



PHYSICS

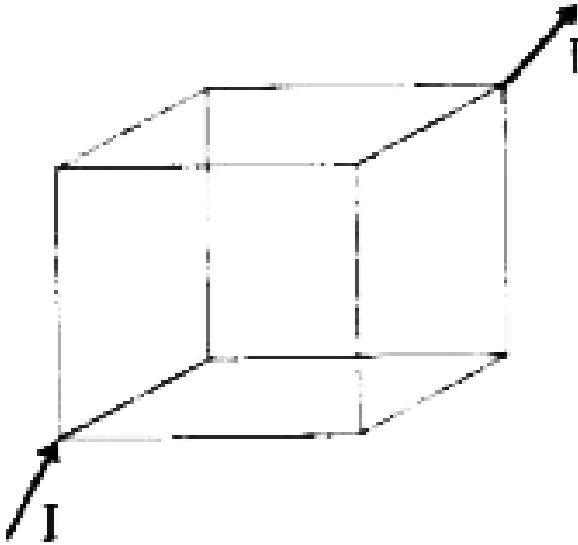
BOOKS - MTG PHYSICS (BENGALI ENGLISH)

QUESTION PAPER 2016

Physics

1. The magnetic field intensity at the centre of a cubical cage of identical wires of length 'a'

due to a current I flowing as shown in the figure is



- A. $\frac{2I}{a}$
- B. $\frac{\sqrt{2}I}{a}$
- C. 0
- D. $I/2a$

Answer:



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2. If a bar magnet of magnetic moment M is kept in a uniform magnetic field B , its time period of oscillation is T . In the same magnetic field, the time period of another magnet of same dimension and same mass but of moment $M/4$ is.

A. T

B. $2T$

C. $T/2$

D. $T/4$

Answer:



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3. An electron of mass ' m ' is accelerated by a potential difference V and the corresponding de-Broglie wavelength is λ . The de Broglie wavelength of a proton of mass M if it is

accelerated by the same potential difference

is.

A. $\lambda \left(\frac{m}{M} \right)$

B. $\lambda \left(\frac{M}{m} \right)$

C. $\lambda \sqrt{\frac{m}{M}}$

D. $\lambda \sqrt{\frac{M}{m}}$

Answer:



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4. If I_1 & I_2 be the sizes of real images for two positions of a convex lens between object and screen, then the size of the object is

A. I_1 / I_2

B. $I_1 I_2$

C. $\sqrt{I_1 I_2}$

D. $\sqrt{I_1 / I_2}$

Answer:



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5. Impedance of a coil having inductance 0.4 H at frequency of 50 Hz will be

A. $20\pi\Omega$

B. $40\pi\Omega$

C. $2\pi\Omega$

D. $4\pi\Omega$

Answer:



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6. 1000 drops of water of radius 1 cm each carrying a charge of 10 esu combine to form a single drop. The capacitance increases thereby

A. 1 time

B. 10 times

C. 100 times

D. 1000 times

Answer:



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7. A micro-ammeter gives full scale deflection at $100\mu A$. Its resistance is $2k\Omega$. The resistance required to convert it to a voltmeter reading 1 V is

- A. $1k\Omega$ in series
- B. $8k\Omega$ in series
- C. $1k\Omega$ in parallel
- D. $8k\Omega$ in parallel

Answer:



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8. In Bohr model of an atom, two electrons move round the nucleus in circular orbits of radii in the ratio 1:4. The ratio of their kinetic energies are

A. 1 : 4

B. 4 : 1

C. 8 : 1

D. 1 : 8

Answer:



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9. If a Young's double slit experiment were conducted inside water instead of air, the fringe width would

A. increase

B. decrease

C. remain same

D. become zero

Answer:



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10. A photon of energy $8eV$ is incident on a metal plate with threshold frequency 1.6×10^{15} Hz. The maximum kinetic energy of the emitted photo electrons is (given $h = 6 \times 10^{-34} Js$)

A. 6 eV

B. 1.6 eV

C. 1.2 eV

D. 2 eV

Answer:



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11. Light is an electromagnetic wave whose

A. \vec{E} and \vec{B} are parallel and both are perpendicular to the direction of propogation

B. \vec{E} and \vec{B} are mutually perpendicular

and the direction of propagation is

parallel to \vec{E}

C. \vec{E} and \vec{B} and the direction of

propagation are mutually perpendicular

D. \vec{E} and \vec{B} are mutually perpendicular

and the direction of propagation is

parallel to

Answer:



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12. A mass m rests on another mass M . The coefficient of static friction between the surfaces of m and M is μ . M rests on a smooth frictionless horizontal plane. The maximum force applied horizontally on M for which m will move along with M without slipping is,

