Name:_____ Date:_____ Block:_____

Black Hole Lab: Tin Foil, Balloons, and Black Holes

Goal: To conceptualize the formation of a black hole.

Materials:

- Round balloon
- Several feet of tin foil
- Balance or scale
- Ruler
- Tape

Procedures:

1. Blow up the balloon so that it has a diameter of about 5 inches. Tie the end so it remains inflated.
2. Cover the outside of the balloon with tin foil so that it stays on the balloon. Be generous with the tin foil and cover the balloon thoroughly. It works best if you can use long sheets and wrap it around twice, rather than using several sheets. Use tape if necessary. We will consider this to be our star, with the balloon representing the "core" and the tin foil representing the "outer layer material".
3. Mass the star on the scale and record this (and all future measurements) in the data table.
4. Now, squeeze your star such that the balloon bursts inside the tin foil. (Think of this as the simulation of the enormous mass of the star collapsing inward toward the core.)
5. Carefully crumple the tin foil into a *loosely compacted* ball. Mass it, measure and record its diameter.
6. Now crush it into a smaller ball. Mass it, measure and record its diameter.
7. Crush it into as small a ball as you can with your hands. Mass it, measure and record it's diameter.

	Mass	Diameter	Volume ($4/3 \pi r^3$)	Density
Full Balloon (Step 3)				
Loosely Compacted star (Step 5)				
Smaller star (Step 6)				
Smallest star (Step 7)				

Conclusion Questions:

1. What do you notice about the mass of the crumpled ball as the size of the ball changes?

2. What do you notice about the change in the density of the ball?

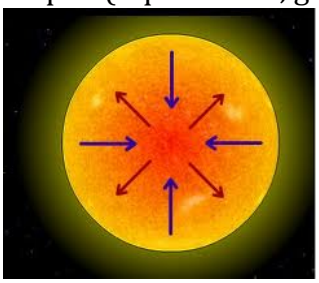
3. How do you change the density of the star by simply compressing it? What is actually happening to cause this change?

4. What accounts for the actual change in density of a real star?

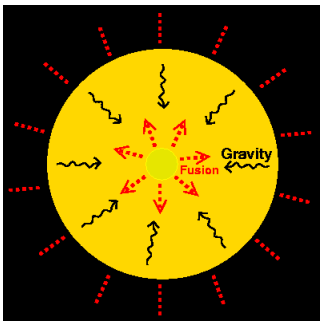
Black Hole Lab Formation Steps

Describe the steps that happen to a star as it dies and forms into a black hole. Use the Key Terms in each of the descriptions.

Step 1: (Equilibrium, gravity, nuclear fusion, fuel)



Step 2: (Gravity, depleted fuel, nuclear fusion, dominate force)



Step 3: (Supernova, gravity, crushing, infinite density, singularity)

Step 4: (Bending light, event horizon)