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| **AP Biology** | **Curriculum Map**  **Making New Cells and Organisms**  http://www.jeffersontownship.org/Portals/0/Images/Logos/hornet.jpg | | | |
| Textbook Resources:  **Chapters 12, 13, 14, 15, 16, 18** | | Month(s):  **February-March** | Time Frame:  **14 days (10/4 block)** | Assessment:  **Reading Quizzes**  **Unit Test** |
| **Learning Targets** | | | **Support Text** | **Podcasts** |
| **EK 1.B.1: Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.** | | | | |
| 1. Structural evidence supports the relatedness of all eukaryotes.    * + - * Linear chromosomes | | | **Chromosomes**  Chapter 16.3 (p.320-321) | [What are Chromosomes?](https://www.youtube.com/watch?v=tsVHWbXqum8) |
| **EK 3.A.2: In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization.** | | | | |
| 1. The cell cycle is a complex set of stages that is highly regulated with checkpoints, which determine the ultimate fate of the cell. 2. Interphase consists of three phases: growth, synthesis of DNA, preparation for mitosis. 3. The cell cycle is directed by internal controls or checkpoints. Internal and external signals provide stop-and-go signs at the checkpoints.    * + - Mitosis-promoting factor (MFP)        - Platelet-derived growth factor (PDGF)        - Cancer results from disruptions in cell cycle control 4. Cyclins and cyclin-dependent kinases control the cell cycle. 5. Mitosis alternates with interphase in the cell cycle. 6. When a cell specializes, it often enters into a stage where it no longer divides, but it can reenter the cell cycle when given appropriate cues. Nondividing cells may exit the cell cycle; or hold at a particular stage in the cell cycle. | | | **The Cell Cycle**  Chapter 12 (p.228-243) | [Cell Cycle, Mitosis & Meiosis](https://www.youtube.com/watch?v=2aVnN4RePyI) |
| 1. Mitosis passes a complete genome from the parent cell to daughter cells. 2. Mitosis occurs after DNA replication. 3. Mitosis followed by cytokinesis produces two genetically identical daughter cells. 4. Mitosis plays a role in growth, repair, and asexual reproduction 5. Mitosis is a continuous process with observable structural features along the mitotic process. Evidence of student learning is demonstrated by knowing the order of the processes (replication, alignment, separation). | | | [Mitosis](https://www.youtube.com/watch?v=1cVZBV9tD-A)  [Phases of Mitosis](https://www.youtube.com/watch?v=mXVoTj06zwg)  [Mitosis & Meiosis Simulation](https://www.youtube.com/watch?v=zGVBAHAsjJM) |
| 1. Meiosis, a reduction division, followed by fertilization ensures genetic diversity in sexually reproducing organisms.    1. Meiosis ensures that each gamete receives one complete haploid (1n) set of chromosomes.    2. During meiosis, homologous chromosomes are paired, with one homologue originating from the maternal parent and the other from the paternal parent. Orientation of the chromosome pairs is random with respect to the cell poles.    3. Separation of the homologous chromosomes ensures that each gamete receives a haploid (1n) set of chromosomes composed of both maternal and paternal chromosomes.    4. During meiosis, homologous chromatids exchange genetic material via a process called “crossing over,” which increases genetic variation in the resultant gametes.    5. Fertilization involves the fusion of two gametes, increases genetic variation in populations by providing for new combinations of genetic information in the zygote, and restores the diploid number of chromosomes. | | | **Meiosis & Sexual Reproduction**  Chapter 13 (p.248-259) | [Meiosis](https://www.youtube.com/watch?v=rB_8dTuh73c)  [Phases of Meiosis](https://www.youtube.com/watch?v=16enC385R0w)  [Mitosis & Meiosis Simulation](https://www.youtube.com/watch?v=zGVBAHAsjJM)  [Diploid & Haploid Cells](https://www.youtube.com/watch?v=zglQ2Ildw4I) |
