CHEMISTRY 101   SPRING 2005
EXAM 1   FORM B   SECTIONS 501-511   DR. KEENEY-KENNICUTT

Directions: (1) Put your name and signature on PART 2 of the exam where indicated.
(2) Sign the Aggie Code on PART 2 of this exam.
(3) Each multiple choice question is actually 2 questions on your scanning sheet. If you are sure of an answer, **put the same answer down for both questions** for 5 pts. If you cannot decide between two answers, put one answer down for one question and the other answer down for the other question. If you get one correct you'll get half credit for 2.5 pts. If there is an ambiguous multiple choice question, use the last page to explain your answer.
(4) Do NOT write on the envelope.
(5) When finished, put everything in the envelope and wait to be excused. At the table, take everything out of the envelope. You can pick up the multiple choice part with the answers outside my office after the exam.
(6) There are a total of 28 questions (16 actual questions).

PART 1

1&2. Which of the following elemental names is **incorrectly** matched with its symbol?

(a) magnesium/Mg   (b) lead/Ld   (c) sodium/Na

(d) tin/Sn   (e) mercuryHg

3&4. The correct name for CH_3OH is:

(a) methane
(b) ethanol
(c) acetone
(d) methanol
(e) ethane

5&6. You can find 2 atoms of sulfur in

(a) 2 moles of NaOH

(b) 1 mole of H_2SO_4

(c) 1 molecule of H_2SO_4

(d) 2 formula units of BaS

(e) 2 grams of S

B1

7&8. What is the percent of carbon by mass in Vitamin E, $C_{29}H_{50}O_2$?

(a) 80.9%

(b) 86.3%

(c) 77.4%

(d) 71.2%

(e) 29.0%

9&10. How many millimoles of Vitamin E, $C_{29}H_{50}O_2$, are present in 10.0 g of Vitamin E?

(a) 33.9 mmol

(b) 20.7 mmol

(c) 23.2 mmol

(d) 43.6 mmol

(e) 28.6 mmol

11&12. How many kilograms of sodium are there in 30.0 kilograms of Na_2CrO_4?

(a) 2.76 kg

(b) 4.17 kg

(c) 6.22 kg

(d) 1.88 kg

(e) 8.52 kg

B2

13&14. An unknown organic compound composed of carbon, hydrogen and oxygen was analyzed and found to be 50.84% C, 8.53% H and 40.63% O by mass. Which of the following represents the correct empirical formula for the compound?

(a) CH_2O (b) $C_3H_6O_2$ (c) $C_4H_8O_3$ (d) C_2H_4O (e) $C_5H_{10}O_3$

15&16. What mass of K_2O can be prepared from the reaction of 10.0 g of K with excess KNO_3?

$$K \ + \ KNO_3 \ \rightarrow \ K_2O \ + \ N_2 \quad \text{(unbalanced - you need to balance this first)}$$

(a) 2.71 g   (b) 14.5 g   (c) 24.6 g   (d) 33.7 g   (e) 41.2 g

17&18. How many grams of K_3PO_4 are required to prepare 300.0 mL of solution that is 2.00% K_3PO_4? The density of the solution is 1.1 g/mL?

    (a) 6.6 g   (b) 5.8 g   (c) 7.1 g   (d) 4.2 g   (e) 3.8 g

19&20. How many grams of K_3PO_4 are required to prepare 300.0 mL of a solution that is 0.200 M?

