**Differentiation** – Worksheet to follow the viewing of the demonstration movie available at:

<http://astro.unl.edu/video/demonstrationvideos>

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| **Row** | **Quantity #1** | **Comparison** | **Quantity #2** |
| **A** | the density of Al | **> = <** | the density of Pb |
| **B** | the mass of 1 kg of Al | **> = <** | the mass of 1 kg of Pb |
| **C** | the volume of 1 kg of Al | **> = <** | the volume of 1 kg of Pb |
|  | Two cubes of Pb  are merged  (used in rows D and E) | | |
| **D** | the density of the original left cube | **> = <** | the density of the new object (merged cubes) |
| **E** | the mass of the original left cube | **> = <** | the mass of the merged cubes |
|  | A cube of Al is sliced into  two pieces (one 2/3 of the volume,  one 1/3 of the volume)  (used in rows F and G) | | |
| **F** | the volume of the left (split) piece of Al | **> = <** | the volume of the right (split) piece of Al |
| **G** | the density of the left (split) piece of Al | **> = <** | the density of the right (split) piece of Al |

1. The following quantities are related to cubes of Aluminum (ρAl =2.7 g/cm3) and Lead (ρPb=11.3 g/cm3). (Note ρWater=1.0 g/cm3). Indicate how the two quantities compare by circling the appropriate comparison operator.

2. A hypothetical planet forms that is composed of 1/3 Al, 1/3 Pb, and 1/3 Fe (ρFe=7.8 g/cm3) by volume. After formation the object’s temperature rises due to heat from radioactive decays and it becomes completely molten. It then differentiates and later cools and solidifies. Sketch a cut-away diagram of the object labeling the composition of any distinct regions.

3. A chef creates a new dressing that is half oil (ρoil =0.9 g/cm3) and half aged balsamic vinegar (ρVin =1.2 g/cm3) by volume. The mixture is well-shaken and three black cherry tomatoes (ρCTom =1.1 g/cm3) are added for decoration. Sketch the final appearance of the dressing container after considerable time has passed indicating the composition of any distinct regions.