

Mastering Physics With Physics Guruji

DPP - Daily Practice Problems

Chapter-wise Sheets

Date : Start Time : End Time :

PHYSICS

CP05

SYLLABUS : Work, Energy and Power

Max. Marks : 120 Marking Scheme : (+4) for correct & (-1) for incorrect answer Time : 60 min.

INSTRUCTIONS : This Daily Practice Problem Sheet contains 30 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

- A spring of spring constant 5×10^3 N/m is stretched initially by 5cm from the unstretched position. Then the work required to stretch it further by another 5 cm is
(a) 12.50 Nm (b) 18.75 Nm
(c) 25.00 Nm (d) 6.25 Nm
- A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion ?
(a) 0.1 m/s^2 (b) 0.15 m/s^2
(c) 0.18 m/s^2 (d) 0.2 m/s^2
- A body is moved along a straight line by a machine delivering a constant power. The distance moved by the body in time 't' is proportional to
(a) $t^{3/4}$ (b) $t^{3/2}$ (c) $t^{1/4}$ (d) $t^{1/2}$
- A ball is thrown vertically downwards from a height of 20 m with an initial velocity v_0 . It collides with the ground and loses 50% of its energy in collision and rebounds to the same height. The initial velocity v_0 is : (Take $g = 10 \text{ ms}^{-2}$)
(a) 20 ms^{-1} (b) 28 ms^{-1}
(c) 10 ms^{-1} (d) 14 ms^{-1}
- When a rubber-band is stretched by a distance x, it exerts restoring force of magnitude $F = ax + bx^2$ where a and b are constants. The work done in stretching the unstretched rubber-band by L is:
(a) $aL^2 + bL^3$ (b) $\frac{1}{2}(aL^2 + bL^3)$
(c) $\frac{aL^2}{2} + \frac{bL^3}{3}$ (d) $\frac{1}{2}\left(\frac{aL^2}{2} + \frac{bL^3}{3}\right)$

RESPONSE GRID

1. (a)(b)(c)(d) 2. (a)(b)(c)(d) 3. (a)(b)(c)(d) 4. (a)(b)(c)(d) 5. (a)(b)(c)(d)

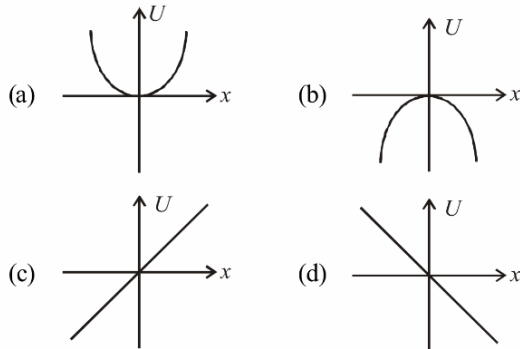
Space for Rough Work

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6. A particle is acted by a force $F = kx$, where k is a +ve constant. Its potential energy at $x = 0$ is zero. Which curve correctly represents the variation of potential energy of the block with respect to x



7. A particle of mass m is driven by a machine that delivers a constant power of k watts. If the particle starts from rest the force on the particle at time t is

- (a) $\sqrt{mk} t^{-1/2}$ (b) $\sqrt{2mk} t^{-1/2}$
 (c) $\frac{1}{2}\sqrt{mk} t^{-1/2}$ (d) $\sqrt{\frac{mk}{2}} t^{-1/2}$

8. A moving body with a mass m_1 and velocity u strikes a stationary body of mass m_2 . The masses m_1 and m_2 should be in the ratio m_1/m_2 so as to decrease the velocity of the first body to $2u/3$ and giving a velocity of v to m_2 assuming a perfectly elastic impact. Then the ratio m_1/m_2 is

- (a) 5 (b) 1/5 (c) 1/25 (d) 25

9. Two similar springs P and Q have spring constants K_p and K_q , such that $K_p > K_q$. They are stretched, first by the same amount (case a,) then by the same force (case b). The work done by the springs W_p and W_q are related as, in case (a) and case (b), respectively

- (a) $W_p = W_q$; $W_p = W_q$

- (b) $W_p > W_q$; $W_q > W_p$

- (c) $W_p < W_q$; $W_q < W_p$

- (d) $W_p = W_q$; $W_p > W_q$

10. A body is allowed to fall freely under gravity from a height of 10m. If it loses 25% of its energy due to impact with the ground, then the maximum height it rises after one impact is
 (a) 2.5m (b) 5.0m (c) 7.5m (d) 8.2m

