DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : PHYSICS
DPP No. : 2

Topic :- LAWS OF MOTION

1 **(c)**

Let T be the tension in the rope and a the acceleration of rope. The absolute acceleration of man is, therefore, $\left(\frac{5g}{4} - a\right)$. Equations of motion for mass and man gives:

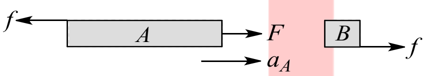
$T - 100g = 100a$ (i)

$T - 60g = 60\left(\frac{5g}{4} - a\right)$ (ii)

Solving (i) and (ii), we get $T = \frac{4875}{4}N$

2 **(a,b,c)**

As the acceleration of A and B are different, it means there is relative motion between A and B. The free-body diagram of A and B can be drawn as below



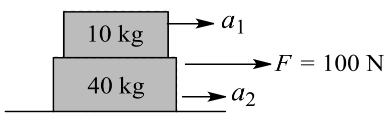
For A, $F - f = Ma_A = 50 \times 3$

For B, $f = ma_B = 20 \times 2 \Rightarrow f = 40$ N, $F = 190$ N

3 **(a,b)**

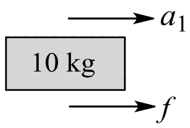
Because mg acts downwards which makes sliding along 4 to be easiest and along 4 to be difficult most

4 **(b,c)**



$F = 10a_1 + 40a_2$

$\Rightarrow 100 = 10a_1 + 40 \times 2 \;\; \Rightarrow \;\; a_1 2 \text{ ms}^{-2}$



So acceleration of A must be 2 ms^{-2} for given conditions to be satisfied

$f \leq f_\ell \Rightarrow 20 \leq \mu m_A g$

$\Rightarrow 20 \leq \mu \times 10g \Rightarrow \mu \geq 0.2$

Hence, m can be greater or equal to 0.2

5 **(a,b,c)**

Here $m_1 g\sin 30° = m_2 g = 20$ N, so there is no tendency of motion in any direction

Hence there is no friction on m_1. Contact force will be only normal force

6 **(a,b,c)**

1. Let acceleration of each block be a

$10g - T_2 = 10a, \quad T_2 - T_1 - f = 3a$

$T_1 - f = 2a, \quad$ where $f = 0.3 \times 2g = 6$ N

From above equations

$10g - 2f = 15a \Rightarrow 10 \times 10 - 2 \times 6 = 15a$

$\Rightarrow a = 88/15 \text{ms}^{-2}$

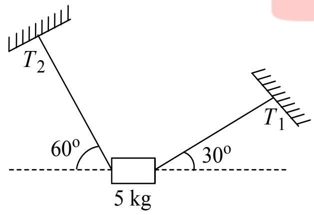
$$T_2 = 10g - 10a = 10 \times 10 - 10 \times \frac{88}{15} = 41.3 \text{ N}$$

$$T_1 = f + 2a = 6 + 2 \times \frac{88}{15} = 17.7 \text{ N}$$

Clearly $T_2 > T_1$

2. This is correct because of greater mass of 3 kg since acceleration is same for both
3. This is incorrect, because net force acting on 10 kg mass is greater due to its larger mass, not due to its acceleration downward

7 **(a,d)**



$T_2 \cos 60° = T_1 \cos 30°$ (i)

And $T_2 \sin 60° + T_1 \sin 30° = 5g$ (ii)

From (i) and (ii)

$T_1 = 25$ N and $T_2 = 25\sqrt{3}$ N

8 **(b,c)**

Force of upthrust will be there on mass m shown in figure, so A weighs less than 2 kg. Balance will show sum of load of beaker and reaction of upthrust so it is reads nore than 5 kg

9 **(b,c)**

Here $F > \mu, mg\left(1 + \frac{m}{M}\right)$, so slipping will occur between the blocks

Fro $mF - \mu_k mg = m.a \Rightarrow a = 1.2$ ms^{-2}

For $M\mu_k mg = MA \Rightarrow A = 0.4$ ms^{-2}

10 **(a,d)**

If initially acceleration of A is greater than that of B, then there will be extension and if that of B is greater than A, then there will be compression in the spring. Otherwise length of spring will remain same

