CET – PHYSICS – 2012

1. A block kept on a rough surface starts sliding when the inclination of the surface is 'θ' with respect to the horizontal. The coefficient of static friction between the block and the surface is

   a) $\tan\theta$ b) $\cos\theta$ c) $\sec\theta$ d) $\sin\theta$

Ans: (a)

2. Two bodies of masses m_1 and m_2 are acted upon by a constant force F for a time t. They start from rest and acquire kinetic energies E_1 and E_2 respectively. Then $\frac{E_1}{E_2}$ is

   a) $\frac{m_2}{m_1}$ b) 1 c) $\frac{\sqrt{m_1 m_2}}{m_1 + m_2}$ d) $\frac{m_1}{m_2}$

Ans: (a)

3. The X and Y components of a force F acting at 30^0 to x-axis are respectively

   a) $\frac{F}{2}, \frac{\sqrt{3}}{2}$ F b) $\frac{\sqrt{3}}{2}$ F, $\frac{1}{2}$ F c) F, $\frac{F}{\sqrt{2}}$ d) $\frac{F}{\sqrt{2}}$, F

Ans: (b)

4. Spheres of iron and lead having same mass are completely immersed in water. Density of lead is more than that of iron. Apparent loss of weight is $W_1$for iron sphere and W_2 for lead sphere. Then $\frac{W_1}{W_2}$ is

   a) between 0 and 1 b) = 0 c) > 1 d) = 1

Ans: (c)

5. A hot body is allowed to cool. The surrounding temperature is constant at 30^0 C. The body takes time t_1 to cool from 90^0 C to 89^0 C and time t_2 to cool from 60^0 C to 59.5^0 C. Then,

   a) $t_2 = \frac{t_1}{2}$ b) $t_2 = 4t_1$ c) $t_2 = t_1$ d) $t_2 = 2t_1$

Ans: (c)

6. A particle executes SHM with amplitude 0.2 m and time period 24 s. The time required for it to move from the mean position to a point 0.1 m from the mean position is

   a) 3 s b) 8 s c) 12 s d) 2 s

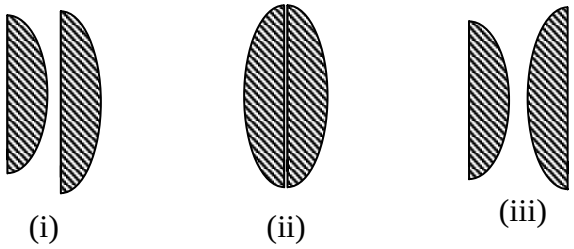
Ans: (d)

7. White light is incident normally on a glass slab. Inside the glass slab,

   a) violet light travels faster then other colours
   b) yellow light travels faster than other colours
   c) all colours travel with the same speed
   d) red light travels faster than other colours

Ans: (d)

8. Two thin plano-convex lenses each of focal length f are placed as shown in the figure. The ratio of their effective focal lengths in the three cases is



a) 1 : 2 : 1 b) 1 : 1 : 1 c) 3 : 2 : 1 d) 1 : 2 : 3

Ans: (b)

9. If the two slits in Young's double slit experiment are of unequal width, then
   a) the bright fringes will have unequal brightness
   b) the fringes do not appear
   c) the dark fringes are not perfectly dark
   d) the bright fringes will have unequal spacing

Ans: (c)

10. The phenomenon of polarization shows that light has …… nature
    a) transverse b) longitudinal c) dual d) particle

Ans: (a)

11. Acceleration of a charged particle of charge 'q' and mass 'm' moving in a uniform electric field of strength 'E' is

    a) $\frac{m}{qE}$ b) mqE c) $\frac{q}{mE}$ d) $\frac{qE}{m}$

Ans: (d)

12. Two fixed charges A and B of 5 μ C each are separated by a distance of 6 m. C is the mid point of the line joining A and B. A charge 'Q' of -5 μ C is shot perpendicular to the line joining A and B through C with a kinetic energy of 0.06 J. The charge 'Q' comes to rest at a point D. The distance CD is

