PHYSICS

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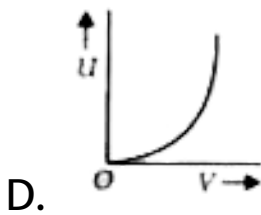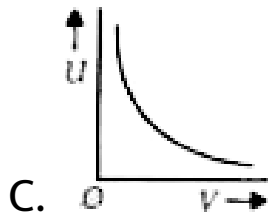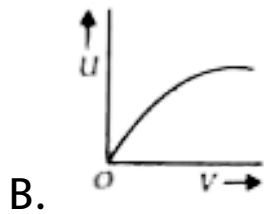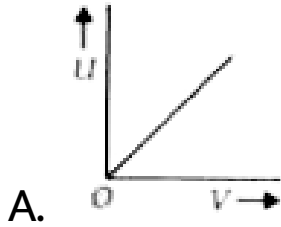
KARNATAKA CET 2012

Physics

1. 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.

Answer: D

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

A. $\dfrac{1}{16} ms^{-1}$

B. $\dfrac{1}{40} ms^{-1}$

C. $\dfrac{1}{80} ms^{-1}$

D. $\dfrac{1}{32} ms^{-1}$

Answer: C

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

A. $\dfrac{1}{r^2}$

B. $\dfrac{1}{r}$
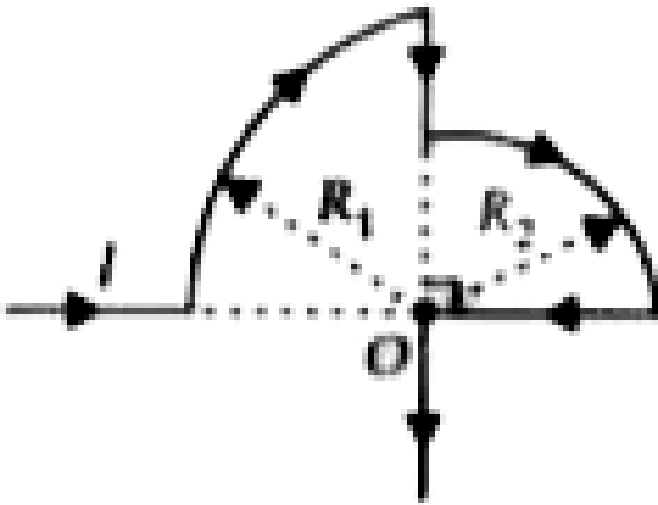
C. $\dfrac{1}{r^3}$

D. $\dfrac{1}{\sqrt{r}}$

Answer: B

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

A. $\dfrac{\mu_0 I}{8}\left(\dfrac{R_1 - R_2}{R_1 R_2}\right)$

B. $\dfrac{\mu_0 I}{8}\left(\dfrac{R_1 + R_2}{R_1 R_2}\right)$

C. $\dfrac{\mu_0 I}{8}\left(\dfrac{R_1 R_2}{R_1 + R_2}\right)$

D. zero

Answer: B

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5. 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. $1:1$

    B. $1:2$

    C. $1:4$

    D. $1:8$

Answer: A

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

    A. Fleming's left hand rule

    B. Fleming's right hand rule
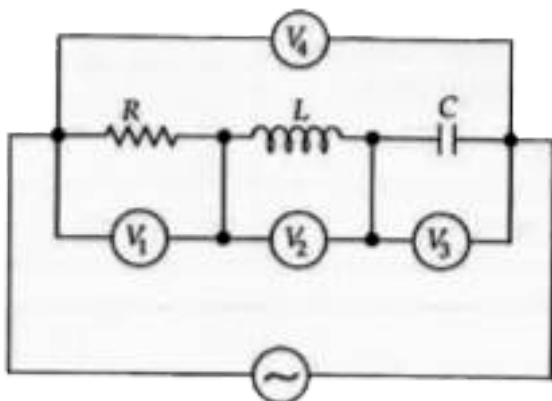
    C. Ampere's rule

    D. Right hand clasp rule

Answer: B

7. 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_3 = reading in V_1

B. reading in V_1 = reading in V_2

C. reading in V_2 = reading in V_4

D. reading in V_2 = reading in V_3

Answer: D

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8. X- rays, gamma rays and microwaves

travelling in vacuum have

A. same wavelength but different velocities

B. same frequency but different velocities

C. same velocity but different wavelengths

D. same velocity and same frequency

Answer: C

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

A. electron energy increases as n increases

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

C. electron energy is zero for n = 1

D. electron energy varies as n^2

Answer: A

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10. In a Ruby laser , the colour of laser light is due to .... atom .