11 **(a,b,c,d)**

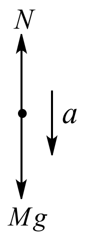
When friction between the blocks becomes zero, the relative sliding between the block will be stopped hence; $v_A = v_B$ and $a_A = a_B$. Also when the friction becomes zero, only forces to move the blocks are F_A and F_B

$$a_A = a_B \Rightarrow \frac{F_A}{m_A} = \frac{F_B}{m_B}$$

12 **(a,c)**

$Mg - T = Ma$ (i)

$T = ma$ (ii)



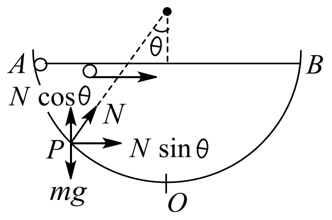
Solving (i) and (ii), $a = \frac{Mg}{M+m}$

FBD of man

$$Mg - N = Ma \Rightarrow N = \frac{Mmg}{(M+m)}$$

13 **(a)**

At A the horizontal speeds of both the masses is the same. The velocity of Q remains the same in horizontal as no force is acting on the horizontal direction. But in case of P as shown at any intermediate position, the horizontal velocity first increases (due to $N\sin\theta$), reaches a maximum value at O and then decreases. Thus it always remains greater than v, Therfore, $t_P < t_Q$



14 **(c)**

$$a = \frac{F}{m} = \frac{5 \times 10^4}{3 \times 10^7} = \frac{5}{3} \times 10^{-3}\ \text{ms}^{-2}$$

$$v = \sqrt{2as} = \sqrt{2 \times \frac{5}{3} \times 10^{-3} \times 3} = 0.1\ \text{ms}^{-1}$$

15 **(b,d)**

Option (a) is wrong since Earth is an accelerated frame and hence cannot be an inertial frame

Option (b) is correct

Option (c) is incorrect; strictly speaking as Earth is accelerated reference frame (earth is treated as a reference frame for practical examples and Newton's law's are applicable to it only as a limiting case)

Option (d) is correct

16 **(a,b,d)**

Newton's second law is $\vec{F} = \frac{d\vec{p}}{dt}$, which itself explains the validity of the given statements

17 **(d)**

Rate of flow water $\frac{v}{t} = 10\ \mathrm{cm^3 s^{-1}}$

$= 10 \times 10^{-6}\ \mathrm{m^3 s^{-1}}$

Density of water $\rho = \frac{10^3 \mathrm{kg}}{\mathrm{m^3}}$

Cross-sectional area of pipe $A = \pi(0.5 \times 10^{-3})^2$

Force $= m\frac{dv}{dt} = \frac{mv}{t} = \frac{V\rho v}{t} = \frac{\rho v}{t} \times \frac{v}{At}$

$= \left(\frac{v}{t}\right)^2 \frac{l}{A} \quad \left(\therefore v = \frac{v}{At}\right)$

$$F = \frac{(10 \times 10^{-6})^2 \times 10^3}{\pi \times (0.5 \times 10^{-3})^2}$$

$= 0.127$ N

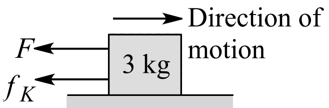
18 **(a)**

Since, $\mu\, mg\cos\theta > mg\sin\theta$

Force of friction is $f = mg\sin\theta$

19 **(b,c,d)**

For some time, the block won't move due to friction force. When $F > f_L$, the motion of block starts



$$a = \frac{F - f_k}{m} = \frac{kt - f_k}{m} \Rightarrow \frac{dv}{dt} = a = \frac{kt - f_k}{m}$$

$$v = \frac{\frac{kt^2}{2} - f_k t}{m} \Rightarrow \frac{ds}{dt} = \frac{\frac{kt^2}{2} - f_k t}{m} \Rightarrow s = \frac{\frac{kt^3}{6} - \frac{f_k t^2}{2}}{m}$$

20 **(b)**

$F = m\frac{dv}{dt} = 0.05 \times \frac{100}{0.02} = 250$ N

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	C	A	B	C	C	A	B	C	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	A	C	B	A	D	A	B	B