

Final Exam
CHM 203 (Dr. Mattson)
11 DECEMBER 2007

Academic Integrity Pledge:

In keeping with Creighton University's ideals and with the Academic Integrity Code adopted by the College of Arts and Sciences, 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 is required! You will receive credit for how you worked each problem as well as for the correct answer. You will receive no credit for answers without work shown. If you need more space, you may use the back of your periodic table — Write: "See PT" in box and then attach the periodic table. **BOX YOUR ANSWERS!** Write legibly.

1. (4 pts) A substance has a density of 3.17 g/cm^3 . What is the volume of 12.2 g of this substance?

2. (5 pts) An order for medication reads "give 1.5 mg per kilogram of body weight." How much medication should be given to a patient weighing 219 lbs? [1 lb = 454 g]

3. (6 pts) How many protons neutrons and electrons are in these?

	Protons	Neutrons	Electrons
$^{56}\text{Co}^{+3}$			
$^{37}\text{Cl}^-$			

4. (6 pts) Write the formula for

sodium sulfide
calcium nitrate
dinitrogen pentoxide
aluminum bromide
sulfur tetrafluoride
sodium sulfate

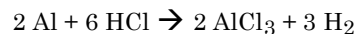
5. (4 pts) Which of these form aqueous solutions that of strong electrolytes?

calcium nitrate	Yes	No
magnesium carbonate	Yes	No
hydrochloric acid	Yes	No
sodium hydroxide	Yes	No

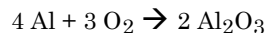
6. (5 pts) An oxide of nitrogen contains 36.86% N. What is its empirical formula?

7. (4 pts) How many moles of F_2 are required to combine with 3.11 mol Xe to produce XeF_4 ?

8. (5 pts) What is the theoretical yield of H_2 if 10.0 mL 0.500 M HCl is reacted with excess aluminum?



9. (5 pts) A mixture of 75 g Al and 42 g O_2 are reacted to completion according to the reaction given below. Which reagent is in excess and by how many grams?



10. (4 pts) Predict if a precipitation will occur when the following pairs of aqueous solutions are mixed.
- | | | |
|-----|----|---------------------------------------|
| Yes | No | Calcium nitrate + sodium sulfide |
| Yes | No | Cobalt(II) chloride + lithium acetate |
| Yes | No | Sodium carbonate + magnesium bromide |
| Yes | No | Barium bromide and sodium sulfate |

11. (4 pts) Which of these sets of quantum numbers (n, l, m_l, m_s) is/are possible designations for the 4p electrons of germanium, Ge?

a.	4, 1, 0, 1/2	Possible	Not possible
b.	3, 1, 0, -1/2	Possible	Not possible
c.	4, 2, 3, 1/2	Possible	Not possible
d.	4, 1, -1, -1/2	Possible	Not possible

12. (5 pts) Which of the following has one or more unpaired electron(s) in the ground state? (May be more than one.)



13. (3 pts) Give the complete electronic configuration for calcium.

14. (2 pts) What atom has this electronic configuration: [Ar] 4s²3d¹⁰4p³?

15. (4 pts) Select the largest species of each of these groups:

- a. Ti⁺² Ti⁺³ Ti
 b. F⁻ Ne Na⁺

16. (4 pts) Which has the largest first ionization energy for each of these groups:

- a. Na K Rb
 b. F Ne Na

17. (2 pts) Which set is listed in order of increasing effective nuclear charge?

- a. O, C, N b. B, C, O c. F, Cl, Br d. F, S, As

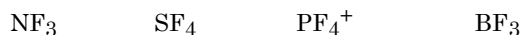
18. (4 pts) Which of the following has lone pairs of electrons on the central atom? (More than one possible)



19. (4 pts) In which of the following is the actual structure a resonance hybrid of Lewis structures? (More than one possible)



20. (4 pts) Which of the following molecules do not obey the octet rule? (More than one possible)

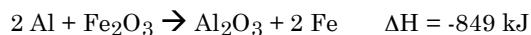


21. (5 pts) What is the shape of the following molecules?

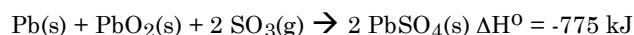
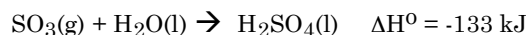
ClF ₃
PH ₃
TeCl ₂
CO ₂
SiF ₄

22. (3 pts) What is the hybridization predicted for the sulfur in SO₃⁻²?

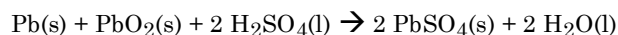
23. (4 pts) How much heat is produced at the same time 100.0 g Fe is produced in the thermite reaction?



24. (4 pts) Given these two reactions:



Calculate ΔH° for the reaction



Sign the Academic Integrity pledge *and* print your name here:

Your exam score (100 possible): _____

Determine your grade:

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

Answers

1. 3.85 cm^3

2. 149 mg

3.

	Protons	Neutrons	Electrons
$^{56}\text{Co}^{+3}$	27	29	24
$^{37}\text{Cl}^-$	17	20	18

4. sodium sulfide, Na_2S ; calcium nitrate, $\text{Ca}(\text{NO}_3)_2$; dinitrogen pentoxide, N_2O_5 ; aluminum bromide, AlBr_3 ; sulfur tetrafluoride, SF_4 ; sodium sulfate, Na_2SO_4

5. Yes, No, Yes, Yes

6. N_2O_3

7. 6.22 mol F_2

8. 0.0025 mol H_2 (or 0.0050 g H_2)

9. 27.81 g Al in excess

10. Yes, No, Yes, Yes

11. Possible, Not possible, Not possible, Possible

12. Be^+ Cu Se

13. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

14. As

15. (a) Ti; (b) F^-

16. (a) Na; (b) Ne

17. (b)

18. ICl_3 and NF_3

19. SO_2 and SO_3

20. SF_4 and BF_3

21. ClF_3 , T-shaped; PH_3 , trigonal pyramid; TeCl_2 , bent; CO_2 , linear; SiF_4 , tetrahedral

22. sp^3

23. $q_{\text{reaction}} = -769 \text{ kJ}$ (or "760 kJ heat produced")

24. $\Delta H^\circ = -509 \text{ kJ}$