PHYSICS

BOOKS - MTG PHYSICS (BENGALI ENGLISH)

QUESTION PAPER 2012

Physics Descriptive Type Questions

1. A shell of mass m is at rest initially. It explodes into three fragments having masses

in the ratio $2:2:1$. The fragments having equal masses fly off along mutually perpendicular direction with speed v. What will be the speed of the third (lighter) fragment?

Watch Video Solution

2. A small spherical ball of mass m slides without friction from the top of a hemisphere of radius R.At what height will the ball lose contact with surface of the sphere?

Watch Video Solution

3. A battery of emf E and internal resistance r is connected across a pure resistive device (such as an electric heater) or resistance R. Prove that the power output of the device will be maximum if R = r .

Watch Video Solution

4. A radioactive isotope X with half life 1.5×10^9yrs, decays into a stable nucleus Y. A

rock sample contains both elements X and Y in ratio 1:15. Find the age of the rock.

Watch Video Solution

Subject Physics

1. A train approaching a railway platform with a speed of $20ms^{-1}$ starts blowing the whistle. Speed of sound in air is $340ms^{-1}$. If the frequency of the emitted sound from the whistle is 640 Hz, the frequency of sound to a

person standing on the platform will appear to be

A. 600 Hz

B. 640 Hz

C. 680 Hz

D. 720 Hz

Answer:

Watch Video Solution

2. A straight wire of length 2 m carries a current of 10 A. If this wire is placed in a uniform magnetic field of 0.15 T making an angle of 45° with the magnetic field, the applied force on the wire will

A. 1.5 N

B. 3 N

C. $3\sqrt{2}N$

D. $\frac{3}{\sqrt{2}}N$

Answer:

Watch Video Solution

3. What is the phase difference between two simple harmonic motions represented by $x_1 = A\sin\left(\omega x + \frac{\pi}{6}\right)$ and $x_2 = A\cos(\omega x)$?

A. $\frac{\pi}{6}$

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

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

D. $\frac{2\pi}{3}$

Answer:

Watch Video Solution

4. Heat is produced at a rate given by H in a resistor when it is connected across a supply of voltage V. If now the resistance of the resistor is doubled and the supply voltage is made V/3 then the rate of production of heat in the resistor will be

A. $H/18$

B. $H/9$

C. 6H

D. 18 H

Answer:

Watch Video Solution

5. Two elements A and B with atomic numbers Z_A and Z_B are used to produce characteristic X-rays with frequencies v_A and v_B respectively. If $Z_A : Z_B$ 1:2, then $v_A : v_B$ will be

A. $1 : \sqrt{2}$

B. $1:8$

C. $4:1$

D. $1:4$

Answer:

 Watch Video Solution

6. The de Broglie wavelength of an electron moving with a velocity c/2 (c =velocity of light in vacuum) is equal to the wavelength of a

photon. The ratio of the kinetic energies of electron and photon is

A. $1:4$

B. $1:2$

C. $1:1$

D. $2:1$

Answer:

Watch Video Solution

7. Two infinite parallel metal planes, contain electric charges with charge densities $+\sigma$ and $-\sigma$ respectively and they are separated by a small distance in air. If the permittivity of air is ε_0 then the magnitude of the field between the two planes with its direction will be

A. σ / ε_0 towards the positively charged plane

B. σ / ε_0 towards the negatively charged plane

C. $\sigma/(2\varepsilon_0)$ towards the positively charged plane

D. 0 and towards any direction

Answer:

Watch Video Solution

8. A box of mass 2 kg is placed on the roof of a car. The box would remain stationary until the car attains a maximum acceleration. Coefficient of static friction between the box

and the roof of the car is 0.2 and $g = 10ms^{-1}$

.

