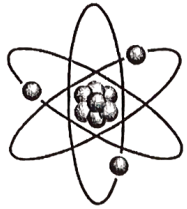


Honors Chemistry

Unit 0: Characteristics of Science Measurement

Homework & Handouts Packet

Name: _____

WORKSHEET – VARIABLES

NAME_____
PERIOD _____
DATE_____

For each experiment, write down the independent variable, dependent variable, and at least two constants.

1. Becky wanted to figure out what type of liquid worked best for growing beans. She watered one with coca-cola, one with lemonade, and one with just water. After one week, she measured how high they had grown.
   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

2. Four groups of rats are first massed and then fed identical diets except for the mount of vitamin A they receive. Each group gets a different amount. After 3 weeks on the diet, the rats' masses are measured again to see if there was any change.
   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

3. Shania wanted to see if eating apples would help her do better on her classwork. The first day, she didn't eat any apples. On day 2, she ate one apple; on day 3, she ate 2 apples; and on day 4, she ate 3 apples. Each day, she recorded the grades she got on her science work.
   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

4. Raekwon wanted to see if listening to music would make the basketball players make more baskets. On day one, he didn't play any music and counted how many baskets they could make in 10 minutes. On day 2, he played rap music and counted the baskets, and on day 3, he played classical music and counted the baskets.
   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

5. Jessica wanted to see what kitchen cleaner worked best for cleaning her counters. She used Lysol, Clorox, Pinesol, and just water. For each cleaner, she put 5 milliliters of grape juice on the counter, sprayed the cleaner, and wiped it with one paper towel.
   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

6. Evan wanted to find out what toothpaste made teeth the cleanest. Everyday he brushed his teeth with a different product and then took a plaque test to see how much plaque was left. He used Crest, Colgate, Close-up, and water.

   a. Independent Variable: _____
   b. Dependent Variable: _____
   c. Constants: _____

7. Angelique wanted to find out what shampoo made her hair the shiniest. Everyday she washed her hair with different shampoos and then rated how shiny her hair was, on a scale from 1-10. She used Pantene, Herbal Essences, L'Oreal, and just water.

   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

8. Harrison wanted to find out what soil works best for growing roses. He grew them in potting soil, clay, sand, and soil he found outside his yard. After one week, he measured their height and how many leaves they had.

   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

9. Emily wanted to see if the temperature of a cup of water would affect the amount of sugar that would dissolve in the water. She heated three separate cups of water to three different temperatures and measured how much sugar would dissolve in each.

   a. Independent Variable : _____
   b. Dependent Variable : _____
   c. Constants: _____

10. A student wanted to test how the mass of a paper airplane affected the distance it would fly. Paper clips were added before each flight. As each paper clip was added, the plane was tested to determine how far it would fly.

    a. Independent Variable: _____
    b. Dependent variable: _____
    c. Constants: _____

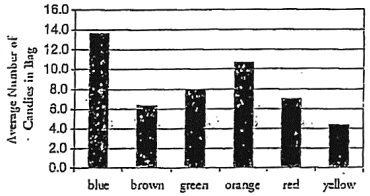
Worksheet - Graphing

Name _____
Period _____
Date _____

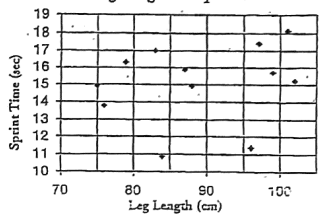
Scientists use graphs to clearly illustrate whether or not there is a relationship between variables. In most cases a scatter plot or line graph is used. Bar graphs are sometimes used if the independent variable is limited to specific numeric values (where the values in-between are not possible) or is non-numeric. A special type of bar graph called a histogram is used in cases where the scientist wants to show how often something happens.

Examples of graphs

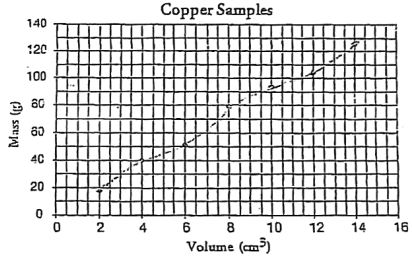
Graph A



Graph B



Graph C



Use the graphs above to answer the following questions.

