Regents Chemistry

Practice Packet

Unit 1: Math & Measurement

This page intentionally left blank

Lesson 1: Metric Conversions

Objective:

- ***Recognize and convert various metric scales of measurement***

Use Reference Tables C and D to help you answer the following questions about the metric system.

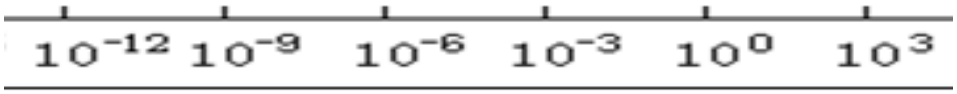
1. Give the unit(s) used to describe the following: (1 pt each)

   a. Mass _____ d. Time: _____

   b. Volume _____ e. Temperature: _____

   c. Energy _____ f. Pressure: _____

2. Complete the following number line by adding the prefixes that pertain to the marked values: (1 pt)



3. Convert the following: (1 pt each)

   a. 900 km = _____ m e. 568 mL = _____ L

   b. 200 kg = _____ g f. 52 mg = _____ g

   c. 5.00 m = _____ km g. 0.025 J = _____ mJ

   d. 7000 J = _____ kJ h. 0.000859 cm = _____ µm

6. Determine the number of mm in 14.3 cm.

7. Convert 5.2 cm of Mg ribbon into mm.

8. Convert 0.049 kg of sulfur to g.

9. Convert 2500 mL of HCl to L of HCl.

10. What is the atomic radius of Lithium in μm? (Hint –use Table S to find it in pm and convert)

11. Convert .39 L to mL.

ASSESS YOURSELF ON THIS LESSON: _____/21

If you missed more than 4, do the Additional Practice.

ADDITIONAL PRACTICE LESSON 1:

1. Give the unit(s) used to describe the following: Concentration _____

2. Convert the following:

   a. 800 cm = _____ m

   b. 20 cg = _____ g

   c. 2.0 L = _____ mL

   d. 0.0256 m = _____ μm

   e. 0.000589g = _____ ng

   f. 0.5987 nm = _____ pm

3. Determine the number of mm in 1600 m.

4. Convert 150mg of aspirin to g of aspirin.

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/10

If you missed more than 2 you should see me for extra help and/or re-watch the lesson video

Lesson 3: Temperature Conversions

Objective:

- ***Differentiate between Kelvin and Celsius scales***
- ***Convert between Celsius and Kelvin temperature***

1) Convert -83 °C to Kelvin ***(include formula and numerical set up!!)***

2) How many Celsius degrees separate the freezing and boiling points of water? _____

   What are these two temperatures? _____ & _____

3) What is the lowest possible temperature in °C? _____

4) How many Kelvin separate the freezing and boiling points of water? _____

   What are these two temperatures? _____ & _____

5) What is the lowest possible temperature in Kelvin? _____

6) Using the temperature conversion formula on Table T in your Reference Tables, convert the following temperatures to either Celsius or Kelvin. (1 pt for each conversion)

Celsius Temperature	Kelvin Temperature
	383 K
80 °C	
	323 K
10 °C	
- 10 °C	
	243 K

For questions 8-10, provide the answer in both Kelvin and Celsius (1 pt each)

7) Using Table S in your reference table what temperature does Sulfur *melt* at?

K: _____ °C: _____

8) What temperature does Sulfur freeze at?

K: _____ °C: _____

9) What is the freezing point of Silver (Ag)?

K: _____ °C: _____

10) What is the boiling point of Mercury (Hg)?

K: _____ °C: _____

ASSESS YOURSELF ON THIS LESSON: _____/15
If you missed more than 2, do the Additional Practice.

ADDITIONAL PRACTICE LESSON 3:

1) Using the temperature conversion formula on Table T in your Reference Tables, convert the following temperatures to either Celsius or Kelvin.

Celsius Temperature	Kelvin Temperature
	251K
50 °C	
	302 K
8 °C	
- 2 °C	
	145 K

2) Using Table S in your reference table what temperature does Sulfur *melt* at?

K: _____ °C: _____

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/7
If you missed more than 1 you should see me for extra help and/or re-watch the lesson video assignment

Lesson 4: Measuring Accuracy (Percent Error)

Objective:

- ***Differentiate between accuracy and precision***
- ***Calculate percent error***

REMEMBER: Include all formulas and numerical set-up in addition to a final answer!!

