Final Exam Review

Information

Your ACS standardized final exam is a *comprehensive*, 70 question multiple choice (a – d) test featuring material from BOTH the CHM 101 and 102 syllabi. Questions are graded as either correct or incorrect. No points are subtracted for wrong guesses. There are two versions of the test, so your neighbors will have a different version of the test.

I normalize your final exam score out of 70 to a score out of 150. This score out of 150 is included in your final course total.

Tips

	A great way to ensure a good grade on your final exam is to practice ACS style questions*. To help you with this, a pair of ACS study guides has been put on reserve in the library. Additionally, if you are going to take the MCAT or PCAT etc., the ACS guide is makes for an excellent resource for these tests' respective chemistry sections. If you wish to purchase a copy ($12 ea.) log on to: http://www3.uwm.edu/dept/chemexams/guides/details_guides.cfm?ID=162

*Ask me to remind you of the 'BB' story

Due to the number of questions set and the time allowed, most of the multiple choice questions you will meet on the final may be considered to be 'lite' versions of my midterm and quiz questions. The following tips will help you record a better score on your final:

1. The test is *cumulative*, so review everything we have covered since the beginning for the course, *as well as the CHM 101 materials*.

2. Review *all the topics*, but concentrate on topics you have had *difficulty* with. Since the questions are not 'super hard', this will increase your number of correct answers. Do not fall in to the trap of studying what you are good at (you'll get those questions right regardless, most likely), so preferentially study what you are 'bad' at.

3. Try to answer the questions *in order* when using a scantron sheet. It is better to guess a wrong answer (and then come back to it) than risk systematically filling out ovals 'a line out'.

4. *Work out the answers on the scratch paper provided*, then check the possible answers provided. This will cut down on 'red herring' type errors (see below)

5. Watch out for obvious 'red herrings', as illustrated by the following example. MOST questions DO NOT have a red herring, but a reasonable fraction do:

Example: CO is the formula for:

a.	copper	c.	cobalt
b.	carbon monoxide	d.	Monocarbon monoxide

Sample Final Exam Questions (CHM 101 syllabus)

1. In all neutral atoms, there are equal numbers of:

a.	electrons and protons	c.	electrons and neutrons
b.	protons and neutrons	d.	electrons and positrons

2. Which pair of particles has the same number of electrons?

a.	F^-, Mg^{2+}	c.	P^{3-}, Al^{3+}
b.	Ne, Ar	d.	Br^-, Se

3. What is the mass percent of oxygen in $Ca(NO_3)_2$?

a.	29.3 %	c.	58.5 %
b.	47.1 %	d.	94.1%

4. A 24.0 g sample of carbon contains how many atoms:

a. 6.02×10^{23} c. 3.01×10^{23}
b. 1.20×10^{24} d. 2.04×10^{24}

5. When 1.187 g of a metallic oxide is reduced with excess hydrogen, 1.054 g of the metal is produced. What is the metallic oxide?

a. Ag_2O c. K_2O
b. Cu_2O d. Tl_2O

6. A single molecule of a certain compound has a mass of 3.4×10^{-22} g. Which value comes closest to the mass of a mole of this compound?

a.   50 g   c.   150 g
b.   100 g   d.   200 g

7. The electronic configuration for the Ca atom is:

a. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$ c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
b. $1s^2 2s^2 2p^6 3s^2$ d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$

8. Two moles of any gas will occupy what volume at STP?

a.   22.4 L   c.   4.48 L
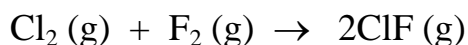b.   11.2 L   d.   44.8 L

Answers:

1.	a.	5.	b.
2.	a.	6.	d.
3.	c.	7.	c.
4.	b.	8.	d.

Sample Final Exam Questions (CHM 102 syllabus)

1. When a material in the liquid state is vaporized and then condensed to a liquid, the steps in the process are, respectively:

a. $\Delta T_2 = 4\ \Delta T_1$ c. $\Delta T_2 = 0.5\ \Delta T_1$
b. $\Delta T_2 = 2\ \Delta T_1$ d. $\Delta T_2 = \Delta T_1$

2. Calculate ΔH^o for the chemical reaction:

$$Cl_2\ (g)\ +\ F_2\ (g)\ \rightarrow\ 2ClF\ (g)$$

Given the bond enthalpies: F-F = 159 kJ/mol
                                   Cl-Cl = 243 kJ/mol
                                   Cl-F = 255 kJ/mol
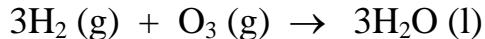
a.   -147 kJ   c.   +171 kJ
b.   -108 kJ   d.   +912 kJ

3. The standard enthalpy of formation ΔH^o_f for NO_2 is the enthalpy change for which reaction?

a. $N\ (g) + 2O\ (g) \rightarrow NO_2\ (g)$ c. $\frac{1}{2} N_2\ (g) + O_2\ (g) \rightarrow NO_2\ (g)$
b. $\frac{1}{2} N_2O_4\ (g) \rightarrow NO_2\ (g)$ d. $NO\ (g) + \frac{1}{2}O_2\ (g) \rightarrow NO_2\ (g)$

