**CHEM 101-080 Fall 2004**
**Problem-Solving Session 1**
**September 13, 2004**

1. **Without doing the calculation, determine the precision (uncertainty) of each sum and the number of significant figures in each product. (Sec. 1-1)**

| A | B | C | Precision of A + B + C | Sig. Figs. in A x B x C |
|---|---|---|---|---|
| 2.5 | 0.20 | 1.625 | | |
| 3500 | 12.5 | 24 | | |
| 153 | 0.24 | 32.667 | | |
| 24010 | 0.658 | 1.29 | | |
| 24001 | 6552 | 40 | | |
| 24001 | 6552 | 40. | | |

2. **Calculate the following sums A + B + C. Report each the value of each function before and after rounding to the proper number of significant figures. Report also the precision (uncertainty) of each result. (Sec. 1-2)**

| A | B | C | Function | Result | | Precision |
|---|---|---|---|---|---|---|
| | | | | (before rounding) | (after rounding) | |
| 1.235 | 0.032 | 65.3278 | A + B + C | | | |
| | | | A + B - C | | | |
| | | | (A x B) + C | | | |
| | | | A + (B x C) | | | |
| | | | (A / B) + C | | | |
| | | | A + (B / C) | | | |
| | | | A x B x C | | | |
| | | | A / (B x C) | | | |

3. **Report each the value of each function before and after rounding to the proper number of significant figures. (Sec. 1-3)**

| A | B | C | Function | Result | Precision |
|---|---|---|---|---|---|
| $6.84 \times 10^{-4}$ | $1.286 \times 10^{-6}$ | $4.30 \times 10^{10}$ | A + B + C | | |
| | | | A - B - C | | |
| | | | A x B x C | | |
| | | | A / (B x C) | | |

**4. Convert each of the numbers to the specified units. Write each solution on the board. (Sec. 1-5)**

| Group | Convert | From | To | Result |
|---|---|---|---|---|
| **1** | $1.25 \times 10^{-4}$ | feet | mm | |
| **2** | 2.24 | km | mi | |
| **3** | 4500 | ml | l | |
| **4** | 4500 | l | ml | |
| **5** | 5.25 | lb | kg | |
| **6** | 8 | oz | g | |
| **7** | 180000 | sec | days | |
| **8** | 180000 | nsec | msec | |

**5. Solve each of the following problems. Write the solution on the board. (Chapter 2)**

| Group | Problem # | Result |
|---|---|---|
| **1** | 2-27 | |
| **2** | 2-33 | |
| **3** | 2-40 | |
| **4** | 2-53 | |
| **5** | 2-58 | |
| **6** | 2-67 | |
| **7** | 2-78 | |
| **8** | 2-99 | |

**6. How many protons, neutrons, and electrons are in each of these isotopes? (Sec. 3-6)**

| Isotope | Protons | Neutrons | Electrons | | Isotope | Protons | Neutrons | Electrons |
|---|---|---|---|---|---|---|---|---|
| **Group 1** | | | | | **Group 5** | | | |
| $^{13}O$ | | | | | $^{82}Y$ | | | |
| $^{14}O$ | | | | | $^{87}Y$ | | | |
| $^{20}O$ | | | | | $^{96}Y$ | | | |
| **Group 2** | | | | | **Group 6** | | | |
| $^{28}P$ | | | | | $^{102}Ag$ | | | |
| $^{32}P$ | | | | | $^{107}Ag$ | | | |
| $^{34}P$ | | | | | $^{109}Ag$ | | | |
| **Group 3** | | | | | **Group 7** | | | |
| $^{35}Ar$ | | | | | $^{106}In$ | | | |
| $^{38}Ar$ | | | | | $^{108}In$ | | | |
| $^{42}Ar$ | | | | | $^{113}In$ | | | |
| **Group 4** | | | | | **Group 8** | | | |
| $^{64}Zn$ | | | | | $^{114}Sn$ | | | |
| $^{69}Zn$ | | | | | $^{118}Sn$ | | | |
| $^{72}Zn$ | | | | | $^{124}Sn$ | | | |

**7. How many protons and electrons are in each of these ions? (Sec. 3-6)**

| Ion | Protons | Electrons | | Ion | Protons | Electrons |
|---|---|---|---|---|---|---|
| **Group 1** | | | | **Group 5** | | |
| $Zn^{2+}$ | | | | $Cr^{6+}$ | | |
| $S^{2-}$ | | | | $Te^{2-}$ | | |
| $NO_3^-$ | | | | $CO_3^{2-}$ | | |
| **Group 2** | | | | **Group 6** | | |
| $Cs^+$ | | | | $Fe^{2+}$ | | |
| $Se^{2-}$ | | | | $F^-$ | | |
| $SO_4^{2-}$ | | | | $SO_3^{2-}$ | | |
| **Group 3** | | | | **Group 7** | | |
| $V^{5+}$ | | | | $Ru^{4+}$ | | |
| $Cl^-$ | | | | $Sc^{3+}$ | | |
| $SO_3^{2-}$ | | | | $ClO_4^-$ | | |
| **Group 4** | | | | **Group 8** | | |
| $Mn^{2+}$ | | | | $Rb^+$ | | |
| $I^-$ | | | | $O^{2-}$ | | |
| $NH_4^+$ | | | | $PH_4^+$ | | |

**8. Calculate the average atomic mass of the following elements from their isotopic mass and natural abundance. Your answer should be close to the corresponding value in the periodic table. (Sec. 3-6)**

| Element | Atomic No. | Isotope | Atomic mass of isotope* | % Abundance | Avg. atomic mass of element |
|---|---|---|---|---|---|
| **Group 1** | | | | | |
| Ga | 31 | $^{69}Ga$ | 68.9257 | 60 | |
| | | $^{71}Ga$ | 70.9249 | 40 | |
| **Group 2** | | | | | |
| Rb | 37 | $^{85}Rb$ | 84.9117 | 72.17 | |
| | | $^{87}Rb$ | 86.9178 | 27.83 | |
| **Group 3** | | | | | |
| Ag | 47 | $^{107}Ag$ | 106.90509 | 51.83 | |
| | | $^{109}Ag$ | 108.9047 | 48.17 | |
| **Group 4** | | | | | |
| In | 49 | $^{113}In$ | 112.9043 | 4.3 | |
| | | $^{115}In$ | 114.9041 | 95.7 | |
| **Group 5** | | | | | |
| Sb | 50 | $^{121}Sb$ | 120.9038 | 57.3 | |
| | | $^{123}Sb$ | 122.9041 | 42.7 | |

**9. Solve each of the following problems. Write the solution on the board. (Chapter 3)**

| Group | Problem # | Result |
|---|---|---|
| **1** | 3-76 | |
| **2** | 3-28 | |
| **3** | 3-33 | |
| **4** | 3-41 | |
| **5** | 3-55 | |
| **6** | 3-62 | |
| **7** | 3-74 | |