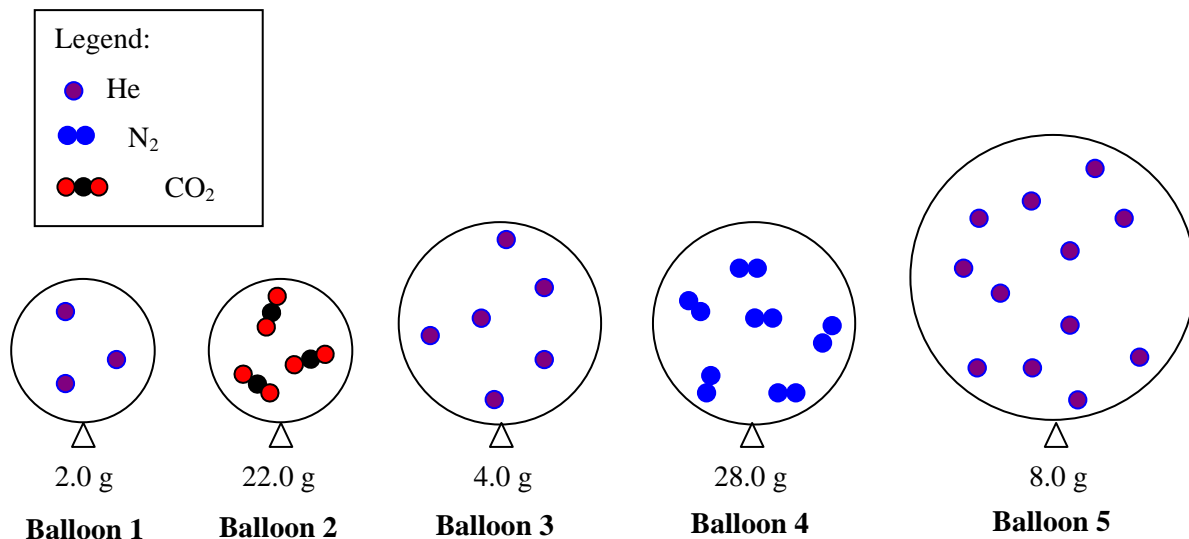


SOLUTION TO Assignment 1 Extra Problem: Comparing Balloons

All five balloons are at the same pressure (1.0 atm) and temperature (273 K).



a) Which balloon has the most gas particles in it?

Balloon 5

b) Which balloon has the greatest total number of atoms in it?

Balloons 4 and 5 have equal quantities of atoms in them

c) The volumes of balloons 3 and 4 are the same. Explain why.

They have the same numbers of particles. Avogadro's hypothesis states that when the pressure and temperature are the same, the number of particles varies proportionally with the volume. It follows that n/V is a constant that depends on p and T . If p and T are the same, then n/V is the same. If two balloons have the same n , then they must also have the same V .

d) Why are the masses of balloons 3 and 4 different?

Even though they have the same n , they do not have the same mass per particle. The molar mass of particles in Balloon 3 is 4.0 g/mol, and the molar mass of particles in Balloon 4 is 28.0 g/mol. Therefore, Balloon 4 should have a mass that is 7 times greater than the mass of Balloon 3.

e) Let's say you want to create a helium (He) balloon with the same mass as balloon 2. Make a drawing of that balloon using the same proportions as in the drawings above.

The balloon should be 11 times bigger than Balloon 1 and should have 11 times as many particles in it (33 particles).

