Name: Date: Blk:

Review of Junior Chemistry & Basic Math

Unit A: Basic Math Skills

Chemistry 11 involves a large amount of algebra. To enable you to better handle the concepts and calculations during the course, answer the questions below. ***NO CALCULATORS*** should be used for Unit A.

1. Order of Operations. Leave your answers in fractional form.

a. $5 + 4 \times 2 - 3 \times 5 + 12 / (3 + 1) =$

b. $3 \times 4 / 2 \times 6 + (\{7 + 1\} \times 2) / (3 + 5) =$

c. $3 \times 4 \times 2 / (2 \times 2 \times 3) + 5^2 / (4 \times \{3 + 2\}) =$

d. $[9 / 3 + 2 + 4 - 3(4 - 1) + 5 \times 1 \times 2 - 3 \times 2 + 4 \times 2]^2 =$

e. $\dfrac{5 + 2 \times 4 \times 3 \times 5 \times 2 \times 2}{2 \times 4 \times 3 \times 5 \times 2 \times 2} =$

f. $\dfrac{3 + 5 \times 2 / 2 \times 6 + 4(2 + 7 - 4)}{12 / (3 + 1) \times (4 - 1) \times 2 / 12} =$

2. Use the distributive property to clear the brackets and group like terms.

a. $4(3t - 2w) + 4(t - w) =$
b. $-4(5t + y) - 5(-3y - t) =$
c. $10(y + 2a) - 3(2y - a) =$
d. $3(4r - 5w + 3z) + 2(2r - 2w + 3z) =$

3. Exponents. Write the following in exponent form or solve (leave your answers in simplest form).

a. $2 \times 2 \times 2 \times 2 \times 2 =$
b. $3.4 \times 3.4 \times 3.4 \times 3.4 =$
c. $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} =$
d. $(5/6)^2 =$
e. $(0.1)^3 =$
f. $-5^2 =$
g. $(-2/7)^2 =$
h. $10^6 =$

4. Scientific Notation. Write the following in scientific notation:

a. $10 \times 10 \times 10 \times 10 \times 10 =$
b. $1/10 \times 1/10 \times 1/10 \times 1/10 =$
c. $100000000000 =$
d. $1 / 100000 =$
e. $0.00001 =$
f. $1/100 \times 1/1000 \times 1/10 =$
g. $100000000000 \times 1/100 =$
h. $45621503 =$
i. $9800000 =$
j. $0.00042 =$
k. $0.51003 =$
l. $2000.04 =$
m. $53.143 =$
n. $0.376 =$

5. Scientific Notation. Write the following in decimal form:

a. 2.3×10^5 =
b. 9.7×10^2 =
c. 6.051×10^{-4} =
d. 5.123×10^{-2} =
e. 6.001×10^4 =
f. 1.11×10^{-3} =

6. Scientific Notation. Solve and write your answers in scientific notation:

a. $(3.2 \times 10^5) + (4.5 \times 10^5)$ =
b. $(9.2 \times 10^{-3}) - (5.6 \times 10^{-3})$ =
c. $(4.33 \times 10^2) + (3.72 \times 10^3)$ =
d. $(5.8 \times 10^4) - (6.42 \times 10^4)$ =
e. $(6.25 \times 10^4) - (3.5 \times 10^5)$ =
f. $(1.9 \times 10^{-3}) - (1.5 \times 10^{-4})$ =
g. $(8.7 \times 10^{-25}) + (2.4 \times 10^{-24})$ =
h. $(1.50 \times 10^{23}) - (1.204 \times 10^{24})$ =

Unit B. Basic Graphing Skills:

1. Determination of Slope from a Graph: When 2 values are plotted against each other on a coordinate plane and if the relationship produces a straight line it is referred to as a direct relationship or linear relationship. This relationship can be expressed either as an equation or as a single number representing the slope of that line. All graphs when plotted in pencil on graph paper should have:

- Title which describes what the graph shows
- Labeled axes
- Appropriate units
- Dependent variable on the x-axis
- Independent variable on the y-axis

The slope of the line (m) = rise/run = $\Delta y / \Delta x$

1. The following data were collected for the reaction of zinc in hydrochloric acid:

$$Zn(s) + 2\ HCl(aq) \rightarrow H_2(g) + ZnCl_2(aq)$$

Time (s)	Mass of zinc (g)
0	30.0
60	24.6
120	20.2
180	16.0

a. Draw and label a graph that shows this reaction. Draw a line of best fit for the data given.
b. Calculate the slope of the graph. Be sure to show your calculations.

