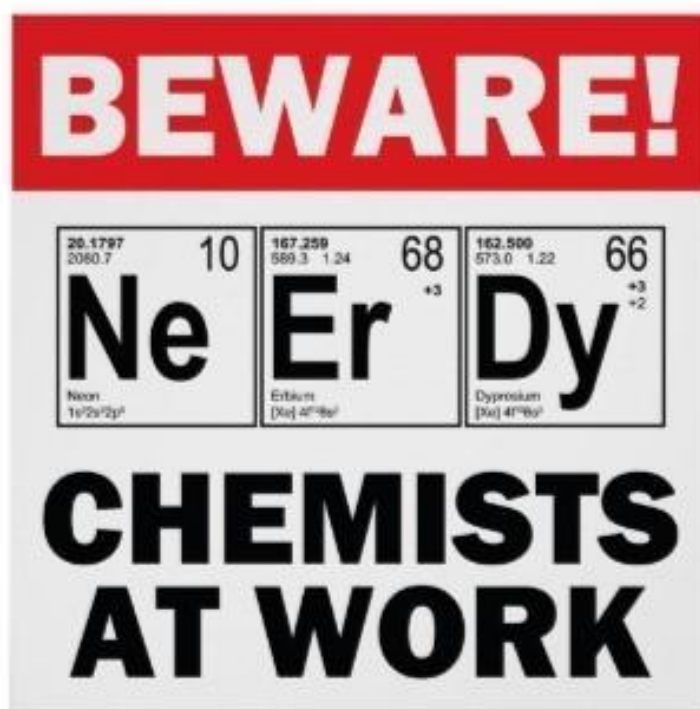
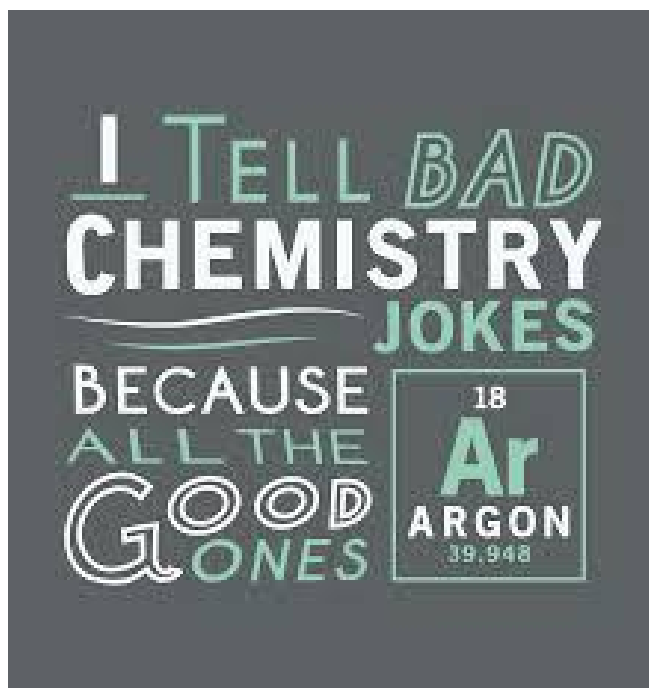


## Honors Summer Assignment Practice

You will need a calculator, and the reference tables (google: Regents Chemistry Reference Tables and you will find a 12 page reference table). Follow the directions for each of the practice problems in this packet. You can use videos on youtube/crash course chemistry or Khan academy to help you.



## Honors Summer Assignment Practice

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### A: Basic Algebra

Try not to use a calculator for these in order to prepare for class this fall!

