

**Exam 1 Chm 203 (Dr Mattson) 10 September 2018**

**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: \_\_\_\_\_

Name: \_\_\_\_\_

**Chemistry Student Number:** \_\_\_\_\_  
(1 point bonus for completing 1. signature, 2. printed name and 3. your correct chemistry student number)

**Instructions:** Show all work whenever a calculation box is provided! 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 data sheet provided — Write: "See data sheet" in the answer box — then write your name on the data sheet. On your desk you are allowed only pencils (but no pencil pouch), an eraser, and a non-programmable calculator without a slipcover. Backpacks, bags, and purse-like items must be stored on the tables in the back of the room. Cell phones must be silent and placed in your backpack/bag/purse — not in your pocket.

1. (8 pts) Which of these metric conversions is correct?  
Check all that are.

- |  |   |
|--|---|
| <input type="checkbox"/> 1 Gs = $1 \times 10^{-9}$ s | <input type="checkbox"/> $1 \times 10^6$ m = 1 Mm         |
| <input type="checkbox"/> $1 \times 10^{-9}$ nm = 1 m | <input type="checkbox"/> 1 fg = $1 \times 10^{15}$ g      |
| <input type="checkbox"/> 1 kg = $1 \times 10^3$ g    | <input type="checkbox"/> 1 $\mu$ L = $1 \times 10^{-3}$ L |
| <input type="checkbox"/> $1 \times 10^{12}$ pL = 1 L | <input type="checkbox"/> 1 Ts = $1 \times 10^{12}$ s      |

2. (4 pts) Convert 477.3  $\mu$ L into mL.

Answer with units: \_\_\_\_\_

3. (5 pts) Copper has a density of  $8.96 \text{ g/cm}^3$ . Suppose a chunk of copper was placed in a graduated cylinder containing 63.4 mL water and is completely submersed. If the water level rises to 91.8 mL, what is the mass of a chunk of copper?

Answer with units: \_\_\_\_\_

4. (5 pts) Molecular oxygen in air has an average speed of 483.5 m/s at  $27^\circ\text{C}$ . Convert this to km/hr.

Answer with units: \_\_\_\_\_

5. (5 pts) A "tall" coffee drink contains 12 fluid ounces of coffee. There are 32 fluid ounces in a quart. One liter is the same as 1.0567 quarts. What is the volume of coffee in mL in this cup?

Answer with units: \_\_\_\_\_

6. (5 pts) Normal body temperature for a cat is  $101.5^\circ\text{F}$  and for a dog is  $102.5^\circ\text{F}$ . Convert the normal body for a dog into units of  $^\circ\text{C}$ . Given:  $T_F = \frac{9}{5} T_C + 32$

Answer with units: \_\_\_\_\_

7. (3 pts) Express this temperature in kelvins.

Answer with units: \_\_\_\_\_

8. (5 pts) The circumference of a baseball is 23.5 cm. Circumference is related to radius by the formula  $\text{Circumference} = 2\pi r$ . Calculate the volume of a baseball given  $V = \frac{4}{3}\pi r^3$ .

Answer with units: \_\_\_\_\_

9. (5 pts) The mass of a baseball is 145 g on average. What is the average density of a baseball?

Answer with units: \_\_\_\_\_

10. (5 pts) A major league fastball pitch is often 95 mph (miles per hour) or more. The pitching mound is 60.5 ft away from home plate. How long does it take, in milliseconds, for a baseball traveling at 95 mph to get from the pitcher to home plate? Given: 1 mile = 5280 ft.

Answer with units: \_\_\_\_\_

11. (12 pts) In each case, you should circle more than one.

11a. Circle the elements that are non-metals.

Fe	Au	Se
K	Sn	Ne

11b. Circle the elements that are halogens.

Na	I	S
P	Br	Ar

11c. Circle the elements that are alkaline earth metals.

Cr	Al	Ge
Be	Ba	Pd

11d. Circle the elements with physical and chemical properties most similar to that of potassium.

Li	Ti	S
Si	Rb	N

11e. Circle the elements that are metalloids.

Pb	As	Si
Hg	V	Xe

11f. Circle the elements with atomic symbols that don't match the name you learned.

O	Br	Pb
Ba	Mg	Sb

12. (3 pts) Circle two compounds that are examples of the law of multiple proportions. (There may be two correct answers in some cases – circle only ONE pair for each.)

- 12a.  $P_2O_5$                    $P_4O_{10}$                    $P_4O_6$   
 12b.  $K_2SO_3$                    $KHSO_4$                    $K_2SO_4$   
 12c.  $C_2H_2$                    $C_6H_{12}$                    $C_2H_6$

13. (5 pts) A 6.74 g sample containing only vanadium and sulfur was found to contain 2.62 g vanadium. According to the law of definite proportions, a sample with mass of 17.7 g should contain what mass of vanadium?

Answer with units: \_\_\_\_\_

14. (5 pts) Aluminum foil from the kitchen is about 0.016 mm thick. The atomic radius of aluminum is 0.143 nm. How many atoms thick is aluminum foil? (Hint: Use the diameter of aluminum.)

