Key

Unit 9: Problem Set 1

1. What is an ideal gas? How does it differ from a real gas?

a) A gas that remains a gas under all conditions.

b) A real gas will change phases with changes in P, V, or T.

2. List three factors that can cause a change of state of a gas.

Change the temp., pressure, or volume of a gas to change its phase

3. Using kinetic-molecular theory, explain why a tire blowout is more likely to happen on a trip in the summer than on one taken in the winter.

↑ Temp = ↑ KE → ↑ Pressure ∴ blowout of a tire
↑ V

4. Use kinetic theory to explain why on a cold autumn morning a camper's air mattress may appear to be somewhat flatter than it was when blown up the afternoon before. Assume no leaks.

↓ Temp = ↓ KE → particles take up less space and hit with less force or ↓ P.

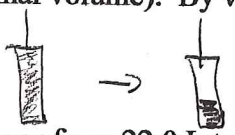
5. During a demonstration, a scientist takes a small, partially inflated balloon out of liquid nitrogen (- 196 °C). As the balloon rests on the table, it begins to expand. Explain this behavior.

↑ T = ↑ KE = ↑ collisions = ↑ Pressure & volume

6. The tank of an air compressor contains gas at normal atmospheric pressure (1 atm). If the compressor motor pumps the equivalent of three extra tanks of air into the compressor tank (4 tanks total), what will be the final pressure?

↑ # of particles by 4 x's in same volume → ↑ P by 4 x's.

7. The end of a bicycle pump is held shut while the plunger is pushed 2/3 of the way down the cylinder (it is 1/3 of its original volume). By what factor has the internal pressure of the gas changed?



$\frac{1}{3}$ less Volume ∴ ↑ P by 3 x's

8. The volume of a gas at 155.0 kPa changes from 22.0 L to 10.0 L. What is the new pressure if the temperature remains constant? *(Use four steps to solve: formula, assignment of varibles, plug in number with labels, answer with label.)*

① $P_1V_1 = P_2V_2$

② $P_1 = 155.0\ kpa$
$V_1 = 22.0L$
$P_2 = X$
$V_2 = 10.0L$

③ $155.0\ Kpa \cdot 22.0L = P_2 \cdot 10.0L$

④ $P_2 = 341\ Kpa$

9. Is it possible for a balloon with an initial internal pressure equal to 250.0 kPa to naturally expand to four times its initial volume (1 L) when the temperature remains constant and atmospheric pressure is 101.3 kPa? *(Use four steps to solve: formula, assignment of varibles, plug in number with labels, answer with label.)*

1. $P_1V_1 = P_2V_2$
2. $P_1 = 250.0\ kpa$ $P_2 = 101.3\ kpa$
$V_1 = 1.0L$ $V_2 = X$
③ $250\ Kpa \cdot 1L = 101.3\ Kpa \cdot V_2$
④ $V_2 = 2.5L \neq 4L$
∴ No