

Chemistry 1542D Exam #1 Version **B**
UW Autumn 2011
Course Staff: Robinson, Strein, Gary, Tsang, Weller, Fitzgerald

Name _____ UW ID _____

TA _____ Section _____

Signature _____.

Your signature, above, implies that you have worked alone on the exam, with no aids except your “memory erased” scientific calculator, your “one” handwritten (IN YOUR OWN WRITING) 3x5 card, **and the final page of “information,”** which may be removed and kept.

All students must sit in their pre-assigned seats as on Seating Chart. Answers to the multiple choice questions **MUST** be circled (only one circle per question) on your paper exam which you will hand in with your scantron form. If the course staff has to enter, or correct, “any data what-so-ever” on your scantron form you will lose “the value of one question” on the exam. There are 14 multiple choice questions. Each has “one best answer, a)-e),” which must be indicated on your scantron form. The questions are all of equal weight but not equal difficulty. They are not in any particular order. There is no penalty for guessing.

Some potentially useful information:

$$N_A = 6.022 \cdot 10^{23} \text{ mol}^{-1}$$

$$R = 0.082 \frac{(\ell - \text{Atm})}{(\text{mol} - \text{K})} \quad C = \frac{\text{moles}}{\text{Volume}}$$

$$m_e = 9.11 \cdot 10^{-31} \text{ kg}$$

$$n = M \cdot V$$

There are 6 pages (plus the periodic table at the end) containing 14 problems. Be sure you have all pages **before you begin**. Each problem is worth 7 points. There is no penalty for guessing. The maximum number of points is 100. You get 2 points for being seated (with your scantron form) before we pass out the exam.

Answer Key

1 D 2 A 3 D 4 A 5 B 6 D 7 D 8 A 9 E 10 D 11 C 12 C 13 C
14 B

Question 10 answer is B

1) Bromine exists naturally as a mixture of bromine-79 and bromine-81 isotopes. An atom of bromine-79 contains

- A) 35 protons, 79 neutrons, and 35 electrons.
- B) 34 protons and 35 electrons only.
- C) 44 protons, 44 electrons, and 35 neutrons.
- D) 35 protons, 44 neutrons, and 35 electrons.
- E) 79 protons, 79 electrons, and 35 neutrons.

*Ans: D Chapter/Section: 3.1 Difficulty: easy Keyword 1: general chemistry
Keyword 2: early atomic theory Keyword 3: atomic theory of matter
Keyword 4: isotopes*

2) Boron naturally occurs in two isotopic forms. The more common isotope is ^{11}B (atomic mass 11.01 amu), which is 80.00% abundant. The average atomic mass of boron is 10.81. What is the mass of the other isotope?

- A) 10.01 amu.
- B) 10.91 amu.
- C) 11.00 amu.
- D) 11.01 amu.
- E) 10.81 amu.

*Ans: A Chapter/Section: 3.1 Difficulty: moderate
Keyword 1: general chemistry Keyword 2: early atomic theory
Keyword 3: atomic theory of matter Keyword 4: atomic weight
Keyword 5: relative atomic mass*

3) For which of the following compounds does 1.0 g represent 5.55×10^{-2} mol?

- A) NO_2
- B) NH_3
- C) C_2H_6
- D) H_2O
- E) CO

*Ans: D Chapter/Section: 3.3 Difficulty: easy Keyword 1: general chemistry
Keyword 2: stoichiometry Keyword 3: mass and moles of substance
Keyword 4: molecular weight*

4) What is the mass (in grams) of one molecule of phosphorus pentachloride?

- A) 3.46×10^{-22} g
- B) 1.10×10^{-22} g
- C) 1.00 g
- D) 208.22 g
- E) 1.25×10^{26} g

Ans: A Chapter/Section: 3.3 Difficulty: moderate

Keyword 1: general chemistry Keyword 2: stoichiometry

Keyword 3: mass and moles of substance Keyword 4: mole

Keyword 5: mole calculations

5) NaHCO_3 is the active ingredient in baking soda. How many grams of oxygen are in 0.44 g of NaHCO_3 ?

- A) 0.016 g
- B) 0.25 g
- C) 0.084 g
- D) 0.0052 g
- E) 1.3 g

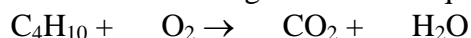
Ans: B Chapter/Section: 3.3 Difficulty: moderate

Keyword 1: general chemistry Keyword 2: stoichiometry

Keyword 3: mass and moles of substance Keyword 4: mole

Keyword 5: mole calculations

6) Consider the following unbalanced equation:



For every 1.0 mol of C_4H_{10} , how many moles of O_2 are required.

- A) 1.0
- B) 13.0
- C) 8.0
- D) 6.5
- E) none of these

Ans: D Chapter/Section: 3.7 Difficulty: easy Keyword 1: general chemistry

Keyword 2: early atomic theory Keyword 3: chemical equation

Keyword 4: balancing chemical equation

7) How many moles of sodium phosphate are required to react completely with 4.6 mol of calcium nitrate to form sodium nitrate and calcium phosphate?