1. Identify each of the graphs as a scatter plot, line graph or a bar graph.
   Graph A _____ Graph B _____ Graph C _____

2. Identify the independent variable and dependent variable for each of the graphs above.

	Graph A	Graph B	Graph C
Independent Variable		★	
Dependent Variable			

3. Explain why a bar graph would not be a good choice for the data graphed in graph B above.

_____

_____

4. For each of the following experiments, choose "scatter plot/line graph" or "bar graph/histogram" as the most appropriate way to display the data. Justify your answers.

A. Students measured the height of each student in class. They wanted to answer the question "What is the most common height among 10th grade students?

Height Range	Number of Students
Under 4'0"	1
4'1" to 4'6"	3
4'7" to 5'0"	5
5'1" to 5'6"	9
5'7" to 6'0"	3
Over 6'0"	1

B. The Fish and Wildlife agency measured the size of Pacific salmon for 1 year and recorded the average weight for each species.

Salmon Species	Average Weight (lbs)
King	15
Sockeye	8
Silver	12
Chum	15
Humpback	5

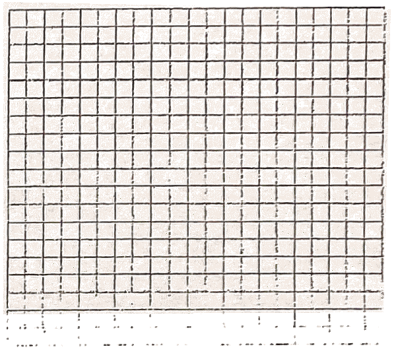
C. The National Oceanic and Atmospheric Administration measured the pressure of the atmosphere at various altitudes.

Altitude (m)	Atmospheric Pressure (atm)
0	1.000
2750	0.750
5486	0.500
8376	0.333
16,132	0.100
30,901	0.010
48,467	0.001

★

5. Graph the following information in a BAR graph. Label and number the x and y-axis appropriately. Put a title on the top of the graph.

Month	# of deer
Sept	38
Oct	32
Nov	26
Dec	20
Jan	15
Feb	12

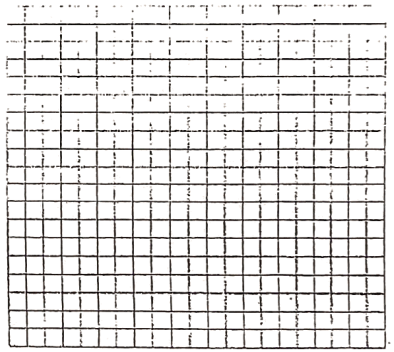


A. What is the independent variable?

B. What is the dependent variable?

6. Graph the following information in a LINE graph. Label and number the x and y-axis appropriately. Put a title on the top of the graph.

# of Days	# of Bacteria
1	4
2	16
3	40
4	80
5	100
6	200

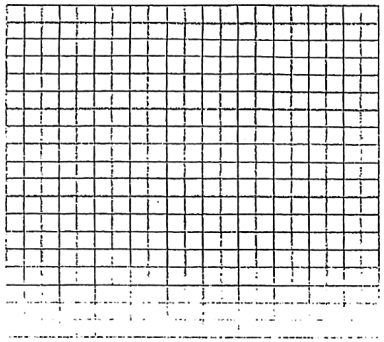


A. What is the independent variable?

B. What is the dependent variable?

7. Graph the following information in a BAR graph. Label and number the x and y-axis appropriately. Put a title on the top of the graph.

# of Hours of Studying	Grade on science quiz
0	20
2	60
4	70
6	80
8	90
10	100

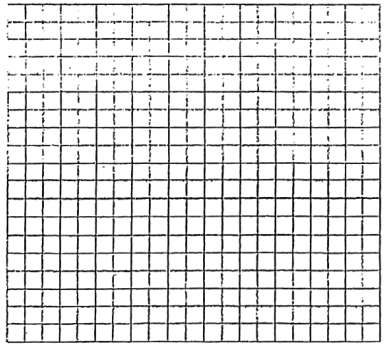


A. What is the independent variable?

B. What is the dependent variable?

8. Graph the following information in a LINE graph. Label and number the x and y-axis appropriately. Put a title on the top of the graph.

Temperature (°F)	Bacteria Growth (millions)
0	0
20	10
30	15
40	20
50	8
60	5
70	0



A. What is the independent variable?

B. What is the dependent variable?

Chapter 1 • Matter and Measurement

SIGNIFICANT FIGURES & ROUNDING

Indicate the number of significant figures then round each to the number of significant figures indicated.

