University Physics 1A

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Air resistance

One model of air resistance:

$$F_{air} = K_1 v^2$$

This model has many common everyday uses. Another model uses a constant for K_2 depending on the size, shape, and other properties of the object.

$$F_{air} = K_2 v$$

For a falling object:

$$F_{net} = F_{air} - mg$$

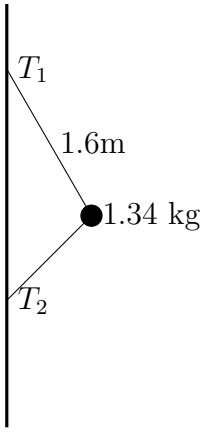
For some v, $F_{air} - mg = 0$, which means the acceleration is 0. This is the point at which the object has reached "terminal velocity".

$$K_1 v^2 - mg = 0$$

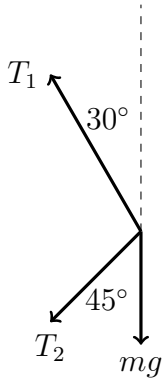
$$v^2 = \frac{mg}{K_1}$$

Practice Problem

A ball of mass 1.34kg is attached to a vertical rod by two strings. The top string is 1.60m long and makes a 30.0° angle with the rod, while the bottom string makes a 45.06° angle with the rod. The rod is rotated at 1 revolution every 1.20s. Find the tension in each string.



Free body diagram:



$$\frac{1rev}{1.2s} = \frac{2\pi r}{1.2s}$$
$$= 4.189\frac{m}{s}$$

Horizontal net force:

$$-T_1\sin(30) - T_2\sin(45) = ma_x = -m\frac{v^2}{r}$$
$$T_1\sin(30) + T_2\sin(45) = 29.39N$$

Vertical net force:

$$T_1\cos(30) - T_2\cos(45) - mg = ma_y = 0$$
$$T_1\cos(30) - T_2\cos(45) = 13.13N$$

Solving for the system of equations:

$$T_1 = 31.1N$$
$$T_2 = 19.5N$$

Reminders and Homework

Complete the homework on TheExpertTA and WebAssign.
Remember to bring the Activities Manual.

You can find all my notes at `http://omgimanerd.tech/notes`. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech