (B) 40π m
    (C) 60π m
    (D) 80π m

34. One Angstrom $\left(\overset{\circ}{A} \right)$ equals

    (A) 10^{-10} cm
    (B) 10^{-10} m
    (C) 10^{-15} m
    (D) 10^{-9} m

35. The dimensional formula $[M^1L^{-1}T^{-2}]$ represents

    (A) Pressure
    (B) Force
    (C) Work
    (D) Torque

36. When an object is placed between the pole and focus of a concave mirror, the image formed is

    (A) virtual, erect and diminished
    (B) real, inverted and diminished
    (C) real, inverted and magnified
    (D) virtual, erect and magnified

37. The velocity of a car changes from 20 ms^{-1} to 30 ms^{-1} in 5 seconds. The acceleration of the car is

    (A) 2 cms^{-2}
    (B) 20 ms^{-2}
    (C) 2 ms^{-2}
    (D) 2 ms^{-1}

38. The maximum distance upto which a TV transmission from a TV tower of height h can be received is proportional to

    (A) h
    (B) h^2
    (C) h$^{1/2}$
    (D) h$^{3/2}$

39. A force of 20N is inclined at 30° to the X axis. The component of force along the X axis is

(A) $10\sqrt{3}$ N

(B) 10 N

(C) $10/\sqrt{3}$ N

(D) Zero

40. A battery of emf 3.5 V and internal resistance r is connected in series with a resistance of 55 Ω through an ammeter of resistance 10 Ω. The ammeter reads 50 mA. Then the value of r is

(A) 5 Ω

(B) 15 Ω

(C) 60 Ω

(D) 70 Ω

41. At the top of the trajectory of a projectile, the acceleration is

(A) 4.9 ms^{-2}

(B) 19.6 ms^{-2}

(C) zero

(D) 9.8 ms^{-2}

42. When light is incident on a plane refracting surface at the polarizing angle, the angle between reflected ray and refracted ray is

(A) 0°

(B) 90°

(C) 180°

(D) 60°

43. What is the unit of R in the gas equation PV = RT ?

(A) Nm

(B) J

(C) JK^{-1}

(D) None of these

44. An α-particle enters a magnetic field of 1 tesla with a velocity 10^6m/s in a direction perpendicular to the field. The force on α-particle is

(A) 1.6×10^{-13} N

(B) 6.4×10^{-13} N

(C) 4.8×10^{-13} N

(D) 3.2×10^{-13} N

45. Two capillary tubes 'A' of radius 0.5 mm and 'B' of radius 1 mm are dipped in water. The rise of water is

(A) higher in tube A

(B) higher in tube B

(C) same in both

(D) zero in both

46. The linear and angular velocities of a body in circular motion are related as

(A) $\vec{v} = \vec{\omega} \times \vec{r}$

(B) $\vec{v} = \vec{r} \times \vec{\omega}$

(C) $\vec{\omega} = \vec{v} \times \vec{r}$

(D) $\vec{\omega} = \vec{r} \cdot \vec{v}$

47. The path difference of two waves for destructive interference should be

(A) $n\lambda$

(B) $n(\lambda + 1)$

(C) $(2n + 1)\lambda/2$

(D) $(n + 1)\lambda/2$

48. The SI unit of magnetic flux is

(A) gauss

(B) maxwell

(C) weber

(D) tesla

49. According to Bohr's atom model, if m and v are mass and velocity of electron respectively in a permitted orbit of radius r, then

(A) $mv = \dfrac{nhr}{2\pi}$

(B) $mr = \dfrac{nhv}{2\pi}$

(C) $mvr = \dfrac{nh}{2\pi}$

(D) $mvr = \dfrac{h}{2\pi}$

50. Eight dipoles of charges of magnitude q are placed inside a cube. The total electric flux coming out of the cube will be

(A) $\dfrac{8q}{\epsilon_0}$

(B) $\dfrac{16q}{\epsilon_0}$

(C) zero

(D) $\dfrac{q}{\epsilon_0}$

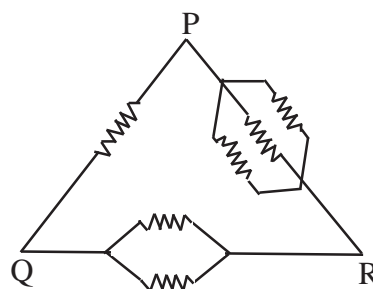51. An ideal heat engine exhausting heat at 77°C is to have 30% efficiency. It must take heat at

(A) 127°C

(B) 227°C

(C) 327°C

(D) 673°C

52. Six equal resistances are connected between points P, Q and R as shown in the figure. Then the net resistance will be maximum between

