key

GAS LAWS PRACTICE WORKSHEET

Answer each of the following questions using your knowledge of Chemistry.

1. Is it possible for a balloon with an initial internal pressure equal to 250.0 kPa (P_1) to naturally expand to four times its initial volume when the temperature remains constant and atmospheric pressure is 101.3 kPa (P_2)?

$P_1 = 250.0$ kPa
$P_2 = 101.3$ kPa
$V_1 = 1$
$V_2 = x$

$P_1V_1 = P_2V_2$
$(250.0\text{ kPa})(1) = (101.3\text{ kPa})(V_2)$
$2.468 = V_2$

no, it can only expand to 2.468 x its initial volume

2. 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 in the afternoon before. Assume no leaks.

as temp ↓, volume of gas ↓.

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.

As temp ↑, pressure ↑, so more collisions w/ walls of tire & tire could pop.

show video?

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

↑T_1, ↑V

For each of the following problems:
- **identify the equation used and define the variables.**
- **Then solve the problem.**
- **Round final answer to significant figures and label with appropriate units.** ✱convert temps to Kelvin!

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

5. The gas in a sealed can is at a pressure of 3.00 atm (P_1) at 25°C (T_1). A warning on the can tells the user not to store the can in a place where the temperature will exceed 52°C (T_2). What would the gas pressure (P_2) in the can be at 52°C?

$P_1 = 3.00$ atm
$P_2 = x$
$T_1 = 25°C + 273 = 298$ K
$T_2 = 52°C + 273 = 325$ K

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{3.00\text{ atm}}{298\text{ K}} = \frac{x}{325\text{ K}}$

$\frac{298x}{298} = \frac{975}{298}$

$x = 3.27$ atm

6. A sample of neon gas occupies a volume of 752 mL (V_1) at 25°C (T_1). What volume will the gas occupy (V_2) at standard temperature (T_2) if the pressure remains constant? Table A: 273 K

$T_1 = 25°C + 273 = 298$ K
$T_2 = 273$ K
$V_1 = 752$ mL
$V_2 = x$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{752\text{ mL}}{298\text{ K}} = \frac{x}{273\text{ K}}$

$\frac{298x}{298} = \frac{205296}{298}$

$x = 689$ mL

7. A sample of oxygen gas has a volume of 150 mL when its pressure is 58.6 kPa. If the pressure is increased to standard pressure and the temperature remains constant, what will the new gas volume be?

(V_1 = 150 mL; P_1 = 58.6 kPa; V_2 = ?)

↳ 101.3 kPa (Table A) (P_2)

V_2

$V_1 = 150\ mL$
$V_2 = x$
$P_1 = 58.6\ kPa$
$P_2 = 101.3\ kPa$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $(58.6\ kPa)(150.\ mL) = (101.3\ kPa)(x)$

$86.8\ mL = x$

8. Ralph had a helium balloon with a volume of 4.88 liters at 150 kPa of pressure. If the volume is changed to 3.15 liters, what would the new pressure in atm? ← convert using Table A

(V_1 = 4.88 L; P_1 = 150. kPa; V_2 = 3.15 L; P_2 = ?)

V_2 P_2

1 atm = 101.3 kPa

$V_1 = 4.88\ L$
$V_2 = 3.15\ L$
$P_1 = 150.\ kPa$
$P_2 = x$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $(150.\ kPa)(4.88\ L) = (x)(3.15\ L)$

$232\ kPa = x$ ← now, convert to atm

$232\ kPa \times \frac{1\ atm}{101.3\ kPa} = 2.29\ atm$

9. If a gas in a closed container is pressurized from 15.0 atm to 16.0 atm and its original temperature was 25.0°C. Determine the final temperature of the gas assuming that the volume of the container did not change.

(T_1 = 25.0°C; T_2 = ?; constant volume)

$P_1 = 15.0\ atm$
$P_2 = 16.0\ atm$
$T_1 = 25.0°C + 273 = 298\ K$
$T_2 = x$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $\frac{15.0\ atm}{298\ K} = \frac{16.0\ atm}{x}$

$318\ K = x$

10. A sample of gas has a volume of 12.0 L and a pressure of 200.0 kPa. If the pressure of the gas increased to 350.0 kPa, what will be the new volume of the sample? (Assuming that temperature remains constant)

(V_1 = 12.0 L; P_1 = 200.0 kPa; P_2 = 350.0 kPa; V_2 = ?)

P_2 V_2

$P_1 = 200.0\ kPa$
$P_2 = 350.0\ kPa$
$V_1 = 12.0\ L$
$V_2 = x$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $(200.0\ kPa)(12.0\ L) = (350.0\ kPa)(x)$

$6.86\ L = x$