NAME _____

CHEMISTRY 101 SPRING 2005

EXAM 1 FORM A 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) uranium/U (b) silicon/Si (c) iron/Fe
(d) chromium/Ch (e) cadmium/Cd

3&4. You can find 4 atoms of oxygen in

(a) 1 mole of K_2SO_4
(b) 4 moles of Na_2O
(c) 1 formula unit of Na_3PO_4
(d) 2 molecules of H_2O
(e) 2 grams of $Ba(OH)_2$

5&6. The correct name for CH_3CH_2OH is:

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

7&8. How many millimoles of vanillin, $C_8H_8O_3$, are present in 3.00 g of vanillin?

(a) 50.7 mmol (b) 31.6 mmol (c) 15.2 mmol
(d) 41.3 mmol (e) 19.7 mmol

9&10. What is the percent of oxygen by mass in vanillin, $C_8H_8O_3$?

(a) 31.6% (b) 19.2% (c) 15.8%
(d) 25.8% (e) 10.5%

11&12. An unknown organic compound composed of carbon, hydrogen and oxygen was analyzed and found to be 46.15% C, 7.74% H and 46.11% O by mass. Which of the following represents the correct empirical formula for the compound?

(a) CH_3O (b) C_2H_3O (c) $C_4H_8O_3$ (d) CH_2O (e) $C_2H_5O_2$

13&14. How many kilograms of oxygen are there in 20.0 kilograms of $KMnO_4$?

(a) 8.10 kg (b) 2.24 kg (c) 10.0 kg (d) 5.00 kg (e) 3.53 kg

15&16. What mass of SiC can be prepared from the reaction of 10.0 g of C with excess SiO_2?

$SiO_2 + C \rightarrow SiC + CO$ (unbalanced - you need to balance this first)

(a) 49.3 g (b) 22.6 g (c) 33.8 g (d) 11.1 g (e) 15.2 g

17&18. How many grams of Na_2SO_4 are required to prepare 50.0 mL of a solution that is 0.100 M?

(a) 0.352 g (b) 0.710 g (c) 7.50 g (d) 1.12 g (e) 4.15 g

19&20. How many grams of Na_2SO_4 are required to prepare 50.0 mL of solution that is 1.00% Na_2SO_4? The density of the solution is 1.20 g/mL?

(a) 1.00 g (b) 3.00 g (c) 6.00 g (d) 0.300 g (e) 0.600 g

21&22. How many grams of Li_2O (FW = 29.88 g/mol) can be produced from the reaction of 10.0 g of lithium metal with excess oxygen gas if the percent yield of the reaction is only 65.0%?

$$4\ Li + O_2 \rightarrow 2\ Li_2O$$

(a) 14.0 g (b) 21.3 g (c) 16.2 g (d) 32.7 g (e) 11.2 g

23&24. How many milliliters of 0.500 M HCl (hydrochloric acid) are required to react with 1.00 g of $Mg(OH)_2$ (FW = 58.3 g/mol), according to:

$$2\ HCl + Mg(OH)_2 \rightarrow MgCl_2 + 2\ H_2O \quad ?$$

(a) 74.6 mL (b) 16.3 mL (c) 45.7 mL (d) 68.6 mL (e) 33.1 mL

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Form A

PART 2

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

25. A scientist has two containers of sulfur and knows that she has Avogadro's number of sulfur **atoms** in each one. One container has only S_2 molecules in it and the other has only S_6 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.

OVER ⇒

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

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

(10 pts) **27.** Give the appropriate name or formula for a compound:

(a) ammonium sulfate _____

(b) iron(II) fluoride _____

(c) magnesium nitrate _____

(d) $Cu(CH_3COO)_2$ _____

(e) KOH _____

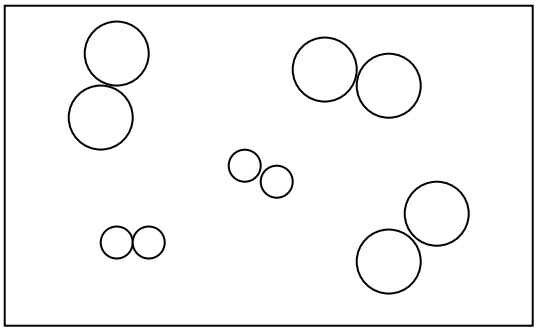
28. Water is formed by the direct reaction of hydrogen gas and oxygen gas, according to the reaction:

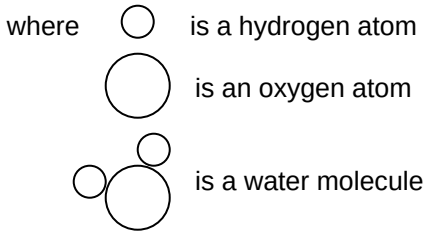
$H_2(g) + O_2(g) \rightarrow H_2O(g)$ **UNBALANCED**

(2 pts) (a) Balance the equation.

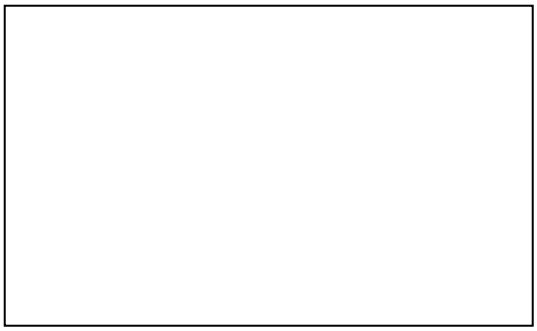
(5 pts) (b) Suppose you start the reaction with 3.0 moles of O_2 and 2.0 moles of H_2.
How many moles of H_2O can you make?
What reactant is left over? How much of it is in excess?

(4 pts) (c) The initial system before the reaction began is represented by the following particle view:





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.

SCRAP PAPER OR COMMENTS ON EXAM

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