(A) P and Q

(B) Q and R

(C) P and R

(D) Any two points

53. The resonance frequency f_o of a series LCR circuit is given by

(A) $\dfrac{2\pi}{\sqrt{LC}}$

(B) $\dfrac{2}{\pi\sqrt{LC}}$

(C) $\dfrac{1}{2\pi\sqrt{LC}}$

(D) $\dfrac{1}{2\pi LC}$

54. The Gravitational potential energy of a body of mass m at a distance r from centre of the earth

(A) increases as r increases

(B) increases as r decreases

(C) independent of r

(D) none of these

55. The speed of electromagnetic waves can be represented as

(A) $c = E/B$

(B) $c = B/E$

(C) $c = E \times B$

(D) none of these

56. Given that $c = \dfrac{1}{\sqrt{\mu_0\varepsilon_0}}$, the dimension of $\mu_0\varepsilon_0$ is

(A) $[LT^{-1}]$

(B) $[L^{-1}T]$

(C) $[L^2T^{-2}]$

(D) $[L^{-2}T^2]$

57. Which of the following radiations has the least wavelength ?

(A) Microwaves

(B) Ultra-Violet

(C) Radiowaves

(D) Red light

58. The numerical ratio of velocity to speed is

(A) less than 0   (B) more than 1

(C) either greater than or equal to 1   (D) either less than or equal to 1

59. A lens is made of glass of refractive index 1.5. When the lens is immersed in a liquid of refractive index 1.25, its focal length

(A) increases by a factor of 1.25   (B) increases by a factor of 2.5

(C) increases by a factor of 1.2   (D) decreases by a factor of 1.2

60. The moment of inertia of a circular ring of mass 'M' and radius 'R' about an axis passing through its centre and perpendicular to its plane is

(A) MR   (B) $(MR)^2$

(C) MR^2 (D) ½ MR

61. Force between two stationary charges placed in free space is 10N. If they are placed in a medium of relative permittivity 5, the force between them is

(A) 50 N   (B) 2 N

(C) 0.5 N   (D) 10 N

62. A person's near point is 50 cm. The power of a lens required by him to read a book clearly at the least distance of distinct vision is

(A) + 2D   (B) – 2D

(C) + 0.02D   (D) – 0.02D

63. As a plane wavefront propagates, its radius of curvature

(A) decreases   (B) increases

(C) first increases and then decreases   (D) remains infinity

64. Which one of the following is not a property of elastic collision ?

(A) Mechanical energy may be converted into other form of energy

(B) Kinetic energy is conserved

(C) Momentum is conserved

(D) Total energy is conserved

65. In a forward biased p-n junction, the potential barrier

(A) becomes zero (B) remains constant

(C) decreases (D) increases

66. The centripetal force on a body in circular motion acts

(A) radially outwards

(B) radially inwards

(C) tangential to the circular path

(D) along the axis normal to the plane of the circular path

67. In Young's double slit experiment, the separation between the slits is halved and the distance between the slit and screen is doubled. The fringe width becomes

(A) unchanged (B) halved

(C) doubled (D) quadrupled

68. A hollow copper sphere is positively charged, the electric field at its centre will be

(A) same as on the surface

(B) less than that on the surface but not zero

(C) more than that on the surface

(D) zero

69. What is the angle between the electric dipole moment and the electric field strength due to the dipole on its equatorial line ?

(A) $0°$ (B) $90°$

(C) $180°$ (D) $270°$

70. If a rate of change of current of $4A\,s^{-1}$ induces an emf of 20 mV in a solenoid, the self-inductance of the solenoid is

(A) 5 mH (B) 5 H

(C) 50 H (D) 5×10^{-2} H

71. At what temperature, the rms speed of a hydrogen molecule is equal to that of a oxygen molecule at $47°C$?

(A) 80 K

(B) -73 K

(C) 3 K

(D) 20 K

72. A capacitor of capacitance 50 μF is charged to 10 V. Its energy is equal to

(A) 2.5×10^{-3} J

(B) 2.5×10^{-4} J

(C) 5×10^{-2} J

(D) 10^{-6} J

73. A block of mass 2 kg rests on a plane inclined at $30°$ with the horizontal. The coefficient of friction between the block and the surface is 0.7. The frictional force acting on the block is

(A) 9.8 N

(B) $0.7 \times 9.8\sqrt{3}$ N

(C) $98\sqrt{3}$ N

(D) 0.7×9.8 N

74. The binding energy per nucleon is maximum for

(A) $_{26}Fe^{56}$

(B) $_{2}He^{4}$

(C) $_{36}Kr^{83}$

(D) $_{92}U^{238}$

75. The unit vector along the direction of the vector $\hat{i} + \hat{j}$ is

(A) $\hat{k}$

(B) $\hat{i} + \hat{j}$

(C) $(\hat{i} + \hat{j})/\sqrt{2}$

(D) $(\hat{i} + \hat{j})/2$

76. What is the resistance between P and Q in the following network ? Each resistance is $3\,\Omega$.
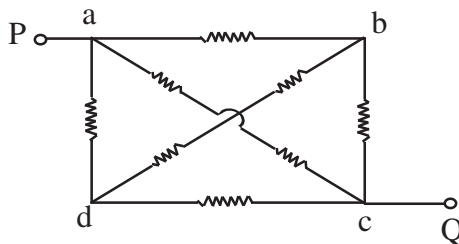
(A) $9\,\Omega$