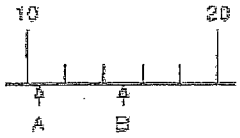
Unit C. Reading Scales:

1. In each of the following, determine the reading as follows. Note: all measurements are in "cm".

i. Find the difference between each numbered division.
ii. Find how many unnumbered subdivisions lie between each numbered division and calculate the value of the intervals between each unnumbered subdivision.
iii. Estimate the value at the pointer (you will have to estimate how far the pointer is from one unnumbered subdivision to the next).

(a) 

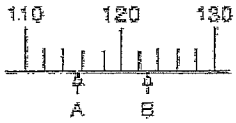
A = _____
B = _____

(b) 

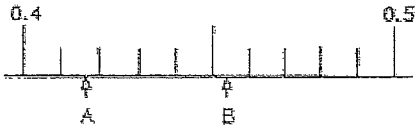
A = _____
B = _____

(c) 

A = _____
B = _____

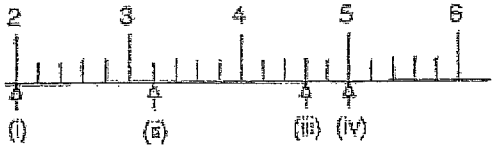
(d) 

A = _____
B = _____

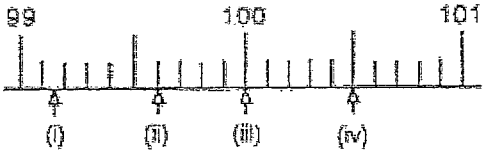
(e) 

A = _____
B = _____

2. Determine the readings on the following centimeter rulers.

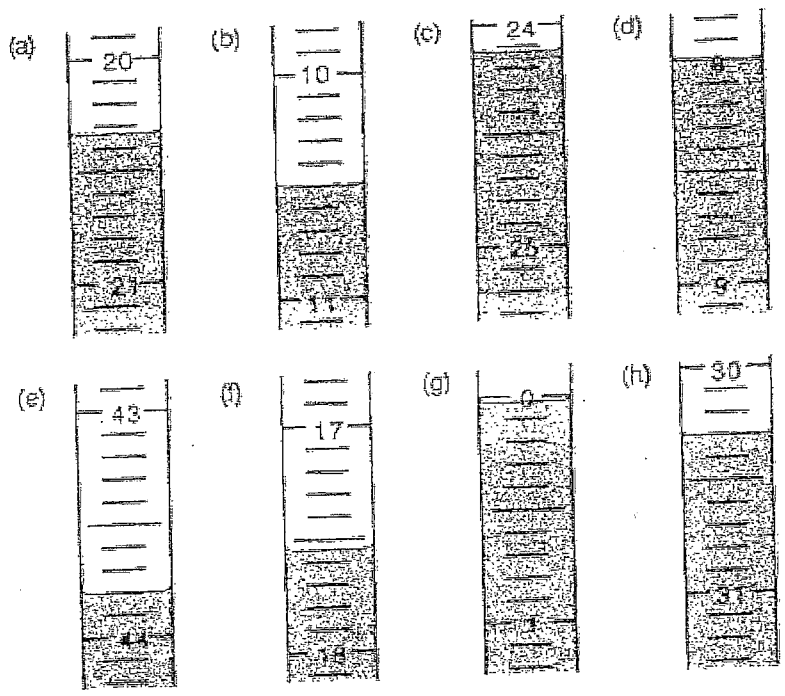
(a) 

(i) = _____
(ii) = _____
(iii) = _____
(iv) = _____

(b) 

(i) = _____
(ii) = _____
(iii) = _____
(iv) = _____

3. Determine the volume readings of the following burettes. Take care! The numbers increase going down the scale!



Unit D. Unit Conversions:

1. For each of the following problem statements, identify:
   - The unknown amount and its unit
   - The initial amount and its unit,
   - The conversion factors and their units

   a. If a chemical costs $50. per gram, what is the cost of 100. g of the chemical?
   b. Computer disks cost $6.00 for 10 disks. How many disks can you buy for $36.00?
   c. Cork has a density of 0.35 g/mL. What is the volume of 20.g of cork?
   d. If 3 kiwi fruit sell for $1, how many kiwi fruit can you buy for $5?
   e. If 4 bims are worth 5 tuds, how many bims can you buy for 30 tuds?
   f. A farmer trades 2 cows for 7 goats. At this rate, how many goats can he get for 10 cows?
   g. One mole of oxygen has a mass of 32g. What is the mass of 5.5 moles of oxygen?
   h. One molecule of sulphur contains 8 sulphur atoms. How many sulphur molecules can be made from 104 sulphur atoms?
   i. How long must an electrical current of 35 coulombs/s flow in order to deliver 200. coulombs?
   j. What temperature increase is caused by 100.kJ of heat if 4.18 kJ of heat causes a 1°C increase in temperature?

