PHYSICS

BOOKS - AIIMS PREVIOUS YEAR PAPERS

AIIMS 1999

Physics

1. A metal rod of length L is clamped at a distance L/4 from one end. It is set into

longitudinal vibrations by pulling on length - wise a resin cover cloth piece . The wavlength for fundamental mode of vibrations will be

A. L/4

B. 3L/4

C. L

D. L/2

Answer: C

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2. A thin equiconvex lens has focal length 10 cm and refractive index 1.5 . One of its faces is now silvered and for an object placed at a distance u in front of it, the image coincides with the object. The value of u is

A. 20 cm

B. 10 cm

C. 5 cm

D. 20 cm

Answer: C

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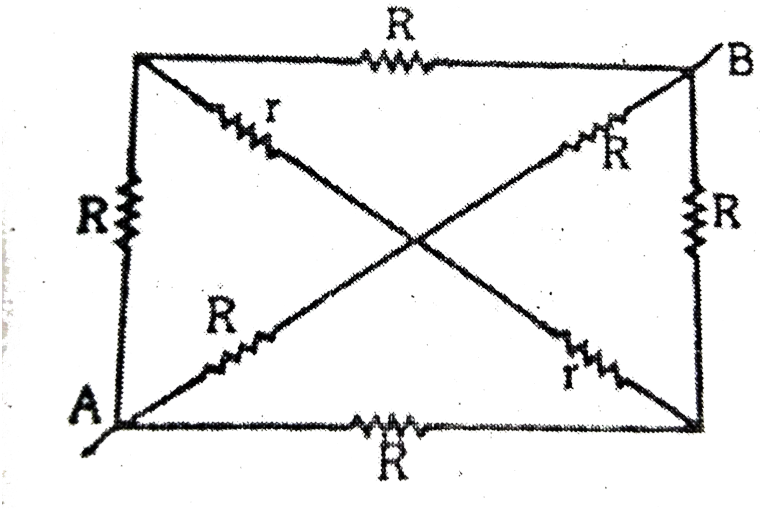
3. Six resistors each of resistance R and two resistors each of resistance r are connected in the network shown below. The equivalent resistance between A and B is



A. 3R+r

B. 6R+2r

C. 2R/3

D. $\frac{R}{3}+\frac{r}{3}$

Answer: C

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4. The radius of a circular loop is r and a current i is flowing in it. The equivalent magnetic moment will be

A. $\pi r^2 i$

B. ir

C. $2\pi ir$

D. $\frac{i}{r2}$

Answer: A

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5. Power factor in a series R-L-C resonant circuit is

A. 0.5

B. 0.707

C. 1

D. 0

Answer: C

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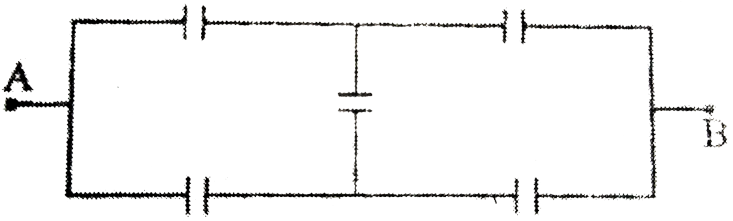
6. In the network given below all the five capacitors have the same capacitance C each . Then the capacitance between the terminal A

and B will be



A. $\frac{C}{5}$

B. $5C$

C. C

D. $\frac{5}{2}$ C

Answer: C

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7. The stationary wave produced in a stretched string is given by $Y = A\cos\left(\frac{2\pi x}{\lambda}\right)\sin\left(\frac{2\pi t}{T}\right)$ The corresponding progresing wave has an amplitude equal to

