DPP - Daily Practice Problems

Chapter-wise Sheets

Date : | Start Time : | End Time :

PHYSICS

CP04

SYLLABUS : Laws of Motion

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.

1. A player stops a football weighing 0.5 kg which comes flying towards him with a velocity of 10m/s. If the impact lasts for 1/50th sec. and the ball bounces back with a velocity of 15 m/s, then the average force involved is

(a) 250 N (b) 1250 N

(c) 500 N (d) 625 N

2. A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 m/s. To give an initial upward acceleration of 20 m/s^2, the amount of gas ejected per second to supply the needed thrust will be (Take g = 10 m/s^2)

(a) 127.5 kg/s (b) 137.5 kg/s

(c) 155.5 kg/s (d) 187.5 kg/s

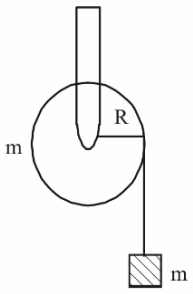
3. A mass 'm' is supported by a massless string wound around a uniform hollow cylinder of mass m and radius R. If the string does not slip on the cylinder, with what acceleration will the mass release?

(a) $\frac{2g}{3}$

(b) $\frac{g}{2}$

(c) $\frac{5g}{6}$

(d) g

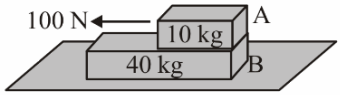


RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ

Space for Rough Work

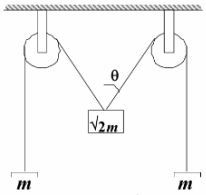
4. A 40 kg slab rests on a frictionless floor as shown in the figure. A 10 kg block rests on the top of the slab. The static coefficient of friction between the block and slab is 0.60 while the coefficient of kinetic friction is 0.40. The 10 kg block is acted upon by a horizontal force of 100 N. If $g = 9.8\ m/s^2$, the resultaing acceleration of the slab will be

(a) $0.98\ m/s^2$
(b) $1.47\ m/s^2$
(c) $1.52\ m/s^2$
(d) $6.1\ m/s^2$



5. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be

(a) 0°
(b) 30°
(c) 45°
(d) 60°



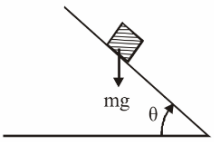
6. A satellite in a force free space sweeps stationary interplanetary dust at a rate $(dM/dt) = \alpha v$. The acceleration of satellite is

(a) $\frac{-2\alpha v^2}{M}$ (b) $\frac{-\alpha v^2}{M}$ (c) $\frac{-\alpha v^2}{2M}$ (d) $-\alpha v^2$

7. A monkey is decending from the branch of a tree with constant acceleration. If the breaking strength is 75% of the weight of the monkey, the minimum acceleration with which monkey can slide down without breaking the branch is

(a) g (b) $\frac{3g}{4}$ (c) $\frac{g}{4}$ (d) $\frac{g}{2}$

8. A plank with a box on it at one end is gradually raised about the other end. As the angle of inclination with the horizontal reaches 30° the box starts to slip and slides 4.0 m down the plank in 4.0s. The coefficients of static and kinetic friction between the box and the plank will be, respectively :

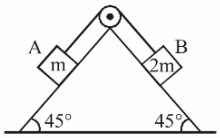


(a) 0.6 and 0.5 (b) 0.5 and 0.6
(c) 0.4 and 0.3 (d) 0.6 and 0.6

9. A car having a mass of 1000 kg is moving at a speed of 30 metres/sec. Brakes are applied to bring the car to rest. If the frictional force between the tyres and the road surface is 5000 newtons, the car will come to rest in

(a) 5 seconds (b) 10 seconds
(c) 12 seconds (d) 6 seconds

10. Block A of mass m and block B of mass 2m are placed on a fixed triangular wedge by means of a massless, inextensible string and a frictionless pulley as shown in figure.



