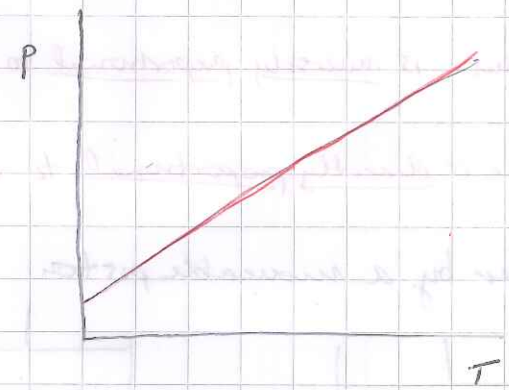
Oxford Gas Laws (Thermal Physics) p. 113 #8-13

(8) Container holds 20g of neon and also 8g of helium.
molar mass Ne = 20g   molar mass He = 4g

Ratio of $\frac{\text{\# atoms Ne}}{\text{\# atoms He}}$ = ? $\frac{6.02 \times 10^{23} \text{ atoms Ne}}{12.04 \times 10^{23} \text{ atoms He}}$ = **0.5**

(9) Fixed mass of ideal gas is heated at constant volume
Sketch graph to show how T varies w/ P.



(10) PV=nRT applies to a real gas under
high temperatures and low pressures

(11) a) (i) Ideal gas = Obeys all gas laws under all conditions
There are no intermolecular forces between collisions
Real gas = can approximate behavior of an ideal gas at high temps / low pressures. If the opposite conditions are true, the gas can be liquified and almost uncompressible.

(ii) With no intermolecular forces, there cannot be any potential energy application ∴ all internal energy = KINETIC

b) Fixed mass of ideal gas w/ $V_1 = 870\,cm^3$ at $P_1 = 1.00 \times 10^5\,Pa$ and $T_1 = 20.0°C$. If P is constant and gas is heated to 21.0°C, what is $V_2 = ?$

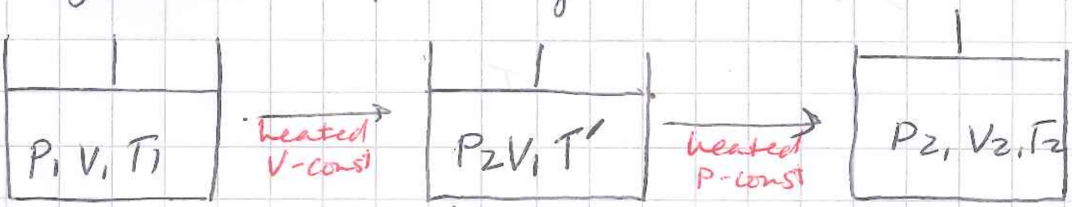
$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \qquad V_2 = \frac{V_1}{T_1} \cdot T_2 = \frac{870\,cm^3}{293\,K} \cdot 294\,K = 873\,cm^3$$

Δ volume = $3\,cm^3$

(12) a) (i) If T = constant, then pressure is inversely proportional to volume.

(ii) If P = constant, then volume is directly proportional to temperature.

b) Ideal gas is held in a cylinder by a moveable piston.



(i) ~~P is inversely proportional to V~~ $\frac{P_1}{T_1} = \frac{P_2}{T'}$

(ii) [illegible] $\frac{V_1}{T'} = \frac{V_2}{T_2}$

c) $T' = \frac{P_2}{P_1} \cdot T_1$ and $T' = \frac{V_1 \cdot T_2}{V_2}$ so $\frac{P_2 \cdot T_1}{P_1} = \frac{V_1 T_2}{V_2} \cdot k$ [illegible]

we get $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ [illegible]

so $\boxed{PV = kT}$

(13) Helium balloon has $V_1 = 0.25 m^3$ when released at ground level.
$T_1 = 30°C$ and $P_1 = 1.01 \times 10^5 Pa$.
Balloon reaches new height so that $T_2 = -10°C$ and
$P_2 = 0.65 \times 10^5 Pa$

a) $V_2 = ?$ $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ $V_2 = \frac{P_1 V_1 T_2}{T_1 \cdot P_2} = \frac{(1.01)(0.25)(263)}{(303)(.65)}$

$V_2 = 0.34 m^3$

b) 2 assumptions about the helium.

c) # moles He $PV = nRT$ $n = \frac{PV}{RT} = \frac{(1.01 \times 10^5)(0.25)}{(8.31)(303)} =$ 10.0 moles