PHYSICS

BOOKS - MTG-WBJEE PHYSICS (HINGLISH)

MODEL TEST PAPER 1

Physics Category 1 Single Option Correct Type 1 Mark

1. The quantity $\left(\frac{nh}{2\pi qB}\right)^{\frac{1}{2}}$, when n is a postive integer, h is Planck's constant, q is charge and B is magnetic field, has the dimensions of

A. area

B. speed

C. length

D. acceleration

Answer: C

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2. The cylindrical tube of spray pump has a cross-section of $8cm^2$ one end of which has 40 fine holes each of area $10^{-8}m^2$. IF the liquid flows inside the tube with a speed of $0.15m\ \min^{-1}$. The speed with which the liquyid is ejected through the holes is

A. $50ms^{-1}$

B. $5ms^{-1}$

C. $0.05ms^{-1}$

D. $0.5ms^{-1}$

Answer: B

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3. An object moving with a speed of 6.25 ms^{-1} , is decelerated at a rate given by $\frac{dv}{dt} = -2.5\sqrt{v}$, where v is the instantaneous speed. The time taken by the object to come to rest, would be

A. 2s

B. 4 s

C. 8 s

D. 1 s

Answer: A

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4. A uniform disc of radius R lies in xy plane with its centre at origin. Its moment of inertia about the axis x = 2 R and y =0 is equal to the moment of inertia about the axis y =d and z = 0. What is d equal to ?

A. $\frac{\sqrt{17}}{2}R$

B. $\sqrt{13}R$

C. $\frac{\sqrt{15}}{2}R$

D. $\frac{4}{3}R$

Answer: A

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5. Tw3o pendulum difer in lengths by 22 cm. They oscillate att the same place os that one of them makes 30 oscillations and the other makes 36 oscillations during the same time. The lengths (in cm) of the pendulums are

A. 72 and 50

B. 60 and 38

C. 50 and 28

D. 80 and 58

Answer: A

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6. A block released from rest from the top of a smooth inclined plane of angle θ_1 reaches the bottom in t_1 . The same block relased from rest from the top of another smooth inclined plane of angle θ_2 , reaches

the bottom in time t_2 . If the two inclined planes have the same height, the relation between t_1 and t_2 is

A. $\frac{t_2}{t_1} = \frac{\sin\theta_1}{(\sin\theta_2)^{\frac{1}{2}}}$

B. $\frac{t_2}{t_1} = 1$

C. $\frac{t_2}{t_1} = \frac{\sin\theta_1}{\sin\theta_2}$

D. $\frac{t_2}{t_1} = \frac{\sin^2\theta_1}{\sin^2\theta_2}$

Answer: C

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7. Starting with a sample of pure $.^{66}Cu$, $\frac{1}{8}$ of it decays into Zn in 15 minutes. The corresponding half life is

A. $(7)\frac{1}{2}$ minutes

B. 5 minutes

C. 15 minutes

D. 10 minutes

Answer: B

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8. The maximum range of projectile fired with some initial velocity is found to be 1000 m, in the absence of wind and air resisstance. The maximum height reached by the projectile is

A. 250 m

B. 500 m

C. 1000 m

D. 2000 m

Answer: A

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9. In an interfernce expriment , third bright fringe is obtained on the screen with a light of 700 nm. What should be the wavelength of the light source in order to obtain fifth bright fringe at the same point ?