A. A/2

B. A

C. 2A

D. $A/\sqrt{2}$

Answer: A

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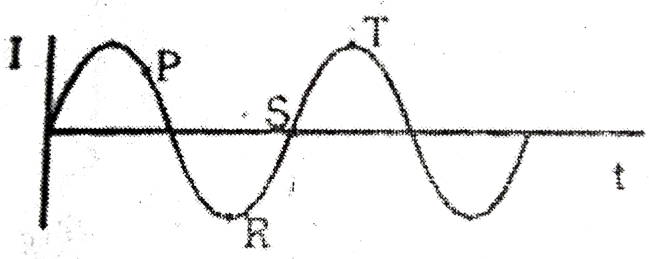
8. A sinusoidal a.c. flows in an inductor as shown in the given below : -

Then the p.d. across the inductor is a maximum at the instant indicated on the graph by the point.



A. S

B. P

C. R

D. T

Answer: A

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9. Which of the following relations between weber, second, ampere and volt be correct ?

A. weber/second =volt

B. weber x second = volt

C. weber/second = ampere

D. weber x second = ampere

Answer: A

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10. A circular coil of radius R carries a current in it. The magnetic field along its axis decreases as we move away from its centre.

The space rate of fall of this field is constant at distance equal to

A. 2 R

B. R

C. 3 R

D. R/2

Answer: D

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11. A soap film is formed on a wire ring held vertically and allowed to drain. A diffuse source of while light is observed by reflection in the soap film . In this connection indicate the wrong statement :

A. The colours are due to refraction of light by the wedge-shaped film

B. The thickness of the film is of the same order as the wavelength of visible light

C. The band of colours move downwards as the film drains

D. Just before the film breaks, it may appear black at the top

Answer: A

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12. The specific charge of an electron is

A. 5.7×10^7 coulomb/kg

B. 1.76×10^{11} coulomb/kg

C. 1.6×10^{-19} coulomb/gm

D. 1.6×10^{-19} coulomb

Answer: B

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13. Vectors $\overrightarrow{3i} - \overrightarrow{2i} + \overrightarrow{k}$ and $\overrightarrow{2i} + \overrightarrow{6j} + \overrightarrow{mk}$ will be perpendicular to each other if

A. m=8

B. m=6

C. m=3

D. m=1

Answer: B

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14. Newton - second is the unit of

A. energy

B. momentum

C. angular momentum

D. velocity

Answer: B

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15. In the S.I. system, the unit of energy is-

A. electron - volt

B. joule

C. calorie

D. erg

Answer: B

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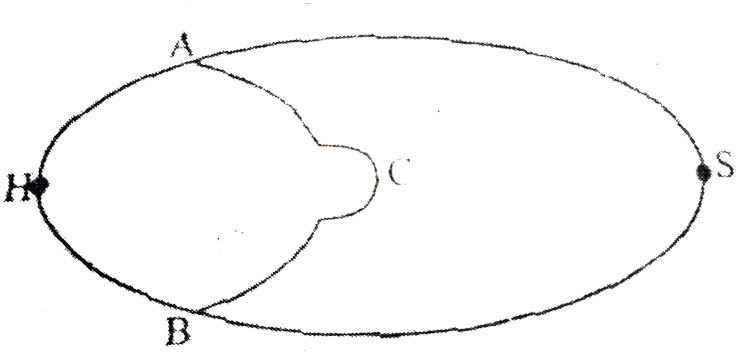
16. Two rods of the same length L but cross-section in the ratio S_B / S_A=4 are joined at a heater H and a heat sink S as shown. The rate of heat flow to s is found to be R_o If points of A and B at distance L/3 each from H are now joined by a conductor C of length L and the

cross-section of C is such that 3c=2S/A, the new rate of heat flow to S will be (See figure)



A. $\frac{6}{5}R_o$

B. $\frac{13}{12}R_o$

C. R_o

D. $\frac{7}{5}R_o$

Answer: C

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17. Most of the comets moving round the sun have orbits of the shape of

A. a hyperbola

B. a parabola

C. an elongated ellipse

D. a circle

Answer: C

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18. Kirchoff's laws are applicable to

