UMSL Introduction to Evolution
Study Guide
Lecture 6 – Sources of Genetic Variation

Important terms and Concepts:

acrocentric
allele
allopolyploid
anaphase
aneuploid series
apomixis
autopolyploid
centromere
chiasma
chromatid
chromosomes
codon
C-value
cytokinesis
deletion
diploids
dominant
Down syndrome
duplication
exons
frameshift mutation
gene
genetic variation
genotype
Gregor Mendel
haploid
heterozygous
hexaploid
homologous chromosomes
homozygous
independent assortment
interphase
introns
inversion
inversion heterozygote
ionizing radiation
karyotype
meiosis
meiosis I
meiosis II
metacentric
metaphase
monosomy

mutagen
nondisjunction
nonsense mutation
octoploid
parthenogenesis
phenotype
ploidy
point mutation
polyploidy
prophase
Raphanobrassica
recessive
recombination
replacement mutation
satellite
segregation
sex chromosome
Sickle Cell
silent mutation
stop codon
stop mutation
synapsis
synonymous mutation
telocentric
telomere
telophase
tetraploid
transition
translocation
translocation heterozygote
transversion
trinucleotide repeats
triplet code
triploid
trisomic
unequal crossing over
unequal translocation
Walter Sutton
Walther Flemming

Study Questions:

1. What is a mutation? Where do they occur and what causes them? Describe the different kinds of mutations. Why are they important for evolution to occur?

2. What is the relative importance of a mutation in the 1st, 2nd and 3rd codon positions? What type of change results mostly in silent mutations? Why is a frameshift mutation often disastrous for the organism?

3. What is the importance of crossing over in prophase I of meiosis? What is the basis for independent assortment in metaphase I?

4. Compare the sex chromosomes of humans in terms of the number of genes they contain. How do they behave during prophase I of meiosis?

5. How common is polyploidy in nature?

6. How does and allopolyploid differ from an autopolyploid?

7. How does an autopolyploid arise in nature? How can you create one in the laboratory?

8. What would be an advantage of being an autopolyploid? What are the disadvantages? What are some examples of polyploids among our cultivated plants?

9. Why is polyploidy rare in animals? When it does occur, what else is usually present?

10. What structural chromosomal changes can lead to changes in chromosome numbers? What kinds of chromosomal changes have occurred among humans and the great apes?

11. What is aneuploidy? Provide an example of aneuploidy in plants, and one in animals. Why do you suppose aneuploidy is more commonly found in plants?

12. Diagram the four main chromosomal alterations that occur: duplication, deletion, inversion, and translocation. What is the significance of the changes for evolutionary change?

13. How can you recognize a chromosome that has undergone a duplication or deletion?

14. Describe and diagram how unequal crossing over can lead to a duplication of part of a strand of DNA.

15. Why do inversion heterozygotes have so much trouble during meiosis? What do they look like at metaphase 1? What happens if there is a crossover between the two strands?

16. What is the relationship between polyploidy, chromosomal rearrangement, and speciation?

17. What are the different types of mutational changes on the nucleotide level and how do they arise? What are the possible effects of a single base substitution?

18. What is the relationship between the complexity of an organism and the amount of DNA in haploid cells?