5 Fig. 5.1 and Fig. 5.2 show an amusement park ride that rotates passengers strapped onto a platform in a vertical circular motion about a pivot. The platform is 8.4 m away from the pivot and there is a counter-weight at the other end of the rotating arm, 3.0 m away from the pivot. The mass of the counter-weight and fully loaded platform are 200 kg and 2000 kg respectively.

The platform is initially brought to the highest position shown in Fig. 5.1 where it is turned upside down and then released from rest. The counter-weight and platform subsequently swings about the pivot until the counter-weight is at the highest position as shown in Fig. 5.2. The speed of the counter weight at that instant is u_c and that of the platform is u_p.

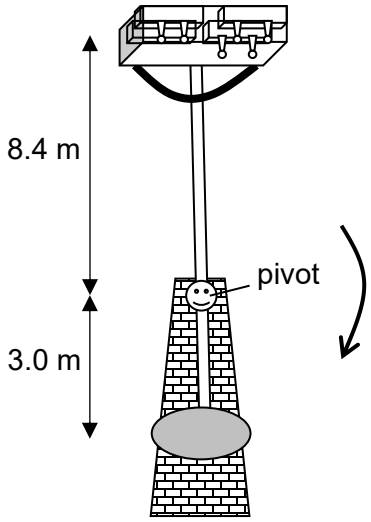

Fig. 5.1

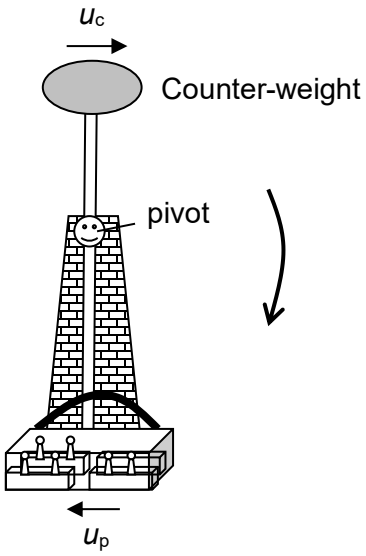

Fig. 5.2

(a) Show that the ratio of $\frac{u_p}{u_c} = 2.8$.

[1]

(b) Hence, show that the speed u_p of the platform when it is at the lowest position is 17.7 m s^{-1}.

[2]

(c) Consider a man with a mass of 70 kg on the ride when the platform is at the lowest position. Given that the force strapping the man to the platform at this position is 100 N, calculate the reaction force which the platform exerts on this man. Explain your working.

reaction force = ... N [3]

(d) When the man is just about to reach the top of the path as shown in Fig. 5.3, his handphone slips from his hands. State and explain the subsequent path of his handphone until it hits the ground.

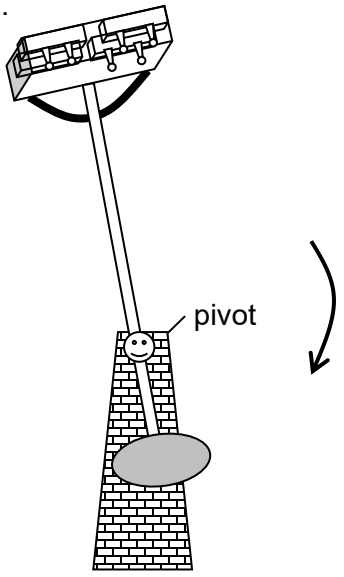

Fig. 5.3

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[2]

[Total: 8]