A. oxygen

B. aluminium

C. xenon

D. chromium

Answer: D

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

A. 4.8

B. 1.2

C. 7.7

D. 9.6

Answer: A

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12. 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- 11 , A - 16

    B. Z - 5 , A - 13

    C. Z - 5 , A - 16

    D. Z - 8 , A - 13

Answer: C

13. For a transistor , $\beta = 100$. The value of α is

    A. 1.01

    B. 0.99

    C. 100

    D. 0.01

Answer: B

14. The following truth table with A and B as inputs is for ...., gate .

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

A. AND

B. OR

C. XOR

D. NOR

Answer: C

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

A. $\dfrac{h}{m\lambda}$

B. $\dfrac{mnh}{\lambda}$

C. $\dfrac{nh}{m\lambda}$

D. $\dfrac{nh}{\lambda}$

Answer: D

16. 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. $E_2 > E_1$

D. $E_2 = 0$

Answer: C

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17. The dimensional formula of physical quantity is $M^a L^b T^c$. Then that physical quantity is

A. surface tension if $a = 1, b = 1, c = -2$

B. force if a = 1 , b = 1 , c= 2

C. angular frequency if a = 0 , b = 0 , c = -1

D. spring constant if a = 1 , b = -1 , c = -2

Answer: C

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18. 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 = $10ms^{-2}$)

A. 5 m

B. 10 m

C. 7.5 m

D. 20 m

Answer: A

19. The circular motion of a particle with constant speed is

A. periodic but not SHM

B. SHM but not periodic

C. periodic and also SHM

D. neither periodic nor SHM

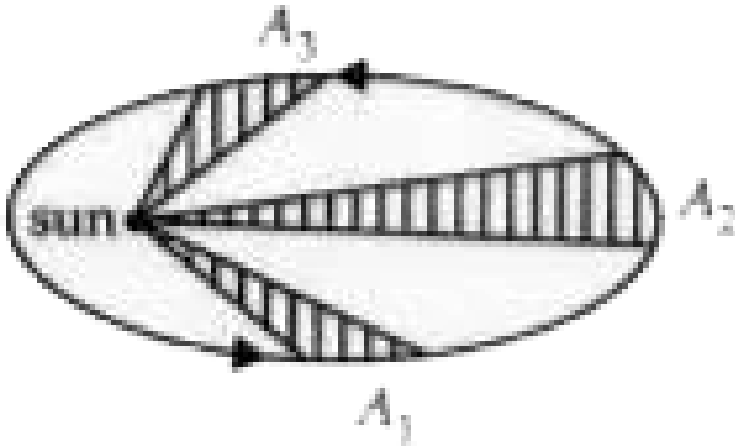**Answer: A**

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20. 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. $3A_1 = 2A_2 = A_3$

