31/07/24 HOME ASSIGNMENT

- Numericals :-

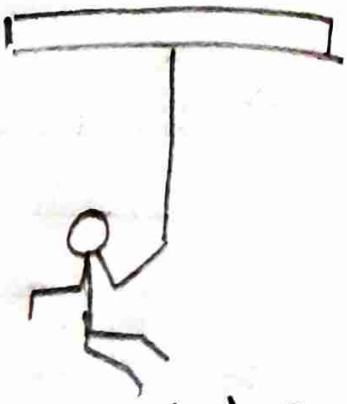
1. A 5kg body collides with a 20kg body and exerts 20N force on it. So force exerted by 20kg body on 5kg body is

(c) 20N

2. A man of mass 50 kg is pulling (being suspended from) a light rope suspended from a roof. By what force the rope is pulling the roof?

Ans) weight = $mg = 50 \times 9.8\ N = 490\ N$

3. A man of mass 50 kg is pulling (being suspended from) a rope of mass 5 kg suspended from a roof. By what force the rope is pulling the roof?



Ans) weight = $mg = (50+5) \times 9.8 = 55 \times 9.8\ N$
$= 539\ N$

(9) A pendulum bob of mass 50g is suspended from the ceiling of an elevator. Find the tension in the string of the elevator.

(a) goes up with acceleration $1.2\ m/s^2$

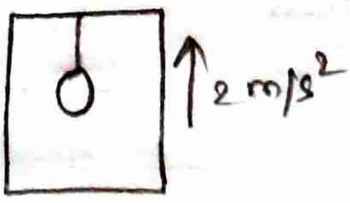


Fig-1

Fig-2

$T - (W + 0.06 \times 1.2) = 0$

$\Rightarrow T = 0.05 \times 9.8 + 0.05 \times 1.2$

$= 0.55\ N$

(b) goes up with deceleration $1.2 m/s^2$

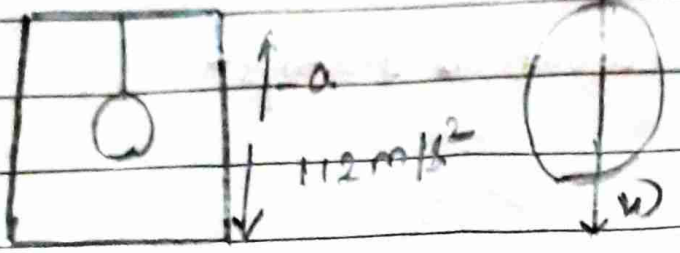


Fig-3 Fig 4

$\therefore T + 0.05 \times 1.2 - 0.05 \times 9.8 = 0$

$\Rightarrow T = 0.05 \times 9.8 - 0.05 \times 1.2 = 0.43N$

(c) goes up with uniform velocity

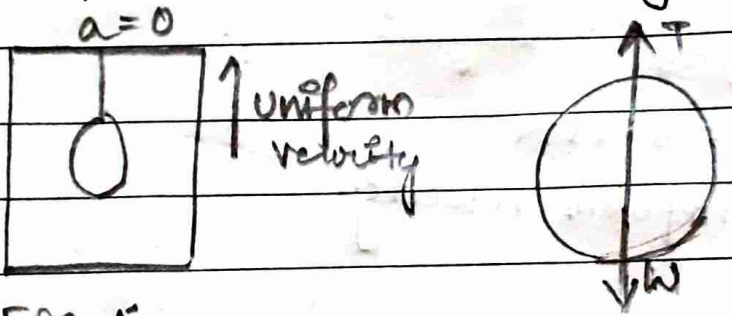


Fig-5 Fig-6

When the elevator makes uniform motion

$T - W = 0$

$\Rightarrow T = W = 0.05 \times 9.8$

$= 0.49N$

