Combined Gas Law Worksheet

1) If I initially have 4.0 L of a gas at a pressure of 1.1 atm, what will the volume be if I increase the pressure to 3.4 atm?

2) A toy balloon has an internal pressure of 1.05 atm and a volume of 5.0 L. If the temperature where the balloon is released is 20° C, what will happen to the volume when the balloon rises to an altitude where the pressure is 0.65 atm and the temperature is –15° C?

3) A small research submarine with a volume of 1.2 x 10^5 L has an internal pressure of 1.0 atm and an internal temperature of 15° C. If the submarine descends to a depth where the pressure is 150 atm and the temperature is 3° C, what will the volume of the gas inside be if the hull of the submarine breaks?

4) People who are angry sometimes say that they feel as if they’ll explode. If a calm person with a lung capacity of 3.5 liters and a body temperature of 36° C gets angry, what will the volume of the person’s lungs be if their temperature rises to 39° C. Based on this, do you think it’s likely they will explode?
Combined Gas Law Worksheet - Solutions

1) If I initially have 4.0 L of a gas at a pressure of 1.1 atm, what will the volume be if I increase the pressure to 3.4 atm?

\[
(1.1 \text{ atm})(4.0 \text{ L}) = (3.4 \text{ atm})(x \text{ L})
\]

\[
x = 1.29 \text{ L}
\]

2) A toy balloon has an internal pressure of 1.05 atm and a volume of 5.0 L. If the temperature where the balloon is released is \(20^0\) C, what will happen to the volume when the balloon rises to an altitude where the pressure is 0.65 atm and the temperature is \(-15^0\) C?

\[
(1.05 \text{ atm})(5.0 \text{ L})/(293 \text{ K}) = (0.65 \text{ atm})(x \text{ L})/(258 \text{ K})
\]

\[
x = 7.11 \text{ L}
\]

3) A small research submarine with a volume of \(1.2 \times 10^5\) L has an internal pressure of 1.0 atm and an internal temperature of \(15^0\) C. If the submarine descends to a depth where the pressure is 150 atm and the temperature is \(3^0\) C, what will the volume of the gas inside be if the hull of the submarine breaks?

\[
(1.0 \text{ atm})(1.2 \times 10^5 \text{ L})/(288 \text{ K}) = (150 \text{ atm})(x \text{ L})/(276 \text{ K})
\]

\[
x = 767 \text{ L}
\]

4) People who are angry sometimes say that they feel as if they’ll explode. If a calm person with a lung capacity of 3.5 liters and a body temperature of \(36^0\) C gets angry, what will the volume of the person’s lungs be if their temperature rises to \(39^0\) C. Based on this, do you think it’s likely they will explode?

\[
(3.5 \text{ L})/(309 \text{ K}) = (x \text{ L})/(312 \text{ K})
\]

\[
x = 3.53 \text{ L}
\]

It seems unlikely that this very small increase in lung volume would cause somebody to explode, though you never know.