**PHYSICS**

**DPP**

DAILY PRACTICE PROBLEMS

# DPP No. 27

**Total Marks : 14**

**Max. Time : 15 min.**

**Topics : Relative Motion, Newtons's Law of Motion**

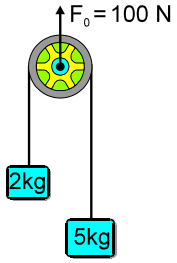
| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 | (3 marks, 3 min.) | [3, 3] |
| Multiple choice objective ('–1' negative marking) Q.2 | (4 marks, 4 min.) | [4, 4] |
| Subjective Questions ('–1' negative marking) Q.3 | (4 marks, 5 min.) | [4, 5] |
| Comprehension ('–1' negative marking) Q.4 to Q.6 | (3 marks, 3 min.) | [3, 3] |

**1.** A stone is projected horizontally with speed v from a height h above ground. A horizontal wind is blowing in direction opposite to velocity of projection and gives the stone a constant horizontal acceleration f (in direction opposite to initial velocity). As a result the stone falls on ground at a point vertically below the point of projection. Then the value of height h in terms of f, g, v is (g is acceleration due to gravity)

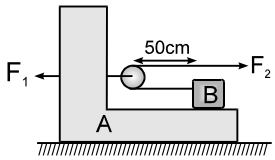
(A) $\frac{gv^2}{2f^2}$ (B) $\frac{gv^2}{f^2}$ (C) $\frac{\sqrt{2}gv^2}{f^2}$ (D) $\frac{2gv^2}{f^2}$

**2.** Two blocks of masses $m_1$ = 2kg and $m_2$ = 5kg hang over a massless pulley as shown in the figure. A force $F_0$ = 100 N acting at the axis of the pulley accelerates the system upwards. Then : (Take g = 9.8 m/s$^2$)

(A) Acceleration of 2 kg mass is 15.2 m/sec$^2$
(B) Acceleration of 5kg mass is 0.2 m/sec$^2$
(C) Acceleration of both the masses is same
(D) Acceleration of both the masses is upward

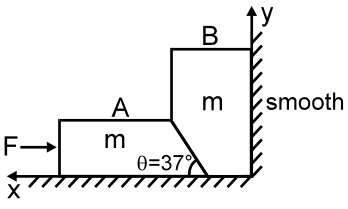



**3.** A 1 kg block 'B' rests as shown on a bracket 'A' of same mass. Constant forces $F_1$ = 20 N and $F_2$ = 8 N start to act at time t = 0 when the distance of block B from pulley is 50 cm.Time when block B reaches the pulley is _____. (Assume that friction is absent every where. Pulley and string are light.




**COMPREHENSION**

Two smooth blocks are placed at a smooth corner as shown. Both the blocks are having mass m. We apply a force F on the small block m. Block A presses the block B in the normal direction, due to which pressing force on vertical wall will increase, and pressing force on the horizontal wall decrease, as we increase F. ($\theta = 37°$ with horizontal). As soon as the pressing force on the horizontal wall by block B becomes zero, it will loose the contact with the ground. If the value of F is further increased, the block B will accelerate in upward direction and simultaneously the block A will move toward right.




**4.** What is minimum value of F, to lift block B from ground :

(A) $\frac{25}{12}$mg (B) $\frac{5}{4}$ mg (C) $\frac{3}{4}$mg (D) $\frac{4}{3}$mg

**5.** If both the blocks are stationary, the force exerted by ground on block A is :

(A) mg + $\frac{3F}{4}$ (B) mg – $\frac{3F}{4}$ (C) mg + $\frac{4F}{3}$ (D) mg – $\frac{4F}{3}$

**6.** If acceleration of block A is a rightward, then acceleration of block B will be :

(A) $\frac{3a}{4}$ upwards (B) $\frac{4a}{3}$ upwards (C) $\frac{3a}{5}$ upwards (D) $\frac{4a}{5}$ upwards

# Answers Key

## DPP NO. - 27

**1.** (D) **2.** (A) (B) (D) **3.** 0.5 sec.
**4.** (C) **5.** (C) **6.** (A)

# Hint & Solutions

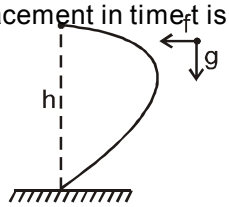
## DPP NO. - 27

**1.** Time taken to reach the ground is given by

$$h = \frac{1}{2}gt^2 \quad .... (1)$$

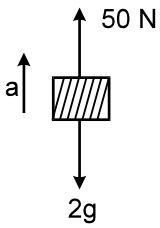
Since horizontal displacement in time t is zero

$$\therefore t = \frac{2v}{f} \quad .....(2)$$




$$h = \frac{2gv^2}{f^2}$$

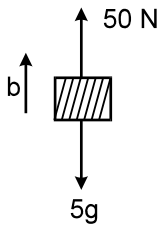
**2.**




$50 - 2g = 2a \qquad \frac{50 - 19.6}{2} = a$

$a = 15.2$ m/sec$^2$ upwards

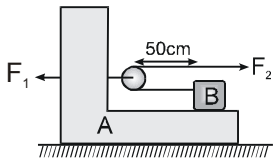
As the acceleration of both the masses is upward.




and also ; $50 - 5g = 5b$

$$\frac{50 - 5 \times 9.8}{2} = b$$

**3.** F.B.D. of A w.r.t. grivel




$F_1 - 2F_2 = m_A\ a_A$

$\Rightarrow\ 20 - 2 \times 8 = 1\ a_A$

$\Rightarrow\ a_A = 4\ m/s^2$

F.B.D. of B w.r.t. A

So $F_2 - ma_A = ma_{BA}$

$\Rightarrow 8 - 1 \times 4 = 1\ a_{BA} \Rightarrow a_{BA} = 4m/s^2$

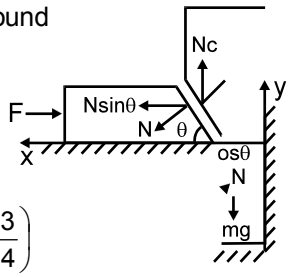
**4.** For equli. of block (A)

$F = N\sin\theta$

$N = F/\sin\theta$

To lift block B from ground

$N\cos\theta \geq mg$




$\frac{F}{\sin\theta}\cos\theta \geq mg$

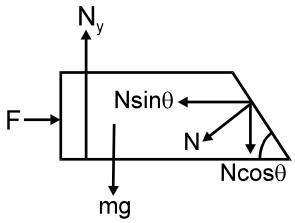
$F \geq mg\tan\theta = mg\left(\frac{3}{4}\right)$

So $F_{min} = \frac{3}{4}mg$

**5.** If both the blocks are stationary,

Balancing forces along x-direction

$F = N\sin\theta \quad \Rightarrow N = F/\sin\theta$




Balancing forces along y-direction

$N_y = mg + N\cos\theta$

$= mg + \left(\frac{F}{\sin\theta}\right)\cos\theta = mg + F\cot\theta$

$N_y = mg + \frac{4F}{3}$

**6.** To keep regular
contact $a \sin\theta = b \cos\theta$

$$b = a \tan\theta = \frac{3}{4}a$$