A. 420 m

B. 500 m

C. 750 m

D. 630 m

Answer: A

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10. In a certain place, the versted component of earth's magnetic field is 0.5 oersted and dip angle is 60° . The earth's magnetic field at that place is

A. 1 orested

B. $\frac{\sqrt{3}}{2}$ orested

C. 2 oerested

D. $\frac{1}{sprt(3)}$ oersted

Answer: D

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11. An object of mass 40 kg and having velocity $4ms^{-1}$ collides with another object of mass 60 kg. having velocity 2 ms^{-1} The loss of kinetic energy when the collision is perfectly ineleastic is

A. 392 J

B. 440 j

C. 48 J

D. 110 J

Answer: C

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12. A galvanometer of resistane G can measure 1 A current. If a shunt S is used to convert it into an ammeter to measure 10 A current . The ratio of $\frac{G}{S}$ is

A. $\frac{1}{9}$

B. $\frac{9}{1}$

C. 10

D. $\frac{1}{10}$

Answer: B

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13. A monoatomic gas is suddenly compressed to $(1/8)^{th}$ of initial volume adiabatically . The ratio of its final pressure to the initial volume adiabatically. The ratio of (Given the ratio of the specific heats of the given gas to be $\frac{5}{3}$)

A. 32

B. $\frac{40}{3}$

C. $\frac{24}{5}$

D. 8

Answer: A

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14. In a common emitter transistor, the base current $I_b = 2\mu A, \alpha = 0.9,$ then I_c is equal to

A. 18 μA

B. $20\mu A$

C. $22\mu A$

D. $24\mu A$

Answer: A

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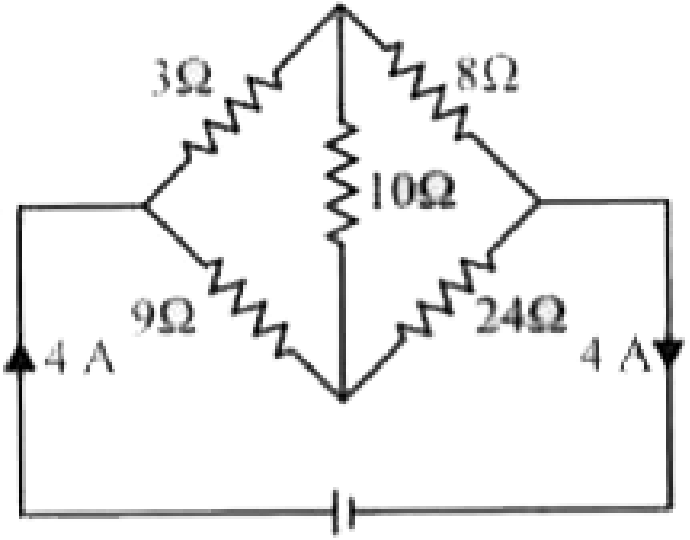
15. In the circuit shown, if the 10Ω resistance is replaced by 20Ω then what is the amount of current

drawn from the battery ?



A. $10A$

B. $4A$

C. $8A$

D. $2A$

Answer: B

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16. The equation of state for 5 g , of O_2 at a pressure P and temperature T , when occupying in a volume V, will be

A. $PV = \frac{5}{32}RT$

B. PV = 5RT

C. $PV = \frac{5}{2}RT$

D. $PV = \frac{5}{16}RT$

Answer: A

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17. Light of wavelength 0.6 μm from a sodium lamp falls on a photocell and causes the emission of Photoelectrons for which the stopping potential is 0.5 V. With light of wavelength $0.4\mu m$ from a sodium lamp, stopping potential is 1.5 V . With this data, the value of h/e is

A. $4 \times 10^{-19} Vs$

B. $0.25 \times 10^{15} Vs$

C. $4 \times 10^{-15} Vs$

D. $4 \times 10^{-8} Vs$

Answer: C

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18. A coll of resistance 10 Ω and inductance 5 H is connected at a 100 V battery. Then the energy stored in the coil is

A. 250 J

B. 250 erg

C. 125 J

D. 125 erg

Answer: A

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19. A doubly ionized lithim atom is hydrogen like with atomic number 3. Find the wavelength of the radiation required to excite the electron in Li^{2+} from the first to the third Bohr orbit. The ionization energy of the hydrogen atom is 13.6 eV. (Take hc=1240 eV nm)

A. 11.4 nm

B. 10.7 nm

C. 12.7 nm

D. 13.4 nm

Answer: C

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20. A carnot engine whose efficiency is 40 % recives heat at 500 K . If the efficiency is to be 50 %. The source temperature for the same exhaust temperature is

A. 900 K

B. 600 K

C. 700 K

D. 800 K

Answer: B

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21. A light rod of length 200 cm is suspended from the ceiling horizontally by means of two vertical wires of equal length tied to its ends. One of the wires is made of steel and is of cross- section 0.1 cm^2 and the other of brass of cross-section 0.2 cm^2 . Along the rod at which distance a weight may be hung to produce equal stresses in both the wires ?