1. What's the difference between being accurate and being precise?

2. Student A reports the length of a sample as 8.865cm; Student B reports the length of a sample as 8.9cm. Which student is measuring to greater precision?

3. There are 140. calories in one can of Coke. In an experiment you determine that there are 210. You are a bit off, but what is your percent error for the experiment?

4. There are 35 mg of sodium in a can of Coke. You determine it to be 15 mg. What is your percent error?

5. Working in the laboratory, a student finds the density of a piece of pure aluminum to be 2.85 g/cm^3. The accepted value for the density of aluminum is 2.70 g/cm^3. Determine the percent error.

6. A student experimentally determines the specific heat of water to be 4.29 J/g•°C. He then looks up the specific heat of water on a reference table B and finds that it is 4.18 J/g•°C. What is his percent error?

7. A student measures the volume of a substance to be 34.5 mL. What is his percent error for this measurement if the actual volume was 0.0250 L?

ASSESS YOURSELF ON THIS LESSON: _____/7

If you missed more than 1, do the Additional Practice.

ADDITIONAL PRACTICE LESSON 4

1. Determine the percent error if a student determines that the mass of a block is 45.6 grams and the actual mass is 46.7g.

2. Working in the laboratory, a student finds the density of an object to be 1.35 g/cm^3. The accepted value for the density of the object is 1.25 g/cm^3. Calculate the percent error.

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/2

If you missed more than 1 you should see me for extra help and/or re-watch the lesson video assignment.

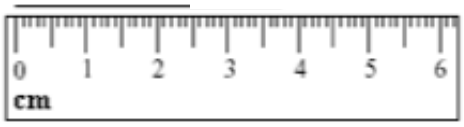
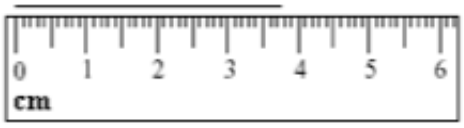
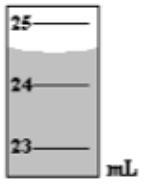
Lesson 5: Precision (Significant Figures in Measurement)

Objective:

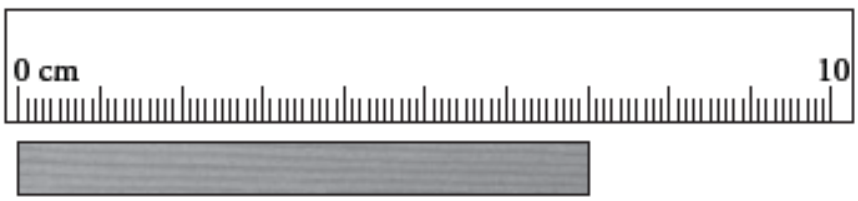
- ***Show uncertainty in measurement (precision) by the use of significant figures..***
- ***Identify the amount of significant figures in a number***

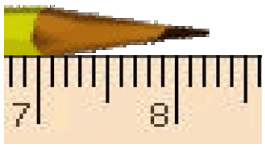
REMINDER: MEASUREMENTS ALWAYS HAVE UNITS

1) For the following measuring devices, record the reading, the precision (place) the measurement was made to and the number of significant figures in the measurement. (1 pt each)

Example	Measurement	Precision (what place value did you estimate to?)	Number of Sig Figs in Measurement
	Acceptable range of answers: 2.44cm – 2.49cm (pick one) 2.46 cm	hundredths	3
			
			
			

2. Record the length of the wooden splint to the proper number of significant digits.



3. 

cm

4. A student finds the mass of a solid using 3 balances. Explain his findings in terms of precision.

Mass 1	45.698 grams
Mass 2	45.7 grams
Mass 3	45.69842 grams

5. A student conducts a laboratory procedure using 30.0mL of an acid at 1.5M concentration. How many significant figures are in the volume measurement for the acid?