The wedge is inclined at 45° to the horizontal on both the sides. If the coefficient of friction between the block A and the wedge is 2/3 and that between the block B and the wedge is 1/3 and both the blocks A and B are released from rest, the acceleration of A will be

(a) $-1\ ms^{-2}$ (b) $1.2\ ms^{-2}$ (c) $0.2\ ms^{-2}$ (d) zero

11. The rate of mass of the gas emitted from rear of a rocket is initially 0.1 kg/sec. If the speed of the gas relative to the rocket is 50 m/sec and mass of the rocket is 2 kg, then the acceleration of the rocket in m/sec^2 is

(a) 5 (b) 5.2 (c) 2.5 (d) 25

12. A block of mass m is resting on a smooth horizontal surface. One end of a uniform rope of mass (m/3) is fixed to the block, which is pulled in the horizontal direction by applying a force F at the other end. The tension in the middle of the rope is

(a) $\frac{8}{7}F$ (b) $\frac{1}{7}F$ (c) $\frac{1}{8}F$ (d) $\frac{7}{8}F$

13. A body of mass M is kept on a rough horizontal surface (friction coefficient μ). A person is trying to pull the body by applying a horizontal force but the body is not moving. The force by the surface on the body is F, then

(a) $F = Mg$
(b) $F = \mu Mg$
(c) $Mg \le F \le Mg\sqrt{1+\mu^2}$
(d) $Mg \ge F \ge Mg\sqrt{1+\mu^2}$

RESPONSE GRID					
4. ⓐⓑⓒⓓ	**5.** ⓐⓑⓒⓓ	**6.** ⓐⓑⓒⓓ	**7.** ⓐⓑⓒⓓ	**8.** ⓐⓑⓒⓓ
9. ⓐⓑⓒⓓ	**10.** ⓐⓑⓒⓓ	**11.** ⓐⓑⓒⓓ	**12.** ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ

Space for Rough Work

14. Which one of the following motions on a smooth plane surface does not involve force?
(a) Accelerated motion in a straight line
(b) Retarded motion in a straight line
(c) Motion with constant momentum along a straight line
(d) Motion along a straight line with varying velocity

15. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table is μ_k. When the block A is sliding on the table, the tension in the string is

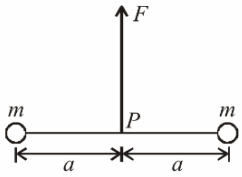
(a) $\frac{(m_2 - \mu_k m_1)g}{(m_1 + m_2)}$ (b) $\frac{m_1 m_2 (1 + \mu_k)g}{(m_1 + m_2)}$

(c) $\frac{m_1 m_2 (1 - \mu_k)g}{(m_1 + m_2)}$ (d) $\frac{(m_2 + \mu_k m_1)g}{(m_1 + m_2)}$

16. The upper half of an inclined plane with inclination f is perfectly smooth while the lower half is rough. A body starting from rest at the top will again come to rest at the bottom if the coefficient of friction for the lower half is given by
(a) $2\cos\phi$ (b) $2\sin\phi$ (c) $\tan\phi$ (d) $2\tan\phi$

17. A particle describes a horizontal circle in a conical funnel whose inner surface is smooth with speed of 0.5 m/s. What is the height of the plane of circle from vertex of the funnel?
(a) 0.25 cm (b) 2 cm (c) 4 cm (d) 2.5 cm

18. Two particles of mass *m* each are tied at the ends of a light string of length 2*a*. The whole system is kept on a frictionless horizontal surface with the string held tight so that each mass is at a distance '*a*' from the centre *P* (as shown in the figure).

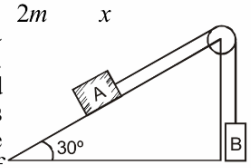


Now, the mid-point of the string is pulled vertically upwards with a small but constant force *F*. As a result, the particles move towards each other on the surface. The magnitude of acceleration, when the separation between them becomes 2*x*, is

(a) $\frac{F}{2m}\frac{a}{\sqrt{a^2 - x^2}}$ (b) $\frac{F}{2m}\frac{x}{\sqrt{a^2 - x^2}}$

(c) $\frac{F}{2m}\frac{x}{a}$ (d) $\frac{F}{2m}\frac{\sqrt{a^2 - x^2}}{x}$

19. Two blocks are connected over a massless pulley as shown in fig. The mass of block A is 10 kg and the coefficient of kinetic friction is 0.2. Block A slides down the incline at constant speed. The mass of block B in kg is



(a) 3.5 (b) 3.3 (c) 3.0 (d) 2.5

20. A light spring balance hangs from the hook of the other light spring balance and a block of mass *M* kg hangs from the former one. Then the true statement about the scale reading is
(a) both the scales read *M* kg each
(b) the scale of the lower one reads *M* kg and of the upper one zero
(c) the reading of the two scales can be anything but the sum of the reading will be *M* kg
(d) both the scales read *M*/2 kg each

21. Tension in the cable supporting an elevator, is equal to the weight of the elevator. From this, we can conclude that the elevator is going up or down with a
(a) uniform velocity (b) uniform acceleration
(c) variable acceleration (d) either (b) or (c)