B. $2A_1 = 3A_2 = 6A_3$
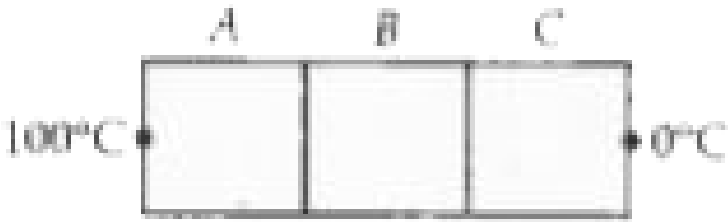
C. $3A_1 = 2A_2 = 6A_3$

D. $6A_1 = 3A_2 = 2A_3$

Answer: A

21. 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
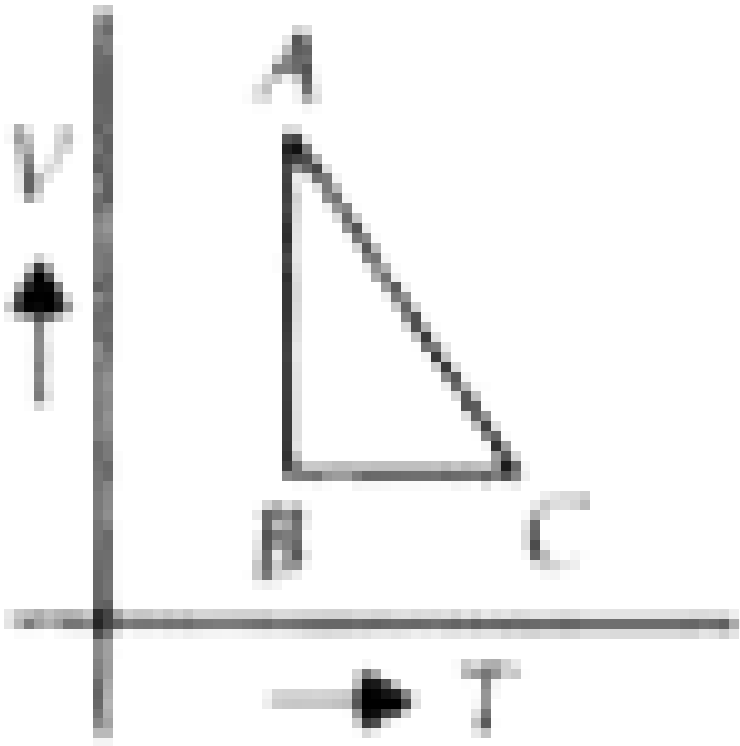
nearly .... $°C$.

A. 71

B. 29

C. 63

D. 37

Answer: A

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22. 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 the temperature for that change is as shown . Its pressure at A is P_0 , volume is V_0 . Then , the internal energy

A. at A is more than at B

B. at C is less than at B

C. at B is more than A

D. at A and B are equal

Answer: D

23. Which of the following is incorrect ?

A. If the wave is longitudinal , it must be a

mechanical wave .

B. If the wave is mechanical , it may or may

not be transverse wave .

C. Mechanical wave cannot propagate in vacuum .

D. Diffraction helps us to distinguish between sound waves and light wave.

Answer: D

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24. Intensity level of sound whose intensity is $10^{-8}Wm^{-2}$ is ..... dB

A. 8

B. 4

C. 40

D. 80

Answer: C

25. A point source of light is kept below the surface of water $\left(n_w = \dfrac{4}{3} \right)$ 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. $\dfrac{3}{\sqrt{7}}$

B. 3

C. $\dfrac{\sqrt{7}}{3}$

D. $\sqrt{7}$

Answer: B

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26. 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. $\dfrac{y}{x}$

B. $\sqrt{\dfrac{x}{y}}$

C. $\dfrac{x}{y-x}$

D. $\dfrac{x}{y}$

Answer: D

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27. In Young's double slit experiment , fringes of width β are produced on a screen kept at a distance of 1 m from the slit . When the screen is moved away by 5×10^{-2} m , fringe width changes by 3×10^{-5} m . The separation

between the slits is 1×10^{-3} m . The wavelength of the light used is ....nm

A. 500

B. 600

C. 700

D. 400

Answer: B

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28. For sustained interference fringes in double slit experiment , essential condition/s is / are

(1) sources must be coherent .

(2) the intensities of the two sources must be equal .

Here , the correct option/s is/are

   A. both (1) (2)

   B. only (1)

   C. only (2)

D. neither (1) nor (2)

Answer: B

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29. In single slit experiment, the width ofthe slit is reduced.Then, the linear width ofthe principal maxima....

A. increases but becomes less bright

B. decreases but becomes more bright

C. increases but becomes more bright

D. decreases but becomes less bright

Answer: A

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30. In the uniform electric field of $E = 1 \times 10^4 NC^{-1}$ an electron is accelerated from rest . The velocity of the electron when it has travelled a distance of 2×10^{-2} m is

nearly ... ms^{-1}

($\dfrac{e}{m}$ of electron = $1.8 \times 10^{11} Ckg^{-1}$)