6. Round to the place indicated (1 pt each)

Value	Nearest *tens*	Nearest *whole number*	Nearest *tenth*	Nearest *hundredth*
859.3073 cm				
73.2665 mol				

Determine the number of sig figs:

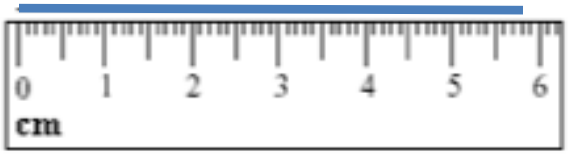
8. 1.0 cm _____
9. 3.05 mm _____
10. 0.505 pm _____
11. 500 mL _____
12. 4.050 g _____
13. 2.500 kg _____
14. 0.0008 µg _____
15. 0.12 g _____
16. 0.000084 g _____
17. 1000mL _____
18. 4,100,000 mm _____
19. 3.020g _____

Round each number to 3 sig figs

20. 98.473 L _____
21. 0.00076321 g _____
22. 57.048 m _____
23. 12.17 °C _____
24. 5678 _____
25. 50674 _____
26. 200.98 _____
27. 199.56 _____
28. 2000.43 _____
29. 0.004567 _____

ASSESS YOURSELF ON THIS LESSON: _____/43
If you missed more than 8, do the Additional Practice.

ADDITIONAL PRACTICE LESSON 5:

	Measurement	**Precision (what place value did you estimate to?)**	**Number of Sig Figs in Measurement**
			

Value	Nearest *tens*	Nearest *whole number*	Nearest *tenth*	Nearest *hundredth*
8.742 mg				

Determine the number of sig figs

1. 52 cm _____
2. 9.083 nm _____
3. 350.230 g _____
4. 200 mL _____
5. 6.02×10^5 L _____
6. 100.0 mL _____

Round each number to 3 sig figs

7. 124.5 g _____
8. 9.1305 m _____
9. 1.040555 mm _____

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/16
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment

Lesson 6: Significant Figures in Calculations

Objective:

- ***Apply the rules of significant figures in calculations.***

WHERE DO I ROUND MY ANSWER TO?

Complete the following addition/subtractions and round to the correct precision. (4 pts)

Problem	Unrounded answer	Rounded answer
1. 10.2 cm + 21cm		
2. 31.3 g + 54.45 g =		
3. 0.023 mg - 0.0004 mg =		
4. 5.068 L - 0.1 L =		

Complete the following multiplication/division and round to the correct number of significant figures. (4 pts)

Problem	Unrounded answer	Rounded answer
5. 5.87 g/cm^3 * 2.1 cm^3 =		
6.. 4.32 cm * 78 cm =		
7. 589 J/ 12g =		
8. 78.632 mol / 52.3 L =		

Round to the correct number of sig figs. (1 pt each)

9. 1.2 m + 2.35 m = _____

10. 2.6538 cm x 2.1 cm = _____

11. 5.681 dm – 2 dm = _____

12. 38.28 g ÷ 25.2 cm^3 = _____

13. 25 cm + 3 cm = _____

14. 1.2 m x 2 m = _____

15. A student measures the density of three different samples of aluminum with the following results: What is the average of the three measurements rounded to the correct number of significant figures?

Sample	Density
1	2.75 g/cm3
2	2.97 g/cm3
3	2.55 g/cm3

Answer: _____

Numbers that are not measurements do not have units and are not subject to the rules of significant figures.

ASSESS YOURSELF ON THIS LESSON: _____/15

If you missed more than 3, do the Additional Practice.

ADDITIONAL PRACTICE LESSON 6

	Unrounded Answer	Rounded Answer
1. 859678.2354 cm – 568426.1 cm =		
2. 5.3 m x 5.2398 m x 2 m =		
1. 45.25252 nm + 45.8563 nm =		
4. 68.23 hm ÷ 38.255 hm =		
5. 2.354 m + 2.354 m + 2.35 m =		
6. 0.28524 m x 0.25124 m x 1.235 m=		
7. 100 cm – 1.0 cm =		
8. 100 cm x 1 cm =		
9. 0.000456 m + 0.00524 m =		
10. 1254.1 cm ÷ 5 =		

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/10

If you missed more than 1 you should see me for extra help and/or re-watch the lesson video assignment

Lesson 2: Density

Objective:

- ***Determine the volume of a substance***
- ***Calculate Density/Mass/Volume***

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Reference table S gives the densities of many elements. Which of the first 10 elements (excluding Carbon) is the least dense? Most dense:

   Least: Most:

2. Generally, what phase of matter (solid, liquid or gas) has the least density? Greatest density?

3. Bubbles in soda rise to the surface. Explain this in terms of density.

4. The density of silver (Ag) is 10.5 g/cm^3. Find the mass of Ag that occupies 965 cm^3 of space.

5. A 2.75 kg sample of a substance occupies a volume of 250.0 cm^3. Find its density in g/cm^3.

6. Under certain conditions, oxygen gas (O_2) has a density of 0.00134 g/mL. Find the volume occupied by 250.0 g of O_2 under the same conditions.