For example:
1.234 has ___4___ significant figures and, rounded to2 significant figures, is ___1.2___

1. 0.6034 has _____ significant figures and, rounded to2 significant figures, is _____
2. 12,700 has _____ significant figures and, rounded to2 significant figures, is _____
3. 12,700.00 has _____ significant figures and, rounded to1 significant figures, is _____
4. 0.000983 has _____ significant figures and, rounded to2 significant figures, is _____
5. 123342.9 has _____ significant figures and, rounded to5 significant figures, is _____
6. 6.023×10^{23} has _____ significant figures and, rounded to2 significant figures, is _____
7. .005600 has _____ significant figures and, rounded to1 significant figures, is _____
8. 10000.5006 has _____ significant figures and, rounded to5 significant figures, is _____
9. 2.0×10^{-3} has _____ significant figures and, rounded to1 significant figures, is _____
10. 3.456110 has _____ significant figures and, rounded to3 significant figures, is _____

Given calculations and the answer, write the answers with the appropriate number of significant figures.

Example:
6.00 x 3.00 = 18 The answer should be ___18.0___

1. 23 + 46 = 69 The answer should be _____
2. 23.0 + 46.0 = 69 The answer should be _____
3. 253 + 345.8 = 598.8 The answer should be _____
4. 56 – 35 = 21 The answer should be _____
5. 56.00 – 35.0 = 21 The answer should be _____
6. 46 x 12 = 552 The answer should be _____
7. 3.24 x 5.63 = 18.2412 The answer should be _____
8. (2.355 + 2.645) x 10.00 = 50 The answer should be _____
9. 654 ÷ 32 = 20.4375 The answer should be _____
10. .024 x .063 = 1.512×10^{-03} The answer should be _____

Chemistry Concepts — Converting Units Worksheet

Name:_____ Date:_____

Complete the following metric equalities.

_____ kg = _____ g	_____ cm = _____ m	_____ mm = _____ m	_____ ms = _____ s
_____ km = _____ m	_____ mL = _____ L	_____ mg = _____ g	

Convert the following units:

1. Convert 360 s to ms

2. Convert 4800 g to kg

3. Convert 5600 cm to m

4. Convert 4800 g to mg

5. Convert 245 ms to s

6. Convert 25 kg to g

7. Convert 4 inches to cm (there are 2.54 cm per inch)

8. Convert 250 grams to lbs (there are 453.6 g in 1 lb.)

9. Convert 3.8 L to gallons (there are 1.057 qts in 1 L and 4 qts in 1 gal)

10. How many seconds are there in 24 hours? [2-step! What equalities do you need?]

PRACTICE WITH SCIENTIFIC NOTATION

Review of Scientific Notation

Scientific notation provides a way to hold the zeroes that come after a whole number or before a fraction, so it is used to write very large or very small numbers. A number in scientific notation is written as the product of a number greater than or equal to 1 and less than 10 and a power of 10. The power of 10 indicates how many places the decimal point was moved.

The line below shows the equivalent values of decimal notation (the way we write numbers usually, like "1,000 dollars") and scientific notation (1 x 10^3 dollars).

	smaller			larger
Fraction	1/100	--	--	--
Decimal notation	0.01	1	100	1,000,000
Scientific notation	1 x 10^{-2}	1 x 10^0	1 x 10^2	1 x 10^6

Practice With Scientific Notation

Section A: Write out the decimal equivalent (regular form) of the following numbers that are in scientific notation.

Model: 1 x 10^1 = 10

1) 2.0 x 10^2 = _____ 4) 2.0 x 10^{-2} = _____

2) 3.56 x 10^4 = _____ 5) 7.68 x 10^{-5} = _____

3) 5.621 x 10^7 = _____ 6) 4.5 x 10^0 = _____

Section B: Convert from decimal form into scientific notation.

Model: 1,000 = 1 x 10^3

7) 20 = _____ 10) 0.156 = _____

8) 3300 = _____ 11) 0.00079 = _____

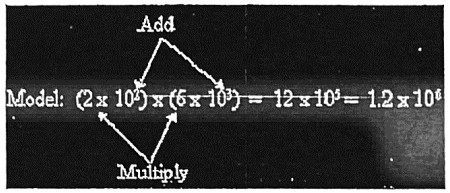
9) 800,000,000 = _____ 12) 1 = _____

Continue to next page ➔

More Practice With Scientific Notation

Perform the following operations in scientific notation. Refer to the introduction if you need help.

