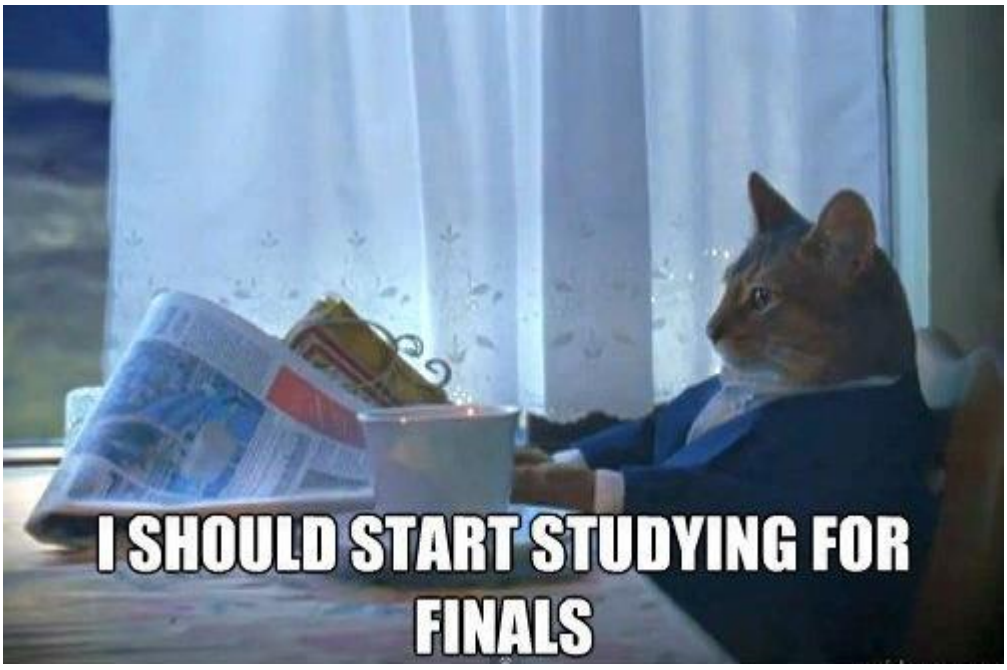
SLG REVIEW PACKAGE – FOR PRACTICE ONLY
WINTER 2016 CHEM 1050 – GENERAL CHEMISTRY II

FORMAT:
10 MC Questions
15 Short Answer Questions

IMPORTANT:
It is **most beneficial** to you to write this mock final **UNDER EXAM CONDITIONS**. This means:

- Try to complete this midterm under 2hrs
- Work on your own.
- Keep your notes and textbook closed.
- Attempt every question.

After the 2 hour time limit, go back over your work with a different colour or on a separate piece of paper and try to do the questions you are unsure of. Record your ideas in the margins to remind yourself of what you were thinking when we take it up. The purpose of this review package is to give you practice answering questions in a timed setting and to help you to gauge which aspects of the course content you know well and which are in need of further development and review. Use this review package as a *learning tool* in preparing for the **actual final!**



GOOD LUCK!

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Which of the following has a standard enthalpy of formation equal to zero?
A) $I_2(s)$
B) Hg(s)
C) $Br_2(g)$
D) $H_2O(l)$
E) $NH_3(g)$

2. Which of the following molecules has the largest entropy at 298K?
A) I2(s)
B) F2(g)
C) Cl2(g)
D) Br2(l)
E) Br2(g)

3. Which of the following has the largest molar entropy at 298K?
A) Mg(s)
B) MgO(s)
C) $MgCO_3(s)$
D) P(s)
E) C(s)

4. Which of the following processes would have a positive $\Delta S rxn^o$
A) $H_20(g) \rightarrow H_2O(s)$
B) $PCl_3(g) + Cl_2(g) \rightarrow PCl_5(g)$
C) $N_2(g) + 3\ H_2(g) \rightarrow 2NH_3(g)$
D) He(g, 1 atm) → He(g, 10atm)
E) $KClO_4(s) + 4C(s) \rightarrow KCl(s) + 4\ CO(g)$

5. Which of the following reaction leads to a decrease in entropy of the system?
A) $2Li_3N(s) \rightarrow 6Li(s) + N_2(g)$
B) $2NaH(s) \rightarrow 2Na(l) + H_2(g)$
C) $NH_4Cl(s) \rightarrow NH_3(g) + HCl(g)$
D) $2MgO(s) + C(s) \rightarrow 2Mg(s) + CO_2(g)$
E) $CaSO_4(s) + 2H_20(g) \rightarrow CaSO_4 \cdot 2H_2O(s)$

6. True or False …. In a working electrochemical cell…
a) the electrons flow from the negative electrode through the external circuit toward the positive electrode
b) the anions in the alt bridge move toward the anode

7. True or False?

A) A cell that uses silver to reduce I_2 under standard conditions at 298K has a positive potential

B) When a sample on an unknown metal is dropped into 1M $H^+(aq)$ under standard conditions, bubbles are obeserved. The unknown metal could be copper. Given: standard potentials of Ag^+/Ag, I_2/I^- and Cu^{2+}/Cu couples are +0.80V, +0.56V and +0.34V respectively.