A. A.C. only

B. D.C . Only

C. Both (a) and (b)

D. Intermittant currents only

Answer: C

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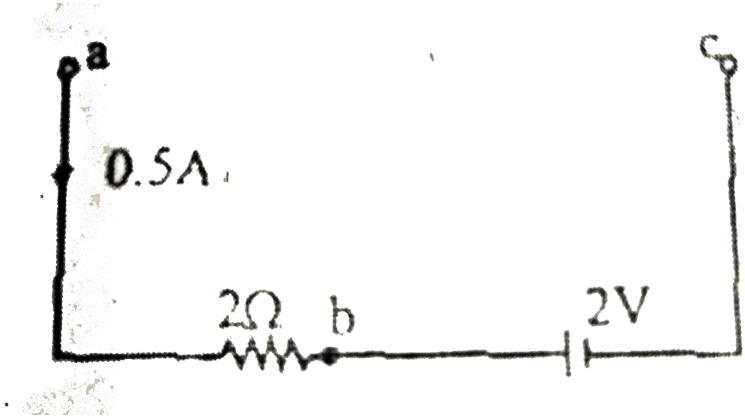
19. In the given diagram, a current of 0.5 A is caused to pass through a resistance as shown. The emf of the cell is 2V, and its internal resistance is zero. Indicate the wrong statement:



A. the p.d. between a and c is 1.0 V

B. the p.d. between a and b is 1.0 V

C. b is at a higher potential than c

D. a is at a higher potential than c

Answer: A

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20. In LCR circuit if $\frac{1}{\mathrm{LC}} > \frac{R^2}{4L^2}$, the circuit is

A. oscillatory

B. dead beat

C. critically damped

D. none of the above

Answer: A

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21. To use a transistor as an amplifier

A. the emitter base junction is forward biased and collector -base junction is reverse biased

B. both junctions are reverse biased

C. both junctions are forward biased

D. it does not matter how the transistor is biased, It always works as an amplifier

Answer: A

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22. An oscilloscope measures the

A. Peak to peak value of AC voltage

B. RMS value of AC voltage

C. D.C. value of a voltage

D. None of the above.

Answer: A

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23. De Broglie wavelength λ is proportional to

A. $\frac{1}{\sqrt{E}}$ for photons and 1/E for particles

B. 1/E for photons and $\frac{1}{\sqrt{E}}$ for particles

C. 1/E for both photons and particles in motion

D. $\frac{1}{\sqrt{E}}$ for both photons and particles.

Answer: B

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24. A given semiconductor has electron concentration of $8 \times 10^{13} \text{per cm}^3$ and a hole concentration of 5×10^{12} per cm^3. What is the resistivity of this sample if the electron

mobility is 23,000 cm^2/V and hole mobility is 100 cm^2/V ?

A. 3.395×10^{-4} ohm x cm

B. 3.395 ohm x cm

C. 5×10^{-6} ohm x cm

D. 45×10^{-6} ohm x cm

Answer: B

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25. What angle θ to the horizon will be formed by the surface of petrol in the tank of a motor car moving horizontally with a constant acceleration of 2.44 m/s^2 ?

A. $\theta = 14^\circ$

B. $\theta = 45^\circ$

C. $\theta = 30^\circ$

D. $\theta = 0$

Answer: A

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26. Unit of "Pascal " is the same as

A. 10^6dyne/cm^2

B. 1 poundal/inch^2

C. 1 newton/metre^2

D. 1dyne/cm^2

Answer: C

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27. A car accelerates from rest at a constant rate for some time after which it decelerates at a constant rate β to come to rest. If the total time elapsed is t, the maximum velocity acquired by the car is given by :

A. $\frac{ab}{(a+b)}t$

B. $\frac{ab}{(a-b)}t$

C. $\frac{at^2}{(a+b)}$

D. $\frac{tb^2}{(a+b)}$

Answer: B

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28. A narrow bent tube open at both ends is lowered from a bridge over a stream into the stream as shown in the figure. Water rises in the tube to a height of 15 cm above water level . The speed of water current must be

