

Honors Chemistry 2019 Summer Assignment

Purpose:

This Honors Chemistry Summer Assignment will review general mathematical and Periodic Table concepts. This assignment is worth a total of 50 earned points, 25 points towards the homework category and 25 points towards the laboratory category.

Due Date:

Print, complete and turn in **only pages 5-9** on **Thursday September 5th**. Late assignments will be deducted 10% points each day late i.e. 5 points each day. You **may be assessed** on these topics during the first full week of school. The exact date of this assessment will be communicated to you on the first day of school.

Information:

An important part of chemistry is the ability to record accurate metric measurements and to perform calculations for experimental data analysis. However, all measurements have some inherent uncertainty. This uncertainty is a result of the measurement device. **Part 1** of this assignment will review significant figures (digits), significant figures in calculations, scientific notation, and the metric system. Before reading the information provided in this packet, watch the [Crash Course Unit Conversions & Significant video](#) (see full link below) located on the Crash Course website and answer questions regarding this video on page 5. Then read the informational pages of this packet on significant figures (digits), significant figures in calculations, scientific notation, and the metric system on pages 2-4 and answer questions on pages 5-6.

Part 2 of this assignment will focus on the periodic table. **This year the periodic table turned official 150 years old!** Read the periodic table article titled [The Periodic Table turns 150](#). It is a terrific summary of how the periodic table organization has developed. There were so many attempts to create the perfect periodic table. However, one person stood out amongst the rest. Read the article to find out who it is and why the periodic table is organized the way it is. There is an opportunity at the end of the reading to jot down any additional questions you may have encountered throughout the reading.

After reading ChemMatters article *The Periodic Table turns 150: Is the best yet to come?*, then review previous learned chemistry topics related to the periodic table. You should be able to locate an element by its name and symbol, determine the amount of protons, electrons and neutrons of an element and determine the location of an element by group and period number.

Web Links:

After clicking this link, scroll to the bottom of the page to [Unit Conversions & Significant](#) Video.

<https://thecrashcourse.com/courses/chemistry?page=2>

ChemMatters Article: The Periodic Table turns 150

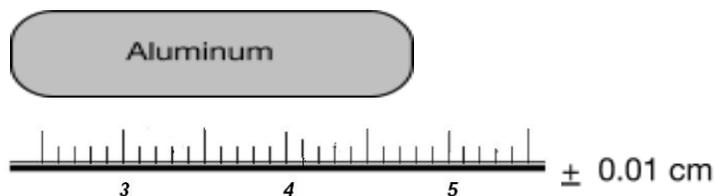
<https://www.acs.org/content/acs/en/education/resources/highschool/chemmatters/past-issues/2018-2019/february-2019/periodic-table-turns-150.html>

Helpful periodic table resource: <https://www.webelements.com/>

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Part 1: Significant Figures

When you use a piece of laboratory equipment, read and record the measurement to one decimal place beyond the smallest marking on the piece of equipment. The length of the aluminum placed along the centimeter stick is 4.75 cm long. There are no graduation markings to help you read the last measurement as 5. This is an estimate. As a result this digit is uncertain. Another person may read this as 4.76 cm. This is acceptable, since it is an estimation.



There is error (uncertainty) built into each measurement that cannot be avoided. If the measurement is reported as 4.75 cm, scientists accept the principle that the last digit has an uncertainty of ± 0.01 cm. In other words, the length might be as small as 4.74 cm or as large as 4.76 cm. It is understood by scientists that the last digit recorded is an estimation and contains some uncertainty.

Guidelines for Determining Significant Figures

1. All digits recorded from a laboratory measurement are called significant figures (or digits).
2. The measurement of 4.75 cm has three significant figures. **NOTE:** If you use an electronic piece of equipment, such as an electronic balance, you should record the measurement exactly as it appears on the display.

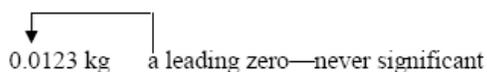
Measurement	Number of Significant Figures
123 g	3
46.54 mL	4
0.33 cm	2
3,500,000 nm	2
0.0325 g	3

3. All non-zero digits are considered significant. There are special rules for zeros. Zeros in a measurement fall into three types: leading zeros, trailing zeros, and middle zeros.
4. A middle zero is always significant.

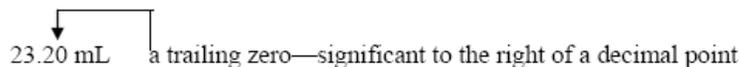
303 mm a middle zero—always significant

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5. A leading zero is never significant. It is only a placeholder; not a part of the actual measurement.


0.0123 kg a leading zero—never significant

6. A trailing zero is significant when it is to the right of a decimal point. This is not a placeholder. It is a part of the actual measurement.


23.20 mL a trailing zero—significant to the right of a decimal point

7. All significant figures include units since they are a result of a measurement. A number without units has little significance. Numbers resulting from measurements made using instruments have a finite number of significant figures.

