Exam 1 Chm 203 (Dr Mattson) 9 September 2019

Name:

Academic Integrity Pledge: In keeping with Creighton University's ideals and with the Academic Integrity Code, I pledge that this work is my own and that I have neither given nor received inappropriate assistance in preparing it.

Signature:

Chemistry Student Number: _____

Instructions: <mark>Show all work whenever a calculation box is provided</mark>! Write legibly. Include units whenever appropriate. You will receive credit for **how** you worked each problem as well as for the correct answer. If you need more space, you may use the back of the periodic table provided — Write: "See PT" in the answer box. Write your name on the periodic table if it contains work to be graded. On your desk you may have pencils (but no pencil pouch), an eraser, and a non-programmable calculator without a slipcover. Backpacks, bags, and similar items must be stored on the tables in the back of the room. Cell phones must be silent and placed in your backpack/bag – not in your pocket.

1. (6 pts) Circle **T** for True or **F** for False.

   T F 1 mm = 1×10^{-3} m   **T F** 1×10^9 ng = 1 g

   T F 1 cm = 1×10^{-2} m   **T F** 1 MJ = 1×10^{-6} J

   T F 1 pL = 1×10^{12} L   **T F** 1 Gs = 1×10^9 s

2. (4 pts) Which of these four is/are arranged from smallest to largest? Circle all that are correct.

   a. 1 Gm   1 km   1 mm   **b.** 1 μg   1 pg   1 ng

   c. 1 ps   1 ns   1 ks   **d.** 1 mJ   1 kJ   1 MJ

3. (5 pts) The mass of a rubidium atom is 1.420×10^{-22} g. What is the total mass of 4 rubidium atoms in ng?

   Show all work for credit.

   Answer with correct significant figures: _____

4a. (5 pts) In the news recently, a cube of pure uranium 5.0 cm on a side was discovered in a private collection. It turns out to be part of a Nazi effort to build a nuclear weapon during WWII. Seven other cubes are also known to exist, but over 650 are still unaccounted for but thought to be in government storage in the US somewhere. Given the density of uranium is 19.1 g/cm^3, calculate the mass of this cube.

   Show all work for credit.

   Answer with units: _____

4b. (5 pts) Given 1 pound = 453.6 grams, what is the mass in pounds of each cube. Show all work for credit.

   Answer with units: _____

5. (5 pts) Bromine has a boiling point of 137.8 ^oF. Express this in units of ^oC given the formula $T_F = 1.8\ T_C + 32$.

   Show all work for credit

   Answer with units: _____

6. (5 pts) Digitalis is a drug used to control atrial fibrillation and is administered at a dosage of 20 μg/kg body mass. What dose (in mg) should a 155 pound person receive? Given: 453.6 g = 1 pound.

   Show all work for credit.

   Answer with units: _____

7. (5 pts) Prior to the industrial revolution, carbon dioxide levels in the earth's atmosphere were about 280 ppm. Just recently that level reached 400 ppm for the first time in over 20 million years and is the major cause of global warming. Given 1.0 ppm CO_2 is the same as 1 g CO_2 per 10^6 g air, convert 400 ppm CO_2 into units of mg CO_2/kg air.

   Show all work for credit.

   Answer with units: _____

8. (5 pts) The distance from the pitcher's mound to home plate is 60 ft 6 inches. How long does it take for a 99 mile/hr fastball to traverse this distance? Given 1 ft = 12 inches and 1 mile = 5280 ft.

   Show all work for credit.

   Answer with units: _____

9. (2 pts) Compound A contains 6.00 g sulfur for every 5.99 g oxygen. Compound B contains 8.60 g sulfur for every 12.88 g oxygen. Compounds A and B are examples of… Check your choice.

    the law of multiple proportions

    the law of conservation of mass

    the law of definite proportions

10. (3 pts) Which of these are real examples of the law of multiple proportions? Circle all that are.

    A. dinitrogen monoxide and nitrogen dioxide

    B. nitrogen dioxide and dinitrogen tetroxide

    C. sodium sulfite and sodium sulfate

11. (3 pts) Find three incorrect element name/atomic symbol combinations. Circle the three mistakes.

