BIO 184 - PAL Problem Set Lecture 9 (Brooker Chapter 4)
Extensions of Mendelian Inheritance

Section A. Dominant vs. recessive alleles

How can dominant and recessive alleles be explained?

Are nascent (newly made) mutations most commonly dominant or recessive? Why?

Can nascent mutations be dominant? Why?

Section B. Extensions of Mendelian Inheritance

What is the simplest explanation to when a monohybrid self-cross results in a phenotypic ratio of 1:2:1 and the majority of the offspring are an intermediate between the other two minority phenotypes? Explain.

In plants, red flower color is dominant to white flower color. However, heterozygous plants have a pink color. If a white flowered plant is crossed with a pink flowered plant, what will be the phenotypic ratios of their offspring?

What is co-dominance?

An mother with type A blood has a child with type O blood. What are the possible blood types of the father?

Which blood types would be excluded as possible fathers?

At a molecular level, how do type A, type B, type AB, and type O blood types differ?

What is overdominance?

Provide an example of heterozygous advantage.

How can overdominance be explained?

In lobster, Y = yellow, y = wild-type. Two Yy (yellow) lobsters are crossed with the following result: 1250 yellow : 620 wild-type. What possibly explains this outcome?

In sheep, white coat color is dominant to yellow coats. However, the yellow coat color allele is lethal when homozygous. If two yellow sheep mate, what fraction of offspring will have yellow coats?

Section C. Sex-influenced, Sex-limited, & Sex-linked patterns of inheritance

What is the difference between Sex-influenced, Sex-limited, & Sex-linked patterns of inheritance?

Provide and explain an example of a sex-limited trait.

Provide and explain an example of a sex-influenced trait.

By what pattern of inheritance is the allele for pattern baldness inherited?

What pattern of inheritance involves an allele dominant in one sex and recessive in the opposite sex?

Define the term "hemizygous".

Which genes are hemizygous in males?

What is X-inactivation?

What is a Barr body?

What is the result of a Barr body in terms of gene expression?

How many Barr bodies does a XXXY genotype have?

How are the fir pattern of calico cats explained by Barr bodies?

Is it possible to have a male calico cat? If so, how?

Section D. Penetrance and gene redundancy

If a dominant trait is describes as being 55% penetrant, what does this mean?

A female carries the dominant allele BRAC1 for breast cancer, but never develops breast cancer in their lifetime. What is this an example of?

How is sex determined in humans, insects (involving XO system), birds (ZW), bees, and ants?

How do bees and ants produce male offspring?

How do bees and ants produce female offspring?

What is epistasis?

Provide an example of epistasis.

What is gene redundancy?

What type of chromosomal rearrangement causes gene redundancy?

How does gene redundancy complicate generating gene knockouts?