

1. (3 points) Indicate the number of significant figures in each of the following measured quantities: (**This problem has no partial credit**)
 - a. 1,302,400 km _____
 - b. 0.000 826 9 mAmp _____
 - c. 3024000.0 cd _____
2. (3 points) Round of each of the numbers listed to the given number of significant figures and present the answer in the correct scientific notation. (**There is no partial credit on this problem**)
 - a. 2,600,961 (5 sig figs)
 - b. 1,295.71 (4 sig figs)
 - c. 0.001 265 982 (5 sig figs)
3. (5 points) Platinum, one of the noble metals, has a melting point of 1768.3°C, while nitrogen has a boiling point of -452.13°F. What are these temperatures in Kelvin? **Show your work for full credit**
4. (6 points) Indicate which of the following statements represent exact (E) or inexact (I) numbers:
 - a. _____ The width of the Nile River
 - b. _____ The volume of a cloud
 - c. _____ The number of nickels in a dollar
 - d. _____ The number of sheets of paper in a ream (package) of paper.

Differentiate between exact and inexact numbers with a complete sentence.

5. (4 points) These values are not written in the most appropriate metric prefix. Re Write them please. **Show the math and reasoning you used to support your answer.**

a. (1 point) $1.23 \times 10^7 \times 10^{-18} \text{ m}$

b. (3 points) $123,456 \text{ nm}^2$

6. (4 points) A certain substance is cooled so that its temperature falls (changes) by 35°C . How many K (degrees Kelvin) does the temperature fall? Pick the appropriate answer and explain your answer. **(No explanation, no credit)**

- a. 308K
- b. -259 K
- c. -35 K
- d. 35K
- e. 95 K

7. (3 points) Predict the ionic formula formed from the following pairs of elements. DO NOT NAME THE COMPOUND! **(There is no partial credit on this problem)**

a. Sr and S

b. K and N

c. Mg and I

8. **(6 points)** Complete the following table

Isotopic symbol	Atomic number	Mass number	Protons	Neutrons	Electrons	Net charge
$^{59}_{27}\text{Co}^{3+}$		59				3+
	51	121				0
			15	31	18	3-

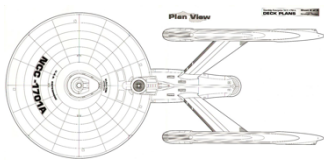
9. (8 points) Which of the following is a chemical property of morphine and which is a physical property of morphine? Use [C] for chemical and [P] for physical.
- a. ____ The solubility is 60 mg morphine sulfate in 100 mL of water at a temperature of 20°C.
 - b. ____ Morphine binds directly to the central nervous system to decrease the feeling of pain and is metabolized through the liver.
 - c. ____ It melts at 255 °C.
 - d. ____ It is a white crystalline solid in pure form at room temperature.
 - e. ____ It has a molecular mass of 285.34 amu
 - f. ____ Morphine yields carbon dioxide and water vapor when burned.

How did you distinguish between a physical property and a chemical property?

10. (6 points) Perform the following calculation and report your answer with the correct significant figures and units. **(Show your work for partial credit)**

- a. (1 point) $2.171\,012\,1\text{ g} + 4.320\,1\text{ g} + 401.278\,77\text{ g} + 21.826\text{ g}$
- b. (3 points) $2.156\,934\,51 \times 10^{86}\text{ °C} + 2.314\,276\,9 \times 10^{88}\text{ °C} + 2.954\,681\,211 \times 10^{90}\text{ °C}$
- c. (2 points) $[10^{123} \times 10^{-16}] / [10^{-18} \times 10^{82}]$

11. (5 points) Science fiction often uses nautical analogies to describe space travel. In the words of Captain Picard, "It's continuing mission: to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no one has gone before."



If the starship *U.S.S. Enterprise* is traveling to this new world at Warp Factor 2.56, what is its speed in yd/s?

