

1. (5 points) Classify each of the following with [E] for an element, [C] for a compound, [M] for a mixture. If it is a mixture, classify the mixture as homogeneous (HO) or heterogeneous (HE).

a) Fruit salad (mango, pineapple, and oranges) _____

b) Blood _____

c) Chocolate chip peanut butter chunk cookie _____

d) Air _____

e) Graphite _____

f) Cream of tartar ($\text{KC}_4\text{H}_5\text{O}_6$) _____

2. (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**

3. (3 points) How does the average kinetic energy of molecules compare with the average energy of attraction between molecules in solids, liquids, and gases? Use one or two complete sentences to support your answer.

4. (1 points) Gallium melts at 302.92 and boils at 2478K . Is gallium a solid, liquid, or a gas at 325.76K . Explain your choice in one or two complete sentences

5. (3 points) Complete the following table. Write the correct symbol with both superscript and subscript of each of the isotopes and fill in the gaps in the table. (This problem has no partial credit)

Isotopic symbol	Atomic number	Mass number	Protons	Neutrons	Electrons	Net charge
${}^{39}_{19}\text{K}$		39				0
	38	87				2+
			33	32	36	

6. (6 points) Indicate which of the following are exact numbers or inexact numbers by designating your choice with an (E) or (I):

- _____ The width of the Nile River
 - _____ The volume of a cloud
 - _____ The number of nickels in a dollar
 - _____ The temperature of the surface of the sun
 - _____ The number of toes on your feet.
 - Differentiate between exact and inexact with a complete sentence.
7. Benzoic acid, $\text{HC}_7\text{H}_5\text{O}_2$, melts at 122°C . The density in the liquid state at 130°C is $1.08\text{g}/\text{cm}^3$. The density of solid benzoic acid at 15°C is $1.266\text{ g}/\text{cm}^3$.
- In which of these two states is the average distance between molecules greater?
 - If you convert a cubic centimeter of liquid benzoic acid into a solid, would the solid take up more volume or less volume than the original cubic centimeter of liquid?

8. (2 points) A student measuring the temperature of water mixed with salt, reported a change of -23°C . What is this temperature **change** in kelvins?
9. (5 points) Indicate the number of significant figures in each of the following measured quantities: (This problem has no partial credit)
- a) 9.356 93 ms
 - b) 0.000 005 010 m^2
 - c) 6, 539, 076, 000 mol
 - d) 274.158 K
 - e) $1.930\,076\,85 \times 10^{-6} \text{ dL}$
10. (6 points) An antacid tablet weighing 0.853-g contained calcium carbonate as the active ingredient, in addition to an inert binder. When an acid solution weighing 56.519 g was added to the tablet, a solution was created and carbon dioxide gas was released, producing a fizz. If all the carbon dioxide was released in the reaction, and the resulting solution weighed 57.152 g, **how many grams of carbon dioxide were released?** [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?**

11. (8 points) In the opening scenes of the movie Raiders of the Lost Ark, Indiana Jones tries to remove a gold idol from a mass sensitive booby-trapped pedestal. He replaces the idol with a bag of sand of approximately equal volume to that of the idol. ($d_{\text{Au}} = 19.32\text{g/mL}$; $d_{\text{sand}} = 1.91\text{g/mL}$) The idol has a radius of 7.50 cm. $V_{\text{sphere}} = (4/3) \pi r^3$
- a) What is the mass of the gold idol?
 - b) What is the mass of sand bag?
 - c) Did Indiana Jones have a reasonable chance for not activating the mass sensitive booby trap? Explain in one or two brief sentence
 - d) In a later scene, Dr. Jones and an unscrupulous guide play catch with the idol. What is the mass of the idol in units of pounds? ($2.205\text{ lb} = 1\text{ kg}$)
 - e) Is playing catch with it a possibility for the average (couch-potato) person? (For reference: a bag of sugar weighs 5 lbs., imagine running and tossing this at the same time.)
 - f) This is a couch potato!



