Extra Gas Laws Practice Problems Boyles', Charles' and Combined Gas Laws

1) A sample of oxygen gas occupies a volume of 250 mL at a pressure of 740. torr. What volume will the gas occupy at a pressure of 800. torr if temperature is held constant?

V_1 P_1 V_2 P_2

Boyles'

$P_1V_1 = P_2V_2$

$740 \cdot 250 = 800 \cdot V_2$

$\frac{185{,}000}{800} = \frac{800V_2}{800}$

$231.25\,mL = V_2$

2) A sample of nitrogen occupies a volume of 250 mL at 25°C. What volume will it occupy at 95°C?

V_1 T_1 V_2 T_2

Charles

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

$\frac{298K}{250M} = \frac{368K}{V_2}$

$\frac{92{,}000}{298K} = 308.72\,mL = V_2$

$T_1 = 25°C + 273 = 298K$ $T_2 = 95°C + 273 = 368K$

COMBINED GAS LAW

3) A sample of gas has a volume of 256 mL at 720 torr and 25°C. What pressure will the gas exert at 50.°C and 245 mL?

V_1 P_1 T_1 P_2 T_2 V_2

T_1 25+273 298K

T_2 50+273 323K

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} = \frac{720 \cdot 256}{298K} = \frac{P_2 \cdot 245}{323K}$

$\frac{73{,}010P_2}{73{,}010} = \frac{59{,}535{,}360}{73{,}010}$

$P_2 = 815.44\,Torr$

4) A sample of carbon dioxide gas occupies a volume of 3.50 L at 125 kPa. Assuming a constant temperature, what pressure is exerted on the gas if it has a volume of 2.00 L?

P_2? V_2

Boyles'

$P_1V_1 = P_2V_2$

V_1 T_1 V_2? T_2

5) A sample of helium occupies a volume of 3.8 L at -45°C. What volume will it occupy at 45°C?

Charles'

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

TEMP → KELVIN

$X°C + 273 = X\ K$

6) Submarines need to be extremely strong to withstand the extremely high pressure of water pushing down on them. An experimental research submarine with a volume of 15,000 L has an internal pressure of 1.2 atm. If the pressure of the ocean breaks the submarine forming a bubble with a pressure of 250 atm pushing on it, what will be the volume of the bubble?

V_2

Boyles'

$$P_1V_1 = P_2V_2$$

V_1 P_1 T_1 V_2?

7) A sample of oxygen gas has a volume of 36.7 L at 145 kPa and 65. C. What volume will the sample have at STP?

$65 + 273 =$

* STP = Standard temp & pressure

273 K

100 kPa

T_2 P_2

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

$$\frac{145\ kPa \cdot 36.7}{65+273\ K} = \frac{100\ kPa \cdot V_2}{273\ K}$$

Combined gas

8) A soda bottle is flexible enough that the volume of the bottle can change when without opening it. If you have an empty soda bottle with a volume of 2.0 L at room temperature (25°C), what volume will the bottle occupy when in the freezer at a temperature of -4.0°C?

Charles' $\frac{T_1}{V_1} = \frac{T_2}{V_2}$ TEMP = KELVIN