Name

In the lab today, we are going to be investigating the big question as to why astronauts are weightless in space and to enhance our understanding of gravity.

**Observations**

Think back to times you were riding inside an elevator. How did you feel (lighter, heavier, or the same) in each of the following four cases compared to standing in front of the elevator:

A. Standing on an elevator before it starts moving.

B. Going upwards from the ground floor as the car started to speed up.

C. Going upwards at a constant speed.

D. Slowing down while going upwards as you approach your floor.

E. Standing on the elevator before it starts moving down.

F. Going down to the ground floor as the car started increasing in speed moving down.

G. Going downwards at a constant speed.

H. Coming to a stop as you approach the ground floor.

**Patterns and Models**

Do you notice any patterns in the above situation?

What is a possible model you could create to help explain those patterns you just described?

**Testing your Model**

According to the model you developed, what might happen if the acceleration downward matched that of *g*?

Can you think of a situation where this happens?

Watch this video and see if the video supports or challenges your model. <https://www.youtube.com/watch?v=6NvBGb5lf78>



**Applications in Space**

What are some reasons that a person may give that an astronaut is weightless in space?

Open the AR simulation you have just downloaded. Before you do anything, play around with the simulation a little bit.

Click on Planet Earth. Put in a low velocity and a very high velocity. Describe what you observe in both cases.

What velocity is a sweet spot? (One in which the object does not crash into the earth or travels away from Earth and is moving in a circular pattern around the Earth).

Describe in your own words what is happening to the object.

If this object were a ship and you were in it, how would your body be reacting to this?

Why are astronauts weightless in space?