

Chemistry 1094 Spring 2017 Test 3

Wednesday, March 22, 2017

Time: 1 hour 50 minutes

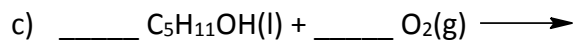
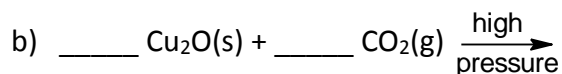
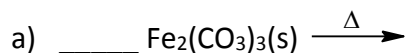
Name: _____

Student #: _____

*This test consists of **six** pages of questions and a periodic table. Please ensure that you have a complete test and, if you do not, obtain one from me **immediately**. There are **43** marks available. Good luck!*

Avogadro's number, should you need it, is $6.022\ 140\ 857 \times 10^{23} \text{ mol}^{-1}$

1) **[6 marks]** Complete and balance the following reactions. Give the phases of all products.



2) **[1 mark]** Calculate the molar mass of $\text{Al}_2(\text{CO}_3)_3 \cdot 4\text{H}_2\text{O}$.

3) **[14 marks total]** *Note: to receive any credit for any part of this question, you must show the complete method by which you obtained your solution.*

Na_2SO_4 has a molar mass of 142.0 grams.

a) **[1 mark]** How many grams of Na_2SO_4 are necessary to supply 0.0500 moles of Na_2SO_4 ?

b) **[1 mark]** How many moles of Na_2SO_4 are in 5.68 grams of Na_2SO_4 ?

c) **[1 mark]** How many moles of oxygen atoms are in 0.0200 moles of Na_2SO_4 ?

d) **[1 mark]** How many moles of Na_2SO_4 are necessary to supply 0.100 moles of oxygen atoms?

e) **[2 marks]** How many grams of sodium atoms are in 0.160 moles of Na_2SO_4 ?

f) **[2 marks]** How many moles of Na_2SO_4 are necessary to supply 1.1495 grams of sodium atoms?

g) **[3 marks]** How many grams of Na_2SO_4 are necessary to supply 3.011×10^{20} atoms of sodium?

h) **[3 marks]** How many sodium atoms are contained in 1.42 grams of Na_2SO_4 ? (Give the actual number and not just a multiple of moles.)

4) **[1 mark]** Calculate the mass of a single atom of sodium in grams.

5) **[4 marks]** Calculate the percent by mass of each element in $\text{Ag}(\text{NH}_3)_2\text{Cl}$.

6) **[5 marks total]** Glucose (an important source of energy) is 40.002 % carbon, 53.285 % oxygen, and the rest hydrogen (all by mass).

a) **[3 marks]** What is the empirical formula of glucose?

b) **[2 marks]** The molar mass of glucose is 180.157 grams. What is the molecular formula of glucose?

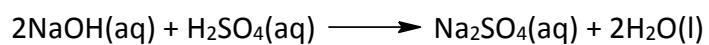
7) **[6 marks]** A 5.844-gram sample of NaCl (58.44 g/mol) was dissolved in enough water to make 250.0 mL of solution **A**. A 15.00-mL aliquot of solution **A** was taken and diluted to 200.0 mL to form solution **B**. Some solution **B** was then taken and diluted to 250.0 mL to form solution **C**. The concentration of solution **C** was found to be 1.200×10^{-3} M.

a) What was the concentration of solution **A**? Give your answer in moles/L.

b) What was the concentration of solution **B**? Give your answer in moles/L.

c) How many mL of solution **B** were used to make solution **C**?

8) **[6 marks]** It took 22.62 mL of 0.1084 M NaOH to titrate a 15.00 mL aliquot of H₂SO₄:



a) What was the [H₂SO₄] in the original aliquot? Give your answer in moles/L.

b) What was the [Na₂SO₄] after the titration was complete? Give your answer in moles/L.