

## Accelerated Honors Chemistry Pre-Semester Assignment

On a separate piece of paper, do the following assignment and be prepared to turn it in on the first day of the semester.

### Scientific notation

Large numbers, such as 59000.71, can be written as  $5.900071 \times 10^4$  simply by moving the decimal point so that there is only one digit to the left of it. The exponent is the number of digits the decimal point was moved over.

Small numbers, such as 0.0000468, can be written as  $4.68 \times 10^{-5}$ . In this case, the decimal point was moved in the opposite direction, so the exponent is negative.

Put the following numbers in scientific notation.

- 40039
- 0.000768
- 0.003201
- 5060.04
- 8
- 0.00001
- $103.51 \times 10^3$  (Note that this is not in scientific notation since there are three digits to the left of the decimal.)
- $4208.09 \times 10^2$
- $20.09 \times 10^{-2}$
- $60009.35 \times 10^{-4}$

Convert the following numbers to normal notation.

- $5.123 \times 10^3$
- $2.009 \times 10^2$
- $8.8087 \times 10^6$
- $1.6406 \times 10^{-4}$
- $9.32 \times 10^{-7}$

### SI Units and Prefixes - Memorize units, prefixes, and basic conversions

length - meter (m)

mass - Kilogram (Kg)

volume - Liter (L)

weight - Newton (N)

density - grams/milliliter (g/ml) or grams/centimeter cubed ( $\text{g/cm}^3$ ) (note that 1 ml =  $1\text{cm}^3$ )

time - seconds (s)

Prefix	Abbreviation	Value	Scientific notation
Giga	G	1,000,000,000	$1 \times 10^9$
Mega	M	1,000,000	$1 \times 10^6$
Kilo	K	1,000	$1 \times 10^3$
hecto	h	100	$1 \times 10^2$
deka	da	10	$1 \times 10^1$
UNIT		1	$1 \times 10^0$
deci	d	0.1	$1 \times 10^{-1}$
centi	c	0.01	$1 \times 10^{-2}$
milli	m	0.001	$1 \times 10^{-3}$
micro	$\mu$	0.000 001	$1 \times 10^{-6}$
nano	n	0.000 000 001	$1 \times 10^{-9}$

The easiest way to convert between two units is to subtract the difference between two exponents in scientific notation. Then simply decide if the new prefix is smaller than the original prefix or larger. *The rule is small unit goes with a big number, big unit goes with a small number.* Consider the following examples.

Example 1: Convert 55 Km to cm.

55 Km can be written as  $55 \times 10^3$  m since Kilo means  $1 \times 10^3$ . Centi means  $1 \times 10^{-2}$ . So subtracting those exponents gives us a difference of 5 decimal places. The new unit (centi) is smaller than the old unit (Kilo), so the value for centi should be bigger. The conversion yields  $55 \times 10^5$  cm. Finally, we can convert this value to scientific notation by moving the decimal over one place. The final answer is  $5.5 \times 10^6$  cm.

Example 2: Convert 0.04 ng to Kg. 0.04 ng can be written as  $0.04 \times 10^{-9}$  g since nano means  $1 \times 10^{-9}$ . Kilo means  $1 \times 10^3$ . So subtracting those exponents gives us a difference of 12 decimal places. The new unit (Kilo) is bigger than the old unit (nano), so the value for Kilo should be smaller. The conversion yields  $0.04 \times 10^{-12}$  Kg. Finally, we can convert this value to scientific notation by moving the decimal over two places. The final answer is  $4 \times 10^{-14}$  Kg.

Do the following conversions. (Please note that this is a minimal assignment. You need to be sure of yourself with these conversions since you will be using them for most of your science classes from now on. If you need more practice, there are many resources online that have practice problems.)

1. 450 dm to nm
2. 23.5 hL to  $\mu$ L
3. 0.07 Mm to cm
4. 0.00505 mg to ng
5. 123  $\mu$ g to dg
6. 18 cm to Km
7. 0.096 dL to GL
8. 0.0005 m to Mm
9. 84.7 ng to g
10. 13.6 ML to  $\mu$ L