PHYSICS

BOOKS - MTG IIT JEE FOUNDATION

FOOTSTEPS TOWARDS JEE MAIN

Section A Multiple Choice Question

1. A person takes time t to go once around a circular path of diameter 2 R . The speed (v) of this person would be

A. $\frac{t}{2\pi R}$

B. $\frac{2\pi R}{t}$

C. $\frac{\pi R^2}{t}$

D. $2\pi Rt$

Answer: B

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2. A truck and a car are moving with velocity v towards each other. They collide head in and stops after some time. If the time of collision

is 1 sec, which vehicle will have maximum change in momentum?

A. Car

B. Truck

C. Both will have same

D. None of these

Answer: C

3. Recoil velocity of gun is

A. equal to velocity of bullet

B. much greater than velocity of bullet

C. much smaller than velocity of bullet

D. cannot say

Answer: C

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4. The acceleration due to gravity g and density of the earth ρ are related by which of the following relations? (where G is the gravitational constant and R_E is the radius of the earth)

A. $\left(\frac{g}{G}\right)\frac{4\pi}{3}R_e^3 = \rho$

B. $\frac{\left(\frac{g}{G}\right)}{\frac{4\pi}{3}R_e} = \rho$

C. $\frac{g}{G}\left(\frac{4\pi}{93}\right)R_e^2 = \rho$

D. $\frac{\left(\frac{g}{G}\right)}{\left(\frac{4\pi}{3}R_e^3\right)} = \rho$

Answer: B

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5. A vibrator generates the waves of the speed 330 m/s and wavelength 0 . 8 m. Then the frequency and time period are

A. 264 Hz, 0 . 00 37 s

B. 42 . 5 Hz, 0 . 00 24 s

C. 412. 5 Hz, 0 . 00 24 s

D. 264 Hz, 0 . 00 30 s

Answer: C

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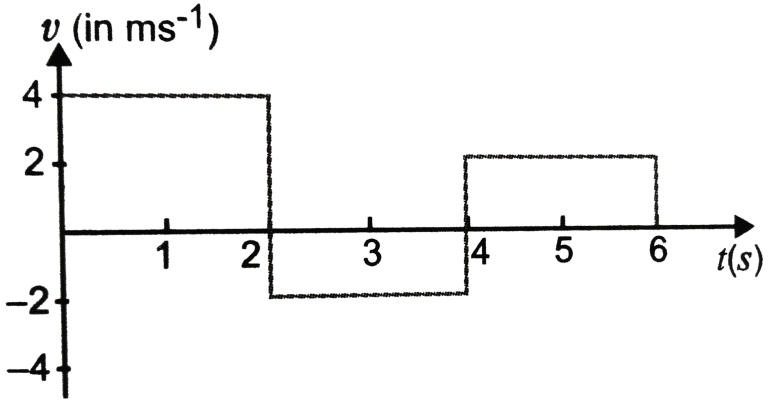
6. The velocit-time graph of a body moving in a straight line is shown in Fig. 2 (d) . 32. Find the displacement and the distance travelled by the body in $6\,\text{sec}\,onds$.



A. 8 m , 16 m

B. 16 m, 8 m

C. 16m, 16m

D. 8 m, 8 m

Answer: A

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7. While opening a tap with two fingers, the forces applied are

A. equal in magnitude

B. parallel to each other

C. opposite in direction

D. all of these

Answer: D

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8. Two balls of different masses have the same kinetic energy. Then the

A. heavier ball has greater momentum than the lighter ball

B. lighter ball has greater momentum than the heavier ball

C. both balls have equal momentum

D. both balls have zero momentum

Answer: A

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9. A metallic sphere of mass 2 . 0 kg and volume $2.5 \times 10^{-4} m^3$ is completely immersed in water. Find the buoyant force exerted by water on the sphere

Density of water $= 1000 kg / m^3$

A. 2 . 45 N

B. 0 . 25 N

C. 20 N

D. 30 N

Answer: A

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10. A stone is dropped into a well 44.1 deep. The sound of splash is heard 0 . 13 seconds after the stone hits the water. What should be the velocity of sounds in air .

