Part 3: Understanding Hot Air Balloons With Physical Properties

1. What **three** primary factors control the density of air? [Hint: these relate to the data you enter into the online density calculator.] For each of these factors, describe its effect on air density. In other words, if the factor increases, what happens to air density? What happens if it decreases?

Factor #1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What happens to air density when factor 1 increases?

Explain why:

Factor #2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What happens to air density when factor 1 increases?

Explain why:

Factor #3: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What happens to air density when factor 1 increases?

Explain why:

2-5. For these problems, consider a hot air balloon that is hovering in the classroom air (neither rising nor sinking). The density of the air in the classroom is 0.00119g/cm3. The balloon’s volume = 250,000 cm3. When all of the air is removed from the balloon, its mass is 25g. Nothing extra is attached to the balloon.

2. What is the balloon’s overall density while it is hovering in the air? Explain how you know.

3. What is the **total** mass of the hovering balloon and all of the air inside?

4. What is the mass of the hot air inside the hovering balloon?

5. What is the density of that hot air?

Assume for these questions that a hot air balloon includes all of the parts of the balloon, plus the hot air inside.

6. In class, we used a hot air blower (like a hairdryer) to pre-fill the balloons with warm air. As we were doing this, what happened to the balloon’s…

a. Mass? b. Volume? c. Density? d. Weight?

7. After the balloon was filled with warm air, a flame was lit inside the balloon. The balloon got hotter and hotter, but it was no longer getting bigger. During this process, what was happening to the balloon’s…

a. Mass? b. Volume? c. Density? d. Weight?