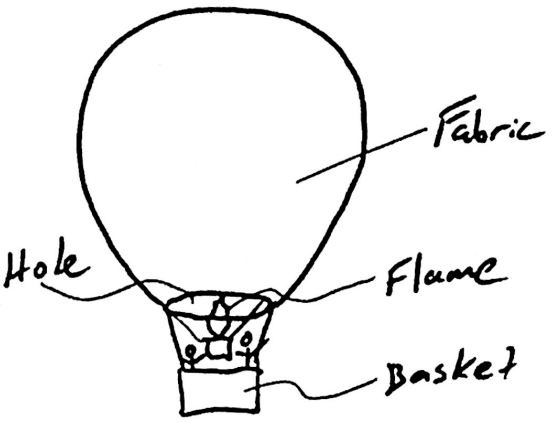
Key

ESS 100 (Stapleton)
Hot Air Balloon Practice

A hot air balloon is basically a big bag with a hole in the bottom. Below the hole is a basket for passengers and a burner to create a flame. When a hot air balloon is sinking, it can be made to rise by turning on the flame and heating the air inside the balloon. There are two processes that can cause a hot air balloon to rise when the air gets heated. They can work alone, or they can work together.



1. Explain how heating the air in the balloon can make the balloon rise by ~~changing the volume~~ getting bigger of the balloon **but** ~~keeping the mass the same~~. In this case... same air

   a. If the balloon is rising, what is happening to its density?

   Density is decreasing!

   b. What happens to the motion of the air particles in the balloon when the flame is turned on.

   Heating speeds them up

   c. How does the volume of the balloon change? What makes it change?

   Volume increases, because the air molecules spread out as they get faster. Heated air expands.

   d. If the overall mass of the balloon is staying the same, what does that tell you about the air in the balloon? What is that air doing or not doing?

   No air is entering or leaving the balloon. It's all the same air; just expanding.

   e. Explain why the density of the balloon is changing. Give an answer that shows that you understand what density means.

   Density is crowdedness. There is the same amount of air, but since it is more spread out it is less crowded (less dense).

   f. How does heating the air in the balloon change its pressure?

   Heating increases pressure.

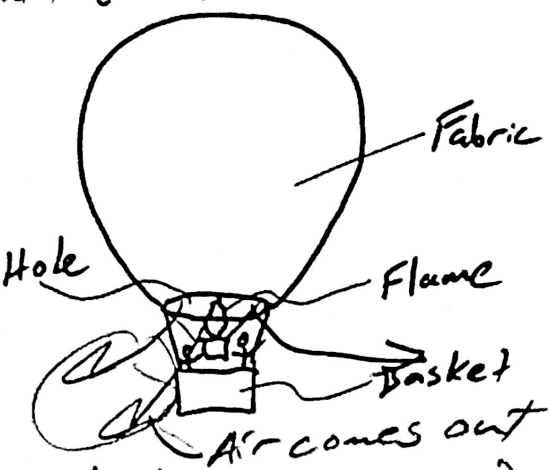
   g. What role does this pressure change play in this process of the balloon rising?

   Stronger pressure pushes the sides outward, making the balloon expand. This makes it less crowded (less dense) than the air around it, so it floats.

2. Explain how heating the air in the balloon can make the balloon rise by changing the mass of the balloon but keeping the volume the same.

It's losing stuff (mass)

Same size



a. If the balloon is rising, what is happening to its density?

It must be getting less dense!

b. If the volume is remaining the same, is the balloon's overall mass increasing or decreasing? Explain your reasoning.

If it's getting less crowded (less dense), and it's size is the same, it must be losing stuff (losing mass).

c. Why is the mass of the balloon changing in this way? What is causing the change?

The air inside is expanding, but the balloon isn't growing, so the air can no longer fit. Some air comes out of the hole.

d. How does heating the air in the balloon change its pressure?

Heating makes the air molecules move faster, so they push harder against the sides of the balloon. This push is pressure.

e. What role does this pressure change play in this process of the balloon rising?

The stronger air pressure causes air to push outward. The air near the hole pushes right out of the hole and leaves the balloon.