

Name: \_\_\_\_\_

**Summer Assignment**

**Honors Chemistry**

**Mr. Knuffke**

**Part 1:** Please email me at [Knuffke.d@deerparkschools.org](mailto:Knuffke.d@deerparkschools.org). Use an email address that you check regularly. Don't forget to include your name. I will put this address on an email distribution list for the course. This will be useful for communication.

**Part 2:** Chemistry is an extremely analytical (read: mathematical) science. This assignment is a review of math skills required for chemistry. The idea is that we will do the boring stuff now, so that we don't have to do it for too long when class begins. Do all work on a separate sheet of paper. Make sure you show your work in each part that requests it of you. For any calculations, indicate an "estimated answer" (accomplished by your brain without aid of a calculator) and a "computed answer" (accomplished by using a calculator). Please let Mr. Knuffke know if there are any problems with the material and assistance will be offered.

**Note:** A tutorial on significant figures is provided at the end of the packet.

The completed packet is due, in class, on Friday, September 17<sup>th</sup>, 2010.

**Do not procrastinate.**

**You are encouraged to work with other students in the class**

**Email any questions: [Knuffke.d@deerparkschools.org](mailto:Knuffke.d@deerparkschools.org)**

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**Part A: Complete the following calculations. Include units on your answers. Show work. Include both estimated and computed answers.**

1.  $\frac{(100 \text{ m})}{(24 \text{ s})}$

8.  $\frac{(8.1 \text{ kg})}{(0.45 \text{ cm} \times 0.55 \text{ cm})}$

2.  $(5.2 \text{ m}) (4.3 \text{ m})$

9.  $0.45 \text{ mm} \times 0.28 \text{ mm} \times 0.85 \text{ mm}$

3.  $\frac{(54 \text{ g})}{(4 \text{ L})}$

10.  $\frac{(75 \text{ kg}) (5.0 \text{ m})}{(2.5 \text{ s}) (6.0 \text{ s})}$

4.  $(34 \text{ cm}) (21 \text{ cm}) (8 \text{ cm})$

11.  $56 \text{ N} \times 2.5 \text{ m}$

5.  $\frac{(10 \text{ kg}) (30 \text{ m})}{(5 \text{ s})}$

12.  $\frac{12700 \text{ J}}{(116 \text{ g}) (4.8^\circ\text{C})}$

6.  $\frac{(4.08 \text{ g})}{(0.061 \text{ g})}$

13.  $\frac{26000 \text{ J}}{125 \text{ g}}$

7.  $\frac{(7.5 \text{ N}) (0.25 \text{ m})}{(0.68 \text{ s})}$

14.  $\frac{1.35 \text{ mol}}{3.55 \text{ L}}$

**Part B: Simplify the following expressions. Show work.**

1.  $5 \frac{(5y - 4y)}{10}$

2.  $\frac{100 \times 5 \times 11}{(18)(2)}$

3.  $\frac{6a \times 5b^2}{3a^3}$

4.  $3d (4d) (0.25d)$

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5.  $\frac{(2a - 3b)(3b)}{3c \times c}$

6.  $(4f + 13g)(2w)$

**Part C: Solve each of the following expressions for x. (x = ?) Show work**

1.  $2x - 15 = 8$

2.  $4x = 3y + 8$  (if  $y = 2$ )

3.  $8x + 5y - z = 0$  (if  $y = 3$  and  $z = -1$ )