Perform the following calculations using your decimal rules:

1.  $12 * 0.02 =$  \_\_\_\_\_

2.  $25 * 0.003 =$  \_\_\_\_\_

3.  $100 * 0.02 =$  \_\_\_\_\_

4.  $1.2 * 0.03 =$  \_\_\_\_\_

5.  $42 * 0.0002 =$  \_\_\_\_\_

6.  $12 / 0.02 =$  \_\_\_\_\_

7.  $15 / 0.03 =$  \_\_\_\_\_

8.  $0.04 / 0.02 =$  \_\_\_\_\_

9.  $0.008 / 0.02 =$  \_\_\_\_\_

10.  $0.050 / 2 =$  \_\_\_\_\_

Perform the following calculations using your percent rules:

11. 10% of 150 = \_\_\_\_\_

12. 20% of 200 = \_\_\_\_\_

13. 25% of 40 = \_\_\_\_\_

14. 30% of 150 = \_\_\_\_\_

15. 40% of 200 = \_\_\_\_\_

16. 50% of 20 = \_\_\_\_\_

17. 60% of 30 = \_\_\_\_\_

18. 75% of 80 = \_\_\_\_\_

19. 80% of 11 = \_\_\_\_\_

20. 100% of 175 = \_\_\_\_\_

Perform the following calculations using your estimating rules:

21.  $10 * 0.02 * 250 * 2 =$  \_\_\_\_\_

22.  $12.024 * 0.0211 * 59.9 =$  \_\_\_\_\_

23.  $5112 / 0.02001 * 25.15 =$  \_\_\_\_\_

24.  $(512.012 + 88.09872) / 30.01 =$  \_\_\_\_\_

25.  $(56.89 - 16.9997) * 0.02 =$  \_\_\_\_\_

# Honors Summer Assignment Practice

## B: Scientific Notation Introduction

Scientific notation is used to express numbers that are very large or small. An example is  $6.02 \times 10^{23}$  which is a large number called a “mole” in chemistry. It means 6.02 times 10 twenty three times; or 602000000000000000000000! The number 6.02 is the “base number”, which must be between 1 and 10. The number 23 is the “exponent” which represents the number of places the decimal moved to get the base number between 1 and 10.

Another number,  $5.12 \times 10^{-5}$  is a small number. The exponent is negative which really means the 5.12 is divided by 10 five times. So the rule is if the exponent is positive the real number is large and if the exponent is negative the real number is small.

### Convert the following numbers into scientific notation:

- 1) 3,400 \_\_\_\_\_
- 2) 0.000023 \_\_\_\_\_
- 3) 101,000 \_\_\_\_\_
- 4) 0.010 \_\_\_\_\_
- 5) 45.01 \_\_\_\_\_
- 6) 1,000,000 \_\_\_\_\_
- 7) 0.00671 \_\_\_\_\_
- 8) 4.50 \_\_\_\_\_

### Convert the following numbers into standard notation:

- 9)  $2.30 \times 10^4$  \_\_\_\_\_
- 10)  $1.76 \times 10^{-3}$  \_\_\_\_\_
- 11)  $1.901 \times 10^{-7}$  \_\_\_\_\_
- 12)  $8.65 \times 10^{-1}$  \_\_\_\_\_
- 13)  $9.11 \times 10^3$  \_\_\_\_\_
- 14)  $5.40 \times 10^1$  \_\_\_\_\_
- 15)  $1.76 \times 10^0$  \_\_\_\_\_

## Honors Summer Assignment Practice

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### B: Scientific Notation Calculations

Try not to use a calculator for these in order to prepare for class this fall!

Fix the following numbers to put them in proper scientific notation:

1.  $230 \times 10^4$  \_\_\_\_\_

2.  $16 \times 10^{-3}$  \_\_\_\_\_

3.  $1901 \times 10^{-7}$  \_\_\_\_\_

4.  $0.00865 \times 10^{-1}$  \_\_\_\_\_

5.  $0.00091 \times 10^3$  \_\_\_\_\_

6.  $0.0540 \times 10^1$  \_\_\_\_\_

Perform the following calculations:

