Name____________________ Period: ___________ Date: _______

Honors Chemistry Chapter 3 Exam Review

Vocabulary

1. absolute zero – lowest point on the Kelvin scale
2. mass
3. volume
4. Kelvin - the official SI scale for temperature
5. Celsius - the non SI temperature scale, very commonly used.
6. weight
7. dimensional analysis - a way to analyze & solve problems
8. conversion factor - a ratio of equivalent measurements
9. precision
10. density
11. measurement
12. energy - the capacity to do work or produce heat.
13. temperature - the degree of hotness or coldness of an object, the average kinetic energy of the particles of a substance.
14. joule
15. accuracy
16. Celsius scale - temperature scale on which water freezes at 0° and boils at 100°.
17. scientific notation
18. meter
19. liter - the volume of a cube 10 cm on each edge.
20. kilogram - the SI base unit of mass.

Commonly Used Metric Prefixes to be familiar with for the exam.			
Prefix	**Meaning**	**Factor**	**Decimal value**
mega (M)	1 million times larger than the unit it precedes	10^6	1000000
kilo (k)	1000 times larger than the unit it precedes	10^3	1000
deci (d)	10 times smaller than the unit it precedes	10^{-1}	.1
centi (c)	100 times smaller than the unit it precedes	10^{-2}	
milli (m)	1000 times smaller than the unit it precedes	10^{-3}	
micro (μ)	1 million times smaller than the unit it precedes	10^{-6}	
nano (n)	1000 million times smaller than the unit it precedes	10^{-9}	
pico (p)	1 trillion times smaller than the unit it precedes	10^{-12}	

Objectives and Skills for the test

1. **(3.1.1) Be able to write numbers in scientific notation.**
   a. Examples:
      i. The diameter of a Nitrogen atom is 0.000 000 000 174 m. What is this number expressed in scientific notation? **answer: 1. 1.74** x **10**$^{-10}$ m
      ii. The expression of 2009 km in scientific notation is 2.009 X 10^3 Km
      iii. .000055 L has 2 significant figures
   b. Solve and express in scientific notation:
      i. (3.5×10^{10}) x (1.5×10^{-7}) 5.3 X 10^3
      ii. (2.5×10^3) + (3.5×10^2) 2.9 X 10^3
2. .(3.1.2) Be able evaluate a set of numbers for accuracy and precision
   a. Example:
      a. Which group of measurements is the most precise? (Each group of measurements is for a different object.)

         a) 12 g,13 g, 14 g
         [✓ b) 22 g, 22.5 g, 23 g]
         c) 12.0 g, 13.0 g, 14.0 g
         d) 31 g, 33 g, 35 g

      b. [✓ True] or false: When a test instrument is calibrated, the instruments accuracy improves.
      c. True or [✓ false:] The closeness of a measurement to its accepted or true value is a measure of its precision.

   d. If several students use the same balance to weigh an 5.00 gram object and they all get 7.28 grams instead of the expected 5.00 gram value, the balance is ([✓ precise] / accurate) but is NOT (precise / [✓ accurate]) Note: Circle the correct word for each pair

3. **(3.1.3) Be able to explain why measurements must be reported to the correct number of significant figures**
   a. Examples:
      i. Write the correct significant figures for each of the following:
         1. .005 – 1
         2. 5077 – 4
         3. 7.30×10^{-5} – 3
         4. 60110 – 4
         5. 60033.00 – 7
         6. .00780 – 3
         7. .04 – 1
         8. .00034 – 2
         9. 822.50 – 5

      ii. In the measurement .612 cm, what is the estimated digit? 2

      iii. When a measurement is multiplied by a conversion factor, the numerical value of the measurement ([✓ IS] / IS NOT) changed, but the actual size of the measurement ([✓ STAYS] / DOES NOT) the same.

