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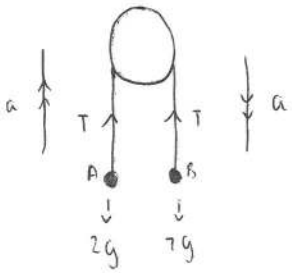
Chapter 10 Problem Solving Set B

Bronze:



a) i) $F = ma$ (↑)
$T - 2g = 2a$

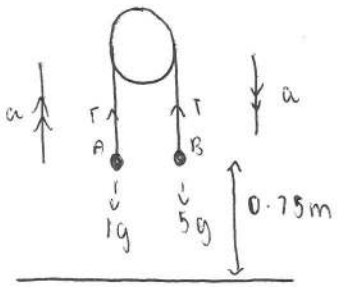
ii) $F = ma$ (↓)
$7g - T = 7a$

b) $T = 2a + 2g$
$T = 7g - 7a$ } sim equation

$2a + 2g = 7g - 7a$
$9a = 5g$
$a = \frac{5}{9}g$

c) This means that you can assume that the tension in the string will be the same on both sides of the pulley.

Silver:



a) $F = ma$ (↑) (A)
$T - 1g = 1a$ → $T = 1a + 1g$

$F = ma$ (↓) (B)
$5g - T = 5a$ → $T = 5g - 5a$ } sim equation

$1a + 1g = 5g - 5a$
$6a = 4g$
$a = \frac{4}{6}g = \frac{2}{3}g$

$a = \frac{19.6}{3} = 6.533\ ms^{-2}$

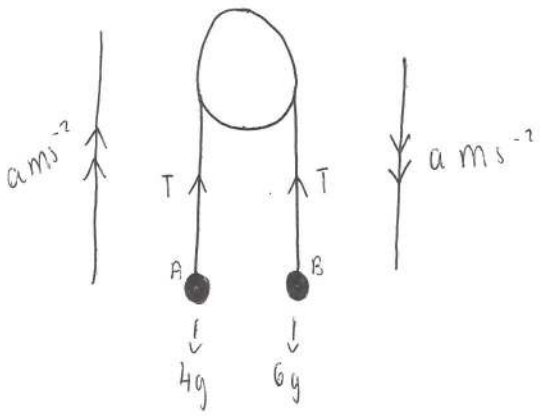
$s = 0.75$
$u = 0$
$v = ?$
$a = 6.533$
$t =$

$v^2 = u^2 + 2as$
$v^2 = 0^2 + 2(6.533)(0.75)$
$v^2 = 9.7995$
$v = 3.13\ ms^{-1}$

b) $s = 0.75$
$u = 0$
$v =$
$a = 6.533$
$t = ?$

$s = ut + \frac{1}{2}at^2$
$0.75 = 0 \times t + \frac{1}{2}(6.533)t^2$
$0.75 = 3.2665t^2$
$t^2 = \frac{0.75}{3.2665} = 0.2296$
$t = \sqrt{0.2296} = 0.48s$
(to 2sf)

Gold:



$F = ma$ (↑) (A)

$T - 4g = 4a$

$T = 4a + 4g$

$F = ma$ (↓) (B)

$6g - T = 6a$

$T = 6g - 6a$

sim equation

$4a + 4g = 6g - 6a$

$10a = 2g$

$a = \frac{g}{5} = \frac{9.8}{5} = 1.96 ms^{-2}$

Velocity of A when B hits the ground:

$s = 2$

$u = 0$

$v = ?$

$a = 1.96$

$t =$

$v^2 = u^2 + 2as$

$v^2 = 0^2 + 2(1.96)(2)$

$v^2 = 7.84$

$v = 2.8 ms^{-1}$

Upward motion of A after B hits the ground:

$s = ?$

$u = 2.8 ms^{-1}$

$v = 0$ → greatest height reached

$a = -9.8$ (travelling upwards)

$t =$

$v^2 = u^2 + 2as$

$0^2 = 2.8^2 + 2(-9.8)s$

$0 = 7.84 - 19.6s$

$19.6s = 7.84$

$s = 0.4m$

$0.4 + 0.4 = 0.8m$