(d) goes down with acceleration $1.2 m/s^2$

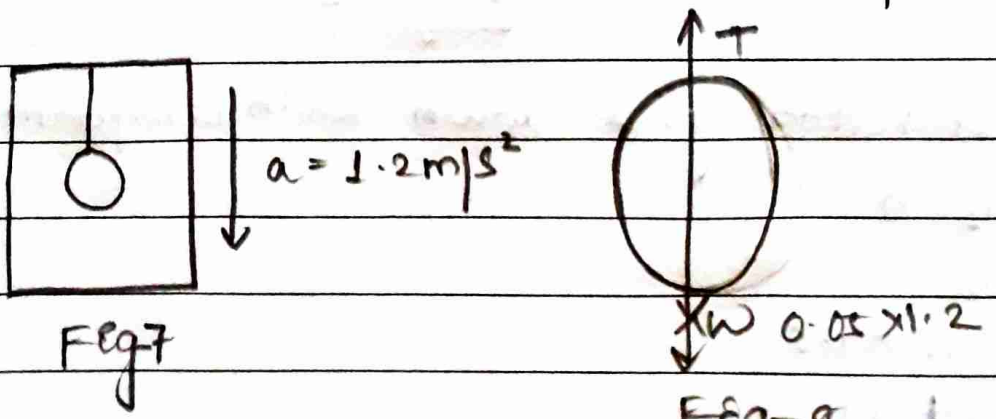


Fig-7 Fig-8

$T + 0.05 \times 1.2 - W = 0$

$\Rightarrow T = W - 0.05 \times 1.2 = 0.43N$

(ii) goes down with deceleration $1.2\ m/s^2$

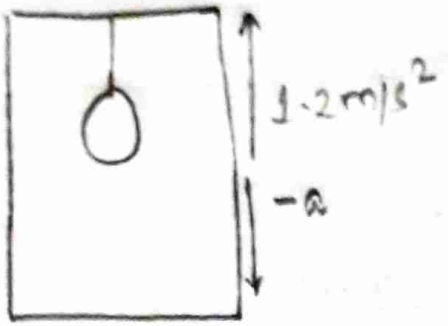


Fig-9

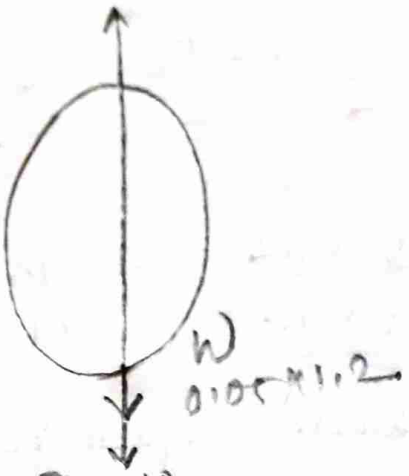


Fig-10

$T - (W + 0.05 \times 1.2) = 0$

$\Rightarrow T = W + 0.05 \times 1.2 = 0.55N$

(iii) goes down with uniform velocity.

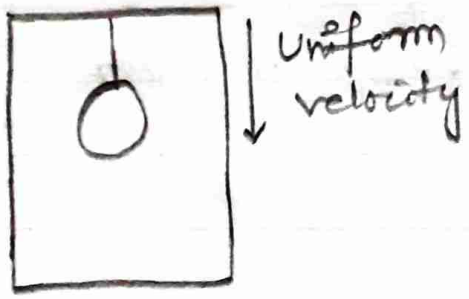


Fig-11

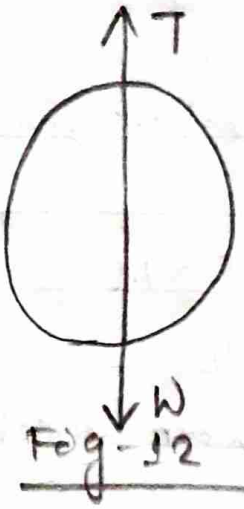


Fig-12

When the elevator goes down with uniform velocity acceleration = 0

$T - W = 0$

$\Rightarrow T = W = 0.05 \times 9.8$

$= 0.49N$

(9) A monkey of mass 40 kg climbs on a rope (as shown in figure) which can stand a maximum tension of 600 N. In which of the following cases will the rope break? the monkey

(a) climbs up with an acceleration of 6 m/s²

(b) Climbs down with an acceleration of 4 m/s².

(c) climbs up with a uniform speed of 5 m/s¹

(d) falls down the rope freely under gravity. (Ignore the mass of the rope).

Case-(a) :-

When the monkey climbs up with an acceleration, a, then = T − mg = ma where T represents the tension in figure

∴ T = mg + ma = m(g + a)

or T = 40 kg (10 + 6) m/s² = 640 N

But the rope can withstand a maximum tension of 600 N. So the rope will break