**Topic Review Guide**: Non-Mendelian (5.4) Genetics and Environmental Effects on Phenotype (5.5)

**To Think About**: What are linked genes? What does map distance tell you about a pair of linked genes? What are sex linked traits? How do sex-linked traits differ from Mendelian traits? How does inheritance determined by multiple genes differ from Mendelian inheritance? How does non-nuclear inheritance differ from Mendelian inheritance? What is phenotypic plasticity? How can the same genotype result in multiple phenotypes? What effect do environmental conditions have on gene expression?

**Watch:** AP Daily Video 5.4 “Non-Mendelian Genetics” Video [1](https://apclassroom.collegeboard.org/d/u20i0gool8?sui=6,5) and [2](https://apclassroom.collegeboard.org/d/qz1enk0b1a?sui=6,5); AP Daily [Video 5.5](https://apclassroom.collegeboard.org/d/a495ltujbd?sui=6,5) “Environmental Effects on Phenotype”

**Read:** Chapter 11.3 - 11.4 & 12.1 - 12.4, Biology in Focus.

**Supplementary Resources**: Click the links below for more information to help you learn more about this lesson.

* Guided Notes 5.4 ([Video 1](https://docs.google.com/document/d/1gUVjPPTnQabPQe43Vh6O1y3TCkoCr5ovuKwUjBEHsHU/edit?usp=sharing), [Video 2](https://docs.google.com/document/d/1rO-JQhEUScyi3juQnnbo4jI-14OtAZERd68bAkzekGA/edit?usp=sharing)), [5.5](https://docs.google.com/document/d/16XFCJrTYyumP-2x9hbG3goSKE_RqvmuURNzNYlrtM78/edit?usp=sharing)
* [Slideshow Presentation](https://docs.google.com/presentation/d/17bmgSoWtyoybjHVb1N2DFJYb_TJ-kltwaXk1XXsOOec/edit?usp=sharing)
* Bozeman Science: [Advanced Genetics](http://www.bozemanscience.com/030-advanced-genetic)
* Crash Course Biology: [Heredity](http://http/www.youtube.com/watch?v=CBezq1fFUEA)
* Hillis et al.: [Independent Assortment of Alleles Animation](http://bcs.whfreeman.com/hillis1e/#667501__674141__)
* Hillis et al.: [Test Cross](http://bcs.whfreeman.com/hillis1e/#667501__708812__)
* DNA From The Beginning: [Classical Genetics Tutorials and Animations](http://dnaftb.org/#classical)
* University of Arizona Biology Project: [Mendelian Genetics Monohybrid Problem Set](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/monohybrid_cross/monohybrid_cross.html)
* University of Arizona Biology Project: [Mendelian Genetics Dihybrid Problem Set](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/dihybrid_cross/dihybrid_cross.html)
* University of Arizona Biology Project: [Sex-Linked Problem Set](http://www.biology.arizona.edu/mendelian_genetics/problem_sets/sex_linked_inheritance/sex_linked_inheritance.html)
* Biocoach: [Mendelian Genetics](http://www.phschool.com/science/biology_place/biocoach/inheritance/intro.html)

**Recall and Review:** Use the lecture in the video and your textbook to help you answer these questions in your BILL. Before you start, mark your level of understanding. After you have completed the questions, then check to see what level of understanding you have achieved. If you’re still at a level N or level A, it is recommended that you stop in for office hours.

| **Essential Knowledge:**  What You Absolutely Must Know and Understand | | | | |
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| Levels of Mastery | | | | *I can explain deviations from Mendel’s model of the inheritance of traits (Topic 5.4)* |
| **N** | **A** | **E** | **M** | **Questions You Should Be Able to Answer** |
|  |  |  |  | 1. **Compare and contrast** linked genes and sex-linked genes. |
|  |  |  |  | 1. **Explain** what map distance tells you about a pair of linked genes. |
|  |  |  |  | 1. **Explain** the difference between parental type and recombinant type chromosomes. **Draw** a diagram that illustrates the difference between the two. |
|  |  |  |  | 1. **Describe** how inheritance determined by multiple genes differs from Mendelian inheritance. |
|  |  |  |  | 1. **Describe** how non-nuclear inheritance differs from Mendelian inheritance. |
| **Essential Knowledge:**  What You Absolutely Must Know and Understand | | | | |
| Levels of Mastery | | | | *I can explain how the same genotype can result in multiple phenotypes under different environmental conditions. (Topic 5.5)* |
|  |  |  |  | 1. **Explain** how flower color in hydrangea plants is an example of environmental conditions influencing phenotype. |

| Learn More: For more information about inheritance of traits and production of gametes, follow the links below:   * [The Blue People of Troublesome Creek](http://www.indiana.edu/~oso/lessons/Blues/TheBlues.htm): interesting story about a family from Kentucky with methemoglobinemia * [Queen Victoria and Hemophilia](http://www.ualberta.ca/~pletendr/tm-modules/genetics/70gen-hemophil.html): Trace the passage of hemophilia through the royal families of Europe * [PBS’ The Evolution of Sex](http://www.pbs.org/wgbh/evolution/sex/advantage/index.html): learn why sexual reproduction is advantageous from an evolutionary standpoint |
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