This maximum acceleration of the car, for the box to remain stationary, is

A. $8ms^{-2}$

B. $6ms^{-2}$

C. $4ms^{-2}$

D. $2ms^{-2}$

Answer:

Watch Video Solution

9. The decimal number equivalent to a binary number 1011001 is

A. 13

B. 17

C. 89

D. 178

Answer:

 Watch Video Solution

10. The frequency of the first overtone of a closed pipe of length l_1 is equal to that of the first overtone of an open pipe of length l_2. The ratio of their lengths $(l_1 : l_2$ is

A. $2:3$

B. $4:5$

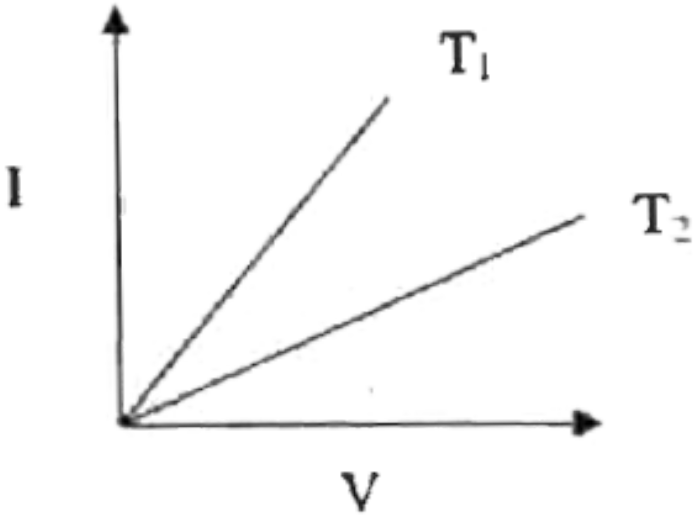
C. $3:5$

D. $3:4$

Answer:

Watch Video Solution

11. The I-V characteristics of a metal wire at two different temperatures (T_1 and T_2) are given in the adjoining figure. Here, we can conclude that



A. $T_1 > T_2$

B. $T_1 < T_2$

C. $T_1 = T_2$

D. $T_1 = 2T_2$

Answer:

Watch Video Solution

12. In a slide calipers, (m+1) number of vernier divisions is equal to m number of smallest main scale divisions. If d unit is the magnitude

of the smallest main scale division, then the magnitude of the vernier constant is

A. d/(m+1) unit

B. md/(m+1) unit

C. d/m unit

D. (m+1)d/m unit

Answer:

 Watch Video Solution

13. From the top of a tower, 80 m high from the ground, a stone is thrown in the horizontal direction with a velocity of $8ms^{-1}$. The stone reaches the ground after a time 't' and falls at a distance of 'd' from the foot of the tower.

Assuming $g = 10ms^{-2}$, the time t and distance d are given respectively by

A. 6 s, 64 m

B. 6 s, 48 m

C. 4 s, 32 m

D. 4 s, 16 m

Answer:

Watch Video Solution

14. A Wheatstone bridge has the resistances 10Ω, 10Ω, 10Ω and 30Ω in its four arms. What resistance joined in parallel to the 30 resistance will bring it to the balanced condition?

A. 2Ω

B. 5Ω

C. 10Ω

D. 15Ω

Answer:

 Watch Video Solution

15. An electric bulb marked as 50 W-200 V is connected across a 100 V supply. The present power of the bulb is

A. 37.5W

B. 25W

C. 12.5 W

D. 10 W

Answer:

Watch Video Solution

16. In a mercury thermometer the ice point (lower fixed point) is marked as 10° and the steam point (upper fixed point) is marked as

130°. At $40^\circ C$ temperature, what Will this thermometer read?

A. 78°

B. 66°

C. 62°

D. 58°

Answer:

Watch Video Solution

17. The magnetic flux linked with a coil satisfies the relation $\phi = 4t^2 + 6t + 9$ Wb where t is the time in second. The e.m.f. induced in the coil at t =2 second is

A. 22 V

B. 18 V

C. 16 V

D. 40 V

Answer:

Watch Video Solution

Watch Video Solution

18. Water is flowing through a very narrow tube. The velocity of water below which the flow remains a streamline flow is known as

A. Relative velocity

B. Critical velocity

C. Terminal velocity

D. Particle velocity

Answer:

Watch Video Solution

19. If the velocity of light in vacuum is $3 \times 10^8 ms^{-1}$, the time taken (in nanosecond) to travel through a glass plate of thickness 10 cm and refractive index 1.5 is