8. In the standard cell Pt | $H_2(g)$ | HCl(aq) || NaCl(aq) | Hg_2Cl_2 (s) | Hg(l)
the cell voltage will increase by which of the following ?

A) increase in the pressure of H_2 (g)
B) increase in the amount of Hg_2Cl_2 (s)
C) decreasing the pH in the anode compartment
D) increase the $[Cl^-_{(aq)}]$ in the anode compartment
E) increase the $[Cl^-_{(aq)}]$ in the cathode compartment

9. Given $2NO_2(g) + F_2(g) \rightarrow 2NO_2F(g)$ rate = $-\Delta [F_2]/\Delta t$
Which of the following could the reaction be also expressed as

A) $-\Delta[NO_2]/\Delta t$
B) $-2\Delta[NO_2]/\Delta t$
C) $-1/2\Delta[NO_2]/\Delta t$
D) $+1/2\Delta[NO_2F]/\Delta t$
E) Both C and D

10. An elementary process has an activation energy of 40kJ/mol. If the activation energy for the reverse reaction is 20kJ/mol what is the enthalpy change for the reaction?

A) -60kJ/mol
B)-20kJ/mol
C) +20kJ/mol
D)+60kJ/mol
E) None of the above

11. Consider the following reaction $A(g) + B(g) \rightarrow 2C(g)$

	Intial Concentration (M)		Initial Rate
Trial	[A]	[B]	
#1	0.40	0.40	$6.05 \times 10^{-2} Ms^{-1}$
#2	0.40	0.30	$5.24 \times 10^{-2} Ms^{-1}$
#3	0.60	0.40	$9.07 \times 10^{-2} Ms^{-1}$

Find the rate law for the equation and calculate k (include units).

12. Given $2A \rightarrow A_2$ rate = $k [A]^2$ If the rate constant is $0.014 M^{-1}s^{-1}$ and the initial concentration of A is 0.0180M find the time required for the rate of consumption of A to drop to $1.25 \times 10^{-5} M\ s^{-1}$

13. Using $2N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$, rate = $k[N_2O_5]$ find the time for the concentration of N_2O_5 to fall to $1/3^{rd}$ of its initial value if the rate constant for the reaction
is: $5.20x10^{-3}s^{-1}$

14. The activation energy for the reaction $N_2O(g) \rightarrow N_2(g) + O(g)$ is 250kJ/mol. If the rate constant is $3.4s^{-1}$ at 1050K at what temperature will the rate constant be one thousand times larger?

15. For the following reaction $A + 2B \rightarrow C + D$ an experimental rate law is given as $rate=k[A]^2[B]$. If the concentration of A is doubled and the concentration of B is tripled, by what factor is the reaction rate changed?

16. For the reaction $Cl_2(g) + 2NO(g) \rightarrow 2NOCl(g)$ it is found that doubling the concentration of both reactants in one experiment increases the rate by a factor of 8. If only the concentration of NO(g) is doubled, the rate increases only by a factor of 2. State a proper rate law equation for this reaction.

17. For the 2 step rxn mechanism

Step I $O_3(g) \leftrightarrow O_2(g) + O(g)$ fast

Step II $O(g) + O_3(g) \leftrightarrow 2O_2(g)$ slow

Write the overall equation, name the intermediate, state the rate determining step and write the rate law for the rate determing step.

18. A piece of gold of mass 25.0g at 88.0°C was placed in a calorimeter that contained 75.0g of water at 25.00°C. If the temperature of the water rose to 25.70°C, what is the specific heat capacity of gold? The specific heat capacity of water is 4.184J g^{-1} $°C^{-1}$

19. The heat capacity of a certain calorimeter is 1.22kJ/K when containing 1.00L of water. When 4.00g of nitric acid are dissolved in water to make 1.00L of solution in this calorimeter, the temperature increases 1.61K. What is the molar enthalpy of solution of nitric acid?

20.. Write a thermochemical equation that represents that standard enthalpy of formation of:

I) mercury (I) chloride

II) potassium bromate

23. The standard enthalpies of combustion of $CH_3OH(l)$, C(s) and hydrogen gas are –726, -394 and –286kJ/mol. What is the standard enthalpy of formation of $CH_3OH(l)$?

24. Given the standard potentials of the Fe^{3+}/Fe^{2+} and Cl_2/Cl^- couples are +0.77V and +1.36V respectively. Calculate E^o for the following cell.

Pt | $Cl^-(aq)$ | Cl_2 || $Fe^{3+}(aq)$, $Fe^{2+}(aq)$ | Pt

25. Consider the following cell: Ni(s) | Ni^{2+}(aq,0.0500M) || Cl^-(aq,0.0700M) | Cl_2(g, 0.800atm) | Pt
Now if the standard cell voltage for the cell is +1.59V at 25^{o}C, determine the cell voltage.

THAT'S IT! ☺

GOOD LUCK ON THE FINAL EXAM!