

Exam 1 Chm 203 (Dr Mattson) 17 Sept. 2014

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: _____

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 periodic table provided — Write: "See PT" in the answer box and then hand the periodic table in with your exam. On your desk you are allowed only pencils (but no pencil pouch), an eraser, and a non-programmable calculator without a slipcover. Backpacks and purses must be closed and stored on the floor. Cell phones must be OFF and placed in your backpack/purse or in the front of the room – but not in your pocket. When you are done, hand in your exam and periodic table and you are free to go. May you do well!

Useful information: $N_A = 6.02 \times 10^{23}$

1. (6 pts) Circle the...

- A. noble gas: K Ca Fe Ga As Br Kr
- B. semi-metal: K Ca Fe Ga As Br Kr
- C. halogen: K Ca Fe Ga As Br Kr
- D. transition metal: K Ca Fe Ga As Br Kr
- E. alkaline earth: K Ca Fe Ga As Br Kr
- F. alkali metal: K Ca Fe Ga As Br Kr

2. (3 pts) Sodium has a diameter of 3.72×10^{-8} cm. Convert this to units of pm.

Answer with units: _____

3. In class, I brought a large balloon filled with methane attached to a large test tube. I condensed gaseous methane into a liquid by holding the test tube in a cup of liquid nitrogen. Then I removed the test tube containing liquid methane from the liquid nitrogen and removed the balloon. The methane started to boil. Next I ignited the gaseous methane as it left the mouth of the test tube.

3a. (4 pts) All of these statements are true. Which refer to chemical properties (C) and which refer to physical properties (P)?

- A. C P Methane burns in air.
- B. C P Methane has a boiling point of -164°C .
- C. C P Methane is a colorless, odorless gas.
- D. C P Nitrogen boils at 77°C .

3b. (3 pts) All of these statements are true. Which represent intensive (I) and extensive (E) properties?

- A. I E Methane releases heat when burned.
- B. I E Methane has a boiling point of -164°C .
- C. I E More liquid methane could have been condensed if I had used a larger balloon.

4. (3 pts) Daytime temperatures on Mercury reach 430°C . What is this temperature in $^\circ\text{F}$? Show all work. Given: $T_C = \frac{5}{9}(T_F - 32)$

Answer with units: _____

Name: _____

Circle your Folder group:

H He Li Be B C N O F Ne Na Mg Al Si P

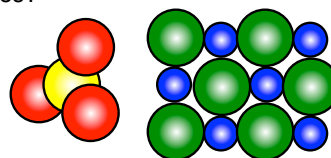
5. (4 pts) Elemental calcium has a density of 1.55 g/cm^3 at room temperature. What is the mass of a 25 cm^3 chunk of calcium?

Answer with units: _____

6. (4 pts) The area of Nebraska is 77353 mi^2 . Convert this to km^2 and express your answer in scientific notation. Given: $1 \text{ mi} = 1.609 \text{ km}$.

Answer with units: _____

7a. (1 pt) What sort of compounds are represented with these figures?

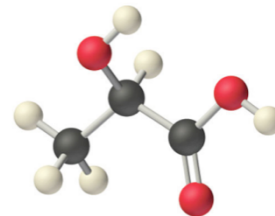


- A. Left: an ionic and Right: a covalent molecular
- B. Left: a covalent molecular and Right: an ionic
- C. Both are covalent molecules
- D. Both are ionic substances
- E. Insufficient information

7b. (1 pt) If we knew one of these two compounds was a gas at 25°C , which one would it be? Circle: Right Left

7c. (1 pt) Which has the formula AB ? Right or Left

8. (1 pt) Lactic acid is produced when muscles are strained, causing stinging pains. The red atoms are oxygen atoms, black are carbon atoms and white are hydrogen atoms. What is the chemical formula of lactic acid?



Answer with units: _____

9. (5 pt) Which of the following isotopic symbols must be erroneous? Circle all that apply.

A. ${}^7_3\text{Li}$ B. ${}^6_3\text{Li}$ C. ${}^{14}_7\text{N}$ D. ${}^{19}_9\text{Ne}$ E. ${}^1_2\text{He}$

10. (2 pts) Given that cesium, Cs, exists as only one isotope, how many protons and neutrons do all cesium atoms have?