    Fe – iron   K – potassium   Ar – arsenic

    Ag – silver   Pt – platinum   Cu – copper

    Ne – neon   Ph - phosphorus Ld – lead

    Co – cobalt   Be – beryllium   Mg – magnesium

12. (5 pts) The gold foil used by Rutherford was 0.50 μm thick. A single gold atom has a diameter of 290 pm. How many atoms thick is the foil?

Show all work for credit.

Answer: _____

13. (3 pts) How many neutrons are present in …

$^{65}_{29}Cu$	$^{79}_{35}Br$	$^{88}_{38}Sr$

14. (5 pts) True or False

    T F   Protons and electrons reside in the nucleus.

    T F   Neutrons and protons are similar in mass.

    T F   Protons have a nuclear charge of +1.

    T F   Electrons occupy most of the atom's space.

    T F   Protons and neutrons have opposite charges.

15. (5 pts) Write the atomic symbol for the element that can be described by each of these:

a. an alkaline earth metal with 20 neutrons	
b. an alkali metal with an atomic mass between 100 and 200	
c. an element that is a yellow-green gas at room temperature and is found as -1 ions.	
d. a semi-metal (metalloid) from the 2nd period	
e. a transition metal with 45 protons	

16. (5 pts) Copper exists as two isotopes, ^{63}Cu with an exact mass of 62.930 amu and an abundance of **x**, and ^{65}Cu with exact mass of 64.928 amu and an abundance of **y**. Given the atomic mass as it appears on the periodic table, calculate the abundance of ^{65}Cu, **y**.

Show all work for credit.

Answer: _____

17a. (4 pts) How many moles of Cu are in 75.00 g?

Show all work for credit.

Answer: _____

17b. (4 pts) How many atoms of Cu are in the sample?
   Given: $N_A = 6.022 \times 10^{23}$

Show all work for credit.

Answer: _____

18. (6 pts) Classify these as **I**onic, **C**ovalent, or **E**lemental.

    I C E NO_3 I C E Zn

    I C E $NH_4C_2H_3O_2$ I C E CaC_2O_4

    I C E $ZnSO_4$ I C E SH_2

19. (10 pts) Nomenclature. Complete the following table.
(If you are nomenclature certified, skip this question.)

	NO_2
	$KC_2H_3O_2$
	$Mn(NO_3)_2$
	$SiBr_4$
	$NaHCO_3$
dioxygen monochloride	
copper(I) phosphide	
ammonium sulfite	
nitrogen trifluoride	
lithium bisulfate	

1. **T** 1 mm = 1×10^{-3} m   **T** 1×10^9 ng = 1 g

    T 1 cm = 1×10^{-2} m   **F** 1 MJ = 1×10^{-6} J

    F 1 pL = 1×10^{12} L   **T** 1 Gs = 1×10^9 s

2. c, d

3. 5.680×10^{-13} ng.

4a. 2400 g

4b. 5.26 pounds

5. 58.8 °C
6. 1.41 mg

7. 400 mg CO_2/kg air.

8. 420 ms

9. the law of multiple proportions

10. A, C

11. Ar – arsenic   Ph - phosphorus Ld – lead

12. 1720 atoms

13. 36, 44, 50

14. F T T T F
15. Ca, Cs, Cl, B, Rh

16. 0.3103

17a. 1.18 mol

17b. 7.1×10^{23}

18.

   C NO_3 **E** Zn

   I $NH_4C_2H_3O_2$ **I** CaC_2O_4

   I $ZnSO_4$ **C** SH_2

19.

nitrogen dioxide	NO_2
potassium acetate	$KC_2H_3O_2$
manganese(II) nitrate	$Mn(NO_3)_2$
silicon tetrabromide	$SiBr_4$
sodium bicarbonate	$NaHCO_3$
dioxygen monochloride	O_2Cl
copper(I) phosphide	Cu_3P
ammonium sulfite	$(NH_4)_2SO_3$
nitrogen trifluoride	NF_3
lithium bisulfate	$LiHCO_3$