Closed Book, Closed Notes

1. What is a chemical reaction?

2. What is reaction stoichiometry?
   What basic conservation law does it represent?
   Single versus multiple reactions, what is the difference?
   (use capital letters to indicate chemical compounds and lower case letter for stoichiometric coefficients)

3. What is (molar) extent of reaction?

4. What is fractional conversion (of the limiting reactant)? How are molar extent of reaction and conversion related?

5. In multiple reactions how many molar extents of reaction do we need to describe the reaction system?
6. What are the conditions for physical equilibrium between chemical species A in the gas and in the liquid phase (in solution).

7. What are the conditions for chemical equilibrium? How would you express these for a simple isomerization reaction A=B?

8. How is the thermodynamic equilibrium constant $K$ for a single reaction (say of stoichiometry $aA + bB = cC + dD$) calculated at standard conditions? Does this constant have units? Is this constant a function of pressure?

9. Write the heat of reaction for reaction $aA + bB = cC + dD$ at temperature $T$ if you know the heats of formation of A, B, C, D.

10. How do we correct the value of the thermodynamic equilibrium constant $K$ for temperature?
11. Express the equilibrium constant $K_y$ for the relationship between mole fractions at equilibrium and equilibrium extent or conversion for the reaction stoichiometry listed in 8 and 9 above. What is the effect of pressure on $K_y$.

12. How is the rate of reaction defined? What is it a function of?

13. Write down the representation of an n-th order reaction rate for an irreversible reaction and show what the Arrhenius representation of the rate constant looks like. What is the meaning of activation energy?

14. What is an elementary reaction? Can we infer its order from its molecularity?

15. What does a reaction mechanism represent?