| **EK 3.A.3: The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.** | | | | |
| 1. Rules of probability can be applied to analyze passage of single gene traits from parent to offspring. | | | **Rules of Probability**  Chapter 14.2 (p.269-271) | [Probability in Genetics: Multiplication & Addition Rules](https://www.youtube.com/watch?v=y4Ne9DXk_Jc) |
| 1. Segregation and independent assortment of chromosomes result in genetic variation. 2. Segregation and independent assortment can be applied to genes that are on different chromosomes. 3. Genes that are adjacent and close to each other on the same chromosome tend to move as a unit; the probability that they will segregate as a unit is a function of the distance between them. 4. The pattern of inheritance (monohybrid, dihybrid, sex-linked, and genes linked on the same homologous chromosome) can often be predicted from data that gives the parent genotype/ phenotype and/or the offspring phenotypes/genotypes. | | | **Law of Segregation & Independent Assortment**  Chapter 14.1 (p.262-269) | [Genetics](https://www.youtube.com/watch?v=ya7h-Y-9l8c)  [Mendelian Genetics](https://www.youtube.com/watch?v=NWqgZUnJdAY)  [A Beginner’s Guide to Punnett Squares](https://www.youtube.com/watch?v=Y1PCwxUDTl8)  [Blood Types](https://www.youtube.com/watch?v=KXTF7WehgM8)  [Advanced Genetics](https://www.youtube.com/watch?v=YoEgUqHOcbc)  [Linked Genes](https://www.youtube.com/watch?v=-_UcDhzjOio)  [Genetic Recombination & Gene Mapping](https://www.youtube.com/watch?v=TU44tR0hJ8A) |
| 1. Certain human genetic disorders can be attributed to the inheritance of single gene traits or specific chromosomal changes, such as nondisjunction.    * + - * Sickle cell anemia          * Tay-Sachs disease          * Huntington’s disease          * X-linked color blindness          * Trisomy 21/Down syndrome          * Klinefelter’s syndrome | | | **Mendelian Genetics**  Chapter 14.4 (p.275-281)  **Non-Mendelian Genetics**  Chapter 14.3 (p.271-274)  **Abnormal Chromosome Number**  Chapter 15.4 (p.297-300) |
| 1. Many ethical, social and medical issues surround human genetic disorders.    * + - * Reproductive issues          * Civic issues such as ownership of genetic information, privacy, historical contexts | | | **Genetic Testing & Counseling**  Chapter 14.4 (p.279-281) | n/a |
| **EK 3.A.4: The inheritance pattern of many traits cannot be explained by simple Mendelian genetics.** | | | | |
| 1. Many traits are the product of multiple genes and/or physiological processes. 2. Patterns of inheritance of many traits do not follow ratios predicted by Mendel’s laws and can be identified by quantitative analysis, where observed phenotypic ratios statistically differ from the predicted ratios. | | | **Non-Mendelian Genetics**  Chapter 14.3 (p.271-274)  **Linked Genes**  Chapter 15.3 (p.292-297) | [Advanced Genetics](https://www.youtube.com/watch?v=YoEgUqHOcbc) |
| 1. Some traits are determined by genes on sex chromosomes.  * Sex-linked genes reside on sex chromosomes (X in humans). * In mammals and flies, the Y chromosome is very small and carries few genes. * In mammals and flies, females are XX and males are XY; as such, X-linked recessive traits are always expressed in males. * Some traits are sex limited, and expression depends on the sex of the individual, such as milk production in female mammals. | | | **Sex-Linked Genes**  Chapter 15.2 (p.289-292) |
| 1. Some traits result from nonnuclear inheritance.    1. Chloroplasts and mitochondria are randomly assorted to gametes and daughter cells; thus, traits determined by chloroplast and mitochondrial DNA do not follow simple Mendelian rules.    2. In animals, mitochondrial DNA is transmitted by the egg and not by sperm; as such, mitochondrial- determined traits are maternally inherited. | | | **Inheritance of Organelle Genes**  Chapter 15.5 (p.301-302) |
