Problem set # 1

Chemistry B 2A

Name:

1. State the number of significant digits in each measurement.

1) **2804 m**	4	2) **2.84 km**	3	3) **5.029 m**	4
4) **0.003068 m**	4	5) **4.6×10^5 m**	2	6) **4.06×10^{-5} m**	3
7) **750 m**	2	8) **75 m**	2	9) **75,000 m**	2
10) **75.00 m**	4	11) **75,000.0 m**	6	12) **10 cm**	1

2. Round the following numbers as indicated:

To four significant figures:

3.682417	21.860051	375.6523	112.511	45.4673
3.682	21.86	375.7	112.5	45.47

To one decimal place:

1.3511	2.473	5.687524	7.555	8.235
1.4	2.5	5.7	7.6	8.2

To two decimal places:

22.494	79.2588	0.03062	3.4125	41.86632
22.49	79.26	0.03	3.41	41.87

3. Solve the following problems and report answers with appropriate number of significant digits.

1) **6.201 cm + 7.4 cm + 0.68 cm +12.0 cm =** 26.281 = 26.3 cm

2) **1.6 km + 1.62 m +1200 cm =** 1613.62 m = 1614 m

3) **8.264 g - 7.8 g + 0.254 g + 56 g =** 56.718 g = 57 g

4) **10.4168 m - 6.0 m + 72.23 m =** 76.6468 m = 76.6 m

5) **12.00 m+15.001 kg=** impossible

6) **1.31 cm × 2.3 cm × 0.001 cm=** $0.003013\ cm^3 = 0.003\ cm^3$ or $3 \times 10^{-3}\ cm^3$

7) **5.7621 m × 6.201 m × 7.01 m × 2100 m =** $525992.843\ m^4 = 530000\ m^4$ or $5.3 \times 10^5\ m^4$

8) **20.2 cm / 7.41 s =** impossible

9) **40.0020 g / 13.000005 g =** $3.0770757 = 3.07708$

4. Express the following numbers in their equivalent scientific notation forms:

1) **123,876.3** 1.24×10^5

2) **1,236,840** 1.24×10^6

3) **422000** 4.22×10^5

4) **0.000000000000211** 2.11×10^{-13}

5) **0.000238** 2.38×10^{-4}

6) **0.0000205** 2.05×10^{-5}

5. Identify the sums or differences of the following:

1) $(8.41 \times 10^4) + (9.71 \times 10^4) =$ $18.12 \times 10^4 = 1.81 \times 10^5$

2) $(5.11 \times 10^2) - (4.2 \times 10^2) =$ $0.91 \times 10^2 = 9.1 \times 10^1$

3) $(8.2 \times 10^5) + (4.0 \times 10^3) =$ $(8.2 \times 10^5) + (0.040 \times 10^5) = 8.2 \times 10^5$

4) $(6.3 \times 10^{-1}) - (2.1 \times 10^{-2}) =$ $(6.3 \times 10^{-1}) - (0.21 \times 10^{-1}) = 6.1 \times 10^{-1}$

6. Express the product and the quotients of the following:

1) $(3.56 \times 10^5)(4.21 \times 10^6) =$ $14.9876 \times 10^{11} = 1.50 \times 10^{12}$

2) $(2 \times 10^7)(8 \times 10^{-9}) =$ $16 \times 10^{-2} = 2 \times 10^{-1}$

3) $(4.11 \times 10^{-6})(7.51 \times 10^{-4}) =$ $30.8661 \times 10^{-10} = 3.09 \times 10^{-9}$

4) $8.45 \times 10^7 / 6.74 \times 10^3 =$ 1.25×10^4

5) $9.7 \times 10^8 / 8.6 \times 10^{-2} =$ $1.1279 \times 10^{8-(-2)} = 1.1 \times 10^{10}$

6) $4.7 \times 10^{-2} / 5.7 \times 10^{-6} =$ $0.8245 \times 10^{-2-(-6)} = 0.8245 \times 10^{-2+6} = 0.8245 \times 10^4$

$= 8.2 \times 10^3$

Problem set # 1

Chemistry B2A

Dimensional analysis (Factor-Label Method)

Name:

1. Calculate the height of a 5 foot 10 inch man in m, mm, and cm.

$$5\ ft \times \frac{12\ in}{1\ ft} = 60\ in + 10\ in = 70\ in$$

$$70\ in \times \frac{2.54\ cm}{1\ in} = 200\ cm \qquad 200\ cm \times \frac{1\ m}{100\ cm} = 2\ m$$

$$2\ m \times \frac{1000\ mm}{1\ m} = 2000\ mm$$

2. Calculate the volume of a fish tank in L, mL, cc, qt. and gal. if it is 0.85 m long, 25 cm wide, and 20 cm high.

$$0.85\ m \times \frac{100\ cm}{1\ m} = 85\ cm$$

$$V = L \times W \times h = 85\ cm \times 25\ cm \times 20\ cm = 40000\ cm^3 = 40000\ mL = 40000\ cc$$

$$40000\ mL \times \frac{1\ L}{1000\ mL} = 40\ L \qquad 40\ L \times \frac{1\ qt}{0.946\ L} = 40\ qt \qquad 40\ L \times \frac{1\ gal}{3.785\ L} = 10\ gal$$

