Name_____

AP Physics 2 Review Questions

Integrating Content, Inquiry and Reasoning

Two balloons of negligible mass are filled with gases to equivalent volumes. Balloon A contains helium (d_{He} = 0.163 g/L). Balloon B contains sulfur hexafluoride (d_{SF_6} = 6.17 g/L). The density of air (at sea-level) is approximately 1.20 g/L.

1. Predict what will occur when the balloons are released from a height of 1.0 m.

2. With respect to Archimedes' principle, explain how you made your predictions.

A new balloon, Balloon C, is filled with 1.5 L of sulfur hexafluoride.

3. Draw a free-body diagram of Balloon C.

4. Predict some changes that could be made to Balloon C to cause it to no longer sink in air.

5. A student proposes the following change to Balloon C: "By adding air to the balloon, the increased volume of the balloon will increase the buoyant force. Do you agree or disagree with the student's proposal? Explain your reasoning.

6. Another student suggests the following: "Adding helium to the balloon will increase the volume of the balloon and decrease the overall density of the contained gases. This will allow the balloon to float."

   a. Do you agree or disagree with the student's proposal? Explain your reasoning.

   b. Verify the student's assertion by calculating the volume of helium needed so that Balloon C neither sinks nor floats.