    a) $\sqrt{3}$ m b) $3\sqrt{3}$ m c) 4 m d) 3 m

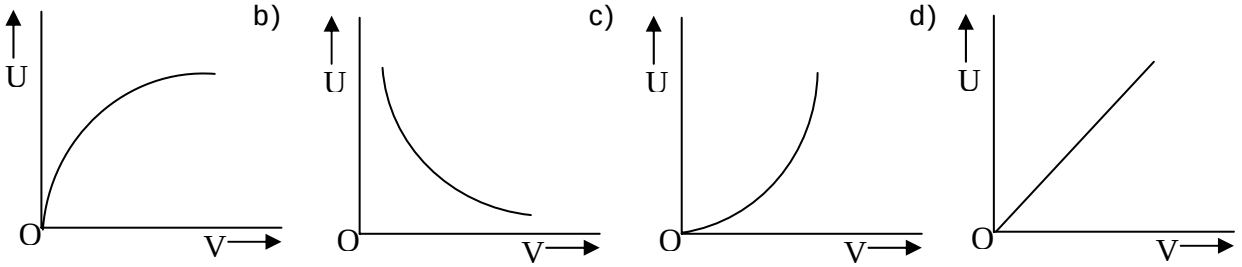
Ans. (c)

13. A capacitor of capacitance 10 μ F is charged to 10 V. The energy stored in it is
    a) 500 μ J b) 1000 μ J c) 1 μ J f) 100 μ J

Ans: (a)

14. Which of the following graphs correctly represents the variation of heat energy (U) produced in a metallic conductor in a given time as a function of potential difference (V) across the conductor?

    a) b) c) d)



Ans: (c)

15. A current of 2 A is passing through a metal wire of cross sectional area 2×10^{6} m^2. If the number density of free electrons in the wire is 5×10^{26} m^{-3}, the drift speed of electrons is (given $e = 1.6 \times 10^{-19}$ C)

a) $\frac{1}{40}$ ms^{-1} b) $\frac{1}{80}$ ms^{-1} c) $\frac{1}{32}$ ms^{-1} d) $\frac{1}{16}$ ms^{-1}

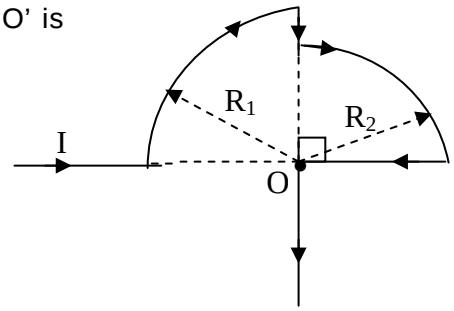
Ans: (b)

16. Magnetic field at a distance r from an infinitely long straight conductor carrying a steady current varies as

a) $\frac{1}{r}$ b) $\frac{1}{r^3}$ c) $\frac{1}{\sqrt{r}}$ d) $\frac{1}{r^2}$

Ans: (a)

17. In the loop shown, the magnetic induction at the point 'O' is



a) $\frac{\mu_0 I}{8}\left(\frac{R_1 + R_2}{R_1 R_2}\right)$ b) $\frac{\mu_0 I}{8}\left(\frac{R_1 R_2}{R_1 + R_2}\right)$ c) zero d) $\frac{\mu_0 I}{8}\left(\frac{R_1 - R_2}{R_1 R_2}\right)$

Ans: (a)

18. An α-particle and a proton moving with the same kinetic energy enter a region of uniform magnetic field at right angles to the field. The ratio of the radii of the paths of α-particle to that of the proton is

a) 1 : 2 b) 1 : 4 c) 1 : 8 d) 1 : 1

Ans: (d)

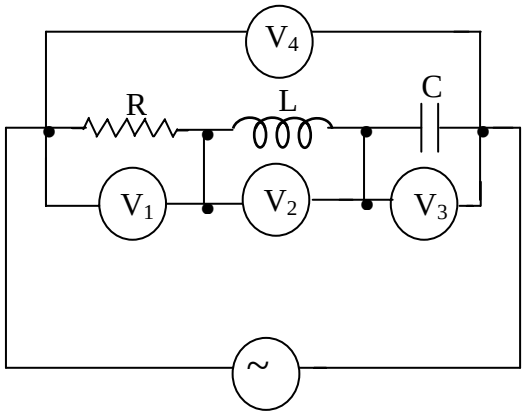
19. Direction of current induced in a wire moving in a magnetic field is found using

a) Fleming's right hand rule b) Ampere's rule

c) Right hand clasp rule d) Fleming's left hand rule

Ans: (a)

20. An ideal resistance R, ideal inductance L, ideal capacitance C and AC volt meters $V_1 - V_2$, V_3 and V_4 are connected to an AC source as shown. At resonance,



a) reading in V_1 = reading in V_2 b) reading in V_2 = reading in V_4

c) reading in V_2 = reading in V_3 d) reading in V_3 = reading in V_1

Ans: (c)