A. $\frac{4}{3}$ m from steel wire

B. $\frac{4}{3}$ m from brass wire

C. 1 m, from steel wire

D. $\frac{1}{4}$ m from brass wire

Answer: A

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22. The electric field part of an electromagnetic wave in a medium is represented by

$$E_x = 0,$$

$$E_y = 2.5\frac{N}{C}\cos\left[\left(2\pi \times 10^6 ra\frac{d}{s}\right]t - \left(\pi \times 10^{-2}\frac{rad}{m}\right)x\right]$$

$$E_z = 0$$

The wave is

A. moving along the + x direaction with frequency 10^6 Hz and wavelength 100 m .

B. moving along + x direction with frequency 10^6 Hz and wavelength 200 m .

C. moving along-x direction with frequency 10^6 Hz and wavelength 200 m .

D. moving along + y direction with frequency $2\pi \times 10^6$ Hz and wavelength 200 m .

Answer: A

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23. A point source of light is placed at a depth of h below the surface of water of refractive index μ. A floating opaque disc is placed on the surface of water so that light from the source is not visible from the surface . The minimum diameter of the disc is

A. $\frac{2h}{(\mu^2-1)^{\frac{1}{2}}}$

B. $2h\frac{(\mu^2-1)^1}{2}$

C. $\frac{h}{2(\mu^2-1)^{\frac{1}{2}}}$

D. $h(\mu^2-1)^{\frac{1}{2}}$

Answer: D

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24. A satellite is orbiting around the earth with total energy E . What happen if the satellite's kinetic energy is made 2E ?

A. Radius of the orbit is doubled.

B. Radius of the orbit is halved

C. Period of revolution is doubled

D. Satellite escapes away

Answer: D

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25. A straight wire of mas 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid-air by a uniform horizontal magnetic field B. The magntiude of B (in tesla) is (Take g = 10 ms^{-2})

A. 2

B. 1.5

C. 0.55

D. 0.66

Answer: D

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26. When 100 V dc is applied a coil, a current of 1 A flows through it. When 100 V 50 Hz ac is applied to the same coil, only 0.5 A flows. The indcutance of the coil is

A. 5.5 mH

B. 0.55 mH

C. 55 mH

D. 0.55 H

Answer: D

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27. A Planet is revolving around a star in an elliptic orbit. The ratio of the fathest distance to the closest distance of the planet from the star is 4. The ratio of kinetic energies of the planet at eh farthest to the closest position is

A. $1:16$

B. $16:1$

C. $1:4$

D. $4:1$

Answer: A

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28. A transverse wave in a medium is described by the equation $y = A\sin 2(\omega t - kx)$. The magntiude of the maximum velocity of particles in the medium is equal that of the of the wave velocity . If the value of A is

A. $\frac{\lambda}{2\pi}$

B. $\frac{\lambda}{4\pi}$

C. $\frac{\lambda}{\pi}$

D. $\frac{2\lambda}{\pi}$

Answer: B

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29. Pure Si at 500 K has equal number of electron (n_e) and hole (n_h) concentraions of $1.5 \times 10^{16} m^{-3}$. Doping by indium increses n_h to $4.5 \times 10^{22} m^{-3}$. The doped semiconductor is of

