Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

6 Connected particles

Exercise A, Question 7

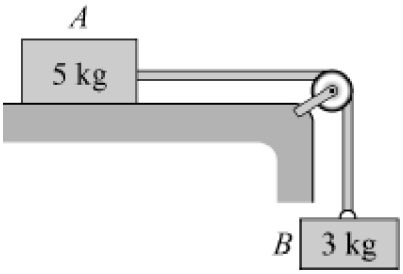
Question:

The diagram shows a mass A of 5 kg initially at rest on a horizontal table. A resistance force of 10 N acts against the motion of A which is connected to mass B of 3 kg by a light, inextensible string which passes over a smooth pulley. The system is released from rest.

(a) Calculate the acceleration of A.

(b) Calculate the tension in the string.
After a short time, B reaches the floor.

(c) Calculate the acceleration of A now.

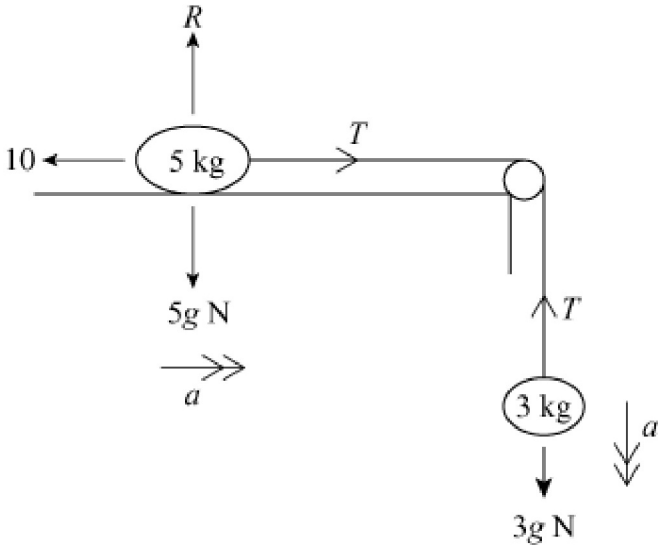


Solution:

(a) Using $F = ma$

for 3 kg mass;	$3g - T$	$= 3a$
for 5 kg mass;	$T - 10$	$= 5a$ [1]
Adding	$3g - 10$	$= 8a$
a		$= 2.425$

Acceleration is 2.43 m s^{-2}



(b) From [1] $T - 10 = 5 \times 2.425$
$T = 22.125$

Tension is 22.1 N

(c) After 3kg reaches the floor, tension in string becomes zero 5 kg mass starts decelerating.

Using $F = ma$ (horizontally) for 5 kg mass
$10 = 5a$
$\therefore a = 2$

$\therefore$ Acceleration is -2 m s^{-2}
($-$ because the mass is decelerating)