(Warp factor 1.709 = 5 times the speed of light; speed of light is 2.998×10^8 m/s; 1 knot is **exactly** 0.562 6 yd/s, 1 meter = 1.093 613 3 yd)

12. (4 points) Recently surfaced is "The Periodic Table of Rejected Elements," constructed by Gerber and Schwartz, noted table-ologists. There is something wrong with the name, the symbol or both. As a hint, they have included the atomic number, which is the only thing correct in this periodic table. Please correct the errors by writing **BOTH** the name and symbol. **SPELLING COUNTS!**

Architectural elements:

- | | |
|----|-----------------|
| 32 | Cafetorium (Ct) |
| 51 | Auditorium (Ad) |
| 80 | Gymnasium (Gy) |
| 48 | Sanatorium (Sa) |

13. (5 points) Classify each of the following as an element [E], a compound [C], or a mixture [M]
- a. ____ Graphite
 - b. ____ Blood
 - c. ____ Butane gas ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$)
 - d. ____ air
 - e. ____ $\text{K}_2\text{C}_2\text{O}_4$

14. (6 points) As we learned in Chapters 1, 10, & 11, intermolecular forces are the forces that keep matter in the most stable phase (or state) at room temperature. Answer the following as True (T) or False (F) about solids, liquids, gases, and intermolecular forces. Correct the wrong answer by crossing out the part that makes it false and giving the word(s) that make it true. **Your answer must be legible and understandable. If you think I will not understand your answer, re-write the statement with the correction in the space provided (This is a good thing to do!)**

- a) [T/F] In solids, the intermolecular forces are strong enough to resist molecular motion.
- b) [T/F] The three types of intermolecular forces that exist between neutral molecules are: dispersion forces, hydrogen bonding, and ion-dipole forces.
- c) [T/F] Gases expand spontaneously to fill its container, flow readily, and are virtually incompressible.
- d) [T/F] The phase (or state) of a substance is the balance between the kinetic energies of the particles and intermolecular forces between them
- e) [T/F] Gases have the strongest dispersion forces between particles
- f) [T/F] Water molecules experience dispersion forces, dipole-dipole interactions, and ion-dipole bonds.

15. (5 points) Two isotopes of thallium occur in nature: isotope 1 has a mass of 204.974 amu and an abundance of 70.525% while isotope 2 has a mass of 202.972 3 amu and an abundance of 29.475%. Find the atomic mass of the element. For full credit, you must show your work.

16. (5 points) In Chapter 2, we studied the basic architecture of the atom. Answer the following by identifying the true and false statements. Correct the wrong answer by crossing out the part that makes it false and giving the word(s) that make it true. **Your answer must be legible and understandable. If you think I will not understand your answer, re-write the statement with the correction in the space provided (This is a good thing to do!)**

- a. The nucleus of an atom contains electrons and protons. [T] [F]
- b. Millikan determined the charge to mass ratio of the electron. [T] [F]
- c. The nucleus of an atom can be positively or negatively charged depending on identity of the atom. [T] [F]
- d. The charge of the neutron and the electron are equal but opposite in sign. [T] [F]
- e. The number of neutrons in the nucleus is equal to the number of electrons outside of the nucleus. [T] [F]

17. (7 points) Give one example (atomic symbol and name) for each of the following **(SPELLING COUNTS!)**:

- a) A transition element, which is noble metal besides platinum
- b) A reactive, green-yellow gas; the halogen gas that is denser than air.
- c) The main group (representative) element in the fourth period and 5th group
- d) An alkali metal in the sixth period
- e) An alkaline earth metal in the fifth period
- f) A liquid diatomic
- g) The noble gas whose Z is $54 > Z > 18$

18. (5 points) In Chapter 2 and 7, we are introduced to the periodic table. Answer the following by identifying the true and false statements. Correct the wrong answer by crossing out the part that makes it false and giving the word(s) that make it true. **Your answer must be legible and understandable. If you think I will not understand your answer, re-write the statement with the correction in the space provided (This is a good thing to do!)**

