

CH301
 BOOT CAMP
 EXAM 1 FREE RESPONSE

Name: KEY
 UT EID: _____

1. Recall the He balloon that we described in class yesterday. The balloon was inflated at room pressure and room temperature. Imagine that we place the balloon in a very cold ice bath, and we bring the temperature of the balloon down to -5°C . Draw a "small particle" diagram of the balloon at room temperature. Then draw another "small particle" model diagram of the balloon at the lower temperature.



Since $PV = nRT$
 n - constant
 P - constant
 R - constant

if $T \downarrow$ V must \downarrow

2. How does the number density of the gas in the balloon at -5°C compare to the number density of the gas inside the balloon at room temperature.

Please explain.

number density increases at lower T

Because

$$\frac{n}{V} = \frac{P}{RT}$$

n constant so $\frac{n}{V}$ \uparrow
 $V \downarrow$

same particles distributed over smaller V

3. How does the mass density of the gas in the balloon at -5°C compare to the mass density of the gas inside the balloon at room temperature.

Please explain.

mass density increases at lower T

$$\text{mass density} = \text{molar mass} \times \frac{n}{V}$$

since number density increases with decreasing T , mass density will as well.
 Same amount of gas spread over a smaller volume!