To prepare for the organic qualifier exam, we suggest that you use the ACS publication, "Organic Chemistry Official Study Guide" which can be obtained at the following web suite:

http://www.uwm.edu/Dept/chemexams/MATERIALS/indexOrh.html

ORGANIC QUALIFIER

Below are listed the more important topics which you will need to review for the organic qualifier.

STRUCTURE

1) Bonding
   - Lewis strucutres
   - Molecular Orbitals, sp^3, sp^2, sp Hybridization
   - Resonance Arguments
   - Effect of electronegativity-inductive effects

2) Stereochemistry
   - 3-D representations of organic molecules
   - structural isomers
   - geometrical isomers (cis/trans, E/Z)
   - stereoisomers
     - R/S configuration
     - enantiomers
     - diastereomers

Nomenclature
- IUPAC system
- Common trivial names

REACTIONS

3) Acid/Base reactions
   - Bronsted-Lowry Acid and Bases
   - Lewis Acids and bases
   - pKa
   - Recognition of whether a molecule is acid or base (and relative strength)
   - Resonance arguments to determine acid/base strengths

4) Nucleophilic Substitution
   - Recognition of Typical Nucleophiles
   - SN1 verus SN2
   - stereochemical effects
   - kinetic effects
   - Potential side reaction (e.g. carbocation rearrangement)
   - Use of ROH instead of R-Cl as substrate (if the OH is suitably activated)
   - Regiochemistry-Saytseff vs Hoffman elimination

5) Electrophilic Addition to Alkenes

Recognition of typical electrophiles
Standard mechanism-Markovnikov Addn.
Bromination-Bromonium ion-anti addn.
Carbocation rearrangements
Stability of carbocations
Hydrogenation-syn addition
Permanganate oxidation syn addition
Formation of oxiranes
Hydroboration, syn addn. anti-Markovnikov
Extension of reactions to alkynes
Extension of reactions to dienes

6) Oxidation/Reductions

1° Alcohols to aldehyde to carboxylic acid
2° Alcohols to ketones
typical oxidants
Reductions - hydride reducing agents
- hydrogenation

7) Electrophilic & Nucleophilic Substitution to Aromatic Compounds

Stability of benzene-resonance and molecular orbital explanation
General mechanism - recognition of typical electrophiles
Substituent effects

8) Aldehydes and Ketones

Nucleophilic attack on carbonyl

a. Simple addition

cyanohydrin formation
Grignard reaction
Hydride reduction

b. Addition followed by further reaction
Formation of Imines and Related Compounds
Acetals
Reductive Amination etc.

9) Carboxylic Acids and their Derivatives

General Chemistry - nucleophilic substitution
acid chlorides, anhydrides, esters, acids and amides
and the reactions for their interconversions

10) Reaction of Enolates with carbonyls

Stability of Enolates
Aldol condensation
Claisen and Dieckmann condensation
Reaction with alpha, beta-unsaturated carbonyl compounds
Phosphorus and sulfur stabilized anions

11) Identification of organic compounds

theory and utilization of IR
theory and utilization of proton NMR

12) Concerted Reactions

Regio - and Stereochemistry of Diels-Alder Reactions.