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| Question: What plant helped Gregor Mendel discover genes?THE WORK OF GREGOR MENDEL |
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| Genetics — is the scientific study of heredity |
| Heredity — the passing on of characteristics from parents to offspring. These characteristics are called traits. |
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| Gregor Mendel, an Austrian monk, discovered important facts about heredity using garden peas. |
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| Garden peas produce male and female sex cells called gametes. Fertilization occurs when the male and female reproductive cells join forming a zygote. The zygote becomes part of a seed. |
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| Mendel used true-breeding peas, meaning if they were allowed self self-pollinate, they would produce offspring identical to themselves. |
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| Mendel studied seven traits of pea plants, but only studied ONE trait at a time, for example to see how height was passed from parent to offspring. Mendel took pollen from a true- breeding tall pea plant and cross-pollinated a true-breeding short pea plant. |
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| Hybrid — offspring of parents that have different forms of a trait. Since only one trait was different the offspring is called a monohybrid. |
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| Parents | Offspring | Offspring of F1 generation |
| P1 generation | F1 generation | F2 generation |
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**Page 1 of 5**

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| Question: What are different forms of genes called?MENDEL’S LAWS OF HEREDITY |
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| Mendel concluded that biological inheritance is determined by factors that are passed from one generation to the next. These factors that determine traits are called genes. |
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| Alleles — different forms of genes, such as genes for height can either produce genes for tall plants or genes for short plants. |
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| 1ST LAW |
| Law of Segregation — every organism has two alleles of each gene and when gametes are produced the alleles separate. |
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| Phenotype — the way an organism looks and behaves (tall or short) |
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| Genotype — the allele combination of an organism (TT, tt, Tt) |
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| An organism is homozygous for a trait if the two alleles for the trait is the same. |
| (TT — homozygous dominant; tt — homozygous recessive) |
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| An organism is heterozygous for a trait if its two for the trait are different (Tt). |
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| 2ND LAW |
| Law of Independent Assortment — genes for different traits are inherited independently of each other. |
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| \*In a dihybrid cross (two traits) you can see both of Mendel’s Laws |
| at work. |
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**Page 2 of 5**

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| Question: How can Punnett squares be used to determine the probability of genotype and phenotype? PUNNETT SQUARES |
| Reginald Punnett came up with Punnett Squares to predict the proportions of possible genotypes in offspring. |
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| one parent’s genotype T t |
|  one parent’s t |  |  | Punnett square for a single |
|  genotype t |  |  | trait |  | single trait |
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| Monohybrid Cross: Heterozygous Plants |
|  Parent 1 X Parent 2  | Crossing two pea plants that are heterozygous for seed color (Tt) will produce offspring in the following ratio: |
|  Tt T t Tt  | 1/4 = TT (Homozygous Dominant) |
|  T TT Tt | 2/4 = Tt (Heterozygous) |
|   | 1/4 = (Homozygous recessive) |
|  t Tt tt |  |
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| Monohybrid Cross: Homozygous Plants |
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| A cross between a yellow  |  Parent 1 X Parent 2  |
| homozygous plant (TT) with a  |  TT t t tt  |
| homozygous recessive green plant  |  T Tt Tt |
| (tt) only produces heterozygous  |   |
| yellow (Tt) offspring. |  T Tt Tt |
|  |   4/4= Tt (Heterozygous) |
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| \*A Punnett square can also be created for dihybrid crosses — it would be four boxes wide and four boxes tall. |
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**Page 3 of 5**

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| Question: If humans have a diploid number of 46 chromosomes, what is the haploid number of chromosomes?MEIOSIS |
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| Meiosis — a type of cell division that produces four cells, each with half the number of chromosomes as the parent cell. |
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| In animals, meiosis occurs in the sex organs — the testes in males and the ovaries in females. |
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| A gamete, or sex cell is a haploid cell, meaning this cell contains only one of each kind of chromosomes versus a diploid cell found in body cells, which have two of each kind of chromosome. |
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| \*Mitosis results in the production of two genetically identical diploid cells, whereas meiosis produces four genetically different haploid cells in two stages known as the 1st and 2nd meiotic divisions. |
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| How are Meiosis and Mitosis alike ? How are Meiosis and Mitosis Different?  |
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Page 5 of 5