Chemistry CP
Gas Law Math quiz

Name: Key

Boyles
$P_1V_1 = P_2V_2$

1. If I have a 2.5 liter sample of a gas at 225 torr of pressure and I increase the volume of the container to 8.9 liters, what is the pressure of my gas at this new volume?

$$(225)(2.5) = (P_2)(8.9)$$
$$\frac{(225 \times 2.5)}{8.9} = P_2 = 63.2 \text{ torr}$$

Boyles
$P_1V_1 = P_2V_2$

2. If I have a 3.9 liter sample of gas at 35 psi and I increase the pressure to 45 psi what is the new volume of the gas?

$$(35)(3.9) = (45)(V_2)$$
$$\frac{(35 \times 3.9)}{45} = V_2 = 3.033 \text{ Liters}$$

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

3. A sample of gas takes up 5.6 liters at a temperature of 15°C, at what temperature will the gas occupy 25 liters of space? $15 + 273 = 288$

$$\frac{5.6}{288} = \frac{25}{T_2} \qquad \frac{25 \times 288}{5.6} = T_2 = 1285.7 K$$
$$-273$$
$$1012.7 °C$$

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

4. A sample of gas takes up 25 liters of space at 35°C, if the temperature is changed to 15°C, what will be the volume of the gas? $35 + 273 = 308$ $15 + 273 = 288$

$$\frac{25}{308} = \frac{V_2}{288} \qquad \frac{25 \times 288}{308} = 23.38 L$$

Avogadro
$\frac{V_1}{n_1} = \frac{V_2}{n_2}$

5. If I have a sample of gas with 2.8 moles of nitrogen gas that takes up 19 liters of space, how many moles are in my sample that takes up 3 liters of space at the same temperature and pressure?

$$\frac{19}{2.8} = \frac{3}{n_2} \qquad \frac{3 \times 2.8}{19} = 0.442 \text{ moles}$$

Avogadro
$\frac{V_1}{n_1} = \frac{V_2}{n_2}$

6. If I have a sample of gas with 3.9 moles of oxygen that takes up 23 liters of space, how many liters of space will be take up by 5 moles of oxygen at the same temperature and pressure?

$$\frac{23}{3.9} = \frac{V_2}{5} \qquad \frac{23 \times 5}{3.9} = 29.5 \text{ Liters}$$

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Ideal

$PV = nRT$

7. How many moles of gas do I have if I have a 25 liter sample of argon gas at 1.08 atm of pressure and 35°C?

35 + 273

$(1.08)(25) = (n)(.0821)(308)$

$\frac{(1.08)(25)}{(.0821)(308)} = n = 1.068$ moles

8. If I have 2.5 moles of gas in a 25 liter container at 1.5 atm of pressure, what is the temperature of the gas?

$(1.5)(25) = (2.5)(.0821)(T)$

$\frac{(1.5)(25)}{(2.5)(.0821)} = T = 182.7$ K
−273
−90.3°C

9. If 3.8 moles of gas are at 25°C and 1.9 atm of pressure, what volume does the gas occupy?

25 + 273 = 298

$(1.9)(V) = (3.8)(.0821)(298)$

$V = \frac{(3.8)(.0821)(298)}{1.9}$ V = 48.93 Liters

10. If there are 2.9 moles of gas in a 13 liter container at 35°C, what is the pressure in the container?

35 + 273 = 308

$(P)(13) = (2.9)(.0821)(308)$

$P = \frac{(2.9)(.0821)(308)}{13}$ P = 5.64 atm

Ideal

$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$

11. What will the new volume of my 0.04 mole sample be if I cool 1.25 liters of Helium at 100°C at 0.981 atm of pressure to 25°C and 0.513 atm of pressure? During the cooling process, 0.01 moles of helium escapes the container.

100 + 273 = 373 25 + 273 = 298
0.04 − 0.01 = 0.03

$\frac{(.981)(1.25)}{(0.04)(373)} = \frac{(0.513)(V)}{(0.03)(298)}$ V = 1.43 Liters

12. How many moles of helium escaped from the container if a 3 mole sample of the gas at 1.5 atm of pressure and 25°C suddenly drops to 1.0 atm and 15°C?

25 + 273 = 298
15 + 273 = 288

$\frac{P_1 \cancel{V_1}}{n_1T_1} = \frac{P_2 \cancel{V_2}}{n_2T_2}$

$\frac{(1.5)}{(3)(298)} = \frac{(1)}{(n)(288)}$ n = 2.06

3 − 2.06 → .94 moles Lost.

13. What is the pressure if 4.25 liters of Helium at 10°C and 1.98 atm of pressure is heated to 45°C and released into a 15 liter container?

10 + 273 = 283 45 + 273 318

$\frac{P_1V_1}{\cancel{n_1}T_1} = \frac{P_2V_2}{\cancel{n_2}T_2}$

$\frac{(1.98)(4.25)}{(283)} = \frac{P_2(15)}{(318)}$ $P_2 = 0.630$ atm

14. What is the temperature of a gas sample that began as a 13 liter sample of oxygen at 15°C and 1.5 atm of pressure if it has been condensed into a 5 liter container at a pressure of 4.5 atm?

15 + 273 =

$\frac{P_1V_1}{\cancel{n_1}T_1} = \frac{P_2V_2}{\cancel{n_2}T_2}$

$\frac{(1.5)(13)}{(288)} = \frac{(4.5)(5)}{T_2}$

$T_2 = 332.3$ K
−273
59°C