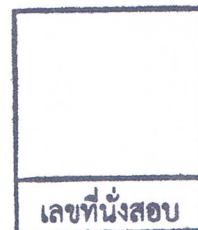


College of Industrial Technology
King Mongkut's University of Technology North Bangkok



Final Examination of Semester 1

Year: 2013

Subject: 392151 Chemistry I

Section: 15-16

Date: 26 September 2013

Time: 10.00-12.00

Name: _____ ID: _____ Class: _____

Instructions:

1. Cheating will result in failure of all classes registered for the current semester. Students who are caught cheating will also be denied registering for the following semester.
2. No documents are allowed to be taken out of the examination room.
3. Only calculators are allowed in the examination.
4. This exam is a closed book examination.
5. Electronic communication devices are NOT allowed in the examination room.
6. The examination has 8 pages (including this page), 2 sections and a total score of 60 points.
7. Write all your solution and answer on this examination sheet.

วิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|--------|---------|--------|--------------|--------|-----------|--------|------------|-------|-----------|--------|-----------|--------|------------|--------|-----------|--------|-------------|--------|-------------|--------|---------|--------|-------------|--------|-----------|--------|
| lanthanum | 57 | cerium | 58 | praseodymium | 59 | neodymium | 60 | promethium | 61 | samarium | 62 | europtium | 63 | gadolinium | 64 | terbium | 65 | dysprosium | 66 | holmium | 67 | erbium | 68 | thulium | 69 | ytterbium | 70 |
| La | 138.91 | Ce | 140.12 | Pr | 140.91 | Nd | 144.24 | Pm | [145] | Sm | 150.36 | Eu | 151.96 | Gd | 157.25 | Tb | 158.93 | Dy | 162.50 | Ho | 164.93 | Er | 167.26 | Tm | 168.93 | Yb | 173.04 |
| actinium | 89 | thorium | 90 | protactinium | 91 | uranium | 92 | neptunium | 93 | plutonium | 94 | americium | 95 | curium | 96 | berkelium | 97 | californium | 98 | einsteinium | 99 | fermium | 100 | mendelevium | 101 | nobelium | 102 |
| Ac | | Th | 232.04 | Pa | 231.04 | U | 238.03 | Np | [237] | Pu | [244] | Am | [243] | Cm | [247] | Bk | [247] | Cf | [251] | Es | [262] | Fm | [257] | Md | [259] | No | [259] |

actinoids

Symbols and names: the symbols and names of the elements, and the symbols and names recommended by the International Union of Pure and Applied Chemistry (IUPAC - <http://www.iupac.org/>). Names have yet to be proposed for the most recently discovered elements 110–112 and 114 so those used here are IUPAC's temporary systematic names. In the USA and some other countries, the spellings aluminium and caesium are normal while in the UK and elsewhere the common spelling is sulphur.

Group labels: the numeric system (1–18) used here is the current IUPAC convention.

Atomic weights (mean relative masses): Apart from the heaviest elements, these are the IUPAC 2001 values and given to 5 significant figures. Elements for which the atomic weight is given within square brackets have no stable nuclides and are represented by the element's longest lived isotope.

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Part 1. Multiple Choice (20 points)

Identify the letter of the choice that best completes the statement or answers the question and showing a short solution in the box below each question.

___ 1. Calculate the mass of 0.50 mol of CaCO_3

a. 50 amu

b. 50 g

c. 100 amu

d. 100 g

___ 2. How many moles of hydrogen and nitrogen atoms are present in 0.25 mol of NH_3 ?

a. 1 mol and 1 mol

b. 3 mol and 1 mol

c. 0.25 mol and 0.25 mol

d. 0.75 mol and 0.25 mol

___ 3. Which of the following has the greatest mass?

a. 1 atom of ^{12}C

b. 1 molecule of H_2

c. 1 amu

d. $4 \times 1.66 \times 10^{-24} \text{ g}$

___ 4. Which of the following has the greatest number of atoms?

a. 1 atom

b. 1 mol of CH_4

c. 1 mol of He

d. 1 mol of H_2O

___ 5. For the reaction $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$, how many molecules of oxygen are required to produce 5 mol of methane, NO_2 ?

a. 1 mol

b. 2 mol

c. 2.5 mol

d. 5 mol

___ 6. The coefficients in a chemical equation represent the ____.

- a. masses, in grams, of all reactants and products
- b. relative numbers of moles of reactants and products
- c. number of atoms in each compound in a reaction
- d. number of valence electrons involved in the reaction

___ 7. What is the percentage of hydrogen in water?

- a. 2
- b. 11
- c. 16
- d. 18

___ 8. In the combustion of natural gas, $\text{CH}_4 + \text{O}_2 \rightarrow \text{H}_2\text{O} + \text{CO}_2$ (unbalanced), what is the mole ratio of CH_4 to oxygen?

- b. 1:1
- b. 1:2
- c. 2:1
- d. 2:2

___ 9. If the mass of 1 atom of X is 4.035×10^{-23} g, what is X?

- a. C
- b. F
- c. Si
- d. Mg

___ 10. Which of the following compound has the greatest relative molecular mass?

- a. H_2O_2
- b. C_5H_{10}
- c. SO_2
- d. PCl_5

Part 2 Answer (40 points)

1. Calculate the mass, in grams, of ____.

(3 points)

- a. 16 amu

b. 2 atoms of Ca

c. 3 mol of He

2. Calculate the average relative atomic mass of Cl using the following data: (3 points)

| Isotope | Natural Relative Abundance (%) | Mass (amu) |
|------------------|--------------------------------|------------|
| ^{35}Cl | 75.77 | 34.969 |
| ^{37}Cl | 24.23 | 36.966 |

3. Determine the molecular mass and the percentage of oxygen in sulfuric acid (H_2SO_4).

(3 points)

4. A substance consists of carbon hydrogen and oxygen only. Determine the amount of carbon in 4.60 g of this substance if this substance contains 13.05% of hydrogen and 34.78% of oxygen.

(3 points)

5. Fungal laccase, a blue protein found in wood-rotting fungi, is 0.390% Cu by mass. If a fungal laccase molecule contains 4 copper atoms, what is the molar mass of fungal laccase? (4 points)

6. What amount (moles) is represented by each of these samples? (3 points)

(a) 56 g of CO_2

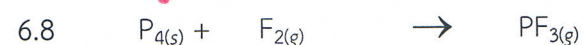
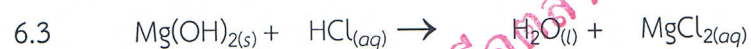
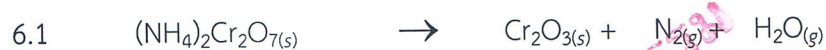
(b) 1 atom of Cu

(c) 500 mL of N_2 at STP

7. How many (a) moles of O_2 and (b) O_2 molecules are contained in 40.0 g of O_2 at 25°C ? (4 points)

8. A sample of NH_3 is pumped from a 1200 mL vessel at STP, what is its mass? How many atoms of N and H in this gas? (4 points)

9. Balance the following reactions. (4 points)



10. Given the following equation, calculate the mass of O_2 needed to react completely with 7.4 g NO.



11. The thermite reaction is $\text{Fe}_2\text{O}_{3(s)} + 2\text{Al}_{(s)} \rightarrow 2\text{Fe}_{(l)} + \text{Al}_2\text{O}_{3(s)}$

What masses of Fe_2O_3 and Al must be used to produce 56.0 g of Fe? What is the maximum mass of Al_2O_3 that could be produced? (5 points)

Monrudee Phongaksorn

วิทยาลัยเทคโนโลยีอุตสาหกรรม