PHYSICS

BOOKS - MTG PHYSICS (BENGALI ENGLISH)

QUESTION PAPER 2011

Physics

1. Given $\overrightarrow{A} = 2\hat{i} + 3\hat{j}$ and $\overrightarrow{B} = \hat{i} + \hat{j}$. The component of vector $\overrightarrow{A}$ along vector $\overrightarrow{B}$ is

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

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

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

D. $\frac{7}{\sqrt{2}}$

Answer:

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2. A cubical vessel of height 1 m is full of water . What is the amount of work done in pumping water out of the vessel ? (Take g = $10mS^{-2}$)

A. $1250J$

B. $5000J$

C. $1000J$

D. $2500J$

Answer:

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3. A stone of relative density K is released from rest on the surface of a lake . If viscous effects

are ignored the stone sinks in water with an acceleration of

A. $g(1-K)$

B. $g(1+K)$

C. $g\left(1-\frac{1}{K}\right)$

D. $g\left(1+\frac{1}{K}\right)$

Answer:

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4. If a person can throw a stone to maximum height of h metre vertically, then the maximum distance through which it can be thrown horizontally by the same person is

A. $\frac{h}{2}$

B. h

C. $2h$

D. $3h$

Answer:

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5. A body of mass 6 kg is acted upon by a force which causes a displacement in it given by $x = \frac{t^2}{4}$ metre where t is the time in second. The work done by the force in 2 seconds is

A. 12 J

B. 9 J

C. 6 J

D. 3 J

Answer:

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6. A box is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportional to

A. $t^{\frac{1}{2}}$

B. $t^{\frac{3}{4}}$

C. $t^{\frac{3}{2}}$

D. t^2

Answer:

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7. A particle is moving with a constant speed v in a circle. What is the magnitude of average velocity after half rotation?

A. $2v$

B. $2\frac{v}{\pi}$

C. $\frac{v}{2}$

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

Answer:

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8. A cricket ball of mass 0.25 kg with speed 10 m/s collides with a bat and returns with same speed withim 0.01 S. The force acted on bat is

A. 25 N

B. 50 N

C. 250 N

D. 500 N

Answer:

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9. If The Earth were to suddenly contract to $\frac{1}{n}th$ of its present radius without any change in its mass. The duration of the new day will be nearly.

A. 24/n hr.

B. 24n hr.

C. $24/n^2hr.$

D. $24n^2hr$

Answer:

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10. If g is the acceleration due to gravity on the surface of the earth , the gain in potential energy of an object of mass m raised from the

earth's surface to a height equal to the radius R of the earth is

A. $\frac{mgR}{4}$

B. $\frac{mgR}{2}$

C. mgR

D. $2mgR$

Answer:

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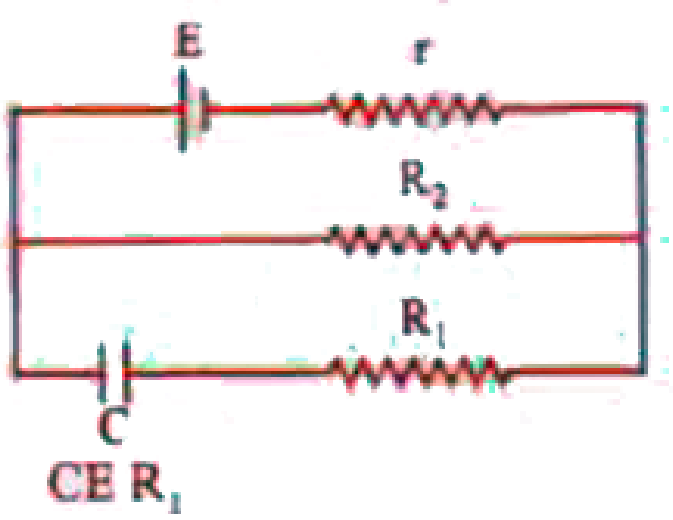
11. The charge on the capacitor of capacitance C shown in the figure below will be