A. 1.6×10^6

B. 0.85×10^6

C. 0.425×10^6
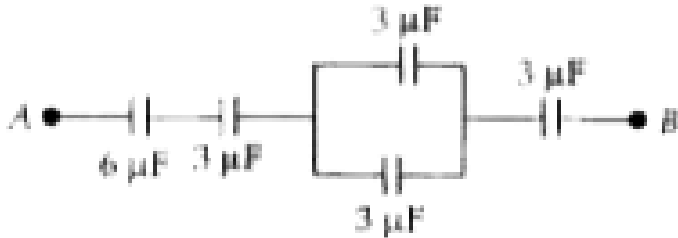
D. 8.5×10^6

Answer: D

31. In this diagram , the P.D. between A and B is 60 V . The P.D. across $6\mu F$ capacitor is ... V

A. 10

B. 5

C. 20

D. 4

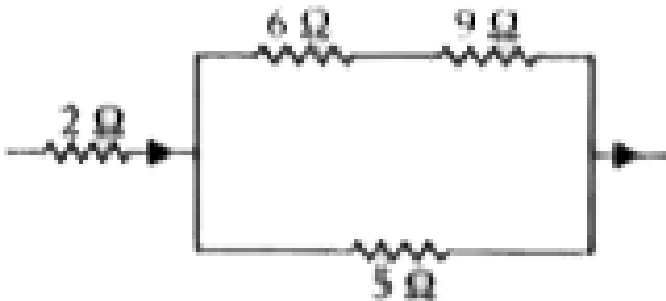Answer: A

32. 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. 5.76

B. 1.44

C. 2.88
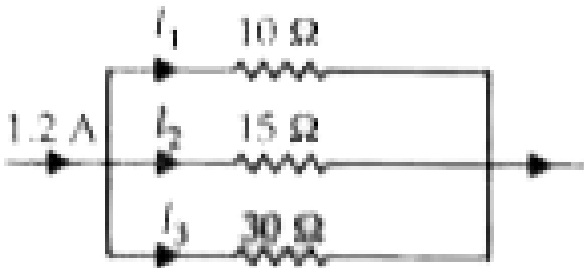
D. 2.02

Answer: C

33. In this circuit , the value of I_2 is

A. 0.2 A

B. 0.3 A

C. 0.4 A

D. 0.6 A

Answer: C

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34. 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. perpendicular to the plane of the loop

B. in the plane of the loop , away from the

center

C. in the plane of the loop , towards the

center

D. zero

Answer: D

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

A. $\dfrac{1}{\sqrt{2}}$

B. $\dfrac{1}{\sqrt{3}}$

C. 0.5

D. 0.6

Answer: A

36. Pick out the wrong statement .

A. The gain in the K.E. of the electron moving at right angles to the magnetic field is zero .

B. When an electron is shot at right angles to the electric field , it traces a parabolic path .

C. An electron moving in the direction of the electric field gains K.E.

D. An electron at rest experiences no force in the magnetic field .

Answer: C

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37. A proton and an α particle are accelerated through the same potential difference V. The ratio of their de Broglie wavelengths is

A. $\sqrt{8}$

B. $\dfrac{1}{\sqrt{8}}$

C. 1

D. 2

Answer: A

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38. Spectrum of sunlight is an example for

A. band emission spectrum

B. line absorption spectrum

C. continuous emission spectrum

D. continuous absorption spectrum

Answer: B

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39. In hydrogen atom , electron excites from ground state of higher energy state and its orbital velocity is reduced to $\left(\dfrac{1}{3}\right)^{rd}$ of its initial value . The radius of the orbit in the

ground state is R . The radius of the orbit in

that higher energy state is ...

A. 2 R

B. 3 R

C. 27 R

D. 9 R

Answer: D

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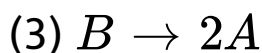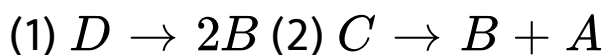
A. e

B. e^2

C. e^{-1}

D. e^{-2}

Answer: D

41. 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 Me V , 8.5 MeV , 8 Me V and 7 Me V respectively . Then , in which of the following reaction/s energy is released ?

(1) $D \rightarrow 2B$ (2) $C \rightarrow B + A$

(3) $B \rightarrow 2A$

    A. only in (1)

B. in (2) , (3)

C. in (1) , (3)

D. in (1) , (2) and (3)

Answer: A

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42. Copper and Germanium are cooled from room temperature to 100 K . Then the resistance of

A. Germanium decreases , Copper increases

B. Germanium decreases , Copper decreases

C. Germanium increases , Copper decreases

D. Germanium increases , Copper increases

Answer: C

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43. The most stable particle in Baryon group is

A. neutron

B. proton

C. lamba particle

D. sigma particle

Answer: B

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44. Frequencies of light incident on a system

of scattering particles are in the ratio of $1:2$.

Then , the intensity of scattered light in a particular direction is ....

