

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

6 Connected particles

Exercise A, Question 23

Question:

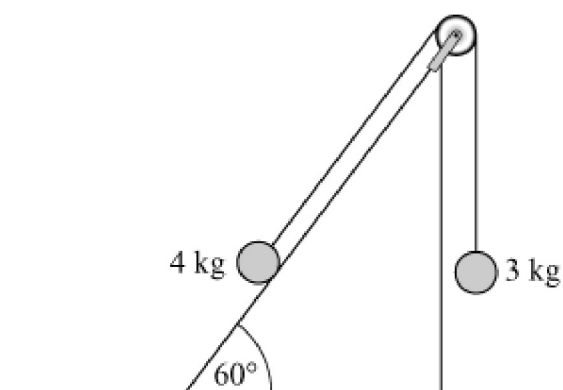
Two particles are connected by a light string that passes over a smooth, light pulley as shown in the diagram. The 4 kg particle is on a smooth, fixed slope, which is at an angle of 60° to the horizontal. The 3 kg particle hangs with the string vertical.

The particles are released from rest at the position shown.

(a) Show that the acceleration of the particles is approximately 0.65 m s^{-2} .

(b) By considering the 3 kg particle, determine the tension in the string.

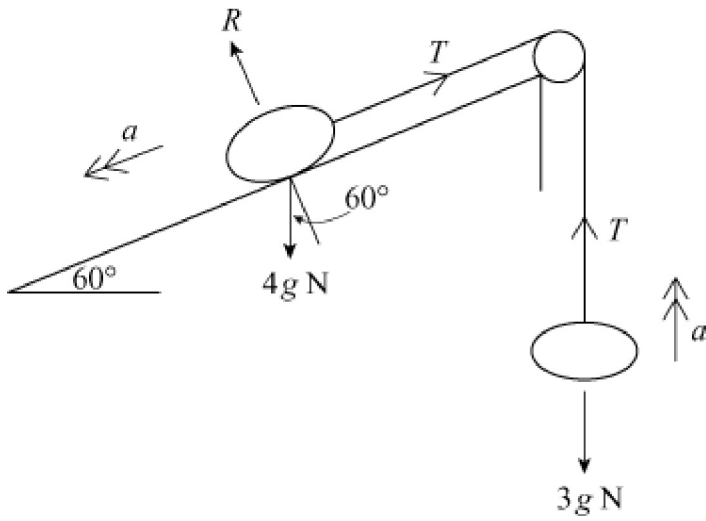
[A]



Solution:

$$\begin{aligned}
 &\text{Using } F &&= ma \text{ for} \\
 &3 \text{ kg particle; } T - 3g &&= 3a \quad [1] \\
 &4 \text{ kg particle (along the slope); } 4g \sin 60^\circ - T &&= 4a \\
 \text{(a)} &\text{Adding } 4g \sin 60^\circ - 3g &&= 7a \\
 &7a &&= 4.548 \\
 &\therefore a &&= 0.6497
 \end{aligned}$$

\therefore Acceleration of the particles is approximately 0.65 m s^{-2}



(b) From [1]

$$\begin{aligned}
 T &= 3g + 3a \\
 &= 3g + 3 \times 0.6497 \\
 &= 31.349
 \end{aligned}$$

\therefore Tension is 31.3 N.

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