7.  $1.00 \times 10^{12} * 2.50 \times 10^3$  \_\_\_\_\_

8.  $2.0 \times 10^4 * 5.0 \times 10^2$  \_\_\_\_\_

9.  $3.0 \times 10^{-13} / 1.0 \times 10^3$  \_\_\_\_\_

10.  $5.0 \times 10^8 / 2.00 \times 10^3$  \_\_\_\_\_

11.  $8 \times 10^4 + 2 \times 10^3$  \_\_\_\_\_

12.  $9 \times 10^5 + 3 \times 10^3$  \_\_\_\_\_

13.  $3 \times 10^6 - 2 \times 10^5$  \_\_\_\_\_

14.  $8 \times 10^{-3} - 2 \times 10^{-2}$  \_\_\_\_\_

15.  $\log (1.0 \times 10^{-5})$  \_\_\_\_\_

16.  $\log (1.0 \times 10^4)$  \_\_\_\_\_

17.  $\log (1.0 \times 10^{-17})$  \_\_\_\_\_

18.  $(1.00 \times 10^{12})^{-1}$  \_\_\_\_\_

19.  $(2.00 \times 10^3)^{-1}$  \_\_\_\_\_

20.  $(1.00 \times 10^{12})^2$  \_\_\_\_\_

21.  $(4.00 \times 10^{12})^2$  \_\_\_\_\_

22.  $(1.00 \times 10^{12})^3$  \_\_\_\_\_

23.  $(2.00 \times 10^{12})^3$  \_\_\_\_\_

24.  $(1.00 \times 10^{12})^{-1/2}$  \_\_\_\_\_

25.  $\sqrt{(1.00 \times 10^{12})}$  \_\_\_\_\_

26.  $\sqrt{(1.60 \times 10^{13})}$  \_\_\_\_\_

27.  $\sqrt{(9 \times 10^8)}$  \_\_\_\_\_

# Honors Summer Assignment Practice

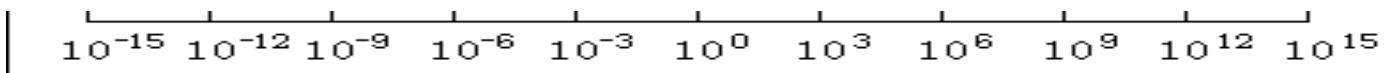
## C: Metric Introduction

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

1. Give the unit used to describe the following:

- |           |       |                 |       |
|-----------|-------|-----------------|-------|
| 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:



3. If a substance weighs 2.00 grams and you need the mass in kilograms, will the number appear to become smaller or larger? Explain your answer.

4. If a liquid has a volume of 5800 mL and you need the mass in Liters, will the number appear to become smaller or larger? Explain your answer.

5. If a substance has a mass of 0.00235 grams and you need the mass in milligrams, will the number appear to become smaller or larger? Explain your answer.

6. Convert the following:

- |           |   |          |                 |   |               |
|-----------|---|----------|-----------------|---|---------------|
| a. 900 km | = | _____ m  | h. 568 mm       | = | _____ m       |
| b. 200 kg | = | _____ g  | i. 52 mg        | = | _____ g       |
| c. 5.00 m | = | _____ km | j. 0.025 J      | = | _____ mJ      |
| d. 7000 J | = | _____ kJ | k. 0.859 s      | = | _____ ms      |
| e. 800 cm | = | _____ m  | l. 0.0256 m     | = | _____ $\mu$ m |
| f. 20 cg  | = | _____ g  | m. 0.000589g    | = | _____ ng      |
| g. 2.0 L  | = | _____ cL | n. 0.00005987 m | = | _____ pm      |

