**Problem Set #2** Added notes on answers

**Chemistry 3A Fall 2025 (Secs 43957 & 43958)**

**2 pages**

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1. Convert these numbers to scientific notation:

a. 0.2809 → 0.2809 → $2.809 \times 10^{-1}$

b. 9200 → 9200. → $9.2 \times 10^3$ zeroes not significant – drop them

c. 9200.00 → 9200.00 → $9.20000 \times 10^3$ zeroes significant! keep them

d. -344.1 → −344.1 $(-3.441 \times 10^2)$ watch negative in significand

e. 0.00024 → 0.00024 $2.4 \times 10^{-4}$

f. 0.00024001 → 0.00024001 $2.4001 \times 10^{-4}$ same movement, more digits

g. 0.0002400 → $2.400 \times 10^{-4}$ – zeroes significant; keep them

2. Convert these to non-scientific notation (regular numbers)

a. $2.3 \times 10^5$ move decimal point to right 5 times 2.30000 → 230,000

b. $3.4768 \times 10^{-5}$ 0.00003.4768 → 0.0000347 68

c. $5.99200 \times 10^3$ 5.99200 → 5992.00

5992 is not correct since not precise

3. Evaluate the expressions. The answer should have the correct number of decimal places and/or significant digits.

decimal place → 2 2 3 sig digits

a. 24.12 + 43.04 - 23.943 sum = 43.217 but use fewest decimal places → 43.22

b. 5.72 × 3.34 product = 19.1048 use fewest sig digits ⇒ 3 sig → 19.1

c. 2.4 × 3.01 - 3.3 ÷ 4 do it by priority: 7.224 − 0.825 = 6.399 → 6.4 | 6.0k

d. $(2.4 \times 10^5) \times (4.9 \times 10^3) = (2.4 \times 4.9) \times 10^5 \times 10^3 = 11.76 \times (10^{(5+3)}) =$

$11.76 \times 10^8 = 1.176 \times 10^9 = 1.2 \times 10^9$

also $240{,}000 \times 4900 = 1{,}176{,}000{,}000 = 1.176 \times 10^9 = 1.2 \times 10^9$

3(c) has a value of "4". Is it a measurement of a constant or "exact count"? Generally it would not be assumed to be a measurement so the significant digits are affected only by other numbers

4. For each of the following, show your use of conversion factors and not just the answer.

Remember: when you do conversions, you are multiplying one or more conversion factors to get a result where the final quantity has the units you are asked to produce, and the factors must cancel the units used in the conversion.

a. 5 milliliters (mL) = ? liters (L) $5\,\text{mL} \cdot \frac{1\,\text{L}}{1000\,\text{mL}} = \frac{5}{1000}\,\text{L} = 0.005\,\text{L}$ or $5 \times 10^{-3}\,\text{L}$

b. 0.023 grams (g) = ? micrograms (μg) $(0.023\,\text{g})\left(\frac{10^6\,\mu\text{g}}{1\,\text{g}}\right) = 23000\,\mu\text{g} = 2.3 \times 10^4\,\mu\text{g}$

c. 5.2 × 10-2 g = ? milligrams (mg) $5.2 \times 10^{-2}\,\text{g} \rightarrow (5.2 \times 10^{-2}\,\text{g})\left(\frac{1000\,\text{mg}}{1\,\text{g}}\right) = 52\,\text{mg}$

d. 50 mg/dL = ? g/L $\left(\frac{50\,\text{mg}}{1\,\text{dL}}\right)\left(\frac{1\,\text{g}}{1000\,\text{mg}}\right)\left(\frac{10\,\text{dL}}{1\,\text{L}}\right) = \left(\frac{50}{1} \cdot \frac{1}{1000} \cdot \frac{10}{1}\right)\frac{\text{g}}{\text{L}} = 0.5\,\frac{\text{g}}{\text{L}}$

5. **True or False**

a. The precision of the resulting number determined by addition and subtraction operations on numbers is determined by the fewest significant digits. False determined by decimal places

b. The precision of the resulting number determined by multiplication and division operations on numbers is determined by the fewest significant digits. True

c. A number expressed in scientific notation will sometimes not equal that number. False A number expressed in scientific notation must always equal original number. It is just expressed in another way

d. Scientific notation is a number whose format is a significand and a power of 10 with the appropriate exponent on the base 10. True (the definition of scientific notation)

e. The number "0.00024" has two significant digits. True

f. The number "240,000,000" has two significant digits. True

g. The number "240.00" has two significant digits. False, Putting zeroes after a decimal point indicates precision to 5 sig digits

h. A measurement is a quantity that must have a number with units. True

This is the definition of a quantity that represents a measurement

[#1: 7 x 3pt, #2: 3 x 3 pt, #3: 4 x 4pt, #4-a,b,c: 4pt, d: 5p, #5: 8 x 2pt ### 79pt]