A. 1.7 metre/sec

B. 1.5 cm/sec

C. 1.2 cm/sec

D. 15 cm/sec

Answer: A

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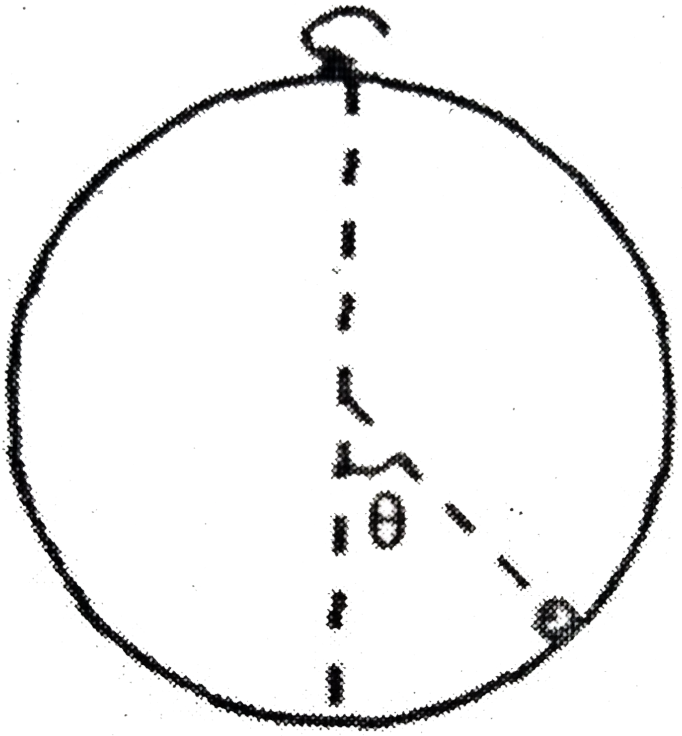
29. A spherical bowl of radius R rotates about the verical diameter with angular velocity ω .The bowl contains a small object inside and in absence of friction, this object takes up a position inside the bowl such that its radius vector makes an angle θ with the vertical (see

figure). Then



A. $\omega = \sqrt{g/r\cos\theta}$

B. $\omega = 2\pi g/r$

C. $\omega = \sqrt{\dfrac{g\cos\theta}{r}}$

D. $\omega = \sqrt{r \cos \theta \times g}$

Answer: A

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30. A dry clean steel needle of diameter d and density ρ when carefully placed on the surface of water remains floating . If T is the surface tension of water , then maximum value for the diameter d of the needle for enabling it to float will be

A. $d = \sqrt{\frac{8\rho\pi}{Tg}}$

B. $d = \sqrt{\frac{4\rho\pi}{Tg}}$

C. $d = \sqrt{\frac{8T}{\rho\pi g}}$

D. data incomplete

Answer: C

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31. In SHM with amplitude a, the potential energy and kinetic energy are equal to each

other as displacement

A. $a / \sqrt{2}$

B. a/4

C. a/3

D. a/2

Answer: A

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32. The acceleration of a'particle starting from rest, varies with time according to the relation $a = kt + c$. The velocity of the particle after time t will be :

A. $kt^2 + \frac{1}{2}ct$

B. $\frac{1}{2}kt^2 + ct$

C. $\frac{1}{2}(kt^2 + c)$

D. $kt^2 + ct$

Answer: B

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33. A particle simultaneously participates in two mutually perpendicular oscillations , $x=2 \sin \omega t$, $y=2 \cos \omega t$. The trajectory of motion will be

A. a straight line

B. a parabola

C. a circle

D. none of these

Answer: C

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34. A piano string $1.5m$ long is made of steel of density $7.7 \times 10^3 kg/m^3$ and $\gamma = 2 \times 10^{11} N/m^2$. It is maintained at a tension which produces an elastic strain of 1% in the string . What is the fundamental frequency of transverse vibration of the string ?

