



1L20.10/8C20.00 Gravitational Well

1L20.10: To illustrate orbital motion in a gravitational potential well.

8C20.00: To model the curvature of space surrounding objects with large mass.

DESCRIPTION A latex rubber membrane is stretched across the mouth of a large pot. A heavy lead ball placed in the center distorts the surface and creates a potential well. A second, much lighter ball with a small initial tangential velocity orbits the central mass a few times before falling into the well. Alternatively, a much larger gravity well can be used to improve visibility and allow the lighter ball to complete more orbits before falling into the well.

[DEFAULT VIDEO](#)

SUGGESTED TECHNIQUE

Default (Small Bucket) and Alternative (Large Gravity Well):

1. Begin with no masses in the gravity well.
2. Roll the lighter ball (or marbles for alternative option) across the surface of the membrane. Note it travels in a straight line path.
3. Place the large mass in the center of the gravity well.
4. Roll the lighter ball (or marble) past the large mass a few times. Vary the initial speed and direction of the small mass's trajectory each time. When the small mass moves along a trajectory far enough away from the large mass, its path only bends around the large mass and it continues on. However, when the small mass moves along a trajectory which brings it close enough to the large mass, it becomes trapped in orbit. Demonstrate both effects.

TECHNICAL DETAILS

LOCATION OF APPARATUS

EQUIPMENT	LOCATION
Curved Space Bucket (Default)	Astronomy A
Lead Ball (Default)	Mechanics F
Black Cloth (Default)	Below Modern Physics B
Light Ball (Both)	General Use
Large Gravity Well (Alternative)	Room 066A
Bowl with Large Gravity Well	Astronomy A

Accessories and Balls (Alternative)	
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LOCATION OF COMMON ACCESSORIES

SETUP INSTRUCTIONS

Default (Small Bucket): Setup Time ~20 min

1. Stretch the latex sheet across the mouth of the pot and tighten the band below the lip to hold the latex in place.
2. Provide the lead ball and lighter ball.
3. Cover the bucket with black cloth if requested (see photo below).
4. You may need to set up a camera to project the image of the gravity well to the class.



Alternative (Large Gravity Well): Setup Time ~30 min

1. The gravity well ring should already be assembled. Attach the base to the gravity well ring.
2. Stretch the large black cloth across the ring as tightly as possible, holding it in place with the round clips.
3. Provide the large metal ball and the small marbles from the large gravity well accessories bowl. The light ball from the default option can also be provided.

[LINK TO VIDEOS](#)

ADDITIONAL RESOURCES