HW Set 7

Q 10] Since carbon monoxide consists of carbon and oxygen, I would call it a compound.

Q 17] Silver atoms weigh more than hydrogen atoms, so ~~it requires~~ one gram of silver contains fewer atoms than one g. of H.

Q 18] One mole of any thing consists of exactly one Avagadro's number of that thing, whether it is hydrogen or silver.

Q 20] One assumed property of ideal gases is that one liter at standard temperature and pressure always contains the same number of ~~atoms~~ molecules, regardless of what the gas is made of. Oxygen gas, O_2, ~~conta~~ has two atoms per molecule, while Carbon dioxide, CO_2, has three. Thus, ~~on the~~ a liter of CO_2 has more atoms than a liter of O_2, if both are at the same T and prsr.

Q 38] 190° F = 88° C, see Figure 7-10 in the book,

Q 41] The freezing point of water is 0° C, and this is equivalent to 273 K.

Q 49] Remember the ideal gas Law: $PV = cT$. If P is constant while T doubles, than V must double.

Q 50] As the tea cools, so does the tea vapor that fills the rest of the bottle. The vapor is mostly ideal, so obeys $PV = cT$. As T goes down, so does P or V. In either case, the bottle compresses — The pressure outside is greater than pressure inside.

1 E 1] The combination ratio is $\frac{8\text{ g O}}{1\text{ g H}}$. With 32 g of O, you need $(32\text{ g})O \cdot \frac{1\text{ g H}}{8\text{ g O}} = 4\text{ g H}$.

1 E 4] The ratio is $\frac{12\text{ g C}}{16\text{ g O}} = \frac{3}{4}\left(\frac{C}{O}\right)$. 80 g of O requires $(80\text{ g O}) \cdot \left(\frac{3}{4}\right)\left(\frac{C}{O}\right) = 60\text{ g C}$. 48 g of Carbon needs $(48\text{ g C}) \cdot \left(\frac{4}{3}\right)\left(\frac{O}{C}\right) = 64\text{ g O}$. I can use all of the carbon and make $48 + 64 =$ 112 g CO.

E 5] The ratio is $\frac{10\text{ g ham}}{50\text{ g bread}} = \frac{1}{5}\left(\frac{h}{b}\right)$. Sandwiches require more grams of bread, so bread is the limiting substance. 1 kg of bread allows $(1\text{ kg})/(50\text{ g}) =$ 20 sandwiches. Each sandwich weighs 60 g, so 20 makes 1.200 kg. This uses 200 g of ham, leaving 800 g.

E6 The ratio is $1 \text{ mole } H_2O = \frac{16 \text{ g O}}{2 \text{ g H}} = \frac{8}{1}\left(\frac{O}{H}\right)$.

Water needs more grams of Oxygen, so it is the limiting substance. One ~~kg~~ kg of Oxygen allows

$$(1 \text{ kg}) \cdot \left(\frac{1 \text{ mole}}{16 \text{ g}}\right) = \underline{62.5} \text{ moles } H_2O.$$

One mole weighs 18 g, so 62.5 makes $\underline{1125}$ g. This ~~leave~~ uses 125 g of H, leaving $\underline{875}$ g.

E17 Pressure is Force per area. The area of the tack is

$A = \pi (\text{Radius})^2 = \pi(.005 \text{ m})^2 = 7.85 \cdot 10^{-5} \text{ m}$. The pressure is

$$P = F/A = 25 \text{ N} / (7.85 \cdot 10^{-5} \text{ m}) = 3.18 \times 10^5 \frac{N}{m^2} = \boxed{3.1 \text{ atm}}$$

E19 Ideal gas Law: $PV = cT$. If $P_{new} = 3 P_{old}$,

Then $V_{new} = \frac{cT}{P_{new}} = \frac{cT}{3 P_{old}} = \boxed{\frac{1}{3} V_{old}}$. One liter compresses into $\underline{1/3 \text{ L}}$.

E21 Again, $PV = cT$. Here, ~~Vold~~ the gas starts at 100 atm, filling a volume of 2 L. In the balloons, the pressure is 1.25 atm, ~~so~~ $V_{new} = \frac{cT}{P_{new}}$ ~~...~~, but also, $cT = P_{old} V_{old}$, so

$$V_{new} = \frac{P_{old}}{P_{new}} V_{old} = \left(\frac{100 \text{ atm}}{1.25 \text{ atm}}\right) 2 \text{ L}$$
$$= \underline{160 \text{ L}}.$$

Each balloon takes one Liter, so 160 balloons.

23] $PV = cT$, so $c = \dfrac{P_i V_i}{T_i}$, and $P_f = \dfrac{cT_f}{V_f} = \dfrac{V_i}{T_i}\dfrac{T_f}{V_f}P_i$

Now, T should be expressed in kelvin,

$T_i = 20 + 273 = 293\text{ K}$, $T_f = 40 + 273 = 313\text{ K}$.

V should be in liters, so $V_i = (150\text{ cm}^3)\cdot\left(\dfrac{1\text{ L}}{1000\text{ cm}^3}\right)$

$= .150\text{ L}$

$V_f = \dfrac{100\text{ cm}^3}{1000} = .100\text{ L}$.

Thus, $P_f = \left(\dfrac{.150\text{ L}}{293\text{ K}}\right)\left(\dfrac{313\text{ K}}{.100\text{ L}}\right)(1\text{ atm})$

$= \boxed{1.6\text{ atm}}$