2. Solve, showing all work and units conversions.
   a. If there are 6.02×10^{23} atoms in 1 mol of atoms, how many atoms are in 5.5 mol of atoms?
   b. If one mole of gas has a volume of 22.4L, how many moles are there in 25.0L of gas?
   c. If one mole of nitrogen has a mass of 28g, how many moles of nitrogen gas are in 7.0g of nitrogen gas?
   d. How many seconds must an electrical current of 35 coulombs/s flow in order to deliver 200.0 coulombs?
   e. A large nugget of naturally occurring silver metal has a mass of 3.20×10^{4} troy ounces. What is the mass in kilograms if 1 troy ounce is equivalent to 0.0311kg?
   f. If 1 mol of octane produces 5450.kJ of heat when burned, how many moles of octane must be burned to produce 15100.kJ of heat?

3. The Cullinan diamond, the largest diamond ever found, has an uncut volume of 177mL. If 1mL of diamond has a mass of 3.51g and 1 carat=0.200g, how many carats was the Cullinan diamond?

4. An ancient Celtic chicken farmer wished to purchase a gift for his wife. The gift was worth 2 horses. At the local market, 3 horses were worth 5 cows, 1 cow was worth 4 pigs, 3 pigs were worth 4 goats, and 1 goat cost 9 chickens. How much was the gift going to cost the farmer, who had to pay in chickens?

5. Convert the following:

a. 3 s into milliseconds	f. 2 L into deciliters	k. 1 year into seconds
b. 50.0 mL into liters	g. 7 μs into milliseconds	l. 1 mg/dL into grams per liter
c. 2 L into microliters	h. 51 kg into milligrams	m. 1 cm/μs into kilometers/second
d. 25 kg into grams	i. 3125 μL into kiloliters	n. 1 cg/mL into decigrams /L
e. 3 Mm into meters	j. 1.7 μg into centigrams	o. 5 cg/ds into milligrams/second

6. Light travels at a rate of 3.00×10^{8} m/s.
   a. It takes light 8.3 min to travel fromt eh surface of the sun to the earth. What is the distance of the earth from the sun?
   b. The moon is 3.8×10^{5} km from the earth. What time will pass between the instant an astronaut on the moon speaks and the instant his voice is heard on earth? (His voice travels by modulated laser beam at the speed of light.)
   c. A robot vehicle is traveling on the surface of Mars while Mars and Earth are at their closest approach (7.83×10^{7} km). Suddenly, a video camera on the robot shows a yawning crevasse dead ahead! How many minutes will it take for an electronic signal traveling at the speed of light to go from the Earth to Mars in order to tell the robot to stop immediately?

7. A measurement is given as 9.0 lb/in^3. If 1 kg = 2.2lb and 1m = 39 in, convert the measurement into kg/m^3.

8. The standard unit of energy is the joule (unit symbol = J). I f 0.334 kJ of energy is required to melt 1.00g of ice and 1 kJ = 1000 J, then:
   a. What mass of ice can be melted by 10.0 kJ of heat?
   b. How many kilojoules of heat are required to melt 50.0 g of ice?
   c. How many joules of heat are required to melt 2.00 kg of ice?

9. A block of beeswax has a volume of 200.0 mL and a density of 961 g/L. What is the mass of the block?

10. Alcohol has a density of 789 g/L. What volume of alcohol is required in order to have 46g of alcohol?

11. A 25.0 mL portion of each of W, X, Y, and Z is poured into a 100 mL graduated cylinder. Each of the 4 compounds is a liquid and will not dissolve in the others. If 55.0 mL of W has a mass of 107.3g, 12.0 mL of X have a mass of 51.8 g, 42.5 mL of Y have a mass of 46.8 g and 115.0 mL of Z have a mass of 74.8g, list the layer in the cylinder from top to bottom.

Unit E. Physical Properties and Changes of Substances

1. Which of the following statements describe physical properties and which describe chemical properties?
   a. Glass is transparent.
   b. Salt melts at 801°C.
   c. Adding lye to fat makes soap.
   d. Copper conducts electricity.
   e. Fumes from ammonia and hydrochloric acid mix to produce a white smoke.

2. Classify each of the following as one of an atom, a molecule, or an ion.
a. S^{2-} b. O_2 c. Sb d. O e. Al^{3+} f. NH_3

3. Which of an element, compound, true solution or mechanical mixture are possible classifications for the following? (There may be more than one answer for each example.)
   a. a clear liquid which can be boiled away to leave a white solid
   b. a collection of solid particles, some of which are white and some of which are red
   c. a solid which melts at 170°C
   d. a gas
   e. a liquid
   f. a liquid which boils away completely at 136°C. When the liquid is strongly heated in a closed container, a yellow gas and a black solid are produced.