4.  $H = WQx$

5.  $Y = \frac{(T + 6)}{x}$

6.  $x + 8 = 23FG$

7.  $\frac{18KRx}{F^2} = E$

8.  $T = LxS$

9.  $15G - x = W$

10.  $\frac{B^2H^5x}{E^4R} = \frac{T^3K}{Y}$

**Part D: Express each of the following in standard form.**

1.  $5.2 \times 10^3$

5.  $3.6 \times 10^1$

2.  $9.65 \times 10^{-4}$

6.  $6.452 \times 10^2$

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3.  $8.5 \times 10^{-2}$

7.  $8.77 \times 10^{-1}$

4.  $2.71 \times 10^4$

8.  $6.4 \times 10^{-3}$

**Part E: Express each of the following in scientific notation.**

1. 78,000

5. 16

2. 0.00053

6. 0.0043

3. 250

7. 0.875

4. 2,687

8. 0.012654

**Part F: Compute the following. Show work. Include estimated and computed answers.**

1.  $(6.02 \times 10^{23})(8.65 \times 10^4)$

8.  $\frac{(5.4 \times 10^4)(2.2 \times 10^7)}{4.5 \times 10^5}$

2.  $(6.02 \times 10^{23})(9.63 \times 10^{-2})$

9.  $\frac{(6.02 \times 10^{23})(-1.42 \times 10^{-15})}{6.54 \times 10^{-6}}$

3.  $\frac{5.6 \times 10^{-18}}{8.9 \times 10^8}$

10.  $\frac{(6.02 \times 10^{23})(-5.11 \times 10^{-27})}{-8.23 \times 10^5}$

4.  $(-4.12 \times 10^{-4})(7.33 \times 10^{12})$

11.  $\frac{(3.1 \times 10^{14})(4.4 \times 10^{-12})}{-6.6 \times 10^{-14}}$

5.  $\frac{1.0 \times 10^{-14}}{4.2 \times 10^{-6}}$

12.  $\frac{(8.2 \times 10^{-3})(-7.9 \times 10^7)}{7.3 \times 10^{-16}}$

6.  $\frac{7.85 \times 10^{26}}{6.02 \times 10^{23}}$

13.  $\frac{(-1.6 \times 10^5)(-2.4 \times 10^{15})}{8.9 \times 10^3}$

7.  $(-3.2 \times 10^{-7})(-8.6 \times 10^{-9})$

14.  $(7.0 \times 10^{28})(-3.2 \times 10^{-20})(-6.4 \times 10^{35})$

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**Part G: Write the number of significant figures in the blank preceding the number.**

- |                     |                       |
|---------------------|-----------------------|
| 1. _____ 23         | 16. _____ 14.380      |
| 2. _____ 1.498      | 17. _____ 307         |
| 3. _____ 248.3      | 18. _____ 1.40082     |
| 4. _____ 107        | 19. _____ 0.00058900  |
| 5. _____ 0.238      | 20. _____ 4500        |
| 6. _____ 8.0335     | 21. _____ 350,000     |
| 7. _____ 0.05587    | 22. _____ 180.00      |
| 8. _____ 14.809     | 23. _____ 3.50        |
| 9. _____ 107.334    | 24. _____ 1.6040      |
| 10. _____ 0.000489  | 25. _____ 0.0459      |
| 11. _____ 3000.     | 26. _____ 0.0950      |
| 12. _____ 804.58    | 27. _____ 10.00       |
| 13. _____ 0.007832  | 28. _____ 10,087.010  |
| 14. _____ 130,004.5 | 29. _____ 100         |
| 15. _____ 250.00    | 30. _____ 0.000010100 |

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**Part H: Write the number of significant figures in the blank preceding the number.**

- |                     |                      |
|---------------------|----------------------|
| 1. _____ 10         | 16. _____ 101        |
| 2. _____ 3201       | 17. _____ 2.808000   |
| 3. _____ 4.00       | 18. _____ 1.80081    |
| 4. _____ 7.99       | 19. _____ 0.00024900 |
| 5. _____ 0.238      | 20. _____ 70         |
| 6. _____ 12.010     | 21. _____ 123,987    |
| 7. _____ 23,000.    | 22. _____ 3,180.00   |
| 8. _____ 12,800     | 23. _____ 43.60      |
| 9. _____ 309.009    | 24. _____ 1.6000040  |
| 10. _____ 1,000,000 | 25. _____ 0.045090   |
| 11. _____ 200.      | 26. _____ 0.095      |
| 12. _____ 102.59    | 27. _____ 100.00     |
| 13. _____ 0.011032  | 28. _____ 30,022.070 |
| 14. _____ 932,004.6 | 29. _____ 910        |
| 15. _____ 880.00    | 30. _____ 0.030300   |