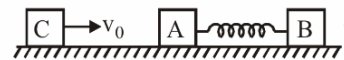
11. Water falls from a height of 60 m at the rate of 15 kg/s to operate a turbine. The losses due to frictional force are 10% of energy. How much power is generated by the turbine? ($g = 10 \text{ m/s}^2$)

- (a) 8.1 kW (b) 10.2 kW
 (c) 12.3 kW (d) 7.0 kW

12. A glass marble dropped from a certain height above the horizontal surface reaches the surface in time t and then continues to bounce up and down. The time in which the marble finally comes to rest is

- (a) e^{nt} (b) e^{2t}
 (c) $t \left[\frac{1+e}{1-e} \right]$ (d) $t \left[\frac{1-e}{1+e} \right]$

13. A block C of mass m is moving with velocity v_0 and collides elastically with block A of mass m and connected to another block B of mass $2m$ through spring constant k . What is k if x_0 is compression of spring when velocity of A and B is same?



- (a) $\frac{mv_0^2}{x_0^2}$ (b) $\frac{mv_0^2}{2x_0^2}$
 (c) $\frac{3}{2} \frac{mv_0^2}{x_0^2}$ (d) $\frac{2}{3} \frac{mv_0^2}{x_0^2}$

**RESPONSE
GRID**

6. (a)(b)(c)(d) 7. (a)(b)(c)(d) 8. (a)(b)(c)(d) 9. (a)(b)(c)(d) 10. (a)(b)(c)(d)
 11. (a)(b)(c)(d) 12. (a)(b)(c)(d) 13. (a)(b)(c)(d)

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14. In the figure shown, a particle of mass m is released from the position A on a smooth track. When the particle reaches at B, then normal reaction on it by the track is



- (a) mg (b) $2mg$ (c) $\frac{2}{3}mg$ (d) $\frac{m^2g}{h}$
15. A body of mass 1 kg begins to move under the action of a time dependent force $\vec{F}=(2t\hat{i}+3t^2\hat{j})$ N, where \hat{i} and \hat{j} are unit vectors along x and y axis. What power will be developed by the force at the time t ?
- (a) $(2t^2 + 3t^3)W$ (b) $(2t^2 + 4t^4)W$
 (c) $(2t^3 + 3t^4)W$ (d) $(2t^3 + 3t^5)W$
16. A bullet of mass 20 g and moving with 600 m/s collides with a block of mass 4 kg hanging with the string. What is the velocity of bullet when it comes out of block, if block rises to height 0.2 m after collision?
- (a) 200 m/s (b) 150 m/s (c) 400 m/s (d) 300 m/s
17. A body of mass m kg is ascending on a smooth inclined plane of inclination θ ($\sin \theta = \frac{1}{x}$) with constant acceleration of a m/s^2 . The final velocity of the body is v m/s . The work done by the body during this motion is (Initial velocity of the body = 0)

- (a) $\frac{1}{2}mv^2(g + xa)$ (b) $\frac{mv^2}{2}\left(\frac{g}{2} + a\right)$
 (c) $\frac{2mv^2x}{a}(a + gx)$ (d) $\frac{mv^2}{2ax}(g + xa)$

18. The potential energy of a 1 kg particle free to move along the x-axis is given by $V(x) = \left(\frac{x^4}{4} - \frac{x^2}{2}\right)$ J.

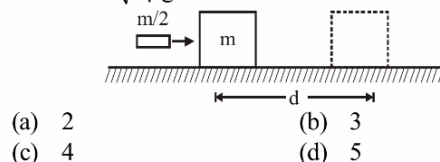
The total mechanical energy of the particle is 2 J. Then, the maximum speed (in m/s) is

- (a) $\frac{3}{\sqrt{2}}$ (b) $\sqrt{2}$
 (c) $\frac{1}{\sqrt{2}}$ (d) 2

19. A car of mass m starts from rest and accelerates so that the instantaneous power delivered to the car has a constant magnitude P_0 . The instantaneous velocity of this car is proportional to :

- (a) t^{2P_0} (b) $t^{1/2}$
 (c) $t^{-1/2}$ (d) $\frac{t}{\sqrt{m}}$

20. A block of mass m rests on a rough horizontal surface (Coefficient of friction is μ). When a bullet of mass $m/2$ strikes horizontally, and get embedded in it, the block moves a distance d before coming to rest. The initial velocity of the bullet is $k\sqrt{2\mu gd}$, then the value of k is