    (a) 9.83 g   (b) 11.1 g   (c) 12.7 g   (d) 10.5 g   (e) 14.3 g

21&22. How many grams of Na_2O_2 can be produced from the reaction of 10.0 g of sodium metal with excess oxygen gas if the percent yield of the reaction is only 55%?

$$2\ Na\ +\ O_2\ \rightarrow\ Na_2O_2$$
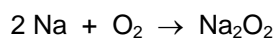
(a) 5.8 g   (b) 9.3 g   (c) 8.6 g   (d) 6.8 g   (e) 12.2 g

23&24. How many milliliters of 0.300 M HBr (hydrobromic acid) are required to react with 0.500 g of $Ca(OH)_2$ (FW = 74.1 g/mol) according to:

$$2\ HBr\ +\ Ca(OH)_2\ \rightarrow\ CaBr_2\ +\ 2\ H_2O$$
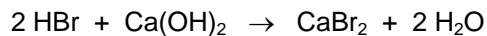
(a) 45.0 mL   (b) 21.3 mL   (c) 50.1 mL   (d) 14.0 mL   (e) 28.6 mL

PART 2

**Please read and sign: "On my honor, as an Aggie, I have neither given
nor received unauthorized aid on this exam."**   _____

(10 pts) **25.**   Give the appropriate name or formula for a compound:

(a)   copper(II) nitrate   _____

(b)   ammonium chloride   _____

(c)   calcium acetate   _____

(d) $Fe(NO_3)_3$ _____
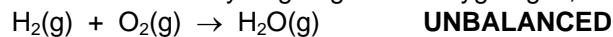
(e)   CaS   _____

(5 pts) **26.**   Consider the following reaction: $H_2O + Na \rightarrow H_2 + NaOH$ **UNBALANCED**

Balance the equation and describe what is happening as the reaction proceeds using the terms:
atom, formula unit, and molecule.

OVER $\Rightarrow$

27.   Water is formed by the direct reaction of hydrogen gas and oxygen gas, according to the reaction:

$$H_2(g) + O_2(g) \rightarrow H_2O(g) \qquad \textbf{UNBALANCED}$$
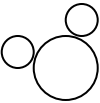
(2 pts)   (a)   Balance the equation.

(5 pts)   (b)   Suppose you start the reaction with 2.0 moles of O_2 and 5.0 moles of H_2.
How many moles of H_2O can you make?
What reactant is left over? How much of it is in excess?

(4 pts)   (c)   The initial system before the reaction began is represented by:
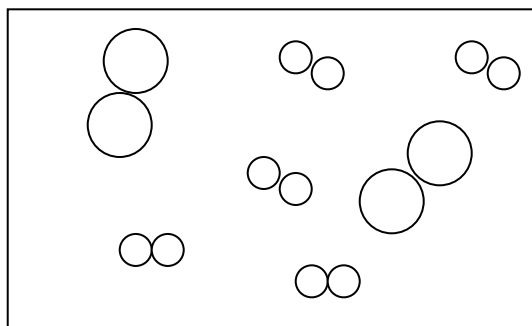
where ◯ is a hydrogen atom

◯ is an oxygen atom

◯◯ is a water molecule

Draw a picture of the system after the reaction has gone to completion.
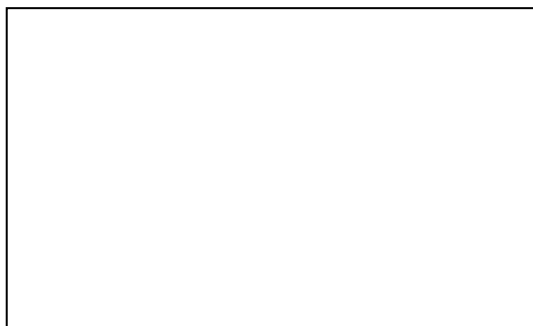
(4 pts)   (d)   Briefly explain this reaction and your picture using the concept of limiting reactant.

B8

28. A scientist has two containers of sulfur and knows that she has Avogadro's number of sulfur **<u>atoms</u>** in each one. One container has only S_4 molecules in it and the other has only S_8 molecules in it. Answer the following questions and show your work to get full credit.

(4 pts)   (a) Are the number of molecules the same in each container? Explain.

(6 pts)   (b) Calculate the number of moles of sulfur molecules in each sample. Are the numbers the same? Draw a picture to defend your results.

SCRAP PAPER OR COMMENTS ON EXAM