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|  | \***Drawing from the Deck of Genes**  How are traits passed down from generation to generation?  Who discovered the basic principles of heredity by breeding garden peas in carefully planned experiments, carried out several decades before chromosomes were observed under the microscope?  Mendel studied what model organism? What were its advantages?  \*Mendel’s Experimental Quantitative Approach  Mendel would cross-pollinate (hybridize) two contrasting, true-breeding pea varieties.  1. The true-breeding parents are the \_\_\_\_\_\_\_ (parental) generation, and their hybrid offspring are the \_\_\_\_\_\_ (first filial) generation.  2. Mendel would then allow the F1 hybrids to self-pollinate to produce an \_\_\_\_\_\_ (second filial) generation.  \*The Law of Segregation in Practice (True white vs. True Purple)  Purple flower color is a \_\_\_\_\_\_\_\_\_\_ trait, and white flower color is a \_\_\_\_\_\_\_\_\_\_ trait.  For Mendel, oftentimes in \*Mendel’s F2 offspring each represented by two different traits, he found the same \_\_\_\_\_\_\_ ratio. |
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|  | 1**. \*Alternative versions of** \_\_\_\_\_\_\_\_\_\_ account for variations in inherited characters.  - These alternative versions of a gene are called \_\_\_\_\_\_\_\_\_\_.    2. For each character, an organism inherits two \_\_\_\_\_\_\_\_\_\_\_, one from each parent.  - A diploid organism inherits one set of chromosomes from each parent.  - Diploid organisms have a pair of homologous chromosomes, therefore, two copies of each gene.  - These homologous loci may be identical, as in the true-breeding plants or they differ, as in the F1    3. If the two alleles at a locus differ, then one, the \_\_\_\_\_\_\_\_\_ allele, determines the organism’s appearance. The other, the \_\_\_\_\_\_\_\_\_\_ allele, has no noticeable effect on the organism’s appearance.    4. \***Mendel’s law of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** states that the two alleles for a heritable character segregate (separate) during gamete production and end up in different gametes.      What are the alleles for flower color in pea plants? Which is dominant? Which is recessive?  Complete the cross on the right. 🡪  What will be the physical appearance of the F2 offspring? |
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|  | **\*Useful Genetic Vocabulary**  In a monohybrid cross in pea plants with purple flowers (Pp x Pp), what percent of the progeny will be phenotypically purple?  In a monohybrid cross in pea plants with purple flowers (Pp x Pp), what percent of the progeny will be genotypically heterozygous?  Monohybrid?  Progeny? |
| Mendel identified the second law of inheritance by following two characters at the same time.  **\*The Law of Independent Assortment**  Dihybrid individuals are heterozygous for \_\_\_\_\_\_\_\_\_ characters  Example:  Four classes of \_\_\_\_\_\_\_\_\_\_\_ (YR, Yr, yR, and yr) are produced in equal amounts  These combinations produce four distinct phenotypes in a \_\_\_\_\_\_\_\_\_\_\_\_\_ ratio.  This law applies only to genes located on different, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosomes |
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|  | What is the probability that a dihyrbid pea plant with yellow, round seeds (YyRr) will produce a Yr gamete?  Mendel’s laws of segregation and independent assortment reflect the rules of \_\_\_\_\_\_\_\_\_\_.  ***\*The multiplication rule***  the probability that two or more independent events will occur together is the product of their individual probabilities  *Ex. If you flip two coins, what is the probability that you will land on heads on one AND heads on the second.*  **The rule of addition**  the probability that any one of two or more exclusive events will occur is calculated by adding together their individual probabilities  *Ex. If you flip two coins, what is the probability that you will land on heads on one OR heads on the second.* |
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|  | **\*Solving Genetics Problems with the Rules of Probability**  The probability that an F2 plant from heterozygous parents will have a YYRR genotype is \_\_\_\_\_\_\_\_.  The probability that an F2 plant from heterozygous parents will have a YyRr genotype is \_\_\_\_\_\_.  ¼ YR ovum X ¼ yr sperm = \_\_\_\_\_\_.  ¼ Yr ovum X ¼ yR sperm = \_\_\_\_\_\_.  ¼ yR ovum X ¼ Yr sperm = \_\_\_\_\_\_.  ¼ yr ovum X ¼ YR sperm = \_\_\_\_\_\_.  What is the probability of an offspring having two recessive phenotypes for at least two of three traits resulting from a trihybrid cross between pea plants that are PpYyRr and Ppyyrr?  Five possible genotypes result in this condition:  What is the probability that a dihyrbid pea plant with yellow, round seeds (YyRr) will produce a gamete with a Y and R? |
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|  | ***\*Inheritance Patterns are often more complex***  The relationship between genotype and phenotype is rarely as simple as in the pea plant characters Mendel studied  Why is the above statement true?  Degrees of Dominance  One extreme is the complete dominance characteristic of Mendel’s crosses. Some alleles show ­\_\_\_\_\_\_\_\_\_\_\_\_\_ dominance.  **\*Multiple Alleles**  The four phenotypes of the ABO blood group in humans are determined by three alleles for the enzyme (I) that attaches A or B carbohydrates to red blood cells: IA, IB, and i.  What are \***Pleiotropic Effects**? Give a few examples. |
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|  | ***\*Human traits that follow Mendelian patterns***  *How do you interpret the pedigree? What do the squares and circles represent? What does solid or empty mean?*  *What is the probability that a child with WwFf parents will have a widow’s peak and attached earlobes having a widow’s peak?* |
| **\*The Behavior of Recessive Alleles**  What is a carrier?  Examples of diseases:  How do these genetic diseases persist? Why aren’t they selected against?  **\*Dominantly Inherited Disorders**  Why are they more rare?  *Examples:* |
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