A. 319 m/s

B. 339 m/s

C. 359 m/s

D. 369m/s

Answer: B

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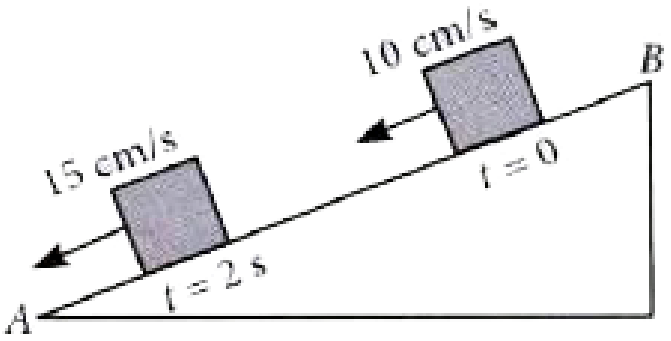
11. An object is sliding down an inclined plane. The velocity changes at a constant rate from 10 cm/s to 15 cm/s in two seconds. What is its acceleration ?



A. $10cm/s^2$

B. $2.9cm/s^2$

C. $2.5cm/s^2$

D. $40cm/s^2$

Answer: C

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12. A force 100 N acts on a body of mass 2 kg for 10 s. The change in velocity of the body is

A. $100ms^{-1}$

B. $250ms^{-1}$

C. $500ms^{-1}$

D. $1000ms^{-1}$

Answer: C

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13. A rock climber of weight 600 N climbs up a rock face of vertical height 300 m in 3600 s.

What is the average power he generates against gravity during this time ?

A. 0.020 w

B. 50 W

C. 1800 W

D. 7200 w

Answer: B

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14. Pressure at a point inside a liquid does not depend on:

A. the depth of the point below the surface of the liquid

B. the nature of the liquid

C. the acceleration due to gravity at the point

D. the shape of the containing liquid

Answer: D

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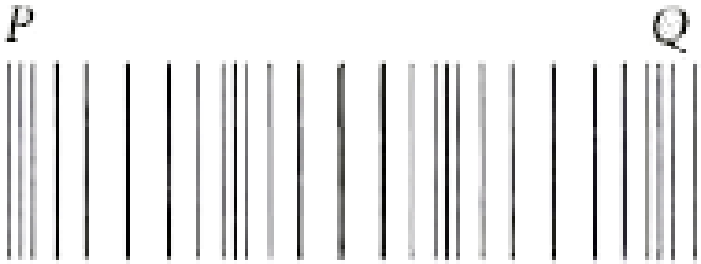
15. A series of compressions and rarefactions of a sound wave is shown in figure. Given that the sound wave has a frequency of 1600 Hz and a sped of $320ms^{-1}$



Calculate the distance between P and Q

A. 0 . 3 m

B. $0.4\ m$

C. $0.6\ m$

D. $0.8\ m$

Answer: C

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16. If a ball is thrown vertically upwards with speed u, the distance covered during the last t second of its ascent is

A. u t

B. $\frac{1}{2}gt^2$

C. $(u+gt)t$

D. $ut-\frac{1}{2}gt^2$

Answer: B

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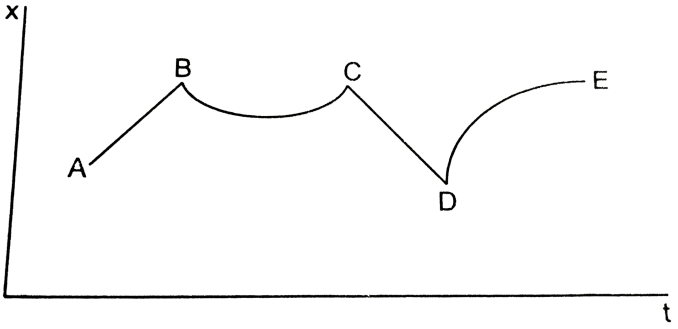
17. Figure shows the displacement of a particle going along the X-axis as a function of time. The force acting on the particle is zero in the

region



A. AB

B. BC

C. CD

D. DE

Answer: A

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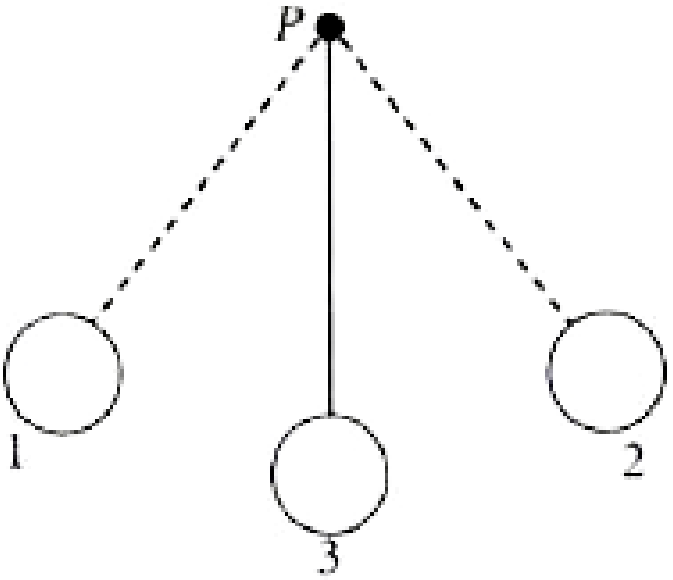
18. A mass hangs on a string fixed at point P . It starts from position 1 and swings tot he farthest position on the opposite side, position 2. It then oscillates several times with decreasing amplitude before ending at position 3