22. A particle tied to a string describes a vertical circular motion of radius r continually. If it has a velocity $\sqrt{3\,gr}$ at the highest point, then the ratio of the respective tensions in the string holding it at the highest and lowest points is
(a) 4 : 3 (b) 5 : 4 (c) 1 : 4 (d) 3 : 2

23. A block of mass *m* is connected to another block of mass *M* by a spring (massless) of spring constant *k*. The block are kept on a smooth horizontal plane. Initially the blocks are at rest and the spring is unstretched. Then a constant force *F* starts acting on the block of mass *M* to pull it. Find the force of the block of mass *m*.

(a) $\frac{MF}{(m+M)}$ (b) $\frac{mF}{M}$

(c) $\frac{(M+m)F}{m}$ (d) $\frac{mF}{(m+M)}$

RESPONSE GRID					
	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ
	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ

Space for Rough Work

24. A block of mass m is placed on a surface with a vertical cross section given by $y = \frac{x^3}{6}$. If the coefficient of friction is 0.5, the maximum height above the ground at which the block can be placed without slipping is:

(a) $\frac{1}{6}$m (b) $\frac{2}{3}$m (c) $\frac{1}{3}$m (d) $\frac{1}{2}$m

25. A ball of mass 10 g moving perpendicular to the plane of the wall strikes it and rebounds in the same line with the same velocity. If the impulse experienced by the wall is 0.54 Ns, the velocity of the ball is

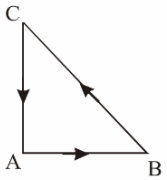
(a) 27 ms^{-1} (b) 3.7 ms^{-1} (c) 54 ms^{-1} (d) 37 ms^{-1}

26. A block is kept on a inclined plane of inclination θ of length ℓ. The velocity of particle at the bottom of inclined is (the coefficient of friction is μ)

(a) $[2g\ell(\mu\cos\theta - \sin\theta)]^{1/2}$ (b) $\sqrt{2g\ell(\sin\theta - \mu\cos\theta)}$

(c) $\sqrt{2g\ell(\sin\theta + \mu\cos\theta)}$ (d) $\sqrt{2g\ell(\cos\theta + \mu\sin\theta)}$

27. Three forces start acting simultaneously on a particle moving with velocity, $\vec{v}$. These forces are represented in magnitude and direction by the three sides of a triangle ABC. The particle will now move with velocity



(a) less than $\vec{v}$

(b) greater than $\vec{v}$

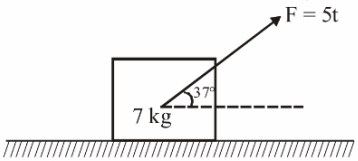
(c) |v| in the direction of the largest force BC

(d) $\vec{v}$, remaining unchanged

28. A bullet is fired from a gun. The force on the bullet is given by $F = 600 - 2 \times 10^5 t$ where, F is in newton and t in second. The force on the bullet becomes zero as soon as it leaves the barrel. What is the average impulse imparted to the bullet?

(a) 1.8 N-s (b) zero (c) 9 N-s (d) 0.9 N-s

29. A block of 7 kg is placed on a rough horizontal surface and is pulled through a variable force F (in N) = 5t, where t is time in second, at an angle of 37° with the horizontal as shown in figure. The coefficient of static friction of the block with the surface is one. If the force starts acting at t = 0s, the time at which the block starts to slide is t_0 sec. Find the value of $t_0/2$ in sec. ($g = 10\ m/s^2$ and $\cos 37° = \frac{4}{5}$)



(a) 3 (b) 4 (c) 5 (d) 6

30. A stationary body of mass 3 kg explodes into three equal pieces. Two of the pieces fly off in two mutually perpendicular directions, one with a velocity of $3\hat{i}$ ms^{-1} and the other with a velocity of $4\hat{j}$ ms^{-1}. If the explosion occurs in 10^{-4} s, the average force acting on the third piece in newton is

(a) $(3\hat{i} + 4\hat{j}) \times 10^{-4}$ (b) $(3\hat{i} - 4\hat{j}) \times 10^{-4}$

(c) $(3\hat{i} - 4\hat{j}) \times 10^{4}$ (d) $-(3\hat{i} + 4\hat{j}) \times 10^{4}$

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

DAILY PRACTICE PROBLEM DPP CHAPTERWISE CP04 - PHYSICS			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	40	Qualifying Score	50
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work