      iv. Express the sum of
         1. 3333 mL and 444 mL using the correct no. of significant figures 3777
         2. 5.69 mL and 4.0 mL using the correct no. of significant figures 9.7

      v. Express the product of:
         1. 2.4 m and 4.00 m using the correct no. of significant figures 9.6
         2. 2.0×10^{-2} g and 7.2×10^{2} g using the correct no. of significant figures $1.4 \text{ X } 10^{1}$
         3. 2.44×10^{-2} g by 1.4×10^{-3} g by 8.4×10^{-3} g using the correct no. of significant figures and units $2.9 \text{ X } 10^{-7}$

      vi. **When multiplying and dividing measured quantities, the number of significant figures in the result should be equal to the number of significant figures in ([✓ LEAST] / MOST) precise.**

      vii. Round off 777.009 mm to 4 significant figures: 777.0

      viii. Round off the following to 3 significant figures:
         1. 3.1236 3.12
         2. 587.67 588
         3. .00312 .00312

      ix. 1000 g = 1 kilograms

4. **(3.2.1)Explain why metric units are easy to use**
   a. **Write correct decimal value for each of the following prefixes:**
      i. kilo 1000
      ii. deci .1
      iii. centi .01
      iv. milli .001
      v. micro .000001

b. The metric system's main advantage over other systems of measurement is that it is in multiples of 10.

c. List the base units in the following for the metric system Base measurements:

   i. Length Meter
   ii. Mass Kilogran
   iii. Volume Cubic decimeter (not the liter, but equal to the liter)
   iv. Temperature Kelvin
   v. Amount of Substance Mole
   vi. Luminous intensity Candela
   vii. Electric current Ampere

d. Circle the smallest volume: liter, milliliter, deciliter, [✓ microliter.]

e. List these mass units in order from smallest to largest: ng, cg, kg, mg, dg, μg, Mg

ng → ug → mg → cg → dg → Kg → Mg

f. Weight is a measure of the pull of the force of gravity on an object and changes when the object changes Locations.

5. **(3.2.2) Identify the temperature unit's scientists commonly use.**

   a. Complete this table:

	Kelvin	Celsius
Absolute Zero	0	−273
Freezing Pt. H_2O	273	0
Boiling Pt. H_2O	373	100
Conversion Equation	K = C + 273	°C = K − 273

6. **(3.3.2) Describe the kinds of problems that can be easily solved using dimensional analysis**

   a. .0045 m = .45 cm

   $\frac{.0045 m}{} \Big| \frac{100 cm}{1 m}$

   b. 1 mL = 10.0 cm^3
   c. 1 mm = .001 m
   d. 1 liter = 1000m^3

7. (3.2.3) **Calculate the density of a substance.**

   a. **Write the 3 equations used for density calculations**

   i. D = $\frac{M}{V}$

   ii. V = $\frac{M}{D}$

   iii. M = D · V

   b. If a substance is heated, causing an increase in its temperature, the **volume** of that substance will ([✓ increase]/decrease) causing the **density** to (increase/[✓ decrease]).

   c. If a substance is cooled down, causing a decrease in its temperature, the **volume** of that substance will (increase/[✓ decrease]) causing the **density** to ([✓ increase]/decrease).

   d. As the density of a substance increases, the volume of a specific mass of that substance (increases/[✓ decreases]/stays the same)

e. Convert 5000kg/m^3 to g/mL.

$$5000\ \frac{kg}{m^3}\left|\frac{1000\ g}{1\ kg}\right|\frac{1\ m^3}{1000\ L}\left|\frac{1\ L}{1000\ mL}\right. = 5\ g/mL$$

f. Convert 40 mi/hr to km/min (1.6 km = 1.0 mi)

$$40\ \frac{mi}{hr}\left|\frac{1.61\ km}{1\ mile}\right|\frac{1\ hr}{60\ min} = 1.07\ \frac{km}{min}$$

g. What is the density of an object having a mass of 50. g and a volume of 25 cm^3?

$$D = \frac{M}{V} = \frac{50.\ g}{25\ cm^3} = 2.0\ g/cm^3$$

h. What is the volume of 80.0 g of ether if the density of ether is 1.40 g/mL?

$$V = \frac{M}{D} = \frac{80.0\ g}{1.40\ g/mL} = 57.1\ mL$$

i. What is the volume of 5049.5 g of silver if the density of silver is 10.5 g/mL?

$$V = \frac{M}{D} = \frac{5049.5\ g}{10.5\ g/mL} = 480.9\ mL$$