4. In a bomb calorimeter, reactions are carried out at:

a.   constant pressure   c.   constant volume
b.   1 atm and 25^oC   d.   1 atm and 0^oC

5. Calculate ΔH^o for the chemical reaction:

$$3H_2 \text{ (g)} + O_3 \text{ (g)} \rightarrow 3H_2O \text{ (l)}$$

Given the ΔH^o_{rxn} enthalpies: H_2 (g) + $\frac{1}{2}O_2$ (g) → H_2O (l) = -286 kJ/mol
$3O_2$ (g) → $2O_3$ (g) = +271 kJ/mol

a.	-15 kJ	c.	-722 kJ
b.	-558 kJ	d.	-994 kJ

6. The gas phase reaction $A_2 + B_2 \rightarrow 2$ AB proceeds by bimolecular collisions between A_2 and B_2 molecules. If the concentrations of both A_2 and B_2 are doubled, the reaction rate will change by a factor of:

a.	½	c.	2
b.	$\sqrt{2}$	d.	4

7. Under certain conditions, the average rate of *appearance* of ozone gas in the reaction

$$3O_2 \text{ (g)} \rightarrow 2O_3 \text{ (g)}$$
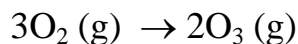
is 1.2×10^{-3} atm.s^{-1}. What is the average rate for the *disappearance* of O_2 (g)?

a.	8.0×10^{-4} atm.s^{-1}	c.	1.8×10^{-3} atm.s^{-1}
b.	1.2×10^{-3} atm.s^{-1}	d.	5.3×10^{-3} atm.s^{-1}

8. A plot of reactant concentration as a function of time gives a straight line. What is the order of reaction for this reactant?

| a.	zero	c.	second
b.	first	d.	third

9. Carbon monoxide gas reacts with hydrogen gas at elevated temperatures to form methanol, according to the equation:

$$CO\ (g)\ +\ 2H_2\ (g)\ \Leftrightarrow\ CH_3OH\ (g)$$
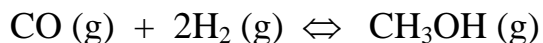
When 0.40 mol of CO and 0.30 mol of H_2 are allowed to reach equilibrium in a 1.0 L container, 0.060 mol of CH_3OH (g) is formed. What is the value of K_c?

a.   0.50
b.   0.98

c.   1.7
d.   5.4

10. Which factors will affect both the position of the equilibrium and the value of the equilibrium constant for this reaction:

$$N_2\ (g)\ +\ 3H_2\ (g)\ \Leftrightarrow\ 2NH_3\ (g);\ \Delta H = -92\ kJ$$
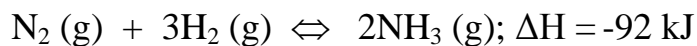
a.   Increasing the volume of the container
b.   Adding more N_2 gas

c.   Removing ammonia gas

d.   Lowering the temperature

11. In a 0.050 M solution of weak monoprotic acid, $[H^+] = 1.8\ x\ 10^{-3}$ M. What is K_a?

a. $3.6\ x\ 10^{-2}$
b. $9.0\ x\ 10^{-5}$

c. $6.7\ x\ 10^{-5}$
d. $1.6\ x\ 10^{-7}$

12. What is the value of the equilibrium constant K, for a reaction in which $\Delta G° = -5.20$ kJ at 50 $°C$?

a.   0.144
b.   0.287

c.   6.93
d.   86.4

Answers:

1.	d.	7.	c.
2.	b.	8.	a.
3.	c.	9.	d.
4.	c.	10.	d.
5.	d.	11.	c.
6.	d.	12.	c.

Post-Final Wrap Up

General chemistry final exams are graded immediately after they have been completed by the students. The final exam scores (out of 150), as well as overall course scores and letter grades, will be available from 10:00 am on Thursday of exam week. **Students can check their scores by sending Dr. Mills an e-mail request at any time before noon on Thursday of exam week**. In order to ensure confidentiality, students requesting such feedback must include the following code word(s) within their e-mail requests:

So Close, Yet so Far?

Unfortunately, it is sometimes the case that students find themselves just a few points below the C/D (50%) cut-off line after the completion of all course materials. In order for such students to achieve a passing 'C' grades, an optional 25 pt. extra credit assignment may be completed. *Students may only complete this assignment if they are in good academic standing (no more than one missed quiz, exam or lab) and contact Dr. Mills, via e-mail with a grade request, no later than noon on Thursday of exam week*. **Such students' final scores must have fallen no more than 25 points below the C/D cut-off in order for them to be eligible to take the assignment.**

Dr. Mills will supply qualifying students with a copy of the extra credit assignment, as an e-mail attachment, via return e-mail. **The hard deadline for completing this assignment is 10:00 am on Friday of exam week – no exceptions.**