Name: _____ date: _____ period: _____

Ch. 12 & 14 stochiometry & gas **test** 60 ~~50~~ points honors chemistry

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

1. Based on the following hypothetical experimental data

volume of gas (mL) =	35
room pressure (kPa) =	102
room temperature (°C) =	21
Δ height (cm) water =	25

and the below table

vapor pressure of water (torr) as a function of temperature (°C)

T	VP		T	VP
0	4.58		21	18.65
5	6.54		22	19.83
10	9.21		23	21.07
12	10.52		24	22.38
14	11.99		25	23.76
16	13.63		26	25.21
17	14.53		27	26.74
18	15.48		28	28.35
19	16.48		29	30.04
20	17.54		30	31.82

in regards to the reaction: $Mg(s) + HCl_{(aq)} \rightarrow \ldots$, determine the mass of magnesium in the reaction. [10 points]

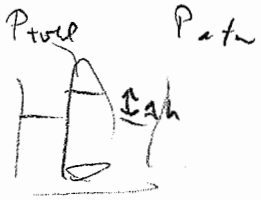
Name: _____ date: _____ period: _____

Weekly quiz: gas stoichiometry lab 10 points honors chemistry

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

1. Based on the following hypothetical experimental data

volume of gas (mL) =	35
room pressure (kPa) =	102
room temperature (°C) =	21
Δ height (cm) water =	25



and the below table

vapor pressure of water (torr) as a function of temperature (°C)

T	VP	T	VP
0	4.58	21	18.65
5	6.54	22	19.83
10	9.21	23	21.07
12	10.52	24	22.38
14	11.99	25	23.76
16	13.63	26	25.21
17	14.53	27	26.74
18	15.48	28	28.35
19	16.48	29	30.04
20	17.54	30	31.82

2pt @

in regards to the reaction: $Mg(s) + HCl_{(aq)} \rightarrow \ldots$, determine the mass of magnesium in the reaction.
Excess

i) $Mg + 2HCl \rightarrow H_2 + MgCl_2$

ii) $P_{atm} - P_{total} = \Delta P$

$P_{total} = P_{atm} - \Delta P = \left(102\ kPa \frac{1\ atm}{101.2\ kPa}\right) - \left(25\ cm \frac{m}{10^2\ cm} \frac{1\ atm}{10.3\ m\ H_2O}\right)$

$= 0.984\ atm$

iii) $P_{total} = P_{H_2} + P_{H_2O}$

$P_{H_2} = P_{total} - P_{H_2O} = 0.984\ atm - \left(18.65\ torr \frac{1\ atm}{760\ torr}\right)$

$= 0.959\ atm$

iv) $P_{H_2} = \frac{n_{H_2} RT}{V} \rightarrow n_{H_2} = \frac{P_{H_2} V}{RT} = \frac{0.959\ atm\ (0.035L)}{\left(0.0821 \frac{L\ atm}{mol\ K}\right)(21 + 273)}$

$= 0.0014\ mol\ H_2$

v) $0.0014\ mol\ H_2 \frac{mol\ Mg}{mol\ H_2} \frac{24\ g}{mol\ Mg} = \boxed{0.033\ g\ Mg}$

2. A 45 mL syringe at 21 °C has a pressure of 95 kPa; the volume is reduced to 25 mL and the temperature is reduced to 4.0 °C; what is the pressure in the syringe ? [10 points]

	V	T	P
1	45 mL	21 °C	95 kPa
2	25 mL	4 °C	?

2 pt

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

3

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

3

$\frac{95\,kPa\,(45\,mL)}{(21+273)\,K} = \frac{P(25\,mL)}{(4+273)\,K}$

$\frac{4275}{294} = \frac{25P}{277}$

2

$P = \frac{4275(277)}{25(294)} = 161\,kPa$

3. 0.50 g of a chemical completely vaporized, where the pressure is 1.0 atm at 85 °C in a 50.0 mL container; what is the molar mass of the chemical ? [10 points]

2+3 pt

i) $PV = nRT$

$n = \frac{PV}{RT} = \frac{1\,atm\,(0.05\,L)}{\left(0.0821\,\frac{L\,atm}{mol\,K}\right)(85+273)\,K} = 0.0017\,mol$

2+3 pt

ii) molar mass: $\frac{g}{n} = \frac{0.5\,g}{0.0017\,mol} = 294\,g/mol$

4. 5.0 g B_2H_6 + 15 g O_2 → HBO_2 + ___ g H_2O [15 points]

3 pts

i) $B_2H_6 + 3O_2 \rightarrow 2HBO_2 + 2H_2O$

4 ii) $5\text{ g } B_2H_6 \dfrac{\text{mol } B_2H_6}{28\text{ g } B_2H_6} \dfrac{3\text{ mol } O_2}{\text{mol } B_2H_6} \dfrac{32\text{ g } O_2}{\text{mol } O_2} = 17.1\text{ g } O_2 \text{ need}$

4 have 15 g O_2 → O_2 is Limiting

4 iii) $15\text{ g } O_2 \dfrac{\text{mol } O_2}{32\text{ g } O_2} \dfrac{2\text{ mol } H_2O}{3\text{ mol } O_2} \dfrac{18\text{ g } H_2O}{1\text{ mol } H_2O} = \boxed{5.6\text{ g}}$

5. 5.0 mL C_8H_{18} (octane) + excess O_2 → ___ g CO_2 + H_2O; density of C_8H_{18} is 0.79 g / mL and the % yield is 85 %.. [15 points]

i) $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$

5 pts ii) $5\text{ mL } \dfrac{0.79\text{ g}}{\text{mL}} \dfrac{1\text{ mol } C_8H_{18}}{114\text{ g } C_8H_{18}} \dfrac{16\text{ mol } CO_2}{2\text{ mol } C_8H_{18}} \dfrac{44\text{ g } CO_2}{1\text{ mol } CO_2}$

$= 12.2\text{ g}$ if % yield is 100%

iii) % yield = $\dfrac{\text{exptl yield}}{\text{calc yield}}$

$85\% = \dfrac{\text{exptl yield}}{12.2}$

exptl yield: $10.4\text{ g } CO_2$