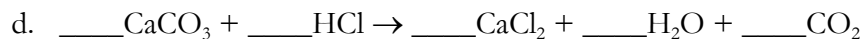
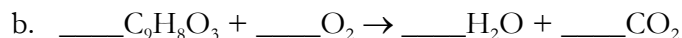
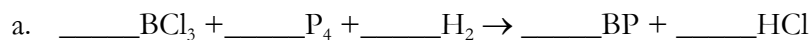
- a. [T] [F] The density of an element decreases down a family.
- b. [T] [F] Elements can be classified as either metalloids or metals.
- c. [T] [F] The elements above the staircase are ductile, malleable, lustrous solids (for the most part) that are good conductors of heat.
- d. [T] [F] Aluminum is a metalloid.
- e. [T] [F] The elements of group 4A show an interesting change in properties moving down the group, in that the elements become less metallic.

19. (6 points) You can dissolve an aluminum soft drink can in an aqueous base such as KOH. You place 2.05g Al in a beaker with 4.12 mL of water, and 4.26 g KOH and allow the reaction to occur. You make 10.20g of KAl(OH)_4 (and some mass of hydrogen gas). The gas is cooled to a pressure of 1.00 atm and a temperature of 0.0°C. Assume the density of water is 1.00g/mL

The density of hydrogen gas at this temperature and pressure is 0.0899 g/L. What is the volume of hydrogen gas produced? [You do not need a balanced equation, gas law information, or formulas for this problem]

In terms of Dalton's law, what does this prove?

20. (6 points) Balance the following equations, for this question, if the coefficient is 1[one], put that in the line as well. You will lose points if you leave the lines blank:



e. Which of the reactions above represents a combustion? Explain your choice in one or two sentences. (2 points)

21. (6pt) Answers the questions below:

a. (1 point) What is the volume contained in the graduated cylinder in mL?



A



B



C



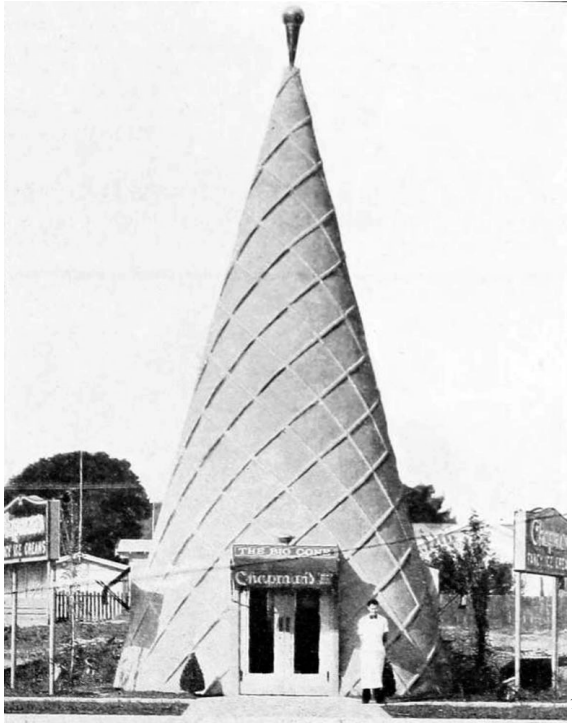
D



b. (4 point) Burt (A), Ernie (B), Kermit (C), and Gonzo (D) enter a dart contest. The prize is an all-expense paid trip to Sesame Street. The winner will be the dart player who is the most accurate and precise.

- Is Ernie (B) more accurate than Gonzo (D)? Explain your choice in one or two sentences.
- Is Burt (A) more precise than Ernie (B)? Explain your choice in one or two sentences.
- Who should win the trip to Sesame Street? Why?

22. (10 points) The building pictured below is a perfect cone (ice cream cone, that is!). The volume of a cone is represented by the formula: $V = \frac{\pi r^2 h}{3}$, where h is the height of the building (or cone). Find the radius of the base of the building, if the height of the building is 0.000 0131 997 Mm. and the volume is 0.04370 **dam**³ (1**dam** [**d**ecameter] =10¹m, same idea as the cm and cm³)



¹ <https://i0.wp.com/www.martinturnbull.com/wp-content/uploads/2011/07/LAChapmansBigCone.jpg>