Part 1: Genotypes and Phenotypes

A Using pipe cleaners, create a representation of the chromosomes in a cell that is 2n = 2

- Each chromosome is double stranded.
- Use one color for the first homolog and a different color for the second homolog.

B Using construction paper and tape, assign three genes along the length of your chromosomes

- Make your homologs heterozygous

Take a picture or sketch a drawing of your starting cell

C Decide what traits your three genes encode and record them below:

Have fun with it!

Trait _____
Allele _____ Phenotype _____ Allele _____ Phenotype _____

Trait _____
Allele _____ Phenotype _____ Allele _____ Phenotype _____

Trait _____
Allele _____ Phenotype _____ Allele _____ Phenotype _____

D Above, for each trait, assign two of the alleles you designated on your homologs (e.g. 'Q' on the img above) and the phenotype that allele encodes

E What is your starting cell's
Genotype:
Phenotype:

Make a sketch of your organism below:

Part 2: DNA Replication and Mitosis

A In each of your homologs simulate DNA replication by opening multiple origins of replication along the chromosome

B Using your starting homologs and additional pipe-cleaners, create a representation of what these homologs look like after S-phase.
- Use tape as a centromere
- Include all genes/alleles on your post S-phase representation

Before moving on, check your representation with your group leader

<u>Mitosis</u>

C Move your post S-phase homologs into a configuration representing Metaphase

D Move your post S-phase homologs into a configuration representing Anaphase

What separates during this phase?

E Move your post S-phase homologs into a configuration representing the end of Telophase.

How many cells were produced?

What is the genotype of each cell?

What is the phenotype of each cell?

What is the ploidy of each cell?

How do these cells compare to the starting cell?

Part 3: Meiosis I

A Re-create your representation of your homologs after S-phase (identical to Part 2:B)

Meiosis I

B Move your post S-phase homologs into a configuration representing Prophase I

What two events occur during this phase that are necessary to produce genetic variation?

C Using scissors and tape, represent the exchange of genetic material

D Move your post-exchange homologs into a configuration representing Anaphase I

What is pulled apart during this phase?

E Move your post-exchange homologs into a configuration representing the end of Telophase I

How many cells have been produced?

How many homologs are in each cell?

What is the ploidy of each cell?

Is this called the reductional or equational division? Why?

Part 3: Meiosis II

Meiosis II

A Move your post-Meiosis I chromosomes into a configuration representing Anaphase II

What is separated during this phase?

B Move your post-Meiosis I chromosomes into a configuration representing the end of Telophase II

How many cells have been produced?

What is the ploidy of each cell?

Is this called the reductional or equational division? Why?

C Below, record the genotype and phenotype of each cell produced

What needs to happen for any of the cells you produced during this activity to make an organism?

D Decide if you produced sperm or egg.

E Mate each of your gametes to each:
Homozygous dominant gametes
Homozygous recessive gametes

What are the genotypes and phenotypes produced?

Part 4: Gamete Exchange

A As a class, make up three traits that your species shares

Have fun with it!

B Below, record the traits and alleles the class decides on together.

Trait _____
Allele _____ Phenotype _____ Allele _____ Phenotype _____

Trait _____
Allele _____ Phenotype _____ Allele _____ Phenotype _____

Trait _____
Allele _____ Phenotype _____ Allele _____ Phenotype _____

C Make up the genotype of at least two gametes (to make sure every group has someone to exchange with)

D Decide if your gametes are eggs or sperm.

E Find another group to make an organism with.

F Draw your beautiful babies below!