A. CE

B. $\frac{CER_1}{R_1 + r}$

C. $\frac{CER_2}{R_2 + r}$

D. $\frac{CER_1}{R_2 + r}$

Answer:

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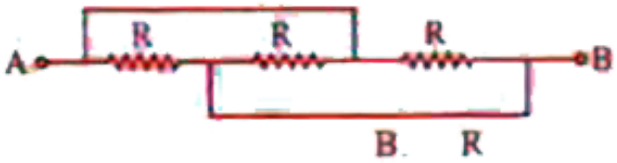
12. The resistance across A and B in the figure below will be



A. $3R$

B. R

C. $\frac{R}{3}$

D. None of the above

Answer:

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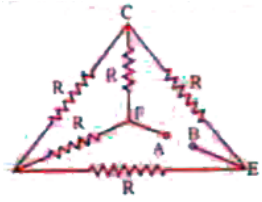
13. Five equal resistances , each of resistance R , are connected as shown in figure below.A battery of V volt is connected between A and B . The current flowing in FC will be.



A. $\frac{3V}{R}$

B. $\frac{V}{R}$

C. $\frac{V}{2R}$

D. $\frac{2V}{R}$

Answer:

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14. Two cells each of emf e but internal resistance r_1 and r_2 are connected in series through an external resistance R. IF the

potential difference across the first cell is szero while current flow, the relation of R in terms of r_1 and r_2

A. $\sqrt{r_1 r_2}$

B. $r_1 + r_2$

C. $r_1 - r_2$

D. $\frac{r_1 + r_2}{2}$

Answer:

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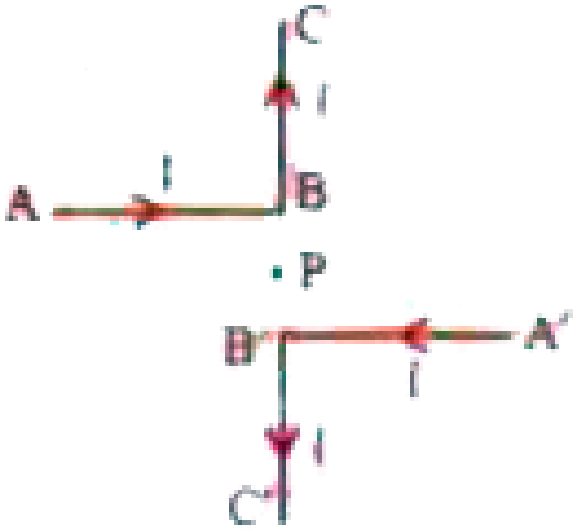
15. Current through ABC and A'B'C' is 1. What is the magnetic field at P? BP = PB' = r (Here C'B'PBC are collinear)



A. $B = \frac{1}{4\pi}\frac{2I}{r}$

B. $B = \frac{\mu_0}{4\pi}\left(\frac{21}{r}\right)$

C. $B = \frac{\mu_0}{4\pi}\left(\frac{1}{r}\right)$

D. zero

Answer:

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16. The magnetic field at the point of intersection of diagonals of a square wire loop of side L carrying a current I is

A. $\frac{\mu_0 I}{\pi L}$

B. $\frac{2\mu_0 I}{\pi L}$

C. $\frac{\sqrt{2}\mu_0 I}{\pi L}$

D. $\frac{2\sqrt{2}\mu_0 I}{\pi L}$

Answer:

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17. In an inelastic colliston an electron excites as hydrogen atom from its ground state to a M- shell state ,A second electron collides instantaneously with the excited hydrogen atom to the atom in the M- state.At least how

much energy the second electron transfers to the atom in the M-shell state?

