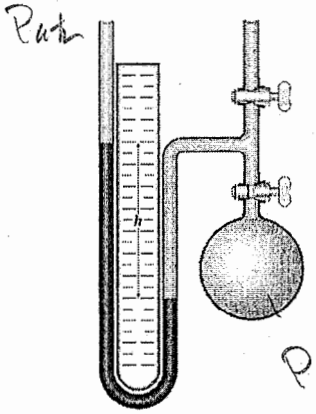
Name: _____ date: _____ period: _____

Ch. 12 gas test 60 points ngss chemistry

In problems involving any calculation, show your work in an organized manner, include (i) any relevant equation (or formula), (ii) conversion factor(s), and (iii) put the proper units in your calculations and answer.

1. What is the pressure in the bulb (in atm) on the right if Patm = 85 kPa and the difference in the height of the mercury in the U-shaped tube, h = 35 mm Hg ? [10 points]



3 pts
3 $P - P_{atm} = \Delta P$
3 $P - (85\ kPa \times \frac{1\ atm}{101.3\ kPa}) = 35\ mm\ Hg \times \frac{1\ atm}{760\ mm\ Hg}$
2 $(P - 0.839 = 0.046)\ atm$
2 $P = 0.793\ atm$

source: https://engineerexcel.com/manometer-equation/

2. At STP, 125 mL $CO_{(g)}$ + 135 mL $O_{2(g)}$ → ___ mL $CO_{2(g)}$ [15 points; hint: based on HW problem]

i) $2CO + O_2 \rightarrow 2CO_2$

ii) $125\ mL\ CO \times \frac{L}{10^3\ mL} \times \frac{mol}{22.4\ L} \times \frac{1\ mol\ O_2}{2\ mol\ CO} \times \frac{22.4\ L}{mol} \times \frac{10^3\ mL}{L} = 62.5\ mL\ O_2\ needed$

5 pts @ has 135 mL O_2 → O_2 excess → CO limiting

iii) $125\ mL\ CO \times \frac{L}{10^3\ mL} \times \frac{mol}{22.4\ L} \times \frac{2\ mol\ CO_2}{2\ mol\ CO} \times \frac{22.4\ L}{mol} \times \frac{10^3\ mL}{L}$

$= 125\ mL\ CO_2$

3. What is the volume of a container with 5.0 grams of water vapor at 125 °C, where the pressure is 775 torr ? [10 points]

3 pts $PV = nRT$
5 $775\ torr \left(\frac{1\ atm}{760\ torr}\right) \cdot V = \left(5\ g\ H_2O \times \frac{mol}{18\ g}\right)\left(0.0821\ \frac{L\cdot atm}{mol\cdot K}\right)(125+273\ K)$
$1.0197\ V = 9.0766$
2 $V = 8.112\ L$

4. 223 mg of a hydrocarbon in a 125 mL flask at 27 °C has a pressure of 1.0 atm; what is the molar mass of the hydrocarbon ? [10 points]

3 pt i) $PV = nRT$

$1\text{atm}\left(125\text{mL}\ \frac{L}{10^3\text{mL}}\right) = n\left(\frac{0.0821\ L\cdot\text{atm}}{\text{mol}\cdot K}\right)(27+273)K$

$0.125 = n\ 24.63$

$n = 0.005075\text{ mol}$

3 ii) molar mass $= \frac{\#g}{\#\text{mol}}$

2 $= \left(223\text{mg}\ \frac{g}{10^3\text{mg}}\right) / 0.005075\text{mol} = 44\ g/\text{mol}$

5. solve. [15 points; based on weekly quiz or lab]

a. A 75 mL syringe has a pressure of 95 kPa at 25 °C, where the syringe's volume is reduced to 35 mL and the temperature becomes 4.0 °C; what is the pressure in the syringe ? Assume that there's no leak in the system.

	(1)	(2)
V:	75 mL	35 mL
P:	95 kPa	?
T:	25 °C	4 °C

1 pt

$PV = nRT$

$\frac{PV}{T} = nR$

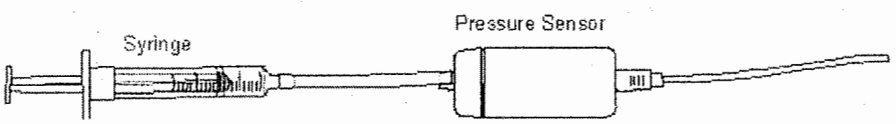
3 pt $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{95\text{kPa}(75\text{mL})}{(25+273)K} = \frac{P(35\text{mL})}{(4+273)K}$

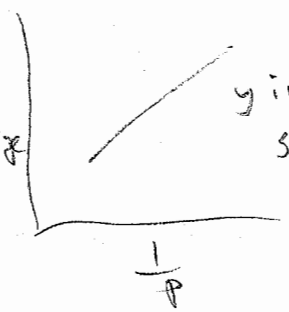
$P = \frac{95(75)27}{35(278)} = 189\text{kPa}$

1 pt

b. the setup for the Boyles' law lab is shown below



describe the graphical analysis to determine the volume of the tubing and the number of moles on gas in the system. Basis / rationale ? sketch / label the graph.



3 pt

y intercept $= -V_{tubing}$

slope $= nRT \rightarrow n = \frac{\text{slope}}{RT}$

2 pt
2 p-l

3 pt $V_{syringe} = nRT\frac{1}{P} + (-V_{tubing})$