12. (3 points) Round of each of the numbers listed to the given number of significant figures and put the answers in correct scientific notation. (This problem has no partial credit)

a) 000 127 7225 (3 sig fig)

b) 0.0753596 (4 sig figs)

c) 129650 (2 sig figs)

13. (6 points) In Chapter 2, we studied the basic architecture of the atom. Answer the following by identifying the true and false statements. Correct the false statements and make then true. If the statement is true, give support for the answer. Use a complete sentence for full credit.

a) The nucleus of an atom contains electrons and neutrons. [T] or [F]

b) Rutherford determined the charge to mass ratio of the electron. [T] or [F]

c) The nucleus of an atom can be positively or negatively charged depending on identity of the atom. [T] or [F]

d) The charge of the neutron and the proton are equal but opposite in sign. [T] or [F]

e) The total number of protons and electrons in the nucleus is equal to the number of neutrons outside of the nucleus. [T] or [F]

f) Madam Curie determine the mass and charge of the electron. [T] or [F]

14. (6 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. $T = 10^{12}$

a) (1 point) 1.234×10^{16} pL

b) (1 point) 9.73×10^3 Gg

c) (1 point) 6.432×10^6 nmol

d) (3 point) 7.564×10^{17} pm³

15. (8 points) Give one example (atomic symbol and name) for each of the following:

a) A transition element in the 4th period with an even atomic number divisible by 4.

b) The halogen that is a solid.

c) The main group (representative) element in the third period and 5th group

d) An alkali metal in the fifth period

e) An alkaline earth metal in the third period

f) One of the seven diatomic molecules.

g) A metalloid that has similar properties to carbon

h) The name of an allotrope of carbon [the allotropes of carbon have the same symbol]

16. (5 points) Two isotopes of iridium occur in nature: isotope 1 has a mass of 190.961 amu and an abundance of 37.30% while isotope 2 has a mass of 192.963 amu and an abundance of 62.70%. Find the atomic mass of the element. **No credit for no work.**

17. (6 points) Perform the following calculation and report your answer with the correct significant figures and units. (This problem has no partial credit)

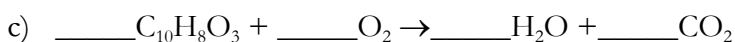
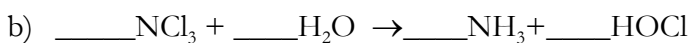
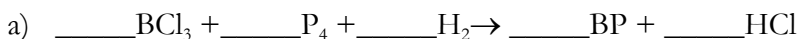
a) (1point) $12.175\,678\,023\text{ g} + 4.320\,001\,23\text{ g} + 401.278\,771\text{ g} + 221.826\,462\,2\text{ g}$

a) $2.156\,934 \times 10^{114} \text{ M}^\circ\text{C} + 2.314\,276 \times 10^{115} \text{ M}^\circ\text{C} + 2.954\,681 \times 10^{116} \text{ M}^\circ\text{C}$

b) (4 points) $2.15693451 \times 10^{98} \text{ }^\circ\text{C} + 2.3142769 \times 10^{101} \text{ }^\circ\text{C} + 2.954681 \times 10^{102} \text{ }^\circ\text{C}$

c) (1point) $(10^{23} \times 10^{-1}) / (10^{18} \times 10^{82})$

18. (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:**



d) Do any of these reactions represent decomposition? Explain in one or two sentences.

e) Do any of these reactions represent combustion? Explain in one or two sentences.

19. (5 points) In Chapters 2 and 7, we are introduced to the periodic table and physical and chemical behavior of selected elements. Answer the following by identifying the true and false statements. Correct the false statements and make them true by writing a complete sentence, not crossing out and repairing the answer.

a) Metals can be solid, liquid, or gas at room temperature. [T] or [F]

b) Elements in periods show similar chemical and physical properties. [T] or [F]

c) Metallic character increases across the periodic table and decreases down a family. [T] or [F]

d) Most of the elements on the periodic table are non-metals. [T] or [F]

e) The most stable allotrope of oxygen is O_3 . [T] or [F]

20. (5 points) Novocain, $C_{13}H_{21}N_2O_2Cl$, is a local anesthetic. A sample of Novocain contains 6.000×10^{25} atoms of carbon. Please show your setups for full credit.

a) How many molecules of Novocain does the sample contain?

b) How many moles of Novocain does this sample contain?

c) What is the molar mass of Novocain? Use the following atomic masses to calculate your molar mass: Carbon: 12.010 7, nitrogen: 14.006 7, hydrogen: 1.007 94, oxygen: 15.999 4, chlorine: 35.452 7. (Your answer will be considered wrong if you do not use these masses; watch your units)

d) What is the mass of 0.002 012 moles of Novocain?

21. (7 points) Copper can be drawn into thin wires. How many kilometers of 34gauge wire (diameter = 6.304×10^{-3} in) can be produced from the copper in 5.1256 lb of covellite, an ore that is 66.013% copper by mass. The volume of a cylinder is $\pi r^2 h$, $d_{Cu} = 8.95 \text{ g/cm}^3$.