Answer on Question #68969 – Physics | Molecular Physics

1. A sample of krypton gas at a pressure of 1.01 atm and a temperature of 29.8 °C, occupies a volume of 11.7 liters. If the gas is compressed at constant temperature to a volume of 6.67 liters, the pressure of the gas sample will be __ atm.

Solution:

Given:

P(Kr)=1.01 atm

T=29.8℃

V=11.7 l

V_1=6.67 l

T=const

P_1-?

$\frac{PV}{T} = \frac{P_1V_1}{T_1}$, if T = const, then:

$PV = P_1V_1$, where $P_1 = \frac{PV}{V_1}$,

$P_1 = \frac{1.01 \cdot 11.7}{6.67} = 1.77\ atm.$

Answer: 1.77 atm.

2. A sample of neon gas at a pressure of 0.963 atm and a temperature of 23.5 °C, occupies a volume of 621 mL. If the gas is allowed to expand at constant temperature until its pressure is 0.660 atm, the volume of the gas sample will be mL.

Solution:

Given:

P(Ne)=0.963 atm

T=23.5℃

V=621 ml

P_1=0.660 atm

T=const

V_1-?

$\frac{PV}{T} = \frac{P_1V_1}{T_1}$, if T = const, then:

$PV = P_1V_1$, where $V_1 = \frac{PV}{P_1}$

$V_1 = \frac{0.963 \cdot 621}{0.66} = 906\ ml.$

Answer: 906 ml.

3. A sample of krypton gas at a pressure of 800 mm Hg and a temperature of 32 °C, occupies a volume of 14.8 liters. If the gas is cooled at constant pressure to a temperature of 6 °C, the volume of the gas sample will be L.

Solution:

Given:

P(Ne)= 800 mm Hg

T = 32℃

V = 14.8 l

T_1 = 6℃

P = const

V_1-?

$\frac{PV}{T} = \frac{P_1V_1}{T_1}$, if P = const, then:

$\frac{V}{T} = \frac{V_1}{T_1}$, where $V_1 = \frac{VT_1}{T}$,

T_1= 32+273=305 K, T = 6 + 273 = 279 K

$V_1 = \frac{14.8 \cdot 305}{279} = 13.5\ l.$

Answer: 13.5 l.

4. A sample of neon gas at a pressure of 0.782 atm and a temperature of 244 °C, occupies a volume of 558 mL. If the gas is heated at constant pressure until its volume is 727 mL, the temperature of the gas sample will be °C.

Solution:

Given:

P(Ne)=0.782 atm

T=244℃

V=558 ml

V_1 = 727 ml

P = const

T_1-?

$\frac{PV}{T} = \frac{P_1V_1}{T_1}$, if P = const, then:

$\frac{V}{T} = \frac{V_1}{T_1}$, where $T_1 = \frac{TV_1}{V}$,

T = 244+273=517 K,

$T_1 = \frac{727 \cdot 517}{558} = 673\ K,$

T_1 = 673 – 273 = 400 ℃.

Answer: 400 ℃.