

### Skydiving

What are some factors that affect the amount of air resistance a falling object experiences?

speed, mass, surface area (size/shape)

Compare the force of gravity to the force of air resistance for this 100. kg skydiver. Compare the acceleration in each diagram.

Diagram A

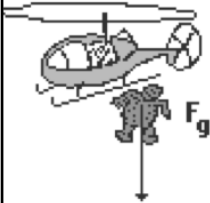


Diagram B



Diagram C

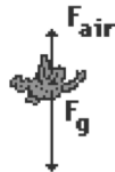
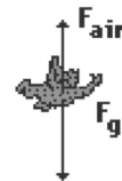
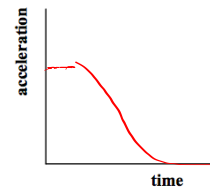
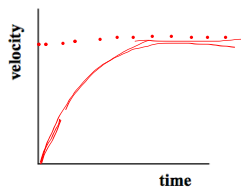


Diagram D



3. Sketch how the magnitude of the skydiver's velocity and acceleration vary with time as he falls.



4. What happens when the force of air resistance equals the force of gravity?

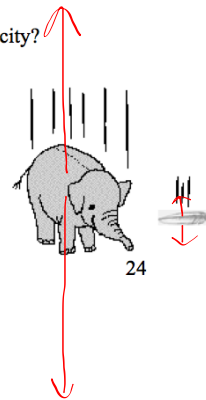
$$\Sigma F = 0 \quad a = 0$$

Terminal velocity: **highest speed possible for a particular falling object**

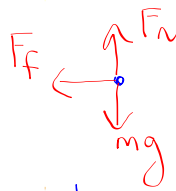
5. What is the force of air resistance acting on a 60 kg skydiver at terminal velocity?

$$600N$$

6. Which experiences a greater force of air resistance: an elephant or a feather? Explain.



The acceleration of gravity is  $9.8 \text{ m/s}^2$ .  
 Calculate the acceleration of the car in front of you when it brakes.  
 Answer in units of  $\text{m/s}^2$ .



$$\begin{aligned}
 a &= \frac{2F}{m} \\
 &= \frac{F_f}{m} \\
 &= \frac{\mu F_n}{m} \\
 &= \frac{\mu mg}{m}
 \end{aligned}$$

**010 (part 2 of 3) 10.0 points**  
 Calculate the braking distance for the car in front of you.

Answer in units of m.

$$v_f^2 = v_o^2 + 2ad$$

**011 (part 3 of 3) 10.0 points**  
 Find the minimum safe distance at which you can follow the car in front of you and avoid hitting it (in the case of emergency braking described here).

Answer in units of m.

$$d = v_o t + \frac{1}{2} a t^2$$