Exact numbers include numbers derived from counting (12 eggs) and definition (1 kg = 1000 g), and they have an infinite number of significant figures. When performing calculations, these values will **not** be used to determine the amount of significant figures in the final answer.

Examples include the amount of items, 25 desks in a room, and a conversion factor, 100 centimeters = 1 meter.

Using Significant Figures in Calculations

Addition and Subtraction

The number of decimal places in the answer should be the same as in the measured quantity with the smallest number of decimal places.

smallest number of decimal places

$$1259.1 \text{ cm} + 1252.365 \text{ cm} + 1215.34 \text{ cm} = 3726.805 \text{ cm}$$

$$\text{Final answer: } 3726.8 \text{ cm}$$

Multiplication and Division

The number of significant figures in the answer should be the same as in the measured quantity with the smallest number of significant figures.

$$\frac{13.356 \text{ g}}{10.42 \text{ mL}} = 1.281765835 \text{ g/mL}$$

$$\text{Final answer: } 1.282 \text{ g/mL}$$

value with the smallest number of significant digits is 10.42 mL

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Using Scientific Notation to Calculate Answers

In chemistry, we deal with very small and very large numbers. It is easier to assess the magnitude of and to perform operations with numbers written in scientific notation. It is also easier to identify the proper number of significant figures. The number is rewritten as the product of a number between 1 and 10 and an exponential term— 10^n , where n is a whole number. Example, the distance between New York City and San Francisco = 4,741,000 meters or 4.741×10^6 m.

Addition/Subtraction Using Scientific Notation (Use a calculator or the following procedure)

1. Convert the numbers to the same power of ten.
2. Add (subtract) the non-exponential portion of the numbers.
3. The power of ten remains the same.

Example: $(1.00 \times 10^4) + (2.30 \times 10^5)$

A good rule to follow is to express all numbers in the problem to the highest power of ten.

Convert (1.00×10^4) to (0.100×10^5) . $(0.100 \times 10^5) + (2.30 \times 10^5) = \mathbf{2.40 \times 10^5}$

Multiplication Using Scientific Notation (Use a calculator or the following procedure)

1. The numbers (including decimals) are multiplied.
2. The exponents are added.
3. The answer is converted to scientific notation—the product of a number between 1 and 10 and an exponential term.

Example: $(4.24 \times 10^2) \times (5.78 \times 10^4)$ $(4.24 \times 5.78) \times (10^{2+4}) = 24.5 \times 10^6 = \mathbf{2.45 \times 10^7}$

Division Using Scientific Notation (Use a calculator or the following procedure)

1. Divide the decimal parts of the number.
2. Subtract the exponents.
3. Express the answer in scientific notation.

Example: $(3.78 \times 10^5) / (6.2 \times 10^8)$ $(3.78 \times 6.2) \times (10^{5-8}) = 0.61 \times 10^{-3} = \mathbf{6.1 \times 10^{-4}}$

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Name _____ Date _____ Period ____ Score ____ /25 pts

Honors Chemistry 2019 Summer Assignment Part 1 Answers (25 points homework)

Crash Course: Unit Conversions & Significant Figures Video Questions: (9 pts)

1. What is the IPK? _____

2. The International System of Units includes: _____

3. What are derived units? _____

4. What is a unit conversion? How does flipping a conversion help solve a problem?

5. Distinguish between exact numbers vs. measured numbers.

6. What are place holders? What value is typically used for placeholders? _____

7. Write 60 in scientific notation. _____

8. Explain how to use addition of significant figures. _____

9. Explain how to use multiplication of significant figures. _____

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Practice Problems: Significant Figures

1. How many significant figures are in each of the following? (2 pts)

451 000 m _____ 6.626 cm _____ 0.0065 g _____ 2300 g _____
4056 mg _____ 0.0540 mL _____ 2.2 L _____ 12 test tubes _____

2. Solve the following problems using the correct number of significant figures include units. (6 pts)

a. $16.27 \text{ m} + 16.463 \text{ m} + 16.1 \text{ m} =$ _____

b. $36.4 \text{ mg} - 0.02 \text{ mg} =$ _____

c. $15.1 \text{ cm} \times 0.032 \text{ cm} =$ _____

d. $13.36 \text{ g} / 0.0468 \text{ cm}^3 =$ _____

e. $1.45 \text{ g} \times 4 \text{ marbles} =$ _____

f. $7.895 \text{ g} / 12 \text{ test tubes} =$ _____

3. Convert the following numbers to exponential notation include units. (4 pts)

a. 0.0369 cm _____

b. 0.0452 g _____

c. 4,520,000 atoms _____

d. 365,000 s _____

4. Carry out the following operations include the correct units. (4 pts)

a. $(3.00 \times 10^8 \text{ m/s}) \div (2.4 \times 10^2 \text{ m})$ _____

b. $(1.75 \times 10^{-1} \text{ cm}) - (4.6 \times 10^{-2} \text{ cm})$ _____

c. $(6.63 \times 10^{-34} \text{ J}\cdot\text{s}) \times (4.5 \times 10^{15} \text{ 1/s})$ _____

d. $(6.02 \times 10^{23} \text{ atoms}) + (6.02 \times 10^{23} \text{ atoms})$ _____

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Honors Chemistry 2019 Summer Assignment Part 2 Answers (25 points laboratory)

Directions: Read the ChemMatters article [The Periodic Table turns 150: Is the best yet to come?](#) and complete the graphic organizer. (8 points)

New	New things you learned about the periodic table	
Ideas	Ideas from the article that will help you in chemistry class.	
Changes	How do you think the periodic table might change in your lifetime? Why?	
Etcetera	Any questions that you have about the periodic table.	