A. n-type with electron concentration

$$n_e = 5 \times 10^{22} m^{-3}$$

B. p-type with electron - concentration

$$n_e = 2.5 \times 10^{10} m^{-3}$$

C. n- type3 with electron concentration

$$n_e = 2.5 \times 10^{23} m^{-3}$$

D. p-type having electron concentration

$$n_e = 5 \times 10^{9} m^{-3}$$

Answer: D

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30. the radus if the rear wheel of bicycle is twice that of the front wheel. When the bicycle is moving . The angular speed of the rear wheel compared to that of the front is

A. Greater

B. smaller

C. same

D. exact double

Answer: B

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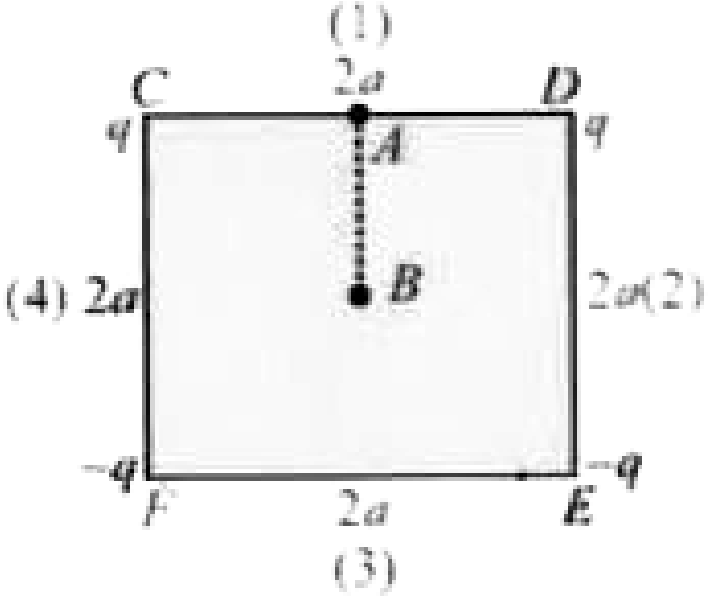
Physics Category 2 Single Option Correct Type 2 Mark

1. Two positive charges of magnitude q are placed at the ends of a side (side 1) of square of side 2a. Two negative cahrges of the same magnitude ar kept at the other comers. Starting from rest, if the charge Q moves from the middle of side (1) to the centre of square , its kinetc energy at the centre of square is



A. $\frac{1}{4\pi \in_0}\frac{2qQ}{a}\left(1-\frac{1}{\sqrt{5}}\right)$

B. zero

C. $\frac{1}{4\pi \in_0}\frac{2qQ}{a}\left(1+\frac{1}{\sqrt{5}}\right.$

D. $\frac{1}{4\pi \in_0}\frac{2qQ}{a}\left(1-\frac{2}{\sqrt{5}}\right)$

Answer: A

View Text Solution

2. Water of volume 2 liter in a container is heated with a coil of 1 kW at $27^\circ C$. The lid of the container is open and energy dissipates at the rate of $160Js^{-1}$. In how much time, temperature will rise from $27^\circ C\text{to}77^\circ C$?

A. 8 min 20 s

B. 6 min 2 s

C. 2 min

D. 14 min

Answer: A

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3. The relation between U,P and V for an ideal gas in an adiabatic process is given by U = 2 + 3 PV. The gas is

A. monoatomic

B. diatomic

C. polyatomic

D. either monoatomic or diatomic

Answer: C

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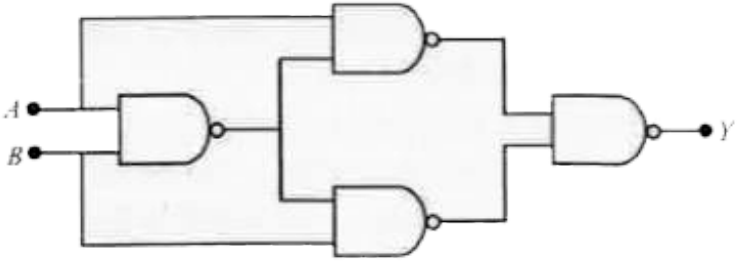
4. The simplified Y output of the given logic circuit is