7. Find the volume that 35.2 g of carbon tetrachloride (CCl_4) will occupy if it has a density of 1.60 g/mL.

8. The density of ethanol is 0.789 g/mL at 20°C. Find the mass of a sample of ethanol that has a volume of 150.0 mL at this temperature.

9. A rectangular block of lead (Pb) measures 20.0 mm X 30.0 mm X 45.0 mm. If the density of Pb is 11.34 g/cm^3, calculate the mass of the block.

10. An irregularly-shaped sample of aluminum (Al) is put on a balance and found to have a mass of 43.6 g. The student decides to use the water-displacement method to find the volume. The initial volume reading is 25.5 mL and, after the Al sample is added, the water level has risen to 41.7 mL. Find the density of the Al sample in g/cm^3. (Remember: 1 mL = 1 cm^3.)

11. A student measures the mass and volume of a sample of copper at room temperature and 101.3kPa. The mass is 48.9 grams and the volume is 5.00 cubic centimeters. The student calculates the density of the sample. What is the percent error of the student's calculated density?

ASSESS YOURSELF ON THIS LESSON: _____/10

If you missed more than 2, do the Additional Practice.

ADDITIONAL PRACTICE LESSON 2 *(show all work!!)*

1. A cube of gold (Au) has a side length of 1.55 cm. If the sample is found to have a mass of 71.9 g, find the density of Au.

2. 30.0 g of hydrochloric acid (HCl, density = 1.1164 g/mL) is needed. Find the volume that must be measured out in a graduated cylinder.

3. Determine the mass of a 15.36cm^3 of magnesium (Mg).

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/3

If you missed more than 1 you should see me for extra help and/or re-watch the lesson video assignment

Lesson 7: Scientific Notation

Objective:

- ***Convert numbers into scientific notation and standard notation***
- ***Calculate mathematical operations using scientific notation***

Convert each of the following to scientific notation

Number	Scientific Notation
1.) 200	
2.) 250.	
3.) 1000	
4.) 200,000	
5.) 2100.	

Convert each of the following to standard notation

Scientific Notation	Standard Notation
6.) 3.56×10^{3}	
7.) 7.982×10^{11}	
8.) 8.3400×10^{15}	
9.) 7.02×10^{-4}	
10.) 6.6×10^{34}	

Calculation	*Answer in standard notation*	*Answer in scientific notation*
11.) $(8.97 \times 10^{4}) - (2.62 \times 10^{3}) =$		
12.) $(4.215 \times 10^{-2}) + (3.2 \times 10^{-4}) =$		
13.) $(3.0 \times 10^{4}) \times (2.7 \times 10^{-3}) =$		
14.) $(6.73 \times 10^{-5}) \times (2.91 \times 10^{2}) =$		
15.) $(6.4 \times 10^{6})/(8.9 \times 10^{2}) =$		
16.) $(3.2 \times 10^{3})/(5.7 \times 10^{-2}) =$		

ASSESS YOURSELF ON THIS LESSON: _____/16

If you missed more than 2, do the Additional Practice.

ADDITIONAL PRACTICE LESSON 7

Convert into scientific notation or standard notation.

Standard Notation	Scientific Notation
1) 503,000	
2)	6.83×10^{-4}
3)	2.050×10^{2}
4) 0.00008503	

Calculation	*Answer in standard notation*	*Answer in scientific notation*
1.) $(2.97 \times 10^{6}) - (3.41 \times 10^{5}) =$		
2.) $(2.54 \times 10^{-3}) + (2.2 \times 10^{-5}) =$		
3.) $(1.44 \times 10^{4}) \times (5.9 \times 10^{1}) =$		
4.) $(3.2 \times 10^{6})/(7.7 \times 10^{4}) =$		

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/8

If you missed more than 1 you should see me for extra help and/or re-watch the lesson video assignment.