A. 256 Hz

B. 178Hz

C. 170Hz

D. 200Hz.

Answer: B

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35. Indicate the only correct statement In the following

A. The maximum amount of heat that can be converted into mechanical energy is 100%

B. The maximum amount of mechanical energy that can be converted into heat is 100 %

C. By opening the door of a working refrigerator in a room, you can cool the surrounding air

D. In an adiabatic expansion of a gas, the product of pressure and volume increases

Answer: B

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36. Two gases O_2 and H_2 are at the same temperature . If E_o is the average kinetic energy of a molecule of oxygen sample , and

E_H is the average kinetic energy of a molecule of hydrogen sample , then

A. $E_o = \frac{1}{16} E_H$

B. $E_o = 16 E_H$

C. $E_o > E_H$

D. $E_o = E_H$

Answer: D

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37. Which one of the following is not a "Black-body" ?

A. A highly polished black car

B. Uniforn temperature enclosure

C. Platinum black

D. The sun.

Answer: A

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38. A beam o monochromatic light of wavelength λ is reflected from air into water to refractive index 4/3. The wavelength of light beam inside water will be

A. $\frac{9}{16} \times \lambda$

B. $3\lambda/4$

C. $\lambda \times \frac{4}{3}$

D. λ

Answer: B

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39. Four perfect polarising plates are stacked so that the axis of each is turned 30° clockwise to the preceding plate, the last plate therefore being crossed with the first. A beam of unpolarised light of intensity 1 passes through the stack perpendicularly. The transmitted beam has intensity

A. $\frac{27}{128}$I

B. $\frac{81}{256}$ I

C. $\frac{1}{8}$I

D. $\frac{27}{64}I$

Answer: A

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40. Two sounds in a gas differ in their loudness level by 20 db. What is the ratio of the amplitudes of the pressure oscillations ?

A. $10:1$

B. $10^4:1$

C. $\sqrt{10}:1$

D. $100:1$

Answer: A

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41. Speed of Electro Magnetic wave depends

A. only upon the electric properties of the medium

B. only upon the magnetic properties of the medium

C. both upon the electric and magnetic properties of the medium

D. mechanical and thermal properties of the medium:

Answer: C

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42. If μ_o represents the magnetic permeability constant in free space and Σ_o is the permitivity in vacuum, and C the speed of light in vacuum , then

A. $\Sigma_o = \sqrt{\mu_o C}$

B. $\Sigma_o^{-2} = \mu_o C^{-1}$

C. $\Sigma_o^{-1} = \mu_o^{-1} C^{-2}$

D. $\Sigma_o = \mu_o^{-1} C^{-2}$

Answer: D

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43. In a nuclear reactor.

A. the thick concrete shield is used to slow down the speed of neutrons

B. heavy water or graphite is used to moderate the activity of the reactor

C. the chain reaction is controlled by rods of uranium whose going in reduces the rate

D. out of U^{238} and U^{235}, the natural uranium has less than 1% of dU^{235}

Answer: D

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44. In a hot wire ammeter the deflection angle θ of the pointer is related with the current I as

A. $I\alpha\theta^2$

B. $I\alpha\sqrt{\theta}$

C. $I\alpha \tan\theta$

D. $I\alpha\theta$

Answer: B

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45. Television signals reach us only through ground waves. The range R is related to the height h of the transmitter antenna as

A. $R\alpha h^{1/3}$

B. $R \alpha h^{1/2}$

C. $R \alpha h^2$

D. $R \alpha h$

Answer: B

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46. Which energy state of triply ionized beryllium $\left(Be^{+3}\right)$ has the same orbital radius as that of state of hydrogen atom