Answer with units: \_\_\_\_\_

15. (5 pts) How many protons, neutrons and electrons are in these neutral elements?

	Protons	Neutrons	Electrons
15a. $^{19}_9F$			
15b. $^{63}_{29}Cu$			
15c. $^{200}_{80}Hg$			

16. (5 pts) Chlorine exists as two isotopes including  $^{35}_{17}Cl$  with an isotopic mass of 34.968852721 amu and an abundance of 75.78%. Using the atomic mass from the periodic table, determine the isotopic mass of the other isotope. (Your answer should have only 4 significant figures.)

Answer with units: \_\_\_\_\_

17. (5 pts) How many moles of aluminum are in a 5.50 g sample?

Answer with units: \_\_\_\_\_

18. (10 pts) Nomenclature. For each of these, determine if you would name the compound using covalent-molecular rules (CM) or ionic rules (I). Then, determine if the formula and the name are correct (Yes) or contain an error of any kind (No).

	Circle:	Circle:
$N_2O_4$ , nitrogen tetroxide	CM or I	Yes No
$Na_2CO_3$ , sodium carbonate	CM or I	Yes No
$Cu_2O$ , copper(I) oxide	CM or I	Yes No
$PF_3$ , phosphorus trifluoride	CM or I	Yes No
$K_3PO_4$ , tripotassium phosphate	CM or I	Yes No
$NH_4NO_3$ , ammonium nitrite	CM or I	Yes No
$Fe_2O_3$ , iron(III) oxide	CM or I	Yes No
$Cl_2O$ , dichlorine monoxide	CM or I	Yes No
$Fe(HCO_3)_2$ , iron(II) bicarbonate	CM or I	Yes No
$Cr(OH)_3$ , chromium hydroxide	CM or I	Yes No

*Did you remember to sign your name, print your name and include your correct chemistry student number? There is a one-point bonus if you did!*

Total score (out of 100): \_\_\_\_\_

A+ ≥ 95% A ≥ 90% B+ ≥ 85% B ≥ 80% C+ ≥ 75% C ≥ 70% D ≥ 60%

## Answers:

1.   $1 \text{ Gs} = 1 \times 10^{-9} \text{ s}$         $1 \times 10^6 \text{ m} = 1 \text{ Mm}$   
  $1 \times 10^{-9} \text{ nm} = 1 \text{ m}$         $1 \text{ fg} = 1 \times 10^{15} \text{ g}$   
  $1 \text{ kg} = 1 \times 10^3 \text{ g}$         $1 \mu\text{L} = 1 \times 10^{-3} \text{ L}$   
  $1 \times 10^{12} \text{ pL} = 1 \text{ L}$         $1 \text{ Ts} = 1 \times 10^{12} \text{ s}$

2. 0.4773 mL.

3. 254.5 g

4. 1741 km/hr

5. 354 mL

6. 39.2 °C

7. 312 K

8. 219 cm<sup>3</sup>

9. 0.66 g/ cm<sup>3</sup>

10. 434 ms

11a. Se and Ne;

11b. I and Br;

11c. Be and Ba

11d. Li and Rb;

11e. As and Si

11f. Pb and Sb

12a. Circle either P<sub>2</sub>O<sub>5</sub> and P<sub>4</sub>O<sub>6</sub> or P<sub>4</sub>O<sub>10</sub> and P<sub>4</sub>O<sub>6</sub>, but not P<sub>2</sub>O<sub>5</sub> and P<sub>4</sub>O<sub>10</sub>

12b. K<sub>2</sub>SO<sub>3</sub> and K<sub>2</sub>SO<sub>4</sub>

12c. Circle any two

13. 6.88 g

14.  $5.6 \times 10^4$  aluminum atoms

15.

	Protons	Neutrons	Electrons
15a. <sup>19</sup> <sub>9</sub> F	9	10	9
15b. <sup>63</sup> <sub>29</sub> Cu	29	34	29
15c. <sup>200</sup> <sub>80</sub> Hg	80	120	80

16. 36.96 amu

17. 0.204 mol

18.

	Circle:	Circle:
N <sub>2</sub> O <sub>4</sub> , nitrogen tetroxide	CM	No
Na <sub>2</sub> CO <sub>3</sub> , sodium carbonate	I	Yes
Cu <sub>2</sub> O, copper(I) oxide	I	Yes
PF <sub>3</sub> , phosphorus trifluoride	CM	Yes
K <sub>3</sub> PO <sub>4</sub> , tripotassium phosphate	I	No
NH <sub>4</sub> NO <sub>3</sub> , ammonium nitrite	I	No
Fe <sub>2</sub> O <sub>3</sub> , iron(III) oxide	I	Yes
Cl <sub>2</sub> O, dichlorine monoxide	CM	Yes
Fe(HCO <sub>3</sub> ) <sub>2</sub> , iron(II) bicarbonate	I	Yes
Cr(OH) <sub>3</sub> , chromium hydroxide	I	No