Still more gas laws ...

Avagadro's principle tells us that even though gas molecule sizes may differ, under the same temp. conditions they occupy the same volume.

* remember under STP (standard temp. & pressure - 0.0°C & 1 atm)
1 mole of gas = 6.02×10^{23} particles = 22.4 L

Using all of the gas laws learned we can draw a new all-encompassing equation called the ideal gas law, which states

$$PV = nRT$$

P = pressure (atm)   V = volume (Liters)
n = number of moles
R = gas constant (0.0821 L·atm/mol·K)
T = Temp. (kelvin)

* This tells us that the product of P × V is constant under controlled/constant Temp.

(We can solve for any variable if we know the other 4)

ex) P = 2 atm   R = 0.0821 L·atm/mol·K
V = 5.0 L   T = 300 K
n = X

$PV = nRT$

$\frac{(2)(5.0)}{(0.0821 \times 300)} = \frac{n(0.0821)(300)}{(0.0821)(300)}$ n = 0.41 mol *when using <u>kPa</u>, <u>R = 8.3145 L·kPa/mol·K</u>

ex) P = 25 kPa R = 8.3145 L·kPa/mol·K

V = 1.5 L T = X

n = 0.3 mol

$PV = nRT$

$$\frac{(25)(1.5)}{(.3)(8.3145)} = \frac{(0.3)(8.3145)X}{(0.3)(8.3145)} = \boxed{15.03\ K}$$

* on homework - 760 torr = 1 atm

so, 720 torr ⇒ atm = $\frac{720}{760}$ = <u>0.95 atm</u>