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Periodic Table Activity (17 points)

Directions: Use the provided periodic table to complete missing information for each neutral atom.

Element	Symbol	Group Location	Period Location	Atomic number	Protons	Electrons
<i>Example: nitrogen</i>	<i>N</i>	<i>VA 15</i>	<i>2</i>	<i>7</i>	<i>7</i>	<i>7</i>
hydrogen						
silicon						
oxygen						
argon						
zinc						
calcium						
chlorine						
cesium						
sodium						
aluminum						
fluorine						
magnesium						

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Element	Symbol	Group Location	Period Location	Atomic number	Protons	Electrons
neon						
helium						
copper						
sulfur						
phosphorus						

The Periodic Table of the Elements

1																	2	
	H 1.008																	He 4.003
	IA	IIA	IIIB	IVB	VB	VIB	VII B	VIII B			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
2	Li 6.941	Be 9.012											B 10.81	C 12.01	N 14.01	O 16.00	F 19.00	Ne 20.18
3	Na 22.99	Mg 24.31											Al 26.98	Si 28.09	P 30.97	S 32.07	Cl 35.45	Ar 39.95
4	K 39.10	Ca 40.08	Sc 44.96	Ti 47.87	V 50.94	Cr 52.00	Mn 54.94	Fe 55.85	Co 58.93	Ni 58.69	Cu 63.55	Zn 65.38	Ga 69.72	Ge 72.64	As 74.92	Se 78.96	Br 79.90	Kr 83.80
5	Rb 85.47	Sr 87.62	Y 88.91	Zr 91.22	Nb 92.91	Mo 95.96	Tc (98)	Ru 101.1	Rh 102.9	Pd 106.4	Ag 107.9	Cd 112.4	In 114.8	Sn 118.7	Sb 121.8	Te 127.6	I 126.9	Xe 131.3
6	Cs 132.9	Ba 137.3	La-Lu ★	Hf 178.5	Ta 180.9	W 183.8	Re 186.2	Os 190.2	Ir 192.2	Pt 195.1	Au 197.0	Hg 200.6	Tl 204.4	Pb 207.2	Bi 209.0	Po (209)	At (210)	Rn (222)
7	Fr (223)	Ra (226)	Ac-Lr #	Rf (267)	Db (268)	Sg (271)	Bh (272)	Hs (270)	Mt (276)	Ds (281)	Rg (280)	Cn (285)	Nh (286)	Fl (289)	Mc (289)	Lv (293)	Ts (294)	Og (294)
	★	La 138.9	Ce 140.1	Pr 140.9	Nd 144.2	Pm (145)	Sm 150.4	Eu 152.0	Gd 157.3	Tb 158.9	Dy 162.5	Ho 164.9	Er 167.3	Tm 168.9	Yb 173.0	Lu 175.0		
	#	Ac (227)	Th 232.0	Pa 231.0	U 238.0	Np (237)	Pu (244)	Am (243)	Cm (247)	Bk (247)	Cf (251)	Es (252)	Fm (257)	Md (258)	No (259)	Lr (262)		

The Periodic Table of the Elements

1	H																2
1,008																	4,003
1A	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3	4											5	6	7	8	9	10
Li	Be											B	C	N	O	F	Ne
6.941	9.012											10.81	12.01	14.01	16.00	19.00	20.18
11	12											13	14	15	16	17	18
Na	Mg											Al	Si	P	S	Cl	Ar
22.99	24.31											26.98	28.09	30.97	32.07	35.45	39.95
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
39.10	40.08	44.96	47.87	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.38	69.72	72.64	74.92	78.96	79.90	83.80
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
85.47	87.62	88.91	91.22	92.91	95.96	(98)	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3
55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs	Ba	La-Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
132.9	137.3	*	178.5	180.9	183.8	186.2	190.2	192.2	195.1	197.0	200.6	204.4	207.2	209.0	(209)	(210)	(222)
87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Fr	Ra	Ac-Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
(223)	(226)	#	(267)	(268)	(271)	(272)	(270)	(276)	(281)	(280)	(285)	(296)	(289)	(289)	(293)	(294)	(294)
* #																	
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71			
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
138.9	140.1	140.9	144.2	(145)	150.4	152.0	157.3	158.9	162.5	164.9	167.3	168.9	173.0	175.0			
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103			
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr			
(227)	232.0	231.0	238.0	(237)	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(262)			