Lesson 8: Graphing

Objective:

- ***Construct and interpret a graph from experimentally obtained data.***
- ***Identify relationships between variables from a graph.***
- ***Make predictions using graphs.***

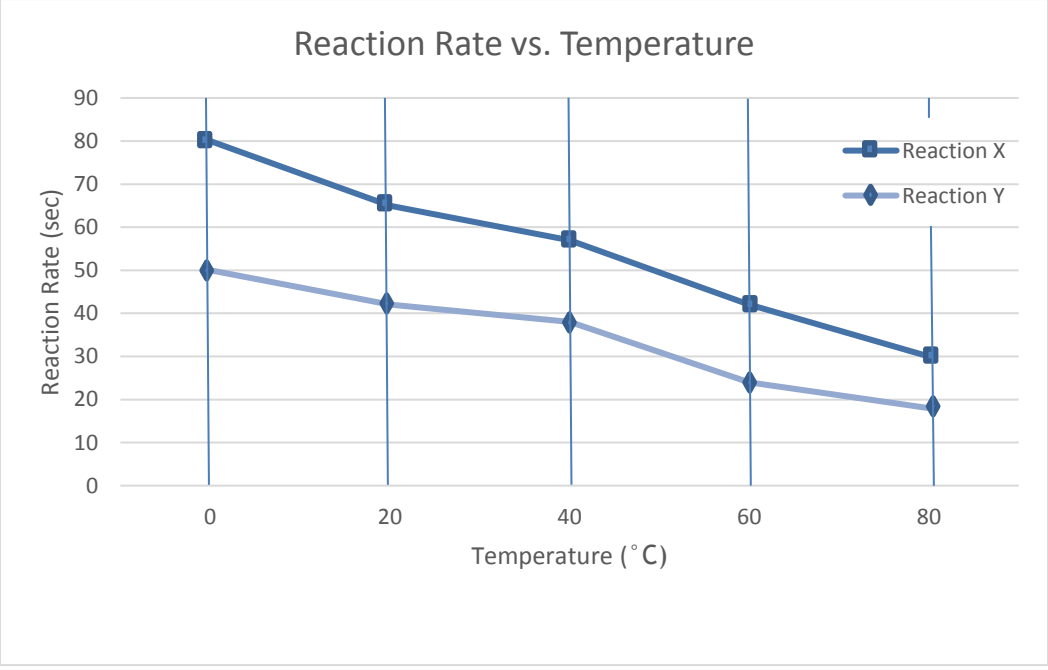
Interpreting graphical data:

A sample graph is shown below. This is a graph representing data collected from a laboratory investigation. Use this graph to answer the following questions:

1. Note that a well-designed graph has a descriptive title that tells the reader what the graph represents. What is the title of this graph? _____
2. What is the independent variable (controlled by the experimenter; x-axis): _____
   What is the dependent variable (measured value; y-axis) : _____
3. Variable are represented by units. The scale used on each axis should have equally spaced increments, but it is not necessary to use the same spacing on both axes.
   a. What unit is used for the independent variable? _____
   b. What unit is used for the dependent variable? _____
   c. What is the value assigned to each space on the horizontal axis? _____
   d. What is the value assigned to each space on the vertical axis? _____
4. How are the different sets of data distinguished in the graph?

   _____

5. Why do scientists graph results of experiments?



Chemistry: Graphing Exercise

A beaker containing 100 ml of water is heated at a constant rate for 10 minutes. The temperature of the liquid is recorded each minute. A second beaker containing 100 ml of ethanoic acid is heated and monitored under similar conditions. The data are recorded below.

Beaker Containing Water		Beaker Containing Acid	
Time (min)	Temperature (°C)	Time (min)	Temperature (°C)
0	20.0	0	20.0
1	21.6	1	23.1
2	23.0	2	26.1
3	24.5	3	29.0
4	25.8	4	33.0
5	27.3	5	35.8
6	29.0	6	38.8
7	30.6	7	41.1
8	32.0	8	44.0
9	33.5	9	47.2
10	34.9	10	49.9

1) Identify the independent variable. _____

2) Identify the dependent variable._____

3) Create a graph for the data in each of the tables above. (put both lines on same graph) Label axis (include units), and plot the points. Draw a "best-fit" line for each graph.