21. X-rays, gamma rays and microwaves traveling in vacuum have

a) same frequency but different velocities b) same velocity but different wavelengths

c) same velocity and same frequency d) same wavelengths but different velocities

Ans: (b)

22. If n is the orbit number of the electron in a hydrogen atom, the correct statement among the following is

a) hydrogen emits infrared rays for the electron transition from n = ∞ to n = 1.

b) electron energy is zero for n = 1

c) electron energy varies as n^2

d) electron energy increases as n increases

Ans: (d)

23. In Ruby laser, the colour of laser light is due to …. Atom

a) Aluminium b) Xenon c) Chromium d) Oxygen

Ans: (c)

24. The radius of $_{29}Cu^{64}$ nucleus in Fermi is (given $R_0 = 1.2 \times 10^{-15}$ m)

a) 1.2 b) 7.7 c) 9.6 d) 4.8

Ans: (d)

25. In a radioactive decay, an element $_ZX^A$ emits four α-particles, three β-particles and eight gamma photons. The atomic number and mass number of the resulting final nucleus are

a) Z – 5, A – 13 b) Z – 5, A – 16 c) Z – 8, A – 13 d) Z – 11, A – 16

Ans: (b)

26. For a transistor, β = 100. The value of α is

a) 0.99 b) 100 c) 0.01 d) 1.01

Ans: (a)

27. The following truth table with A and B as inputs in for …… gate.

A	B	Output
1	0	1
1	1	0
0	1	1
0	0	0

a) OR b) XOR c) NOR d) AND

Ans: (b)

28. 'n' photons of wavelength 'λ' are absorbed by a black body of mass 'm'. The momentum gained by the body is

a) $\frac{mnh}{\lambda}$ b) $\frac{nh}{m\lambda}$ c) $\frac{nh}{\lambda}$ d) $\frac{h}{m\lambda}$

Ans: (c)

29. A radioactive nucleus has specific binding energy 'E_1'. It emits an α-particle. The resulting nucleus has specific binding energy 'E_2'. Then

a) $E_2 < E_1$ b) $E_2 > E_1$ c) $E_2 = 0$ d) $E_2 = E_1$

Ans: (b)

30. The dimensional formula of physical quantity is $M^a L^b T^c$. Then that physical quantity is
    a) force if a = 1, b = 1, c = 2
    b) angular frequency if a = 0, b = 0, c = -1
    c) spring constant if a = 1, b = - 1, c = - 2
    d) surface tension if a = 1, b = 1, c = - 2

Ans: (b)

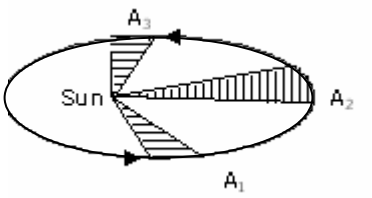
31. A person throws balls into air vertically upward in regular intervals of time of one second. The next ball is thrown when the velocity of the ball thrown earlier becomes zero. The height to which the balls rise is (Assume , g = 10 ms^{-2})
    a) 10 m b) 7.5 m c) 20 m d) 5 m

Ans: (d)

32. The circular motion of a particle with constant speed is
    a) SHM but not periodic b) periodic and also SHM
    c) neither periodic nor SHM d) periodic but not SHM

Ans: (d)

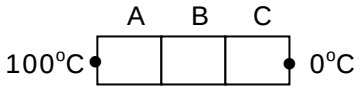
33. A planet moving around sun sweeps area A_1 in 2 days, A_2 in 3 days and A_3 in 6 days. Then the relation between A_1, A_2 and A_3 is



    a) $2A_1 = 3A_2 = 6A_3$ b) $3A_1 = 2A_2 = 6A_3$
    c) $6A_1 = 3A_2 = 2A_3$ d) $3A_1 = 2A_2 = A_3$

Ans: (d)

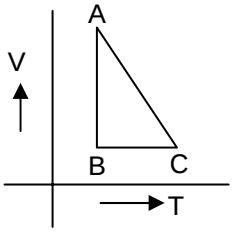
34. A, B and C are the three identical conductors but made from different materials. They are kept in contact as shown.