Where does the ball have the maximum kinetic

energy ?



A. At position 1

B. At position 2

C. The first time at position 3

D. The last time at position 3

Answer: C

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19. If g is the acceleration due to gravity on the surface of the earth , its value at a height equal to double the radius of the earth is

A. g

B. g/2

C. g/3

D. g/9

Answer: D

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20. The highest frequency produced by a man is 1700 Hz and that of a woman is 2780 Hz . The ratio of wavelengths of sound of man and woman are (speed of sound is $340ms^{-1}$)

A. $1:0.34$

B. $1:0.61$

C. $1:0.69$

D. $1:0.59$

Answer: B

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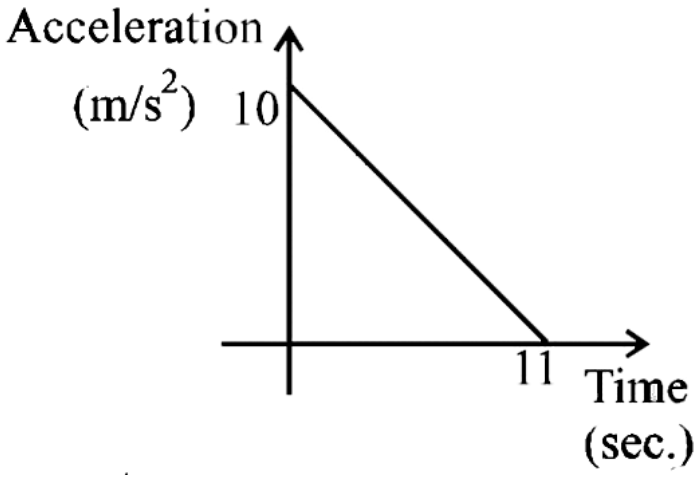
Section B Numerical Value Type Questions

1. A body starts from rest at time $t = 0$, the acceleration time graph is shown in the figure . The maximum velocity attained by the body

will be



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2. A cricket ball of mass 500 g is moving with speed of $36kmh^{-1}$. It is reflected back with the same speed . The impulse (in kg ms^{-1}) applied on it is _____

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3. Two bodies with kinetic energies in the ratio 2 : 3 are moving with equal momentum . If $m_1 = xm_2$, then the value of x is _____

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4. A hollow spherical object weighs 25 g in air. Its material density is $5g/cm^3$. If it weights 15

g in water , then the volume (in cm^3) of the hollow space in it will be _____

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5. A boat at anchor is rocked by waves whose crests are $100m$ apart and whose speed is $25m/s$. These waves reach the boat once every :

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6. A car moving on a straight road covers 1/3 of the distance with 25 km / h and rest with 75 km/h . The average speed (in km h^{-1}) is

_____

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7. Sand drops from a stationary hopper at the rate of $5kg/s$ on to a conveyor belt moving with a constant speed of $2m/s$. What is the force required to keep the belt moving and

what is the power delivered by the motor, moving the belt?

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8. The acceleration due to gravity on the surface of a pulsar of mass $M = 1.98 \times 10^{30}$ kg and radius R = 12 km rotating with time period T =0 . 0 41 seconds is $x \times 10^{11} ms^{-2}$ where the value of x is _____

$\left(G = 6.67 \times 10^{-11} MKS\right)$

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9. A body can reduce the pressure in his lungs to 750 mm of mercury. Using a straw he can drink water from a glass upto the maximum depth of _____ cm

(atmospheric pressure = 760 mm of mercury, density of mercury $= 13.6 gcm^{-3}$)

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10. A motor pump lifts 6 tonnes of water from a well of depth 25 m to the first floor of height

35 m from the ground floor in 20 minutes. The power of the pump (in kW) is $[g = 10ms^{-2}]$

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