4) Determine the slope of each line. Slope= $m = \frac{y_1 - y_2}{x_1 - x_2}$

a) Slope water:

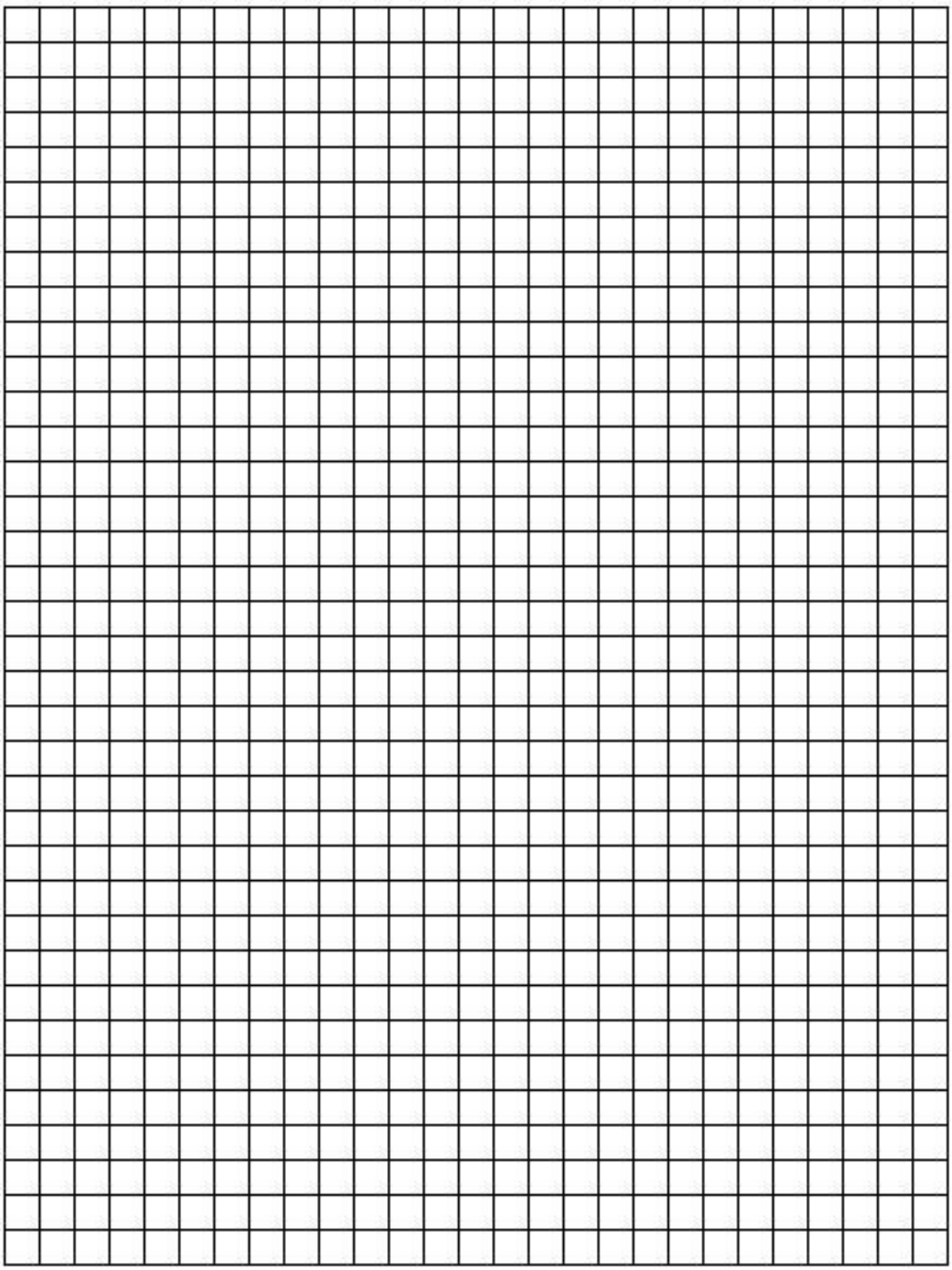
b) Slope acid:

5) How long did it take for the water to reach 27ºC?_____

6) How long did it take for the acid to reach 27ºC?_____

7) What would the temperature of the water be at 1.5 minutes?_____ Is this an example of extrapolation or interpolation?

8) What would the temperature of the acid be at 10.5 minutes?_____ Is this an example of extrapolation or interpolation?



VOCABULARY

You are responsible for the definition of each of the words in your notes packet. The selected terms below represent concepts which you are required to understand and not just define. In the space below, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word or explain how the concept is used. Give an example if you can.

density: _____

temperature:_____

absolute zero: _____

tare: _____

accuracy: _____

precision: _____

percent error: _____

dependent variable: _____

independent variable: _____

direct relationship:_____

indirect (inverse) relationship:_____