    Their thermal conductivities are K, 2K and $\frac{K}{2}$. The free end of A is at 100°C and the free end of C is at 0°C. During steady state, the temperature of the junction of A and B is nearly _____ °C.
    a) 29 b) 63 c) 37 d) 71

Ans: (d)

35. One mole of an ideal gas is taken from A to B, from B to C and then back to A. The variation of its volume with temperature for that change is as shown. Its pressure at A is P_0, volume is V_0. Then, the internal energy
    a) at C is less than at B
    b) at B is more than at A
    c) at A and B are equal
    d) at A is more than at B



Ans: (c)

36. Which of the following is incorrect?

a) If the wave is mechanical, it may OR may not be a transverse wave.

b) Mechanical waves cannot propagate in vacuum.

c) 'Diffraction' helps us to distinguish between sound wave and light wave.

d) If the wave is longitudinal, it must be a mechanical wave.

Ans: (c)

37. Intensity level of sound whose intensity is 10^{-8} wm^{-2} is _____ dB

a) 4 b) 40 c) 80 d) 8

Ans: (b)

38. A point source of light is kept below the surface of water (n_w = 4/3) at a depth of $\sqrt{7}$ m. The radius of the circular bright patch of light noticed on the surface of water is _____ m.

a) 3 b) $\frac{\sqrt{7}}{3}$ c) $\sqrt{7}$ d) $\frac{3}{\sqrt{7}}$

Ans: (a)

39. A monochromatic beam of light is travelling from medium A of refractive index n_1 to a medium B of refractive index n_2. In the medium A, there are x number of waves in certain distance. In the medium B, there are y number of waves in the same distance. Then, refractive index of medium A with respect to medium B is

a) $\sqrt{\frac{x}{y}}$ b) $\frac{x}{y-x}$ c) $\frac{x}{y}$ d) $\frac{y}{x}$

Ans: (c)

40. In Young's double slit experiment, fringes of width β are produced on a screen kept at a distance of 1m from the slit. When the screen is moved away by 5 x 10^{-2} m, fringe width changes by 3 x 10^{-5} m. The separation between the slits is 1 x 10^{-3} m. The wavelength of the light used is ____ nm.

a) 600 b) 700 c) 400 d) 500

Ans: (a)

41. For sustained inference fringes in double slit experiment, essential condition/s is/are

a) sources must be coherent

b) the intensities of the two sources must be equal

Here, the correct option/s is/are

1) only (a) b) only (b) c) neither (a) nor (b) d) both (a) (b)

Ans: (a)

42. In single slit experiment, the width of the slit is reduced. Then, the linear width of the principal maxima _____

a) decreases but becomes more bright

b) increases but becomes more bright

c) decreases but becomes less bright

d) increases but becomes less bright

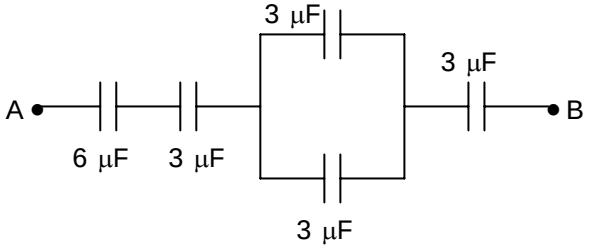
Ans: (d)

43. In the uniform electric field of E = 1 x 10^4 NC^{-1}, an electron is accelerated from rest. The velocity of the electron when it has travelled a distance of 2 x 10^{-2} m is nearly _____ ms^{-1} ($\frac{e}{m}$ of electron ≈ 1.8 x 10^{11} C kg^{-1})

a) 0.85 x 10^6 b) 0.425 x 10^6 c) 8.5 x 10^6 d) 1.6 x 10^6

Ans: (c)

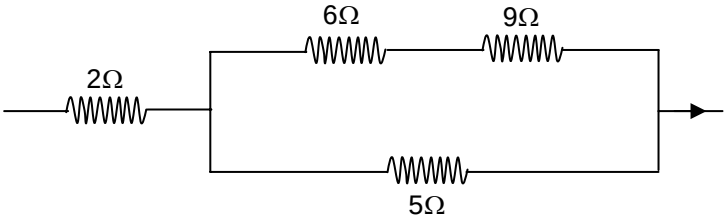
44. In this diagram, the P.D between A and B is 60 V, the P.D across 6 μF capacitor is _____ V



a) 5 b) 20 c) 4 d) 10

Ans: (d)

