**Unit 6 – Meiosis and Genetics STUDY GUIDE**

Be able to define the following vocabulary:

* Heredity: passing of traits from parents to offspring
* Meiosis: process of forming 4 haploid sex cells
* Gamete: fancy word for sex cell (sperm or egg)
* Trait: physical characteristic usually passed on by genetic information
* Hybrid/Heterozygous: two different alleles of a gene for a trait
* Allele: different forms of a gene
* Purebred/Homozygous: two identical alleles of a gene for a trait
* Gene: sections of a chromosome that carry the genetic code for a particular trait
* Dominant: an allele whose trait always shows up in the organism when the allele is present
* Recessive: allele that is masked/hidden when a dominant allele is present
* Genotype: an organisms genetic make-up
* Phenotype: an organisms physical appearance
* Parental generation: the parent generation (the beginning of the crosses)
* F1 generation: first generation of a cross of the parental generation
* F2 generation: second generation of a cross of the parental generation
* Chromosome: rod of tightly wound/coiled DNA
* Probability: likelihood that something will happen

What is the purpose of meiosis?

The purpose of meiosis is to produce reproductive (sex) cells that carry half the genetic material of the parent.

Compare and contrast cell cycle (mitosis) and meiosis.

|  |  |  |
| --- | --- | --- |
| Cell Division | Mitosis (cell cycle) | Meiosis |
| Purpose | to produce cells identical to the parent cell for growth and repair | To produce reproductive (sex) cells that carry half of the genetic material of the parent cell |
| Cell Type that is produced | Body cells (somatic cells) | Gametes (sex cells-sperm or eggs) |
| # of divisions | 1 | 2 |
| # of daughter cells produced | 2 | 4 |
| Daughter cells compared to parent cells | Identical diploid cells with the exact same number of chromosomes as the parent cell. | Non identical haploid cells (1/2 the number of chromosomes as the parent cell) |

Explain the relationship between chromosomes, genes, and alleles.

Chromosomes are rods of DNA that have many genes on them. Alleles are different forms of the genes that are responsible for an organism’s traits.

How are most traits transmitted from generation to generation? Use Mendel’s experiment to follow a trait from the parental generation to the F1, and then F2 generations.

Traits are passed down from generation to generation with each parent giving one copy of each gene to each offspring. Mendel crossed a purebred tall pea plant with a purebred short pea plant (the P generation or the parental generation) to create the F1 generation. In the F1 generation, the phenotypes of the offspring were all tall because the tall allele is dominant and was masking/hiding the recessive short allele. When the F1 generation was crossed, the F2 generation displayed roughly 75% of the dominant trait (tall) while 25% displayed the recessive trait of being short.

What is a punnett square?

A punnett square is a way to organize all the possible combination of alleles that result from a genetic cross.

Use a punnett square to solve the problem. Mice can be black or white. Two heterozygous black mice are crossbred. What possible genotypes and phenotypes are their offspring?

B b

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  | BB | Bb |
|  | Bb | bb |

Genotypes: BB, Bb, bb

Phenotypes: 75% black

B

b

25% white

Explain how dominant traits relate to recessive traits.

Dominant traits mask recessive traits in a heterozygous pair. Recessive traits are only seen when there are no dominant traits in a genotype.

What determines if traits can be inherited?

Traits that are determined by genetic make-up can be inherited.

List 4 scientists discussed in class, and their contributions to our basic genetic knowledge.

Crick and Watson: figured out the double helix structure of DNA

Franklin: took pictures of DNA using x-ray crystallography

Mendel: Known as the father of modern genetics, he developed a controlled method for cross-pollination and was the first to identify genes (factors) that are passed down from parent to offspring.

In addition to answering these questions you need to be able to:

* Solve Punnett Squares

Extra Practice:

In fruit flies, long wings (L) are dominant to short wings (l). Show the results of crossing a homozygous long wing fly (LL) with a heterozygous long wing fly (Ll).

Cross: \_\_\_\_\_\_\_\_\_\_ X \_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
|  |  |
|  |  |

genotypes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

phenotypes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_