| **EK 3.B.2: A variety of intercellular and intracellular signal transmissions mediate gene expression.** | | | | |
| 1. Signal transmission within and between cells mediates cell function.  * Changes in p53 & RAS activity can result in cancer. | | | **Cancer and Cell Cycle Control**  Chapter 18.5 (p.373-377) | n/a |
| **EK 3.C.1: Changes in genotype can result in changes in phenotype.** | | |  |  |
| 1. Errors in mitosis or meiosis can result in changes in phenotype. 2. Changes in chromosome number often result in new phenotypes, including sterility caused by triploidy and increased vigor of other polyploids. 3. Changes in chromosome number often result in human disorders with developmental limitations, including Trisomy 21 (Down syndrome) and XO (Turner syndrome). | | | **Abnormal Chromosome Number**  Chapter 15.4 (p.297-300) | n/a |
| **EK 3.C.2: Biological systems have multiple processes that increase genetic variation.** | | | | |
| 1. Sexual reproduction in eukaryotes involving gamete formation, including crossing-over during meiosis and the random assortment of chromosomes during meiosis, and fertilization serve to increase variation. Reproduction processes that increase genetic variation are evolutionarily conserved and are shared by various organisms. | | | **Sexual Reproduction**  Chapter 13.1 & 13.2 (p.248-253) | [Meiosis](https://www.youtube.com/watch?v=rB_8dTuh73c) |
| **EK 3.D.1: Cell communication processes share common features that reflect a shared evolutionary history.** | | | | |
| 1. In multicellular organisms, signal transduction pathways coordinate the activities within individual cells that support the function of the organism as a whole.  * DNA repair mechanisms * Apoptosis | | | **Apoptosis**  Chapter 11.5 (p.223-225) | n/a |
| **EK 3.D.4: Changes in signal transduction pathways can alter cellular response.** | | | | |
| 1. Conditions where signal transduction is blocked or defective can be deleterious, preventative or prophylactic.  * Cancer | | | **Cancer**  Chapter 12.3 (p.242-243)  Chapter 18.5 (p.373-377) | [Cancer](https://www.youtube.com/watch?v=UopUxkeC4Ls) |

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| **Vocabulary** | | | | | | |
| alleles | cleavage furrow | gametogenesis | kinetochores | oncogene | recessive | Trisomy 21 |
| anaphase | codominance | genes | law of independent assortment | oogenesis | S phase | true-breeding |
| apoptosis | color blindness | genotype | law of segregation | ovaries | sex chromosomes | tummor suppressor gene |
| autosomes | crossing-over | germ cells | linked genes | ovum | sex-linked trait | Turner syndrome |
| Barr body | Cyclin | gonads | locus | P1, F1, F2 generation | sickle-cell anemia | trait |
| BRACA1 | Cyclin dependent kinase (CDK) | Gregor Mendel | meiosis | p53 | sister chromatids | translocation |
| cancer | cytokinesis | haploid | meiosis I & II | phenotype | spermatogenesis |  |
| carrier | dihybrid cross | hemophilia | metaphase | platelet derived growth factor (PDGF) | spindle fibers |  |
| cell cycle | diploid | heterozygous | metaphase plate | polar bodies | synapsis |  |
| cell division | dominant | homologous chromosomes | mitosis | polygenic inheritance | Tay sachs disease |  |
| cell plate | Down’s syndrome | homozygous | mitosis promoting factor (MPF) | polyploidy | telophase |  |
| centromere | G1 phase | Huntington's disease | monohybrid cross | prophase | testes |  |
| chiasmata | G2 phase | incomplete dominance | multiple alleles | proto-oncogene | tetrad |  |
| chromatin | gametes | interphase | nondisjunction | RAS | translocation |  |