A. 0.5

B. 1.0

C. 2.0

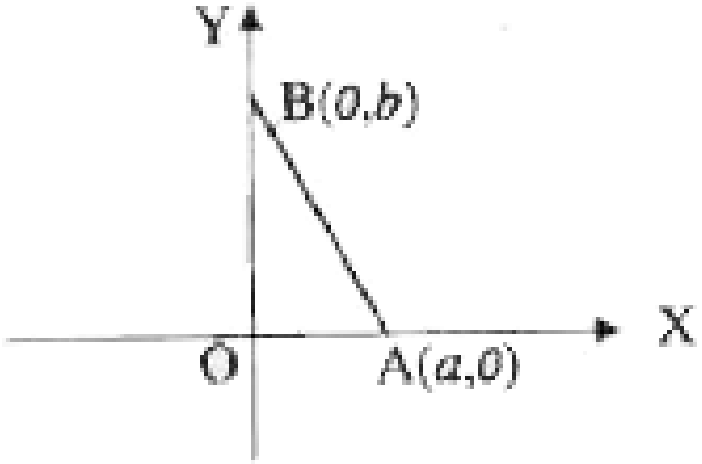
D. 3.0

Answer:

Watch Video Solution

20. A charge +q is placed at the origin of X-Y axes as shown in the figure. The work done in taking a charge Q from A to B along the

straight line AB is



A. $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{a-b}{ab}\right)$

B. $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{b-a}{ab}\right)$

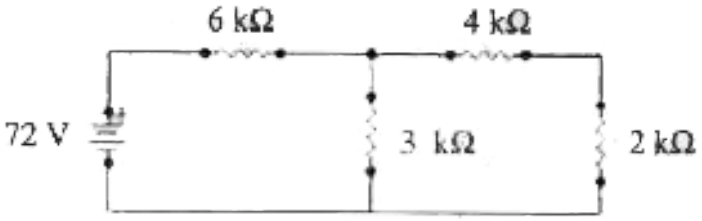
C. $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{b}{a^2}-\frac{1}{b}\right)$

D. $\frac{qQ}{4\pi\varepsilon_0}\left(\frac{a}{b^2}-\frac{1}{b}\right)$

Answer:

Watch Video Solution

21. What current will flow through the 2 $K\Omega$ resistor in the circuit shown in the figure?



A. 3mA

B. 6 mA

C. 12 mA

D. 36 mA

Answer:

Watch Video Solution

22. In a region, the intensity of an electric field is given by $\vec{E} = 2\hat{i} + 3\hat{j} + \hat{k}$ in NC^{-1}. The electric flux through a surface $\vec{S} = 10\hat{i}m^2$ in the region is

A. $5Nm^2C^{-1}$

B. $10Nm^2C^{-1}$

C. $15Nm^2C^{-1}$

D. $20Nm^2C^{-1}$

Answer:

Watch Video Solution

23. The dimension of angular momentum is

A. $M^0L^1T^{-1}$

B. $M^0L^2T^{-2}$

C. $M^1L^2T^{-1}$

D. $M^2L^1T^{-2}$

Answer:

Watch Video Solution

24. If $\vec{A} = \vec{B} + \vec{C}$ and $\vec{A}, \vec{B}, \vec{C}$ have scalar magnitudes of 5, 4, 3 units respectively then the angle between $\vec{A}$ and $\vec{C}$ is

A. $\cos^{-1}(3/5)$

B. $\cos^{-1}(4/5)$

C. $\pi/2$

D. $\sin^{-1}(3/4)$

Answer:

Watch Video Solution

25. A particle is travelling along a straight line OX. The distance x (in metres) of the particle from O at a time t is given by $x = 37 + 27t - t^3$ where t is time in seconds. The distance of the particle from O when it comes to rest is

A. 81 m

B. 91 m

C. 101 m

D. 111 m

Answer:

Watch Video Solution

26. A particle is projected from the ground with a kinetic energy E at an angle of 60° with the horizontal. Its kinetic energy at the highest point of its motion will be

A. $E/\sqrt{2}$

B. $E/2$

C. $E/4$

D. $E/8$

Answer:

Watch Video Solution

27. A bullet on penetrating 30 cm into its target loses its velocity by 50%. What

additional distance will it penetrate into the target before it comes to rest?

