**CHEM 100** **Name**_____
**Quiz 7** **Fall 2017**

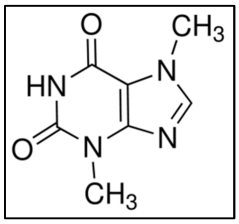
Complete each of the following problems.

1. Balance the reactions below using whole number coefficients. (4 pts.)

   a. _2_$C_8H_{18}(\ell)$ + _25_$O_2(g)$ → _16_$CO_2(g)$ + _18_$H_2O(\ell)$

   b. _2_$FeCl_3(aq)$ + _3_$CaS(aq)$ → _1_$Fe_2S_3(s)$ + _3_$CaCl_2(aq)$

2. Theobromine is an organic compound that gives dark chocolate a somewhat bitter taste. The structure of theobromine is shown at the right.




   a. If the molecular formula of theobromine is $C_7H_8N_4O_2$, what is the molar mass of theobromine? (3 pts.)

$$7(12.011) + 8(1.008) + 4(14.007) + 2(15.999) = 180.167$$

Thus, the molar mass is 180.167 g/mol

Given that you should use at least two decimal places for molar masses from the periodic table, your molar mass should have at least two decimal places.

   b. Theobromine is also toxic to dogs at doses greater than 300 mg of theobromine per kg body weight. That means my 10.0 kg dog would experience toxic effects if she eats 3.0 grams of theobromine. How many moles are present in 3.0 grams of theobromine? (3 pts.)

$$3.0 \text{ ~~g theobromine~~} \times \frac{1 \text{ mol theobromine}}{180.167 \text{ ~~g theobromine~~}} = 0.01665 \text{ mol theobromine}$$

To determine the number of significant figures, we count the number of sig figs in the data used in the calculation. 3.0 g has 2 sig figs and 180.167 g/mol has 6 sig figs. Since we are multiplying, the number of sig figs in the result must be the smallest of 2 or 6. Therefore, our result should have 2 sig figs: **0.017 mol theobromine.**

Possibly Useful Information

To save some calculation time, you may round all atomic masses to two (2) decimal points.

| 1 1A | 2 2A | 3 3B | 4 4B | 5 5B | 6 6B | 7 7B | 8 | 9 8B | 10 | 11 1B | 12 2B | 13 3A | 14 4A | 15 5A | 16 6A | 17 7A | 18 8A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 H 1.00794 | | | | | | | | | | | | | | | | | 2 He 4.00260 |
| 3 Li 6.941 | 4 Be 9.01218 | | | | | | | | | | | 5 B 10.811 | 6 C 12.011 | 7 N 14.0067 | 8 O 15.9994 | 9 F 18.9984 | 10 Ne 20.1797 |
| 11 Na 22.9898 | 12 Mg 24.3050 | | | | | | | | | | | 13 Al 26.9815 | 14 Si 28.0855 | 15 P 30.9738 | 16 S 32.066 | 17 Cl 35.4527 | 18 Ar 39.948 |
| 19 K 39.0983 | 20 Ca 40.078 | 21 Sc 44.9559 | 22 Ti 47.88 | 23 V 50.9415 | 24 Cr 51.9961 | 25 Mn 54.9381 | 26 Fe 55.847 | 27 Co 58.9332 | 28 Ni 58.693 | 29 Cu 63.546 | 30 Zn 65.39 | 31 Ga 69.723 | 32 Ge 72.61 | 33 As 74.9216 | 34 Se 78.96 | 35 Br 79.904 | 36 Kr 83.80 |
| 37 Rb 85.4678 | 38 Sr 87.62 | 39 Y 88.9059 | 40 Zr 91.224 | 41 Nb 92.9064 | 42 Mo 95.94 | 43 Tc (98) | 44 Ru 101.07 | 45 Rh 102.906 | 46 Pd 106.42 | 47 Ag 107.868 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.710 | 51 Sb 121.757 | 52 Te 127.60 | 53 I 126.904 | 54 Xe 131.29 |
| 55 Cs 132.905 | 56 Ba 137.327 | 57 *La 138.906 | 72 Hf 178.49 | 73 Ta 180.948 | 74 W 183.84 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.22 | 78 Pt 195.08 | 79 Au 196.967 | 80 Hg 200.59 | 81 Tl 204.383 | 82 Pb 207.2 | 83 Bi 208.980 | 84 Po (209) | 85 At (210) | 86 Rn (222) |
| 87 Fr (223) | 88 Ra 226.025 | 89 †Ac 227.028 | 104 Rf (261) | 105 Db (262) | 106 Sg (266) | 107 Bh (264) | 108 Hs (277) | 109 Mt (268) | 110 Ds (271) | 111 Rg (272) | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Lanthanide series | 58 Ce 140.115 | 59 Pr 140.908 | 60 Nd 144.24 | 61 Pm (145) | 62 Sm 150.36 | 63 Eu 151.965 | 64 Gd 157.25 | 65 Tb 158.925 | 66 Dy 162.50 | 67 Ho 164.930 | 68 Er 167.26 | 69 Tm 168.934 | 70 Yb 173.04 | 71 Lu 174.967 |
| †Actinide series | 90 Th 232.038 | 91 Pa 231.036 | 92 U 238.029 | 93 Np 237.048 | 94 Pu (244) | 95 Am (243) | 96 Cm (247) | 97 Bk (247) | 98 Cf (251) | 99 Es (252) | 100 Fm (257) | 101 Md (258) | 102 No (259) | 103 Lr (262) |