

### Exam 1 Practice

Chem 161 – K. Marr

Answer all questions. You must show work to receive full credit!  
Report numerical answers to the correct number of significant figures.

1. (8) Complete the following conversions. Show your work and report your answer to the correct number of significant figures. No credit is given for answers without work shown.

a.  $4.89 \times 10^2 \text{ nm}$  to cm

b.  $0.0045 \frac{\text{g}}{\text{mL}}$  to  $\frac{\text{ug}}{\text{L}}$

c.  $120 \text{ mm}^3$  to L

d.  $65 \frac{\text{mi}}{\text{hr}}$  to  $\frac{\text{m}}{\text{s}}$  (1 km = 0.625 mi)

2. (10) Two students collected data to measure the density of solid metal beads using the method of water displacement. The data is shown below.

	Student A	Student B
Initial volume in grad. cylinder (mL)	40.0	50.0
Final volume in grad. cylinder (mL)	40.5	53.5
Mass of solid (g)	3.562	29.740

- a. Calculate the density (to the correct number of significant figures) based on each students' data.
- b. The true value for the density of the solid is 8.35 g/mL. Calculate the % error for each student. Which student was more accurate? Why? Was the equipment or the procedure at fault? What improvements or changes would you suggest to improve the results of the student?

3. (8) Shown below is the data table from an experiment to determine the percent water in a hydrate. From the data, calculate the percent water in the hydrate.

Mass of evaporating dish	18.035 g
Mass of dish + hydrate	20.620 g
Mass of dish + hydrate after 1 <sup>st</sup> heating	19.560 g
Mass of dish + hydrate after 2 <sup>nd</sup> heating	19.557 g

4. (9) How did each of the following scientists contribute to our understanding of the nature of matter at the atomic scale? Explain clearly.

a. John Dalton

b. Ernst Rutherford

- 6.(8) The element Cl has two isotopes:  $^{35}\text{Cl}$  (mass = 34.968852 amu ) and  $^{37}\text{Cl}$ (36.965903 amu). Calculate the percent abundance of each isotope. You must show your work to receive credit.

- 7.(8) Complete the following table:

Element	#p <sup>+</sup>	#n <sup>0</sup>	#e <sup>-</sup>	Mass Number
	53			131
Ni		34		
	12	13	10	
		2	0	3

8. (5) Give an example of each of the following: (note: there may be more than one correct answer)

- The only non metal in the alkali metal group \_\_\_\_\_
- An alkaline earth metal ion with the same number of electrons as Ar. \_\_\_\_\_
- A non metal ion with the same number of electrons as Ne. \_\_\_\_\_
- A diatomic element that is not in the halogen or alkali metal group \_\_\_\_\_
- A transition metal in the same period (row) as potassium \_\_\_\_\_

9. (10) Give the correct name. Spelling counts.

- Ca<sub>3</sub>P<sub>2</sub> \_\_\_\_\_
- K<sub>3</sub>PO<sub>4</sub> \_\_\_\_\_
- SO<sub>3</sub> \_\_\_\_\_
- MnO<sub>2</sub> \_\_\_\_\_
- H<sub>2</sub>SO<sub>3</sub> \_\_\_\_\_

10. (10) Give the correct formula.

- Magnesium sulfide \_\_\_\_\_
- Dinitrogen monoxide \_\_\_\_\_
- Iron(III)sulfate \_\_\_\_\_
- Sodium Bicarbonate (or sodium hydrogen carbonate) \_\_\_\_\_
- Carbonic Acid \_\_\_\_\_

11. (6) The formula for Calcium oxalate is CaC<sub>2</sub>O<sub>4</sub>.

From this information, what is the formula (including charge) for the oxalate ion?

What is the correct formula for sodium oxalate ?

Oxalic acid is the substance in rhubarb leaves that makes them toxic to eat. It is also found in small (non-toxic) quantities in spinach leaves. What is the correct formula for oxalic acid.

12. (10) The graph below shows a plot of density vs. % ethanol for several ethanol/water solutions.
- Calculate the slope and y-intercept of this line. Clearly show all work and mark the points used on the graph.
  - The density of an unknown solution is measured and found to be 0.8536 g/mL . Using the calculated slope and intercept from part *a* above, calculate the % alcohol in this solution. Show your work.