## C: Density

## Honors Summer Assignment Practice

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1. Reference table S gives the densities of many elements. Which of the first 10 elements is the least dense?
2. Which of the first ten elements has the greatest density?
3. Generally, what phase (solid, liquid, or gas) are all elements in that have low densities? What phase has high densities?
4. Bubbles in soda rise to the surface. Explain this in terms of density.
5. Sand in the ocean always settles to the ocean floor. Explain this in terms of density.
6. A sample of sulfur has a mass of 28.5 grams. What is this sample's volume in mL?
7. A sample of oxygen has a mass of 16.0 grams, what is the volume of the sample in Liters?
8. A balloon is filled with helium to a volume of 2.00L. What is the mass of the helium in grams?
9. A lead cube with a length of 2.2cm has what volume? What is the mass?
10. A pure elemental gas has a mass of 0.018 g and a volume of 20.0 mL. What gas could it be?
12. A pure metallic liquid has a mass of 162.6 g and a volume of 12mL. What element could it be?
13. A 2.75 kg sample of a substance occupies a volume of 250.0 cm<sup>3</sup>. Find its density in g/cm<sup>3</sup>.
14. 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<sup>3</sup>, calculate the mass of the block.

## Honors Summer Assignment Practice

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### C: Temperature Conversions

Use the formula for temperature conversions on the back of the chemistry reference table.

1) Convert 83 °C to Kelvin

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.

383 K	
	80C
323K	
	10 C
10K	

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

8) Using table S, what is the freezing point of Silver (Ag)?

9) Using table S, what is the boiling point of Mercury (Hg)?

10) Using Table S, if room temperature is 22C, is Bromine a solid, liquid, or gas?

# Honors Summer Assignment Practice

## D: Significant Figures

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

	Data
Mass 1	45.698 grams
Mass 2	45.7 grams
Mass 3	45.69842 grams
Mass 4	45.9 grams

2. A beaker has marks every 50mL. A cylinder has marks every 10mL. A pipette has marks every 1mL. Is the pipette the most accurate or precise tool? Explain your answer.

3. Sally measures 11mL of water in the beaker described in question 2. Henry measures 11mL in the pipette described in question 2. When they add their water together in one cup, do they have exactly 22mL combined? Why or why not?

**In order to report the most precise and accurate data possible we must learn to count significant figures. When measuring a substance's mass, volume, etc. the device requires you to measure "one place beyond." All the numbers you report count as a significant figure (sig fig) except leading zeros and sometimes the trailing zeros. Let's investigate:**

**Example 1:** A piece of aluminum has a mass of 0.0521 grams which has 3 sig figs. This is not 5 sig figs because if we convert that mass to mg the mass becomes 52.1 mg. Again the number has 3 sig figs which shows it didn't get any more precise. Proof that leading zeros never count.

**Example 2:** A beaker of water contains 520 mL which has 2 sig figs. The trailing zero doesn't count *this time* because if we convert to liters the volume is .52 L. The trailing zero was not measured. If we want to show that it was exactly 520 mL we would report it as 520. mL with a decimal point. That way if we convert to liters it is .520L.

**Example 3:** A reaction takes 0.0025050 s which has 5 sig figs. Remember the first three zeros are "place holders and don't count. If we convert to ms we get 2.5050 ms, also with 5 sig figs. The trailing zero was measured or else the student wouldn't have reported it. The rule is: **Leading zeros never count, trapped zeros always count, they are measured) and trailing zeros count if there is a decimal.**

**Using the rules above, count the number of significant figures in the following measurements:**

- |               |       |               |       |
|---------------|-------|---------------|-------|
| 4. 3.456 L    | _____ | 7. 0.000206 m | _____ |
| 5. 2.300 g    | _____ | 8. 0.025600 L | _____ |
| 6. 1.258092 m | _____ | 9. 0.520301 J | _____ |



## Honors Summer Assignment Practice

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If a piece of glassware is very precise it may have a lot of sig figs, as many as 4. A less accurate piece of glassware such as a beaker will only have 1 sig fig. If both pieces of glassware are used to measure quantities in a lab we have to round our results to the least precise measurement. When working with measurements the quantity with the least decimal places is the least precise. For example, if the beaker measures 10mL and a cylinder measures 10.1mL the cylinder is more precise. If the two quantities are added together the new volume is 20mL. The decimal must be rounded to make our answer to one sig fig. Therefore the rule is: **When adding or subtracting measurements, round your answer to the lowest number of decimal places given.**