A. $+3.4eV$

B. $+1.51eV$

C. $-3.4eV$

D. $-1.51eV$

Answer:

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18. A radioactive nucleus of mass number A , initially at rest , emits an α -particle with a speed v. the recoil speed of the daughter nucleus will be

A. $\frac{2v}{A-4}$

B. $\frac{2v}{A+4}$

C. $\frac{4v}{A-4}$

D. $\frac{4v}{A+4}$

Answer:

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19. In the nuclear reaction

$$\underset{7}{\overset{14}{N}} + X \rightarrow \underset{6}{\overset{14}{C}} + \underset{1}{\overset{1}{H}}$$

the X will be

A. $\underset{1}{\overset{0}{C}}$

B. $\underset{1}{\overset{1}{H}}$

C. $\underset{1}{\overset{2}{H}}$

D. $\underset{0}{\overset{1}{n}}$

Answer:

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20. Which type of Gate the following truth table represents ?

Input		Output
A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

A. NOT

B. AND

C. OR

D. NAND

Answer:

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21. A material has Poisson 's ratio 0.50 . If a uniform rod it suffers a longitudinal strain of 2×10^{-3} then the percentage change in volume is

A. 0.6

B. 0.4

C. 0.2

D. zero

Answer:

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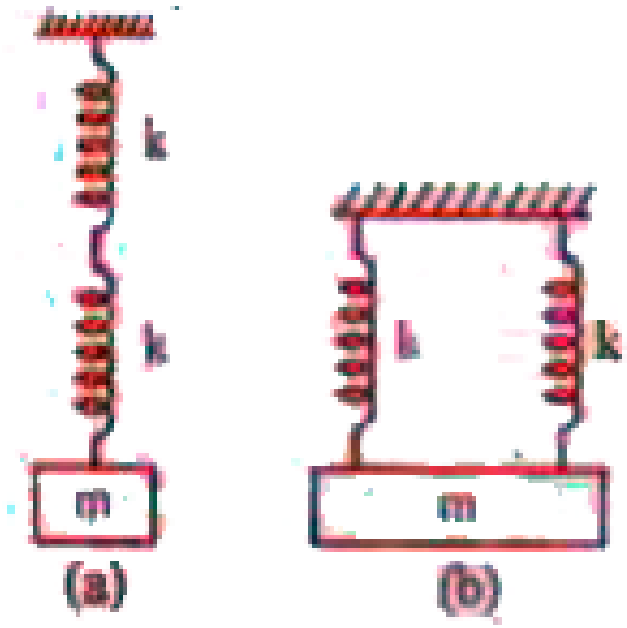
22. Two identical springs are connected to mass m as shown (k= spring constant) If the period of the configuration in (a) is 2S , the

period of the configuration (b) is



A. $\sqrt{2}S$

B. $1S$

C. $\frac{1}{\sqrt{2}}S$

D. $2\sqrt{2}S$

Answer:

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23. An object weighs m_1 in a liquid of density d_1 and that in liquid of density d_2 is m_2. The density d of the object is

A. $d = \frac{m_2 d_2 - m_1 d_1}{m_2 - m_1}$

B. $d = \frac{m_1 d_1 - m_2 d_2}{m_2 - m_1}$

C. $d = \frac{m_2 d_1 - m_1 d_2}{m_1 - m_2}$

D. $d = \frac{m_1 d_2 - m_2 d_1}{m_1 - m_2}$

Answer:

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24. A body floats in water with 40% of its volume outside water. When the same body floats in oil, 60% of its volume remains outside oil. The relative density of the oil is

A. 0.9

B. 1.0

C. 1.2

D. 1.5

Answer:

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25. Two soap bubbles of radii x and y coalesce to constitute a bubble of radius z. Then z is equal to

A. $\sqrt{x^2 + y^2}$

B. $\sqrt{x + y}$

C. $x + y$

D. $\frac{x + y}{2}$

Answer:

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26. A particle of mass m is located in a one dimensional potential field where potential energy is given by

V(x) = A(1- cos Px) , where A and P are constant .