- (a) 2 (b) 3
 (c) 4 (d) 5

21. A force acts on a 30 gm particle in such a way that the position of the particle as a function of time is given by $x = 3t - 4t^2 + t^3$, where x is in metres and t is in seconds. The work done during the first 4 seconds is

- (a) 576mJ (b) 450mJ
 (c) 490mJ (d) 530mJ

22. A steel ball of mass 5g is thrown downward with velocity 10 m/s from height 19.5 m. It penetrates sand by 50 cm. The change in mechanical energy will be ($g = 10$ m/s^2)

- (a) 1J (b) 1.25J
 (c) 1.5J (d) 1.75J

**RESPONSE
GRID**

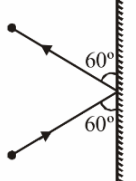
14. (a)(b)(c)(d) 15. (a)(b)(c)(d) 16. (a)(b)(c)(d) 17. (a)(b)(c)(d) 18. (a)(b)(c)(d)
 19. (a)(b)(c)(d) 20. (a)(b)(c)(d) 21. (a)(b)(c)(d) 22. (a)(b)(c)(d)

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23. A 10 H.P. motor pumps out water from a well of depth 20 m and fills a water tank of volume 22380 litres at a height of 10 m from the ground. The running time of the motor to fill the empty water tank is ($g = 10\text{ms}^{-2}$)
 (a) 5 minutes (b) 10 minutes
 (c) 15 minutes (d) 20 minutes
24. A 3 kg ball strikes a heavy rigid wall with a speed of 10 m/s at an angle of 60° . It gets reflected with the same speed and angle as shown here. If the ball is in contact with the wall for 0.20 s, what is the average force exerted on the ball by the wall?
 (a) 150 N (b) 300 N (c) $150\sqrt{3}$ N (d) zero
- 
25. A 2 kg block slides on a horizontal floor with a speed of 4 m/s. It strikes an uncompressed spring, and compresses it till the block is motionless. The kinetic friction force is 15 N and spring constant is 10,000 N/m. The spring compresses by
 (a) 8.5 cm (b) 5.5 cm (c) 2.5 cm (d) 11.0 cm
26. A stone is tied to a string of length ℓ and is whirled in a vertical circle with the other end of the string as the centre. At a certain instant of time, the stone is at its lowest position and has a speed u . The magnitude of the change in velocity as it reaches a position where the string is horizontal (g being acceleration due to gravity) is
 (a) $\sqrt{2g\ell}$ (b) $\sqrt{2(u^2 - g\ell)}$
 (c) $\sqrt{u^2 - g\ell}$ (d) $u - \sqrt{u^2 - 2g\ell}$
27. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of 2 m/s. The mass per unit length of water in the pipe is 100 kg/m. What is the power of the engine?
 (a) 400 W (b) 200 W
 (c) 100 W (d) 800 W
28. A body of mass 50 kg is projected vertically upwards with velocity of 100 m/sec. After 5 seconds this body breaks into two pieces of 20 kg and 30 kg. If 20 kg piece travels upwards with 150 m/sec, then the velocity of other block will be
 (a) 15 m/sec downwards (b) 15 m/sec upwards
 (c) 51 m/sec downwards (d) 51 m/sec upwards
29. The K.E. acquired by a mass m in travelling a certain distance d , starting from rest, under the action of a constant force is directly proportional to
 (a) m (b) \sqrt{m}
 (c) $\frac{1}{\sqrt{m}}$ (d) independent of m
30. A vertical spring with force constant k is fixed on a table. A ball of mass m at a height h above the free upper end of the spring falls vertically on the spring so that the spring is compressed by a distance d . The net work done in the process is
 (a) $mg(h+d) - \frac{1}{2}kd^2$ (b) $mg(h-d) - \frac{1}{2}kd^2$
 (c) $mg(h-d) + \frac{1}{2}kd^2$ (d) $mg(h+d) + \frac{1}{2}kd^2$

RESPONSE GRID	23. (a)(b)(c)(d)	24. (a)(b)(c)(d)	25. (a)(b)(c)(d)	26. (a)(b)(c)(d)	27. (a)(b)(c)(d)
	28. (a)(b)(c)(d)	29. (a)(b)(c)(d)	30. (a)(b)(c)(d)		

DAILY PRACTICE PROBLEM DPP CHAPTERWISE CP05 - PHYSICS			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	45	Qualifying Score	60
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

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