A. $\overline{A}.B + A.\overline{B}$

B. $A.\overline{B} + A.B$

C. $\overline{A}.\overline{B}+A.B$

D. $A.\overline{B}+\overline{A}.\overline{B}$

Answer: A

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5. A 1000 kg elevator rises from rest in the basement to the fourth floor, a distance of 20 m. As it passes the fourth floor its speed is $4ms^{-1}$. There is a constant frictional force of 500 N. The work done by the lifting mechanism is

A. 196×10^{3}J

B. $204 \times 10^3 J$

C. $214 \times 10^3 J$

D. $203 \times 10^5 J$

Answer: C

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Physics Category 3 Single Option Correct Type 2 Mark

1. The instantaneous velocity of a partical at any instant is equal to time derivative of its position vector and the instancous vector. Which of the following options are wrong ?

A. The instantancous velocity depends on the instantaneous position vector.

B. Instantaneous acceleration is independent of instantaneous position vector and instantaneous velocity.

C. Instananeous acceleration is independent of instantaneous position vector but depends on the instantanous velocity.

D. Instantaneous acceleration depends both on the instantaneous postion vector and instantaneous velocity.

Answer: A::C::D

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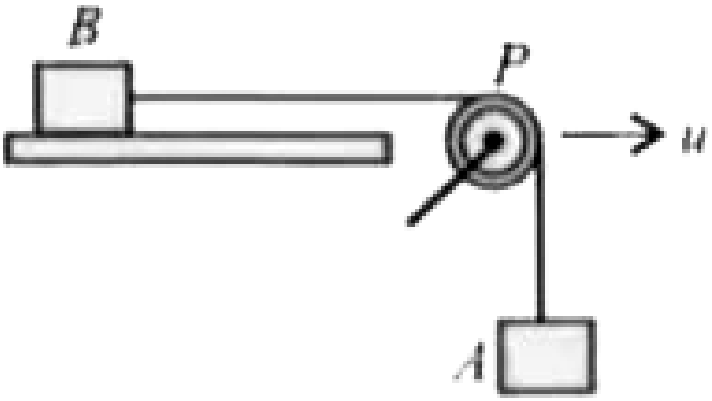
2. In the figure, the pulley P moves to the right with a constant speed u. The downward spee of A is v_A and the speed of B to the right is v_B . Then,



A. $v_A = v_B$

B. $v_B = u + v_A$

C. $v_B + u = v_A$

D. the two blocks have accelerations of the same magnitude.

Answer: B::D

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3. A closed vessel contains a mixture of two diatomic gases A and B. Molar mass of A is 16 times that of B and mass of gas A. contained in the vessel is 2 times that of B . Then

A. average kinetic energy per molecule of gas A is equal to that of gas B.

B. root mean square value of translational velocity of gas B is four times that of A.

C. root mean square value of translational velocity of gas B is four times that of A.

D. number of molecules of gas B in the cylinder is eight times that of gas A.

Answer: A::B::C::D

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4. Two long, thin, parallel conductors are kept very close to each other , without touching . One carries a current I, and the other has charge λ per unit length. An electron moving parallel to the conductors is undeflected. Let c be the velocity of light and v be the velocity of electron, then

A. $v = \frac{\lambda c^2}{I}$

B. $v = \frac{I}{\lambda}$

C. $c = \frac{I}{\lambda}$

D. the electron may be any distance from the conductor.

Answer: A::D

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5. The figure shows an energy level diagram for the hydrogen atom. Several trasitions are marked as I,II,III, ... The diagram is only indicative and not to scale. Then,

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A. The transition in which a Balmer series photon absorbed is VI.

B. the wavelength of te radiation involved in transition II is 486 nm.

C. transition IV will occur when a hydrogen atom is irradiated with radiation of wavelength 103 nm.

D. transition IV will emit the longest wavelength line in the visible portion of the hydrogen spectrum.

Answer: A::B::D

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