3. Calculate the number of kg, g, and mg in 0.25lb of margarine.

$$0.25\ lb \times \frac{454\ g}{1\ lb} = 113.5\ g = 110\ g$$

$$110\ g \times \frac{1\ Kg}{1000\ g} = 0.11\ Kg \qquad 110\ g \times \frac{1000\ mg}{1\ g} = 110000\ mg$$

4. A box measures 3.12 ft in length, 0.0455 yd in width and 7.87 inches in height. What is its volume in cubic centimeters?

$$3.12\ ft \times \frac{12\ in}{1\ ft} \times \frac{2.54\ cm}{1\ in} = 95.1\ cm$$

$$0.0455\ yd \times \frac{3\ ft}{1\ yd} \times \frac{12\ in}{1\ ft} \times \frac{2.54\ cm}{1\ in} = 4.16\ cm$$

$$7.87\ in \times \frac{2.54\ cm}{1\ in} = 20.0\ cm \qquad V = L \times W \times h = 95.1\ cm \times 4.16\ cm \times 20.0\ cm = 7910\ cm^3$$

5. How many µg are there in 5.27×10^{-13} kg?

$$5.27\times10^{-13}\ kg \times \frac{1000\ g}{1\ kg} \times \frac{1\ \mu g}{10^{-6}\ g} = 5.27\times10^{-4}\ \mu g$$

6. Convert 65 miles/hour to meters/second.

$$65\ \frac{mi}{hr} \times \frac{1609\ m}{1\ mi} \times \frac{1\ hr}{60\ min} \times \frac{1\ min}{60\ s} = 29\ m/s$$

7. Convert 85 kilometers/hour to meters/second.

$$85\ \frac{Km}{hr} \times \frac{1000\ m}{1\ Km} \times \frac{1\ hr}{60\ min} \times \frac{1\ min}{60\ s} = 24\ m/s$$

8. What is the density of mercury (13.6 g/cm^3) in units of kg/m^3?

$$13.6\ \frac{g}{cm^3} \times \frac{1\ Kg}{1000\ g} \times \left(\frac{100\ cm}{1\ m}\right)^3 = 1.36 \times 10^4\ Kg/m^3$$

9. Convert the density of mercury (13.6 g/mL) to its equivalent in lb/ft^3.

$$13.6\ \frac{g}{cm^3} \times \frac{1\ lb}{454\ g} \times \left(\frac{2.54\ cm}{1\ in} \times \frac{12\ in}{1\ ft}\right)^3 = 848\ lb/ft^3$$

$1\ mL = 1\ cm^3$

10. Convert 15 years to minutes.

$$15\ yr \times \frac{365\ day}{1\ yr} \times \frac{24\ hr}{1\ day} \times \frac{60\ min}{1\ hr} = 7884000\ min$$

$$7.9 \times 10^6\ min$$

1 in = 2.54 cm
1 ft = 12 in
1 qt = 0.946 L
1 gal = 3.785 L
1 lb = 454 g
1 mi = 1609 m

1 yd = 3 ft
Micro (μ) = 10^{-6}

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1 yd = 3 ft
Micro (μ) = 10^{-6}

Additional problems:

1. Convert to Celsius and to Kelvin: $^\circ C = \frac{^\circ F - 32}{1.8}$

a) 320°F $^\circ C = \frac{320^\circ F - 32}{1.8} = 160\,^\circ C$

b) 212°F $^\circ C = \frac{212^\circ F - 32}{1.8} = 100.\,^\circ C$

c) -250°F $^\circ C = \frac{-250^\circ F - 32}{1.8} = -156.67\,^\circ C = -160\,^\circ C$

d) 0°F $^\circ C = \frac{0 - 32}{1.8} = 18\,^\circ C$

2. Convert to Fahrenheit and to Kelvin: $^\circ F = 1.8\,^\circ C + 32$

a) 35°C $^\circ F = 35\,^\circ C \times 1.8 + 32 \Rightarrow ^\circ F = 95\,^\circ F$

b) 250°C $^\circ F = 250\,^\circ C \times 1.8 + 32 \Rightarrow ^\circ F = 480\,^\circ F$

c) -273°C $^\circ F = -273\,^\circ C \times 1.8 + 32 \Rightarrow ^\circ F = -460\,^\circ F$

d) 120°C $^\circ F = 120\,^\circ C \times 1.8 + 32 \Rightarrow ^\circ F = 250\,^\circ F$

3. The density of titanium is 4.54 g/mL. What is the volume, in millimetres, of 163 kg of titanium?

$163\,kg \times \frac{1000\,g}{1\,kg} = 163000\,g$

$d = \frac{m}{V} \Rightarrow 4.54\,\frac{g}{mL} = \frac{163000\,g}{V} \Rightarrow V = 35900\,mL$