11. (5 pts) Magnesium has three naturally occurring isotopes and summarized below. The atomic mass of magnesium as shown on the periodic table is 24.3050 amu. What is the abundance and exact mass of the third isotope?

Isotope	Abundance	Exact mass
${}^{24}_{12}\text{Mg}$	78.99 %	23.985 amu
${}^{25}_{12}\text{Mg}$	10.00 %	24.986 amu
${}^?_{12}\text{Mg}$		

Add your answer to the table above.

12a. (4 pts) How many moles of carbon are in a speck of carbon with a mass of 35 μg ?

Answer with units: _____

12b. (4 pts) How many carbon atoms (use Avogadro's number) are in this same speck of carbon (from Question 12a)?

Answer with units: _____

13. (1 pt) What is the significance of the coefficients in a balanced equation? The coefficients represent the...

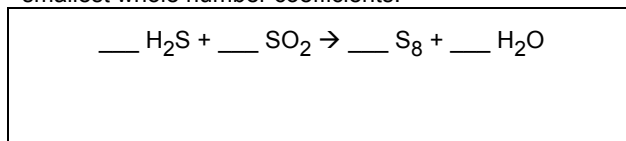
- A. mass relationships between chemical formulas
- B. mole relationships between chemical formulas
- C. volume relationships between chemical formulas
- D. density relationships between chemical formulas

Note: If you are Nomenclature Certified, you may skip Question 14. Proceed to Question 15.

14. (10 pts) Complete the table:

Circle rule	Name	Formula
Ionic or CM		$\text{Cr}_2(\text{SO}_4)_3$
Ionic or CM	lithium hypochlorite	
Ionic or CM	dinitrogen monoxide	
Ionic or CM		BrF_3
Ionic or CM		NH_4NO_3

15. (3 pts) Balance the following equation with the smallest whole number coefficients.



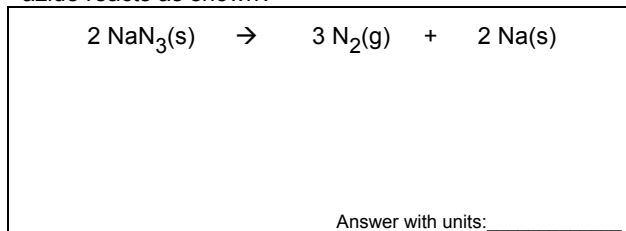
16. (3 pts) What is the molar mass of calcium chlorite?

Answer with units: _____

17. (4 pts) How many moles of tetraphosphorus trioxide are present in a 25.0 g ampoule of the substance?

Answer with units: _____

18. (4 pts) Sodium azide is the compound that inflates automotive airbags in the event of a collision. What is the theoretical yield (in grams) of $\text{N}_2(\text{g})$ if 40.9 g sodium azide reacts as shown?



19. (4 pts) In another experiment with sodium azide, given that the theoretical yield of Na was 0.96 mol and the actual yield was 17.2 g, what is the percent yield?

Answer with units: _____

Subtotal from exam: _____

Folder work: (20 max) _____

Total: _____

Answers:

1.

- A. noble gas: Kr
- B. semi-metal: As
- C. halogen: Br
- D. transition metal: Fe
- E. alkaline earth: Ca
- F. alkali metal: K

2. 372 pm

3a. C P P P

3b. E I E

4. 806 °F

5. 38.8 g

6. $2.00 \times 10^5 \text{ km}^2$

7a. B

7b. Left

7c. Right

8. $\text{C}_3\text{H}_6\text{O}_3$

9. D and E

10. 55 protons and 78 neutrons

11. 11.01 % 25.982 amu

12a. $2.9 \times 10^{-6} \text{ mol}$

12b. $1.8 \times 10^{18} \text{ C atoms}$

13. B

14.

Circle rule	Name	Formula
ionic	Chromium(III) sulfate	$\text{Cr}_2(\text{SO}_4)_3$
ionic	lithium hypochlorite	LiClO
CM	dinitrogen monoxide	N_2O
CM	Bromine trifluoride	BrF_3
ionic	Ammonium nitrate	NH_4NO_3

15. $16 \text{ H}_2\text{S} + 8 \text{ SO}_2 \rightarrow 3 \text{ S}_8 + 16 \text{ H}_2\text{O}$

16. 175 g/mol

17. 0.145 mol

18. 26.4 g

19. 78%