Introduction to Genetics

Section 1: Genetics and Heredity

[17] Even though Mendel did not have the knowledge of chromosomes that you have, he reasoned that the F_1 hybrid offspring must have received a hereditary factor for round seeds

[26] Mendel recognized that the heritable factors (or genes) were different depending on the phenotype of the parent plant. The phenotype is the of a trait in an organism inherited in a gene. For example, the phenotype of the dominant seed shape would be round. The phenotype of the recessive seed shape would be wrinkled. Write the definition for

[34] Using the character seed shape as an example, the letter for the dominant trait's allele would be a capital "R" for round. This letter would then determine the recessive trait's allele to be a lower case or small letter "r" for wrinkled. You may have noticed that the dominant trait's description tends to determine which letter will be used. Take a minute to fill in the blanks in your lab book at the start of Section 4.

[35] Here you see a sperm carrying the allele for round seeds (R) and the egg carrying the all

[43] Reminder! Genotypes have two letters per inherited character because genotypes represent diploid organisms. Gametes have one letter per inherited character as they represent a haploid reproductive cell with one allele representing one trait. Let's continue.

[44] Now remember that each parent contributes a gamete to the offspring, so when fertilization takes place, the zygote gets a "R" from one parent and a "r" from the other. Will the offspring be homozygous or heterozygous? Click on the correct answer. It should match what Mendel observed.

[45] Remember that Mendel went on to investigate why all of the F_1 generation produced only round-shaped seeds by allowing the F_1 plants to self-fertilize. The cross of two F_1 plants can be expressed using their genotypes; Rr Rr. What gametes do each produce? Each of the F_1 plants can produce two different gametes.

[46] Now things are get

[53] What phenotypes can we expect from this mating? Three boxes contain the genotypes “RR” or “Rr”. Both of those genotypes produce the round-seed phenotype. Only one box has a genotype “rr” that will produce the wrinkled-seed phenotype. So, the phenotypic ratio predicted in the F_2 generation is ¾ round-seed shape to ¼ wrinkled

[61] One more look at Mendelian inheritance, this time in corn. Kernel color in corn is a trait that also involves

[68] Compare Mendelian dominant and recessive inheritance to incomplete dominance. The offspring in the F_2 generation of incomplete dominant inheritance will have a 1:2:1 phenotypic ratio of red to pink to white flower color as well as a 1:2:1 genotypic ratio. What are the ratios for both in this example of Mendelian inheritance?000 219.3613 666.24cm BT 45 0 0 45 0 0 (t) -eneiar

[76] Today we would summarize Mendel's Law of Independent Assortment as: the alleles of genes that represent different characters assort independently of each other when gametes are formed in meiosis. For example, the alleles of the gene for seed color segregate independently of the alleles for seed-shape when forming sperm or egg. Record the Law of Independent Assortment in your lab book.

[77] Let's follow Mendel's Law of Independent Assortment inside the cells of the garden peas. Each of Mendel's parental plants had two alleles for seed shape and two alleles for seed color

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[97] Linked genes change how you would predict gamete formation. When genes are linked, linkage does not allow the genes to segregate independently of each other during meiosis. Look at this example of a fly that is a heterozygote for gray body and long wings and copy down the fly's genotype in your lab book.

[98] Keep in mind that the genes for body color and wing length are linked as you take the heterozygous fly through meiosis I and separate the homologous chromosomes by dragging them. You can observe that segregation between the characters of body color and wing length cannot assort independently. Generally, there is no independent assortment between linked genes.

[99] Now take the fly through meiosis II and separate the sister chromatids. You can see that "G" and "L" must segregate together as well as "g" and "l". There will be only two types of gametes formed. In Mendel's gamete formation of a dihybrid, you would have observed independent assortment and the formation of four different gametes. Not with linked genes! Fill in the results of meiosis II in your lab book and solve a problem with fruit flies and linked genes.

[100] Can linked genes ever be separated? Think about the meiosis lab and recall the crossing over you performed between homologous bead chromosomes. Crossing over has a greater chance of occurring the further two genes are apart. If crossing over occurs between the two homologous chromosomes

[104] There are extra sample problems and solutions here in the lab book for you in addition to the self-test. You should be well prepared for our next lab on human genetics… you did great work.