Section C: Multiplication (Remember that you just need to multiply the main numbers and add the exponents).



Model: $(2 \times 10^2) \times (6 \times 10^3) = 12 \times 10^5 = 1.2 \times 10^6$

Remember that your answer should be expressed in two parts, as in the model above. The first part should be a number less than 10 (eg: 1.2) and the second part should be a power of 10 (eg: 10^6). If the first part is a number greater than ten, you will have to convert the first part. In the above example, you would convert your first answer (12×10^5) to the second answer, which has the first part less than ten (1.2×10^6). For extra practice, convert your answer to decimal notation. In the above example, the decimal answer would be 1,200,000.

		scientific notation	decimal notation
13)	$(1 \times 10^3) \times (3 \times 10^1) =$	_____	_____
14)	$(3 \times 10^4) \times (2 \times 10^3) =$	_____	_____
15)	$(5 \times 10^{-5}) \times (11 \times 10^4) =$	_____	_____
16)	$(2 \times 10^{-4}) \times (4 \times 10^3) =$	_____	_____

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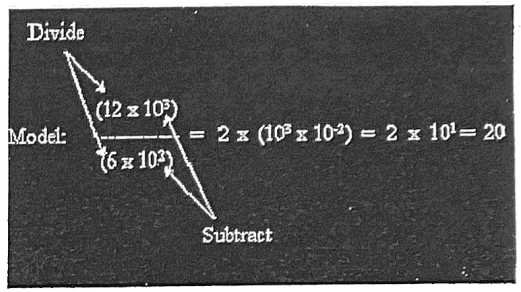
Section D: Division (Remember that you just need to divide the main numbers and subtract the exponents).



Model: $\frac{(12 \times 10^3)}{(6 \times 10^2)} = 2 \times (10^{(3-2)}) = 2 \times 10^1 = 20$

final answer (in scientific notation)

17) $(8 \times 10^6) / (4 \times 10^3) =$ _____

18) $(3.6 \times 10^8) / (1.2 \times 10^4) =$ _____

19) $(4 \times 10^3) / (8 \times 10^5) =$ _____

20) $(9 \times 10^{21}) / (3 \times 10^{19}) =$ _____

Continue to next page ➔

Section E Addition The first step is to make sure the exponents are the same. We do this by changing the main number (making it bigger or smaller) so that the exponent can change (get bigger or smaller). Then we can add the main numbers and keep the exponents the same.

Model: $(3.0 \times 10^4) + (2 \times 10^3) = (3 \times 10^4) + (0.2 \times 10^4)$
$= 3.2 \times 10^4$
$= 32{,}000$

First express the problem with the exponents in the same form, then solve the problem.

final answer

21) $(4.0 \times 10^3) + (3 \times 10^2) =$ _____

22) $(9 \times 10^2) + (1.00 \times 10^4) =$ _____

23) $(8 \times 10^6) + (3.2 \times 10^7) =$ _____

24) $(1.32 \times 10^{-3}) + (3.44 \times 10^{-4}) =$ _____

Section F Subtraction Just like addition, the first step is to make the exponents the same. Instead of adding the main numbers, they are subtracted.

Model: $(3 \times 10^4) - (2 \times 10^3) = (30 \times 10^3) - (2 \times 10^3)$
$= 28 \times 10^3$
$= 2.8 \times 10^4$

final answer

25) $(2.00 \times 10^2) - (4 \times 10^1) =$ _____

Continue to next page ➔

26) $(3.0 \times 10^{-6}) - (5 \times 10^{-7}) =$ _____

27) $(9 \times 10^{12}) - (8.1 \times 10^9) =$ _____

28) $(2.2 \times 10^{-4}) - (3 \times 10^2) =$ _____

AND FOR EVEN MORE PRACTICE, REFER TO YOUR TEXTBOOK OR THESE SITES!!

http://janus.astro.umd.edu/astro/scinote/

http://www.aaamath.com/dec71i-dec2sci.html

Worksheet: Dimensional Analysis

1. The distance from the thumb to the little finger on Erbie Terbium's hand is 9 inches. Convert this to centimeters.

2. According to the Guinness Book of Records the heaviest baby ever born weighed 29 lbs 4 oz. (29.25 lbs). What was the baby's mass in kG? (Historical Note: The birth occurred in Effingham IL in 1939 and due to respiratory problems the baby died two hours later. The heaviest babies to survive weighed 22.5 lbs and were born in 1955 and 1982.)