*Complete the following operations and report to the correct number of significant figures.*

- |     |                |       |     |                          |       |
|-----|----------------|-------|-----|--------------------------|-------|
| 10. | $10.2 + 21$    | _____ | 14. | $0.023 - 0.0004$         | _____ |
| 11. | $31.3 + 54.45$ | _____ | 15. | $5.068 - 0.1$            | _____ |
| 12. | $22.59 + 21$   | _____ | 16. | $45.6 - 22.12 + 11$      | _____ |
| 13. | $0.023 + 20.1$ | _____ | 17. | $0.0123 + 5.689 - 0.014$ | _____ |

When performing calculations with our data sometimes we have to multiply and divide our data. In this case, the most precise answer is the one with the most sig figs. Since we need to round to our least precise measurement, we should round to the least number of sig figs given. For example, if the mass of a substance is 10.0 grams (3 sig figs) and the volume is 2 mL (1 sig fig) the density is 5 g/mL (also 1 sig fig). The rule is: **When multiplying or dividing measurements, round your answer to the lowest number of significant figures given.**

*Complete the following operations and report to the correct number of significant figures.*

- |     |                |       |     |                   |       |
|-----|----------------|-------|-----|-------------------|-------|
| 18. | $5.87 * 2.1$   | _____ | 22. | $589 / 12$        | _____ |
| 19. | $4 * 78$       | _____ | 23. | $78.632 / 52.3$   | _____ |
| 20. | $0.0235 * 9$   | _____ | 24. | $1569 / 24 * 2$   | _____ |
| 21. | $0.014 * 0.01$ | _____ | 25. | $(596 * 32) / 22$ | _____ |

If both types of operations are used, always follow the multiplication rules (least sig figs). Finally, in scientific notation, only the base number counts (not the exponent or the 10). Use **PEMDAS!**

- |     |                         |       |     |   |       |
|-----|-------------------------|-------|-----|---|-------|
| 26. | $(22.1 - 10.0) / 2$     | _____ | 28. | $6.23 \times 10^{-3} / 2.15 \times 10^{-4}$ | _____ |
| 27. | $12.35 / (4.56 - 2.14)$ | _____ | 29. | $(2.1 \times 10^2 - 1.4 \times 10^1) * 2$   | _____ |

## Honors Summer Assignment Practice

### D: Rounding Significant Figures

	Unrounded Answer	Rounded Answer
1. $1.2\text{m} + 2.35\text{m}$		
2. $2.6358\text{cm} * 2.1\text{cm}$		
3. $5.681\text{mm} - 2.\text{mm}$		
4. $3845.2\text{L} / 25.2354\text{L}$		
5. $25\text{cm} + 3\text{cm}$		
6. $1.2\text{m} * 2\text{m}$		
7. $859678.2354\text{cm} - 568426.1\text{cm}$		
8. $5.3\text{m} * 5.2398\text{m} * 2\text{m}$		
9. $45.25252\text{nm} + 45.8563\text{nm}$		
10. $68.23\text{m} / 38.255\text{m}$		
11. $10000\text{g} / 10.0\text{g}$		
12. $1\text{L} * 1.0\text{L}$		
13. $1254.1\text{cm} / 100\text{cm}$		
14. $0.000456\text{m} + 0.00524\text{m}$		

# Honors Summer Assignment Practice

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## D: Percent Error

1. 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?
2. There are 35 mg of sodium in a can of Coke. You determine it to be 15 mg. What is your percent error?
3. There is 3.5 grams of fat in a granola bar. You determine the fat content to be 4.0 g in the lab. What is the percent error?
4. Working in the laboratory, a student finds the density of a piece of pure aluminum to be  $2.85 \text{ g/cm}^3$ . The accepted value for the density of aluminum is  $2.699 \text{ g/cm}^3$ .
5. A student experimentally determines the specific heat of water to be  $4.29 \text{ J/g} \times \text{C}^\circ$ . He then looks up the specific heat of water on a reference table and finds that it is  $4.18 \text{ J/g} \cdot \text{C}^\circ$ . What is his percent error?
6. A student measures the volume of a substance to be 34.5 mL. What is their percent error for this measurement if the actual volume was 0.0250 L?

