1. For each of the following, determine the correct number of significant figures each answer should be reported to. Try to figure out the answers without computing the numerical answers!

   A) $6.42 \times 10^4 + 2.5 \times 10^3$ 3 sig figs (both numbers only good to hundreds place)

   B) $\frac{2.00\times10^5}{4.0\times10^3}$ 2 sig figs (denominator only good to 2 sig figs)

   C) $\frac{9.284-4.81}{12\times1.13}$ 2 sig figs (denominator product only good to 2 sig figs)

   D) How would the numerical answer for 1C change if you rounded after each mathematical step? Compute the expression rounding after each step and then by rounding only at the end.
   Answer rounding at the end is 0.33

   Answer rounding after each step is 0.32 because numerator = 4.74 and denominator = 14

2. The speed of light is 299,792,458 m/s. Express the speed of light in feet per nanosecond (ft/ns). Then estimate how long it takes for light to travel from the lights above you to your eyes.

   Note: 1 ft = 0.3048 m

First, the conversion:

$$299792458\,\frac{\text{m}}{\text{s}} \times \frac{1\text{ ft}}{0.3048\text{ m}} \times \frac{10^{-9}\text{ s}}{1\text{ ns}} = 0.983571056\,\frac{\text{ft}}{\text{ns}}$$

Assume distance between lights and eyes is ~10 ft:

$$10\text{ ft} \times \frac{1\text{ ns}}{0.983571056\text{ ft}} \approx 10\text{ ns}$$

3. Write the chemical formula for each of the following compounds.
   A) Silver(I) cyanide $AgCN$
   B) Calcium hypochlorite $Ca(ClO)_2$
   C) Potassium chlorate $KClO_3$
   D) Iron(III) nitrite $Fe(NO_2)_3$

4. Give the systematic name for each of the following compounds.
   A) CaF_2 Calcium fluoride
   B) P_2O_5 Diphosphorus Pentoxide
   C) Cu_2S Copper(I) sulfide
   D) CuS Copper(II) sulfide
   E) NH_4ClO Ammonium hypochlorite

5. Complete the table below:

Symbol	${}^{137}_{55}Cs^{+}$	${}^{56}_{26}Fe^{3+}$	${}^{17}_{8}O^{2-}$	${}^{64}_{30}Zn^{2+}$	${}^{16}_{16}S^{2-}$	${}^{90}_{40}Zr^{4+}$
# Protons	55	26	8	30	16	40
# Neutrons	82	30	9	34	16	50
# Electrons	54	23	10	28	18	36
Mass Number	137	56	16	64	32	90

6. An unknown ion has a total charge of 2+ and 27 electrons. Which ion might this be?

Ion has 27 e^-, so the neutral atom has 29 e^- and 29 protons, so ion is likely Cu^{2+}.

7. There are two stable isotopes of nitrogen: ${}_{14}N$ (14.00307 amu) and ${}_{15}N$ (15.00011 amu). If the average atomic mass of nitrogen is 14.00676 amu, what is the natural abundances of the two isotopes?

First, note that the sum of the abundances will equal 100 % (or 1 in decimal form).

$$^{14}\mathrm{N} \quad m_1 = 14.00307 \text{ amu} \qquad a_1 = x$$
$$^{15}\mathrm{N} \quad m_2 = 15.00011 \text{ amu} \qquad a_2 = 1 - x$$

Now, set up the expression to compute the average atomic mass for nitrogen to solve for x.

$$m_{\mathrm{N}} = m_1 a_1 + m_2 a_2$$
$$14.00676 = (14.00307)(x) + (15.00011)(1 - x)$$
$$14.00676 = 14.00307x + 15.00011 - 15.00011x$$
$$-0.99335 = -0.99704x$$
$$x = 0.99630$$

Finally, the abundances are:

$$a_1 = 99.630\ \%$$
$$a_2 = 0.37010\ \%$$