- A) 6.9 mol
- B) 4.6 mol
- C) 2.3 mol
- D) 3.1 mol
- E) 1.5 mol

Ans: D Chapter/Section: 3.7 Difficulty: moderate

Keyword 1: general chemistry Keyword 2: stoichiometry

Keyword 3: stoichiometry calculation Keyword 4: molar interpretation

8) In the reaction



4.0 mol A are present to react with 4.0 mol B. Which reactant is limiting?

- A) B is limiting because there are 4.0 mol of it but 6.0 mol are needed.
- B) B is limiting because 3 is larger than 2 (the coefficients in the balanced equation).
- C) A is limiting because there are 4 moles of it but 8.0 mol are needed.
- D) A is limiting because 2 is smaller than 3 (the coefficients in the balanced equation).
- E) Neither is limiting because equal amounts (4.0 mol) of each reactant are used.

Ans: A Chapter/Section: 3.9 Difficulty: moderate

Keyword 1: general chemistry Keyword 2: stoichiometry

Keyword 3: stoichiometry calculation Keyword 4: limiting reactant

9) Elemental analysis of a compound composed of C, H, N and O showed that the hydrogen was 5.56 mass percent and the mass spectra data showed that the molecule weight was 181.3. In the molecular formula for this molecule, what is the subscript on the H?

- A) 8
- B) 6
- C) 4
- D) 12
- E) 10

Answer is E 10

10) In the net ionic reaction in acid, $IO_3^-(aq) + I^-(aq) \rightarrow I_3^-(aq)$ for the completely balanced reaction the stoichiometric coefficient for the water is:

- A) 22
- B) 3
- C) 15
- D) 9
- E) 0

Answer was D 9. Revised answer is B (3)

11) What is the net ionic equation for the reaction of aqueous sodium hydroxide with aqueous nitric acid?

- A) $Na^+(aq) + OH^-(aq) + H^+(aq) + NO_3^-(aq) \rightarrow Na^+(aq) + NO_3^-(aq) + H_2O(l)$
- B) $Na^+(aq) + OH^-(aq) + H^+(aq) + NO_3^-(aq) \rightarrow NaOH(s) + HNO_3(l)$
- C) $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
- D) $Na^+(aq) + OH^-(aq) \rightarrow NaOH(s)$
- E) none of these

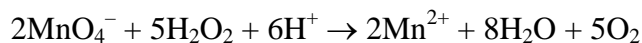
Ans: C Chapter/Section: 4.6,4.9 Difficulty: difficult

Keyword 1: general chemistry Keyword 2: chemical reactions

Keyword 3: ions in aqueous solution Keyword 4: ionic equation

Keyword 5: net ionic equation

12) In the reaction



what volume of 0.150 M KMnO_4 solution is needed to titrate 75.0 mL of a 0.150 M H_2O_2 solution?

- A) 75.0 mL
- B) 45.0 mL
- C) 30.0 mL
- D) 15.0 mL
- E) none of these

Ans: C 30 mls. Chapter/Section: 4.12 Difficulty: difficult

Keyword 1: general chemistry Keyword 2: stoichiometry

Keyword 3: stoichiometry calculation Keyword 4: limiting reactant

13) For the reaction of sodium bromide with chlorine gas to form sodium chloride and bromine, what are the appropriate half-reactions? (ox = oxidation and re = reduction)

- A) ox: $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$; re: $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$
- B) ox: $\text{Cl} + \text{e}^- \rightarrow \text{Cl}^-$; re: $\text{Br} \rightarrow \text{Br}^- + \text{e}^-$
- C) ox: $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$; re: $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
- D) ox: $\text{Br} + 2\text{e}^- \rightarrow \text{Br}^{2-}$; re: $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
- E) ox: $2\text{Na}^+ + 2\text{e}^- \rightarrow 2\text{Na}$; re: $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

Ans: C Chapter/Section: 4.11 Difficulty: moderate

Keyword 1: general chemistry Keyword 2: chemical reactions

Keyword 3: types of chemical reactions Keyword 4: oxidation-reduction reaction

Keyword 5: common oxidation-reduction reactions

14) Which of the following statements is(are) true?

Oxidation and reduction

- I. cannot occur independently of each other.
- II. accompany all chemical changes.
- III. describe the loss and gain of electron(s), respectively.
- IV. result in a change in the oxidation states of the species involved.

- A) III only
- B) I, III, and IV
- C) IV only
- D) I only
- E) II only

Ans: B Chapter/Section: 4.10 Difficulty: easy

Keyword 1: general chemistry Keyword 2: chemical reactions

Keyword 3: types of chemical reactions Keyword 4: oxidation-reduction reaction

Keyword 5: oxidation number