## Honors Summer Assignment Practice

### Baby Dies In Hospital, And Parents Plan to Sue

By BRUCE LAMBERT Published: February 09, 2002

He was their first child, and Ana and Giovanni Vargas feared they might lose him even before birth. Doctors discovered a heart valve defect and called the pregnancy high-risk. But, little Gianni was born full-term by Caesarean section on Jan. 30, weighing almost 8 pounds. Then his parents worried about whether he would survive delicate corrective heart surgery last Saturday. They were thrilled when the operation was declared a success and doctors said he would go home in a week or so. But then a seemingly tiny mistake occurred while Gianni was recuperating in the neonatal intensive care unit of Stony Brook University Hospital in Stony Brook, N.Y. A missing decimal point in a prescription resulted in a tenfold overdose of intravenous potassium chloride, the Vargases said they were told by hospital officials, and Gianni died early Tuesday. Only after Gianni's death did his mother and father hold him in their arms for the first time. "I am angry because I was so close to bringing him home," Mr. Vargas said yesterday at a news conference. His wife, a native of the Dominican Republic who spoke through an interpreter, said she could not explain how she felt. The couple, who live in Brentwood, appeared in the Lake Grove office of their lawyer, David Raimondo, and announced that they were filing a notice of claim as a prelude to a malpractice lawsuit for wrongful death. The hospital acknowledged the infant's death, which Newsday reported yesterday, and ordered an immediate internal investigation. As required, it also notified the State Health Department, which started its own inquiry. "We are sincerely sorry and extend to the grieving family our heartfelt condolences," said the hospital's director, Bruce Schroffel. "We are conducting a thorough investigation of this baby's death to determine what steps are necessary to ensure that this will never happen again." Experts say that poorly written or carelessly read prescriptions are a common source of medical mistakes that harm patients. And among wrongly administered medications, potassium chloride is one of five most frequently involved, they say. Gianni's prescription was supposed to be for 3.5 units of potassium chloride but instead was written as 35, the Vargases said they were told. They said they did not know who wrote the prescription. Recommended preventive measures include the preparation of potassium chloride by hospital pharmacists instead of by nurses, and the use of computerized systems that automatically challenge prescriptions that appear to be inappropriate. Stony Brook hospital declined to comment on whether it uses pharmacists to prepare potassium chloride and if it has a computerized prescription system. It did say that its procedures had called for checking medications at three different steps, and that in the aftermath of the fatality, hospital administrators doubled the number of staff members involved. The hospital would not say how many people that is. "Medication errors are fixable, and there is no excuse for them occurring at the rate they are," said Arthur A. Levin, who was on the committee that wrote "To Err Is Human," a 1999 report on medical mistakes written for the Institute of Medicine at the National Academy of Sciences. The national group that reviews hospitals, the Joint Commission on Accreditation of Healthcare Organizations, named potassium chloride as a problem-prone medication in 1999. In another report last year on prescriptions, the group stressed the critical importance of the decimal point, especially in handwritten documents. "Misinterpretation of such orders could lead to a tenfold dosing error," the report said. Mr. Vargas married Ana after meeting her at their church. He said he is a construction union member and worked at ground zero from Sept. 15 until he was laid off on Dec. 17. He and his wife chose Stony Brook because of its reputation for quality, he said. Many relatives have been treated there, including his sister, who gave birth a few weeks ago. But Mr. Vargas said that he and his wife do not intend to return.

1. What is believed to be the underlying cause of administering the wrong dosage?
2. Do you think leaving the units off the prescription could result in a similar tragedy?
3. Can you think of an over-the-counter medication that you take that could result in major medical problems or even death by mistakenly doubling or tripling the dosage? Give an example.