A. $mg + \mu mg$

B. $(M + m)\mu g$

C. $\frac{mM}{M + m}\mu g$

D. μmg

Answer:



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13. The dimension of co-efficient of viscosity η is

A. $[MLT^{-2}]$

B. $[M^{-1}LT^{-1}]$

C. $[M^{-1}LT^{-2}]$

D. $[ML^{-1}T^{-1}]$

Answer:



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14. The ratio of the masses of two planets is 2 : 3 and the ratio of their radii is 3:2 The ratio of acceleration due to gravity on these two planets is

A. 9:4

B. 4: 9

C. 2: 3

D. 3: 2

Answer:



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15. The length of a wire is l_1 , when tension is T_1 and is l_2 when tension is T_2 The length of the wire without any tension is

A. $\frac{l_2 T_1 - l_1 T_2}{T_1 - T_2}$

B. $\frac{l_1 T_1 - l_2 T_2}{T_1 - T_2}$

C. $\frac{l_1 T_1}{T_2 - T_1}$

D. $\frac{l_2 T_2}{T_1 - T_2}$

Answer:



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16. A particle of mass m is moving in a circular orbit of radius r in a force field given by

$\vec{F} = -\frac{k}{r^2}\hat{r}$. The angular momentum L of

the particle about the centre varies as

A. $L \propto \sqrt{r}$

B. $L \propto r^{3/2}$

C. $L \propto \frac{1}{\sqrt{r}}$

D. $L \propto r^{1/3}$

Answer:



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17. An explosive of mass 9 kg is divided in two parts. One part of mass 3 kg moves with velocity of 16 m/s. The kinetic energy of other part will be

A. 192 J

B. 162 J

C. 150 J

D. 200 J

Answer:



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18. Two sound waves of wavelengths 50 cm and 51 cm produce 12 beats per second. The velocity of sound is

A. 306ms^{-1}

B. 331ms^{-1}

C. 340ms^{-1}

D. 360ms^{-1}

Answer:





19. Air is expanded from 50 litre to 150 litre at 2 atmospheric pressure (1 atm pressure - 10^5 kgm^2). The external work done is

A. 200 J

B. 2000 J

C. $2 \times 10^4 \text{ J}$

D. $2 \times 10^{-12} \text{ J}$

Answer:



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20. The Young's modulus of a metal is $2 \times 10^{12} \text{ dyn/cm}^2$ - and its breaking stress is 11000 kg/cm^2 . In case of longitudinal strain the maximum energy that can be stored per cubic metre of this metal is approximately (Assume $g = 10 \text{ m/s}^2$)

A. $58.28 \times 10^5 \text{ J}$

B. $30.25 \times 10^5 \text{ J}$

C. $37.15 \times 10^5 \text{ J}$

D. $15.15 \times 10^5 J$

Answer:



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21. When a body moves in a circular orbit its total energy is

A. positive

B. negative

C. zero

D. infinite

Answer:



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22. A sphere, a cube and a thin circular plate, all made of the same material and having the same mass, are initially heated to a temperature of $200^{\circ}C$. When left in air at room temperature, the following cools fastest

A. Sphere

B. Cube

C. Plate

D. All of these

Answer:



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23. A body attached to the lower end of a vertical spring oscillates with time period of 1 sec. The time period when two such springs

are connected one below another is approximately

A. 0.7 sec

B. 1 sec

C. 1.4 sec

D. 2 sec

Answer:



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24. The minimum and maximum capacitances, which may be obtained by the combination of three capacitors each of capacitance $6\mu F$ are

A. $6\mu F$ and $18\mu F$

B. $2\mu F$ and $18\mu F$

C. $2\mu F$ and $12\mu F$

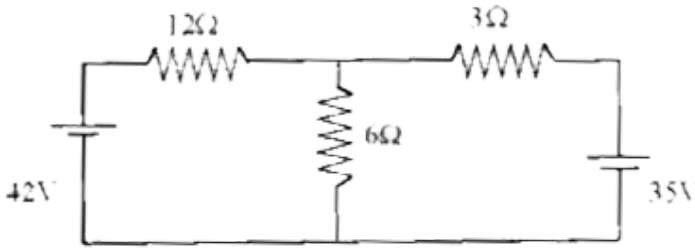
D. $6\mu F$ and $12\mu F$

Answer:



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25. The current flowing through the 3Ω resistor in the circuit is



- A. 4.2 A
- B. 3.0 A
- C. 3.5 A
- D. 1.6 A

Answer:



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26. A series LCR circuit resonates at 10 kHz. If the capacitor is $0.01\mu F$, the inductance used is approximately