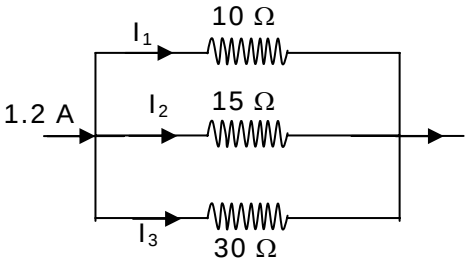
45. In this circuit, when certain current flows, the heat produced in 5Ω is 4.05 J in a time t. The heat produced in 2Ω coil in the same time interval is



a) 1.44 b) 2.88 c) 2.02 d) 5.76

Ans: (b)

46. In this circuit, the value of I_2 is



a) 0.3 A b) 0.4 A
c) 0.6 A d) 0.2 A

Ans: (b)

47. A straight current carrying conductor is kept along the axis of circular loop carrying current. The force exerted by the straight conductor on the loop is _____

a) in the plane of the loop, away from the center
b) in the plane of the loop, towards the center
c) zero
d) perpendicular to the plane of the loop

Ans: (c)

48. A resistor of 500 Ω, an inductance of 0.5 H are in series with an a.c. which is given by V = $100\sqrt{2}$ sin(1000 t). The power factor of the combination is

a) $\frac{1}{\sqrt{3}}$ b) 0.5 c) 0.6 d) $\frac{1}{\sqrt{2}}$

Ans: (d)

49. Pick our the WRONG statement.
a) When an electron is shot at right angles to the electric field, it traces a parabolic path.
b) An electron moving in the direction of the electric field gains K.E
c) An electron at rest experiences no force in the magnetic field
d) The gain in the K.E of the electron moving at right angles to the magnetic field is zero

Ans: (b)

50. A proton and an alpha particle are accelerated under the same potential difference. The ratio of de-Broglie wavelengths of the proton and the alpha particle is

a) $\frac{1}{\sqrt{8}}$ b) 1 c) 2 d) $\sqrt{8}$

Ans: (d)

51. Spectrum of sunlight is an example for
a) Line absorption spectrum b) Continuous emission spectrum
c) Continuous absorption spectrum d) Band emission spectrum

Ans: (a)

52. In hydrogen atom, electron excites from ground state to higher energy state and its orbit velocity is reduced to $\frac{1}{3}$rd of its initial value. The radius of the orbit in the ground state is. The radius of the orbit in that higher energy state is

a) 3 R b) 27 R c) 9 R d) 2 R

Ans: (c)

53. Decay constants of two radio-active samples A and B are 15x and 3x respectively. The have equal number of initial nuclei. The ratio of the number of nuclei left in A and B after time $\frac{1}{6x}$ is

a) e^2 b) e^{-1} c) e^{-2} d) e

Ans: (c)

54. Mass numbers of the elements A, B, C and D are 30, 60, 90 and 120 respectively. The specific binding energy of them are 5 MeV, 8.5 MeV, 8 MeV and 7 MeV respectively. Then, in which of the following reaction/s energy is released?
a) $D \rightarrow 2B$
b) $C \rightarrow B + A$
c) $B \rightarrow 2A$
a) in (b), (c) b) in (a), (c)
c) in (a), (b) and (c) d) only in (a)

Ans: (d)

55. Copper and germanium are cooled from room temperature to 100 K. Then the resistance of
a) Germanium decreases, copper decreases
b) Germanium increases, copper decreases
c) Germanium increases, copper increases
d) Germanium decreases, copper increases

Ans: (b)

56. The most stable particle in the Baryon group is

a) Proton b) lamda particle c) sigma particle d) neutron

Ans: (a)

57. Frequencies of light incident on a system of scattering particles are in the ratio 1 : 2. Then, the intensity of scattered light in a particular direction is _____

a) 1 : 2 b) 1 : 8 c) 1 : 16 d) 1 : 4

Ans: (c)

58. The ratio of the magnetic dipole moment to the angular momentum of the electron in the 1^{st} orbit of hydrogen atom is

a) $\frac{e}{m}$ b) $\frac{2m}{e}$ c) $\frac{m}{e}$ d) $\frac{e}{2m}$

Ans: (d)

59. Milk is an example for

a) foam b) elastic gel c) emulsion d) inelastic gel

Ans: (c)

60. A body of mass 'm' is travelling with a velocity 'u'. When a constant retarding force 'F' is applied, it comes to rest after travelling a distance 's_1' . If the initial velocity is '2u' , with the same force 'F', the distance travelled it comes to rest is 's_2'. Then

a) $s_2 = \frac{s_1}{2}$ b) $s_2 = s_1$ c) $s_2 = 4s_1$ d) $s_2 = 2s_1$

Ans: (c)