A. n = 8 state

B. n = 5 state

C. n = 4 state

D. n = 2 state.

Answer: D

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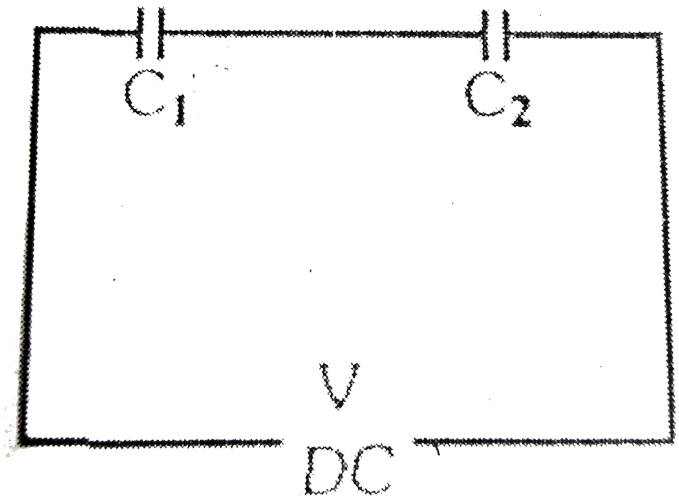
47. A Capacitor of capacitance $C_1 = 1\mu F$ can withstand a maximum voltage V_1=6.0 KV while another capacitor of capacitance $C_2 = 2.0\mu F$

withstands the maximum voltage V_2=4.0 KV . What maximum will the system of these two capacitance withstand when connected in series as shown below .



A. 5.0 KV

B. 9.0 KV

C. 2.0 KV

D. 10.0 KV

Answer: B

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48. A battery is connected across a resistance wire of uniform cross-section . If another resistance wire is connected in parallel, then the intensity of electric field in the first wire will

A. be halved

B. be doubled

C. become zero

D. remain unchanged

Answer: D

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49. Transistor is a

A. current operated device

B. voltage operated device

C. both current and voltage operated device

D. none of the above.

Answer: A

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50. Satisfactory explanation of the phenomenon of photo electric effect is based on

A. Planck's quantum theory

B. Einstein's theory of relativity

C. Huygen's wave theory

D. Newton's corpuscular theory.

Answer: A

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51. Assertion A pulsar is a source of radio waves that varies in intensity at regular

intervals

Reason A pulsar is a rotating neutron star

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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52. Radioactivity of 108 undecayed radioactive nuclei of half life of 50 days is equal to that of 1.2×108 number of undecayed nuclei of some material with half life of 60 days

Radioactivity is proportional to half-life.

A. Both Assertion and Reason are true and Reason is the correct explanation of

Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: C

53. Assertion : A laser beam $0.2W$ power can drill holes through a metal sheet, whereas $1000W$ torch-light cannot.

Reason : The frequency of laser light is much higher than that of torch light.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of

Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: C

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54. Assertion : In a radioactive disintegration, an electron is emitted by the nucleus.

Reason : Electrons are always present inside the nucleus.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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55. Assertion:We always see the same face of the moon

Reason : The period of rotation of the moon about its axis and its period of revolution about the earth are equal

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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56. Assertion:In an electric bulb , the filament is in the form of a coiled coil

Reason:A coiled coil filament occupies less space and is therefore not cooled significantly by the convection currents in the bulb

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of

Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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57. Assertion: Wood is a bad conductor of electricity

Reason:Wood has a large number of free electrons

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: C

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58. Assertion:A sail boat cannot be propelled by air blown at the sail from a big fan attached to the boat

Reason:Action of the air from the fan and reaction of the sail, both act on the boat

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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59. Assertion:Cooling inside a refrigerator is not proper when a thick layer of ice deposits on the freezer .

Reason : Ice is a bad conductor of heat

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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60. Assertion:Even a small bird hitting a flying aeroplane can cause heavy damage to it

Reason:The bird imparts a large impulse and a large force during the short time of impact

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion

B. Both Assertion and Reason are true but Reason is not a correct explanation of Assertion

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: A

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