The period of small oscillations of the particle is

A. $2\pi\sqrt{\frac{m}{(AP)}}$

B. $2\pi\sqrt{\frac{m}{(AP^2)}}$

C. $2\pi\sqrt{\frac{m}{A}}$

D. $\frac{1}{2\pi}\sqrt{\frac{Ap}{m}}$

Answer:

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27. In Young's double Slit experiment the two slits are d distances apart.Interference pattern is observed on a screen at a distance D from the slits . A dark frings is observed on the screen directly opposite to one of the slits. The wavelength of lights is

A. $\frac{D^2}{2d}$

B. $\frac{d^2}{2D}$

C. $\frac{D^2}{d}$

D. $\frac{d^2}{D}$

Answer:

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28. A plane progressive wave is given by y = 2 $\cos 6.284(330t - x)$. What is the period of the wave?

A. $\frac{1}{330}S$

B. $2\pi \times 330S$

C. $(2\pi \times 330)^{-1}S$

D. $\frac{6.284}{330}S$

Answer:

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29. The displacement of a particle in S.H.M. varies according to the relation $x = 4(\cos \pi t + \sin \pi t)$. The amplitude of the particle is

A. -4

B. 4

C. $4\sqrt{2}$

D. 8

Answer:

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30. Two temperature scale A and B are related by $\frac{A-42}{110}=\frac{B-72}{220}$. At which temperature two scales have the same reading ?

A. -42°

B. -72°

C. $+12^{\circ}$

D. -40°

Answer:

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31. An ideal gas is compressed isothermally unit its pressure is doubled and then allowed to expand adiabatically to regain its original

volume $\left(\gamma = 1.4 \text{ and } 2^{-1.4} = 0.38\right)$ The ratio of the final to initial pressure is

A. $0.76:1$

B. $1:1$

C. $0.66:1$

D. $0.86:1$

Answer:

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32. Air inside a closed container is saturated with water vapour . The air pressure is p and the saturated vapour pressure of water is $\overrightarrow{p}$. If the mixture is compressed to one half of its volume by maintaining temperature constant, the pressure becomes

A. $2\left(p+\overrightarrow{q}\right)$

B. $2p+\bar{p}$

C. $\left(p+\bar{p}\right)/2$

D. $p+2\bar{p}$

Answer:

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33. 1.56×10^5 J of heat is conducted through a $2m^2$ wall of 12 cm thick in one hour. Temperature difference between the two sides of the wall is $20^\circ C$ The thermal conductivity of the material of the wall is (in $Wm^{-1}K^{-1}$)

A. 0.11

B. 0.13

C. 0.15

D. 1.2

Answer:

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34. A diver , at a depth of 12m in water $\left(\mu = \frac{4}{3}\right)$ sees the sky in a cone of semivertical angle

A. $\sin^{-1}\left(\frac{4}{3}\right)$

B. $\tan^{-1}\left(\frac{4}{3}\right)$

C. $\sin^{-1}\left(\frac{3}{4}\right)$

D. 90°

Answer:

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35. Two thin lenses of focal lengths 20 cm and 25 cm are placed in contact. The effective power of the combinations is

A. 9D

B. 2D

C. 3D

D. 7D

Answer:

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36. A convex lens of focal lengths 30 cm produces 5 times magnified real image of an object What is the object distance ?

A. 36 cm

B. 25 cm

C. 30 cm

D. 150 cm

Answer:

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37. If the focal length of the eye piece of a telescope is doubled, its magnifying power (m) will be

A. 2m

B. 3m

C. $\frac{m}{2}$

D. $4m$

Answer:

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38. A plano -concave lens is made of glass of refractive index 1.5 and radius of curvature of

its curved face is 100 cm . What is the power of the lens ?

A. $+0.5D$

B. $-0.5D$

C. $-2D$

D. $+2D$

Answer:

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39. Four charges equal to -Q are placed at the four corners of a square and a charge q is at its centre. If the system is in equilibrium , the value of q is

A. $\frac{-Q}{4}(1+2\sqrt{2})$

B. $\frac{Q}{4}(1+2\sqrt{2})$

C. $\frac{-Q}{2}(1+2\sqrt{2})$

D. $\frac{Q}{2}(1+2\sqrt{2})$

Answer:

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