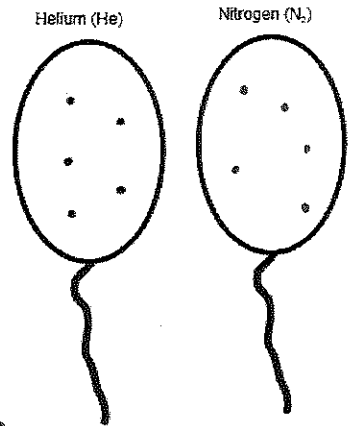Name
Gas laws review

Complete the following picture

1. In the balloon provided draw the number of particles in the Nitrogen balloon using the He balloon. Both balloons are at 1 atmosphere and 25C.

$n = \frac{PV}{RT}$ Same conditions equals same moles
— Ideal gas

Helium (He)   Nitrogen (N₂)

Short Answer:

2. Use the Kinetic molecular theory to JUSTIFY/NULLIFY the following.

a. In a rigid container the temperature increases causing the pressure to increase.

Justify ↑ # of collisions/area of inside of Container

b. A balloon is floating up into the air where the atmospheric pressure is reduced causing the balloon to expand.

Justify Pressure ↓ due to less collisions/area larger volume

c. A piston has the force on it doubled, causing the volume to decrease and the pressure to decrease. increase

Nullify

P↑ due to more collisions/area ← smaller

d. In a balloon of helium at 25C, all the helium particles are traveling the same speed.

Nullify → Average Kinetic Energy ← Temperature
↖ average speed

3. In a rigid container, holding equal amounts of He and oxygen at 25C.

a. The average kinetic energy of each of these substances are equal. Justify or nullify.

⟶ Temp = 25°C

b. The molecular velocity of these substances are equal. Nullify

$KE = \frac{1}{2}mu^2$ ↑M = ↓V   O₂↓   He↑

273
100
─────
373 K

4. 15 grams of H_2O is heated until all the gas is evaporated. At 100°C and 1 atm what is the volume of gas as it is released into a balloon?

$PV = nRT$

$V = \frac{nRT}{P}$

$15g \cdot \frac{1 \, mol}{18} = 0.83$

$\frac{0.83 \cdot 0.0821 \cdot 373K}{1} = 25.4 L$

5. A car tire is inflated to 1710 mmHg at 6°C. The temperature goes up over the next 9 days to 50°C. What is the new pressure of the tire.

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ V = Constant

$T_1 = 273 + 6 = 279 K$
$T_2 = 273 + 50 = 323 K$

$\frac{1710}{279} = \frac{x}{323}$

$x = 1979 \, mmHg$

6. What mass of N_2 gas exerts the same pressure as Cl_2 at STP assuming they are contained in the same 1-liter bottle.

Identity of gas does not matter
→ we need equal moles of Particles

$1L \cdot \frac{1 \, mol}{22.4L} = 0.0446 \, mol \, N_2$

$0.0446 mol \cdot \frac{1 \, mol \, Cl_2}{} = 3.16 g$

7. An air ~~mattress~~ balloon with a volume of 80L at 13°C is brought to a temperature of 40°C. What is the new volume?

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ P = Constant

$13 + 273 = 286$ $40 + 273 = 313$

$\frac{80L}{286} = \frac{x}{313}$

$x = 87.5 L$

8. ~~its new volume?~~

New Q

$22g \, CO_2 \cdot \frac{1 \, mol}{44 \, g} = 0.5 \, mol \, CO_2$

$PV = nRT$

$P = \frac{nRT}{V} = \frac{.5 \cdot 0.0821 \cdot 273}{22.4L} = 0.5 \, Atm$