A. 10 mH

B. 25 mH

C. 50 mH

D. 100 mH

Answer:



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27. Two charges of equal amount $+Q$ are placed on a line. Another charge q is placed at the mid-point of the line. The system will be in equilibrium if the value of q is

A. $-\frac{Q}{4}$

B. $-\frac{Q}{2}$

C. $+\frac{Q}{2}$

D. $+\frac{Q}{4}$

Answer:



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28. The increase in electrostatic potential energy of a dipole of moment p when it is taken from parallel to anti-parallel orientation in an electric field E is

A. $2pE$

B. $3pE$

C. $5pE$

D. 6pE

Answer:



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29. An n-p-n transistor of current gain 80 in common emitter mode gives emitter current equal to 8.1mA . The base current is

A. $0.1\mu\text{A}$

B. 0.01mA

C. 0.1mA

D. $0.01\mu\text{A}$

Answer:



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30. A zener diode has break down voltage of 5.0 V. The resistance required to allow a current of 100 mA through the zener in reverse bias when connected to a battery of emf 12V is

A. 50Ω

B. 70Ω

C. 100Ω

D. 150Ω

Answer:



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31. A particle of mass 'm' and carrying a charge q enters with a velocity 'v' perpendicular to a

uniform magnetic field. The time period of rotation of the particle

A. decreases with increase of velocity v .

B. increases with increase of radius of the orbit

C. depends only on magnetic field

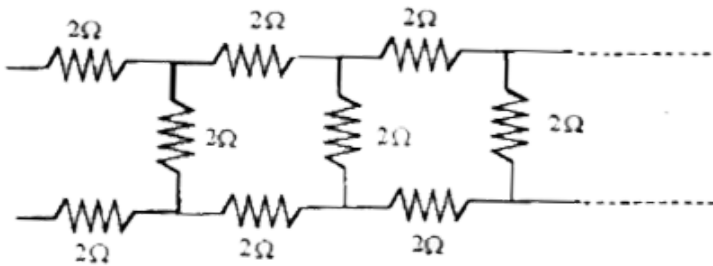
D. depends on magnetic field and (q/m) of the particle

Answer:



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32. Equivalent resistance of the given infinite circuit is



A. 4Ω

B. 2Ω

C. infinity

D. greater than 4Ω but less than 6Ω

Answer:



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33. The ionization potential of hydrogen is -13.6 eV. The energy required to excite the electron from the first to the third orbit is approximately

A. $10.2J$

B. $12.09 \times 10^{-6} J$

C. $19.94J$

$$D. 19.34 \times 10^{-19} J$$

Answer:



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34. Assume that the Earth rotates in a circular orbit round the Sun in 365 days. If the mass of the sun gets doubled but the radius of the orbit remains unchanged, the length of the year would be approximately

A. 183 days

B. 258 days

C. 516 days

D. 730 days

Answer:



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35. For the following set(s) of forces (in the same unit) the resultant can never be zero

A. 10,10,10

B. 10,10,20

C. 10,20,30

D. 10,20,40

Answer:



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36. An electric dipole is placed in a non-uniform electric field \vec{E} . The electric field is along x direction. The dipole will experience

A. a torque when the dipole is parallel to

$$\vec{E} .$$

B. a torque when the dipole makes an

angle with \vec{E} .

C. a force perpendicular to \vec{E} .

D. a force when the dipole is parallel to \vec{E}

Answer:



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37. At any instant current i through a coil of self inductance 2 mH is given by $i = t^2 e^{-t}$.

The induced e.m.f. will be zero at time

A. 1 sec

B. 2 sec

C. 3 sec

D. 4 sec

Answer:



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38. A and B are two parallel sided transparent slabs of refractive indices n_1 and n_2 respectively. A ray is incident at an angle θ on the surface of separation of A and B and after refraction from B into air grazes the surface of

B. Then

$$\sin \theta = \frac{1}{n_2}$$

$$\sin \theta = \frac{1}{n_1}$$

$$\sin \theta = \frac{n_2}{n_1}$$

$$\sin \theta = \frac{n_1}{n_2}$$



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39. The pair of parameters temperature T , pressure P , volume V and work W characterises the thermodynamic state of matter

A. T, P

B. T, V

C. T, W

D. P, W

Answer:



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40. Equation of a wave is given by

$$y = 10^4 \sin(60t + 2x) , x \text{ \& \ } y \text{ in metre and } t \text{ is}$$

in second. Then

A. Wave is propagating along the negative

x direction with velocity 30 m/s

B. Wavelength is π metre

C. frequency is $30/\pi$ Hz.

D. Wave is propagating along positive x

direction with velocity 60 m/s

Answer:



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