A. $1:4$

B. $1:2$

C. $1:8$

D. $1:16$

Answer: D

45. The ratio of the magnetic dipole moment to the angular momentum of the electron in the 1st orbit of hydrogen atom is

A. $\dfrac{e}{2m}$

B. $\dfrac{e}{m}$

C. $\dfrac{2m}{e}$

D. $\dfrac{m}{e}$

Answer: A

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46. Milk is an example for

A. inelastic gel

B. foam

C. elastic gel

D. emulsion

Answer: D

47. 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 before it comes to rest is s_2 . then

   A. $s_2 = 2s_1$

   B. $s_2 = \dfrac{s_1}{2}$

   C. $s_2 = s_1$

   D. $s_2 = 4s_1$

Answer: D

48. 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. $\sin \theta$

B. $\tan \theta$

C. $\cos \theta$

D. $\sec \theta$

Answer: B

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49. 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 $\dfrac{E_1}{E_2}$ is

A. $\dfrac{m_1}{m_2}$

B. $\dfrac{m_2}{m_1}$

C. 1

D. $\dfrac{\sqrt{m_1 m_2}}{m_1 + m_2}$

Answer: B

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50. The X and Y components of a force F acting

at $30°$ to x- axis are respectively

A. $\dfrac{F}{\sqrt{2}}, F$

B. $\dfrac{F}{2}, \dfrac{\sqrt{3}}{2}F$

C. $\dfrac{\sqrt{3}}{2}F, \dfrac{1}{2}F$

D. $F, \dfrac{F}{\sqrt{2}}$

Answer: C

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51. 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 $\dfrac{W_1}{W_2}$ is

A. $= 1$

B. between 0 and 1

C. $= 0$

D. > 1

Answer: D

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

   A. $t_2 = 2t_1$

   B. $t_2 = \dfrac{t_1}{2}$

   C. $t_2 = 4t_1$

   D. $t_2 = t_1$

Answer: D

53. 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. 2 s

B. 3 s

C. 8 s

D. 12 s

Answer: A

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

   A. red light travels faster than other

      colours

   B. violet light travels faster than other

      colours .

C. yellow light travels faster than other

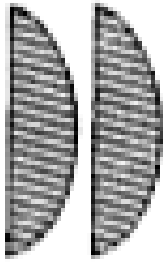colours .

D. all colours travel with the same speed .
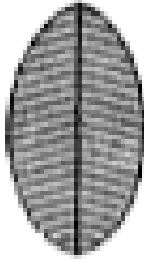
Answer: A

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55. Two thin plano-convex lenses each of focal

length f are placed as shown in the figure . The
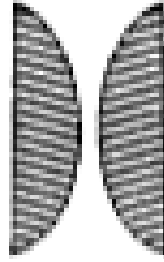
ratio of their effective focal lengths in the

three cases is

(i)   (ii)   (iii)

A. $1:2:3$

B. $1:2:1$

C. $1:1:1$

D. $3:2:1$

Answer:

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56. White light is used to illuminate the two slits in Young's double slit experiment. The separation between the slits is b and the screen is at a distance d> > b) from the slits. At a point on the screen directly infront of one of the slits, certain wavelengths are missing. Some of these missing wavelengths are

A. the bright fringes will have unequal spacing .

B. the bright fringes will have unequal brightness.

C. the fringes do not appear .

D. the dark fringes are not perfectly dark .

Answer: D

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57. The phenomenon of polarization shows that light has ...., nature .

A. particle

B. transverse

C. longitudinal

D. dual

Answer: B

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

A. $\dfrac{qE}{m}$

B. $\dfrac{m}{qE}$

C. mqE

D. $\dfrac{q}{mE}$

Answer: A

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59. Two fixed charges "A" and "B" of $5\mu C$ each are separated by a distance of "6m" .C is the mid point of the line joining "A" and "B" .A

charge Q of $-5\mu C$ 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) 3m (b) $\sqrt{3}m$ (c) $3\sqrt{3}m$(d) $4m$

    A. 3 m

    B. $\sqrt{3}$ m

    C. $3\sqrt{3}$ m

    D. 4 m

Answer: D

60. A capacitor of capacitance of $10\mu F$ is charged to 10 V . The energy stored in it is

A. $100\mu J$

B. $500\mu J$

C. $1000\mu J$

D. $1\mu J$

Answer: B