A. 30 cm

B. 20 cm

C. 10 cm

D. 5 cm

Answer:

Watch Video Solution

28. When a spring is stretched by 10 cm, the potential energy stored is E. When the spring is stretched by 10 cm more, the potential energy stored in the spring becomes

A. 2E

B. 4E

C. 6E

D. 10E

Answer:

Watch Video Solution

Watch Video Solution

29. Average distance of the Earth from the Sun is L_1. If one year of the Earth= D days, one year of another planet whose average distance from the Sun is L_2 will be

A. $D\left(\frac{L_2}{L_1}\right)^{\frac{1}{2}}$ days

B. $D\left(\frac{L_2}{L_1}\right)^{\frac{3}{2}}$ days

C. $D\left(\frac{L_2}{L_1}\right)^{\frac{2}{3}}$ days

D. $D\left(\frac{L_2}{L_1}\right)$ days

Answer:

Watch Video Solution

30. A spherical ball A of mass 4 kg, moving along a straight line strikes another spherical ball B of mass 1 kg at rest. After the collision, A and B move with velocities $v_1 ms^{-1}$ and $v_2 ms^{-1}$ respectively making angles of 30° and 60° with respect to the original direction of motion of A. The ratio $\frac{v_1}{v_2}$ will be

A. $\frac{\sqrt{3}}{4}$

B. $\frac{4}{\sqrt{3}}$

C. $\frac{1}{\sqrt{3}}$

D. $\sqrt{3}$

Answer:

Watch Video Solution

31. When a certain metal surface is illuminated with light of frequency v, the stopping potential for photoelectric current is V_0. When

the same surface is illuminated by light of frequency $\frac{v}{2}$ the stopping potent $\frac{V_0}{4}$. The threshold frequency for photoelectric emission is

A. $\frac{v}{6}$

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

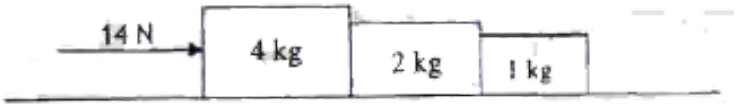
C. $\frac{2v}{3}$

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

Answer:

Watch Video Solution

32. Three blocks of mass 4 kg, 2 kg, 1 kg respectively are in contact on a frictionless table as shown in the figure. If a force of 14 N is applied on the 4 kg block, the contact force between the 4 kg and the 2 kg block will be



A. 2 N

B. 6 N

C. 8 N

D. 14 N

Answer:

Watch Video Solution

33. Let L be the length and d be the diameter of cross section of a wire. Wires of the same material with different L and d are subjected to the same tension along the length of the wire. In which of the following cases, the extension of wire will be the maximum?

L= 200 cm, d=0.5 mm

L= 300 cm, d=1.0 mm

L= 50 cm, d= 0.05 mm

L=100 cm, d=0.2 mm

Watch Video Solution

34. An object placed in front of a concave mirror at a distance of x cm from the pole gives a 3 times magnified real image. If it is moved to a distance of (x+5) cm, the

magnification of the image becomes 2. The focal length of the mirror is

A. 15 cm

B. 20 cm

C. 25 cm

D. 30 cm

Answer:

Watch Video Solution

35. 22320 cal of heat is supplied to 100 g of ice at $0^\circ C$. If the latent heat of fusion of ice is $80 cal g^{-1}$ and latent heat of vaporization of water is $540 cal g^{-1}$, the final amount of water thus obtained and its temperature respectively are

A. $8g$, $100^\circ C$

B. $100g$, $90^\circ C$

C. $92g$, $100^\circ C$

D. $82g$, $100^\circ C$

Answer:

Watch Video Solution

36. A progressive wave moving along x-axis is represented by $y = A\sin\left[\frac{2\pi}{\lambda}(vt - x)\right]$ The wavelength (λ) at which the maximum particle velocity is 3 times the wave velocity is

A. $A/3$

B. $2A/(3\pi)$

C. $(3/4)\pi A$

D. $(2/3)\pi A$

Answer:

Watch Video Solution

37. Two radioactive substances A and B have decay constants 5λ and λ respectively. At t-0, they have the same number of nuclei. The ratio of number of nuclei of A to that of B will be $(1/e)^2$ after a time interval of

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

B. $\frac{1}{2\lambda}$

C. $\frac{1}{3\lambda}$

D. $\frac{1}{4\lambda}$

Answer:

Watch Video Solution

38. A magnetic needle is placed in a uniform magnetic field and is aligned with the field. The needle is now rotated by an angle of 60°

and the work done is W. The torque on the magnetic needle at this position is

A. $2\sqrt{3}W$

B. $\sqrt{3W}$

C. $\frac{\sqrt{3}}{2}W$

D. $\frac{\sqrt{3}}{4}W$

Answer:

Watch Video Solution