(B) $6\,\Omega$

(C) $3\,\Omega$

(D) $2\,\Omega$

77. A metallic wire of resistance $40\,\Omega$ is stretched to twice of its length. Its new resistance would be

(A) $20\,\Omega$

(B) $80\,\Omega$

(C) $160\,\Omega$

(D) $120\,\Omega$

78. The change in internal energy of the system, when it absorbs 2 kilocalorie of heat and at the same time does 500 J of work is

(A) 7900 J   (B) 8200 J

(C) 5600 J   (D) 6400 J

79. Heat developed in half a minute in a resistance of 5 Ω is 15000 J. The current through the resistor is

(A) 5 A   (B) 100 A

(C) 40 A   (D) 10 A

80. If a body moves in a direction perpendicular to that in which the force acts, then the force does

(A) maximum positive work   (B) positive but not maximum work

(C) zero work   (D) negative work

81. If masses of all molecules of a gas are halved and their speeds doubled, then the ratio of the initial and final pressures will be

(A) 2:1   (B) 1:2

(C) 4:1   (D) 1:4

82. A photon having energy 'E' have momentum given by

(A) E/c^2 (B) E/c

(C) E/h (D) E/λ

83. An electron continues to move in a straight line while passing through magnetic field $\overset{\leftrightarrow}{B}$. Choose the correct statement.

(A) It is never possible

(B) It is possible when $\overset{\leftrightarrow}{B}$ is perpendicular to the direction of motion of the electron

(C) It is possible if $\overset{\leftrightarrow}{B}$ is parallel to the direction of motion of the electron

(D) It is possible if $\overset{\leftrightarrow}{B}$ is at 45° to the direction of motion of the electron

84. The angle of friction is equal to

   (A) limiting friction   (B) angle of repose

   (C) normal reaction   (D) coefficient of friction

85. The materials suitable for making electromagnets should have

   (A) high retentivity and high coercivity

   (B) low retentivity and low coercivity

   (C) high retentivity and low coercivity

   (D) low retentivity and high coercivity

86. A rectangular coil of area A of N turns has a current I flowing in clockwise direction, when looked at from above. The magnetic moment associated with it

   (A) points upwards   (B) points vertically downwards

   (C) is zero   (D) is directly proportional to A^2

87. The band width of speech signal is

   (A) 2800 Hz   (B) 280 MHz

   (C) 2800 kHz   (D) 28000 Hz

88. Two parallel beams of positrons moving in the same direction will

   (A) repel each other

   (B) will not interact with each other

   (C) attract each other

   (D) be deflected normal to the plane containing the two beams

89. weber ampere per metre is equal to

   (A) joule   (B) henry

   (C) newton   (D) watt

90. When the balanced point is obtained in the potentiometer, the current is drawn from

    (A) both the cell and auxiliary battery

    (B) cell only

    (C) auxiliary battery only

    (D) neither cell nor auxiliary battery

91. Name the diode for which the output voltage is a regulated voltage

    (A) L.E.D   (B) Photodiode

    (C) Zener diode   (D) None of these

92. A gas expands $0.25 \, m^3$ at constant pressure $10^3 \, N/m^2$. The work done is

    (A) 2.5 ergs   (B) 250 J

    (C) 250 W   (D) 250 N

93. When we kick a stone we get hurt. This happens due to the property of

    (A) inertia   (B) velocity

    (C) reaction   (D) momentum

94. The work done by an agency to carry a –10C charge from infinity to a point in electrostatic field is 50 J. The potential at that point is

    (A) 0.2 V   (B) – 5 V

    (C) 5 V   (D) – 500 V

95. The capacitive reactance of a $5 \, \mu F$ capacitor for a frequency of 50 Hz is

    (A) $636.9 \, \Omega$ (B) $63.69 \, \Omega$

    (C) $6.369 \, \Omega$ (D) $6369 \, \Omega$

96. Time period of a simple pendulum is 2 seconds. If its length is increased by 4 times, then its period becomes

    (A) 16 s   (B) 12 s

    (C) 8 s   (D) 4 s

97. Which one of the following is not true for nuclear reaction ?

    (A) Momentum is conserved

    (B) Mass and energy is not conserved

    (C) Charge number is conserved

    (D) Nucleon number is conserved

98. The maximum kinetic energy with which photoelectrons are emitted from a metal surface depends upon

    (A) Intensity of incident light

    (B) Frequency of incident light

    (C) Both (A) and (B)

    (D) None of these

99. If the distance between two point masses is doubled, the gravitational attraction between them

    (A) is doubled

    (B) is reduced to half

    (C) is reduced to quarter

    (D) remains unchanged

100. A force applied on a mass is represented as $F = 6\hat{i} - 8\hat{j} + 10\hat{k}$ and produces an acceleration of $1 \, \text{ms}^{-2}$. What will be the mass of the body ?

    (A) $10\sqrt{2}$ kg

    (B) $2\sqrt{10}$ kg

    (C) 10 kg

    (D) 20 kg

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