Rate of Reaction Test Topics:

How do the following thing affect the rate of reaction, and why? (explain using collision theory!)
- Increase Temp
- Increase Particle Size (if you have a given mass of solid reactant)
- Add a catalyst
- Add an inhibitor (don't worry about explanation on this one)
- Increase the concentration of reactants.

Read a graph to determine the ΔH_{rxn}(including the sign) and the activation energy.
(Or draw graph if given the values)

Determine the rate law based on data... $r = k[A]^x[B]^y$.. determine k, x, y. Including units on k.
What are possible units for k if the reaction is 1st order overall? 2nd? 3rd?

Half-life: Know the definition of a half-life. Know that only first order reactions have a constant half-life.
Be able to calculate the half-life from the first-order rate constant, or vice versa.

Determine the rate of formation of a reactant or product, if given the rate of formation of another reactant or product (stoichiometry!)

Given the mechanism (the set of elementary steps, and which are fast/slow), you should be able to:
- Determine the rate law
- Identify any catalysts or intermediates
- Show that the mechanism is consistent with the overall reaction stoichiometry(add it up!)
- classify elementary steps as "unimolecular", "bimolecular", or "termolecular"

How does the equilibrium constant relate to the forward and reverse rate constants?
If you add a catalyst, increase temp, or decrease temp, what happens to $k_{forward}$? $k_{reverse}$? K_{eq}?
Explain! (and in which cases do you need to know the sign of ΔH to be able to answer?)

Catalyst: Be able to define a catalyst and explain how it works.
Homogeneous and heterogeneous catalysts – what's the difference?
Be able to give an example of a commonly used heterogeneous catalyst!

What is an enzyme? What class of biological molecule is it? What does it do?
Vocab: Enzyme, active site, substrate, lock and key, turnover number, optimum temperature.

Equations you need to have memorized* (and be able to use in problems):

First order: $X = X_o e^{-kt}$

and $k t_{1/2} = \ln 2$

Second order $\frac{1}{X} = \frac{1}{X_o} + k t$

X = concentration of reactants after time t
Xo = original concentration

k = the rate constant
t = time
$t_{1/2}$= half-life
T = temperature, in kelvin

Graphing Stuff you need to know/use:

First order reaction: a plot of ln[X] vs time will be linear, with a slope of -k

Second order reaction: a plot 1/[X] vs time will be linear, with a slope of k.

(*AP "Green Sheets" will be given.
Note that the first and second order equations appear in slightly different form on the green sheets.)