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**Part I: Conversion Factors**

*Below are some conversion factors used in the SI System, and which we will use in this class.*

<u>kilo- = 1000</u> <u>Conversions</u>	<u>centi- = 1/100</u>	<u>milli- = 1/1000</u>	<u>Other</u>
1 kg = 1000 g		1000 mg = 1 g	1 mL = 1 cm <sup>3</sup>
1 km = 1000 m	100 cm = 1 m	1000 mm = 1 m	1 L = 1 dm <sup>3</sup>
1 kL = 1000 L		1000 mL = 1 L	1 cm = 10 mm

*Solve each of the following problems. Show the correct set-up and always use units.*

1. Determine the number of mm in 1600 m.

2. Determine the number of m in 1600 mm.

3. Determine the number of mm in 14.3 cm.

4. How many seconds are in 4.3 years?

5. Convert 2875 cm<sup>3</sup> to liters.

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6. The density of lead (Pb) is  $11.34 \text{ g/cm}^3$ . Find the density of Pb in  $\text{kg/dm}^3$ .

7. Convert 5.2 cm of magnesium (Mg) ribbon to mm of Mg ribbon.

8. Convert 0.049 kg sulfur (S) to g of S.

9. Convert 0.020 kg of tin (Sn) to mg of Sn.

10. Convert 150 mg of acetylsalicylic acid (aspirin) to g of aspirin.

11. Convert 2500 mL of hydrochloric acid (HCl) to L of HCl.

12. A metallurgist is making an alloy that consists of 325 g of chromium (Cr) and 2.5 kg of iron (Fe).  
Find the total mass of the mixture in kg.

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13. How many mL of water ( $\text{H}_2\text{O}$ ) will it take to fill a 2 L bottle that already contains 1.87 L of  $\text{H}_2\text{O}$ ?

14. Convert 150 cm of copper (Cu) wire into mm of Cu wire.

15. Convert 0.5 g of sodium (Na) to kg of Na.

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## Significant Figure Rules

(from: <http://www.chem.sc.edu/faculty/morgan/resources/sigfigs/sigfigs3.html>)

### What is a "significant figure"?

The number of significant figures in a result is simply the number of figures that are known with some degree of reliability. The number 13.2 is said to have 3 significant figures. The number 13.20 is said to have 4 significant figures.

### Rules for deciding the number of significant figures:

**(1) All nonzero digits are significant:**

1.234 g has 4 significant figures,

1.2 g has 2 significant figures.

**(2) Zeroes between nonzero digits are significant:**

1002 kg has 4 significant figures,

3.07 mL has 3 significant figures.

**(3) Leading zeroes to the left of the first nonzero digits are not significant; such zeroes merely indicate the position of the decimal point:**

0.001 °C has only 1 significant figure,

0.012 g has 2 significant figures.

**(4) Trailing zeroes that are also to the right of a decimal point in a number are significant:**

0.0230 mL has 3 significant figures,

0.20 g has 2 significant figures.

**(5) When a number ends in zeroes that are not to the right of a decimal point, the zeroes are not necessarily significant:**

190 miles may be 2 or 3 significant figures,

50,600 calories may be 3, 4, or 5 significant figures.

The potential ambiguity in the last rule can be avoided by the use of standard exponential, or "scientific," notation. For example, depending on whether the number of significant figures is 3, 4, or 5, we would write 50,600 calories as:

$5.06 \times 10^4$  calories (3 significant figures)

$5.060 \times 10^4$  calories (4 significant figures), or

$5.0600 \times 10^4$  calories (5 significant figures).

### What is an "exact number"?

Some numbers are exact because they are known with complete certainty.

Most exact numbers are integers: exactly 12 inches are in a foot, there might be exactly 23 students in a class. Exact numbers are often found as conversion factors or as counts of objects.

Exact numbers can be considered to have an infinite number of significant figures. Thus, the number of apparent significant figures in any exact number can be ignored as a limiting factor in determining the number of significant figures in the result of a calculation.