3. Your cross country skis are 210 cM long. What is their length in inches?

4. A condor has a wing span of 3.05 M. What is the wing span in feet?

5. In Europe gasoline is sold by the liter. Assume that it takes 14 gallons of gasoline to fill the tank of a compact car. How many liters of gasoline will it take?

6. You have just received a French cookbook from the exchange student. You want to make 3 quarts of punch for a party. Will a recipe of 2.5 L be enough?

7. Some owls maintain territories of up to 3 acres. How many owls could live in a large wooded area of 20 hectares? (1 hectare=1 sq. dekameter=100 m^2= 2.47 acres)

8. Ruth Palladium (RuPd) bought 10 acres of land and built a house on 2 acres. RuPd wanted to raise sheep on the remaining 8 acres. If it takes 1/8 (0.125) hectare to raise one sheep, how many sheep can be raised on the 8 acres.

9. One 1.6 oz. of package of cinnamon and spice instant oatmeal contains 34 G of carbohydrates. If you had instant oatmeal 6 days a week, how many ounces of carbohydrate would you consume in a week? (16 oz =1 lb = 454 G =256 Drams = 7000 Grains)

10. Many candybars have 9 G of fat per bar. If during a "chocolate attack" you ate one pack of candy (0.6 dekabars), how many ounces of fat would you have eaten? There are approximately 9 Calories per gram of fat, how many Calories is this?

11. If the RDA for vitamin C is 60 mG per day and there are 70 mG of vitamin C per 100 G of orange, how many 3 oz. oranges would you have to eat each week to meet this requirement?

12. If Gasp cigarettes have 5 mG tar and 0.4 mG nicotine per cigarette and there are 20 cigarettes per pack, how many packs of cigarettes would have to be smoked to coat your lungs with 8 oz (1/4 lb.) of tar? How many packs would you have to smoke to coat your lungs with one gram of nicotine?

13. You are riding home from a party and the driver has been drinking. The car is traveling at 60 mi per hour. Suddenly a child steps into the road ahead. Because the driver has been drinking his reaction time has been slowed by 1 second. How far toward the impending accident will the car travel before the driver begins to stop? (Note: This is equal to the extra distance it will take to stop the car because the driver has been drinking.)

Temperature Conversions

Convert each of the following. SHOW ALL WORK INCLUDING THE FORMULA USED

1. 212°F = _____K

2. -273°C = _____°F

3. 77°F = _____°C

4. 450K = _____°C

5. 37°C = _____K

6. 225K = _____°F

Worksheet – Percent Error

Name _____
Period _____ Date _____

Directions: SHOW ALL WORK INCLUDING THE FORMULA. BOX IN YOUR ANSWERS

$$\text{Percent Error} = \frac{|\text{Experimental Value} - \text{Accepted Value}|}{\text{Accepted Value}} \times 100$$

1. Joshua uses his thermometer and finds the boiling point of ethyl alcohol to be 75° C. He looks in a reference book and finds that the actual boiling point of ethyl alcohol is 80°C. What is his percent error?

2. The density of water at 4°C is known to be 1.00 g/mL. Kayla experimentally found the density of water to be 1.075 g/mL. What is her percent error?

3. An object has a mass of 35.0 grams. On Anthony's balance, it weighs 34.85 grams. What is the percent error of his balance?

4. The concentration determined for an unknown sample of hydrochloric acid by a student is 0.1355 M. According to the instructor's information, the true molarity (M) of this solution is 0.1364 M. What is the percent error in this experiment?

5. The melting point of potassium thiocyanate determined by a student in the laboratory turned out to be 174.5 °C. The accepted value of this melting point is 173.2 °C. What is the percent error in this reading?

6. An object with an actual mass of exactly 0.54 g is given to 2 students. One student obtains a mass of 0.59 g for the object, while another says the mass is 0.49 g. Which of the students, if either has the greater percent error?