

Principles of Genetics (BIOL-362)
Problem Set #2

(7-7) Explain Barbara McClintock's findings of autonomous and non-autonomous transposable elements in corn?

(7-8) How can non-replicative transposition result in a net increase in transposable elements if it occurs during chromosome replication?

(7-9) What makes a retrotransposon different from a transposon?

(8-1) What 4 important steps are required to clone DNA and create a recombinant library?

(8-2) Identify the advantages and disadvantages of three different types of cloning vectors?

(8-3) What features of pUC19 make it a functional cloning vector? Which of these features are contained in the polylinker region?

(8-4) If you were making a genomic DNA library, why might you choose to use a partial digestion instead of a complete digestion?

(8-5) What makes a cDNA library different from a genomic DNA library? Identify the steps used to create a cDNA library to illustrate your answer?

(8-6) Describe the Southern Blot set-up. Why would a geneticist want to use one of these?

(8-7) What are the PCR reaction contents, and what thermal-cycling steps are required?

(8-9) Contrast manual dideoxy- and automated dye-terminator DNA sequencing.

(9-1) What characteristics of microsatellites make them ideal for DNA fingerprinting?

(9-2) How would you locate a protein-coding gene if the protein already is identified? How would you locate the gene if the protein is unknown?

(9-3) What is the difference between "chromosome walking" and "chromosome jumping"? How were these techniques used to isolate the cystic fibrosis gene?

(10-1) Describe the procedure used to "shot-gun" sequence and reassemble a genome?

(10-2) What is "proteomics", and why is it important to study of disease?

(11-1) What are Mendel's principles, and why are they important?

(12-1) Compare and contrast Y chromosome and X chromosome-autobalance mechanisms of genotypic sex determination.

(13-1) What is the molecular basis for complete, incomplete, and co-dominance?

(13-2) How does recessive epistasis influence coat color in rodents?

(14-1) Explain how Harriet Creighton's and Barbara McClintock's studies of corn in 1931 provided the first convincing experimental evidence for Morgan's hypothesis of recombination and chromosomal exchange?

(14-2) Describe the formation of the Holliday intermediate and explain how cleavage of this molecular structure can result in parental and recombinant allele combinations.

(14-3) Use the two-point recombination frequency data from question 14.6 at the back of your book to map the genes a, b, c, d, and e.

(14-4) Order tetrad experiments indicate that crossing over occurs at the 4-chromatid stage, prophase I of meiosis. What is the alternative? What features of the ordered tetrad experiments make them ideally informative in this respect?

(14-5) What is the process of gene conversion, and why is it important?

(14-6) Illustrate an example of mitotic recombination.