I. **Mutations: what are they?**
   A. They are changes in the DNA sequence
   B. Can arise:
   C. Consequences of mutations in a haploid genome:
      
      D. If mutation is not repaired before next round of replication:
      
      E. Revision to wild-type is possible depending on the nature of the mutation

II. **Types of Mutations:**
   A. Single base pair mutations (called a substitution or a point mutation)
B. Frameshifts by insertion/deletion of a 1-2 bases

C. Insertions and deletions of larger DNA fragments
   1. Gain or loss of 100-1000’s (or more) of bases
   2. Results in complete loss of gene function
   3. Some deletions might wipe out entire gene cluster
   4. Translocation:
   5. Inversion:
   6. Why/how does this happen?
   7. Big deletions in most cases are not revertible.

D. Caused by deliberate insertion of DNA segments like:

E. Back mutations or reversions
   1. Point mutations are usually reversible
   2. Restoration occurs by a counteractive mutation
   3. It is common that mutations that alter cellular metabolism have sufficient selective pressure for compensatory mutations that repair the original defect
4. How back mutations arise:

5. Types of suppressors:

III. Rates of mutation

A. Rate of mutation depends on the kinds of mutations
   1. some are rare others are frequent
   2. Some genes have “hot spots” for mutations.

B. Do mutations arise by an adaptive response to a selective agent (acquired immunity) or are mutations spontaneously and continuously occurring in a culture and it is the selective process that reveals the specific mutation? (See slide for example)
   1. Fluctuation Test by Luria and Delbruck demonstrated that:
IV. **Chemical Mutagens**

A. Spontaneous mutations vs. chemical mutagens:
   1. Some chemicals can significantly increase the natural rates of mutations
   2. Some chemicals exhibit specificity for a particular type of mutation

B. Structural analogs of nucleotides (Fig. 13.32)
   1. 5-Bromouracil (BU)

C. Agents that modify DNA

D. DNA intercalating agents
   1. Acridine organe and ethidium bromide

V. **How to test if a chemical is mutagenic? You can use the Ames Test**

A. A bacterial test that measures how mutagenic a compound is (Box 13.2)

B. Use the Ames Test as an indicator for a carcinogenic potential.