WAUCONDA SCHOOL DISTRICT 118
UNIT PLANNING ORGANIZER

Subject: AP Biology

Unit 5: Heredity

Pacing: 17 days (Spring Semester)

STAGE 1 – DESIRED RESULTS

Essential Questions:

How are unique gametes created?

How are traits inherited through the generations?

Big Ideas:

2. Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.
3. Living systems store, retrieve, transmit and respond to information essential to life processes.
4. Biological systems interact, and these systems and their interactions possess complex properties.

CollegeBoard (Priority Standards):

3.A: Heritable information provides for continuity of life.

3.B: Expression of genetic information involves cellular and molecular mechanisms.

3.C: The processing of genetic information is imperfect and is a source of genetic variation.

4.C: Naturally occurring diversity among and between components within biological systems affects interactions with the environment

CollegeBoard (Supporting Standards):

3.A.1: DNA, and in some cases RNA, is the primary source of heritable information.

3.A.3: The chromosomal basis of inheritance provides an understanding of the pattern of passage (transmission) of genes from parent to offspring.

3.A.4: The inheritance pattern of many traits cannot be explained by simple Mendelian genetics.

3.B.1: Gene regulation results in differential gene expression, leading to cell specialization.

3.C.1: Changes in genotype can result in changes in phenotype.

3.C.2: Biological systems have multiple processes that increase genetic variation.

4.C.1: Variation in molecular units provides cells with a wider range of functions.

STAGE 2 – EVIDENCE

Concepts (What students need to know)	Performance Tasks (What students will be able to do)	21st Century Skills
● Meiosis ○ creates haploid cells that are unique ○ creates gametes ○ Independent Assortment ○ Crossing over ○ Fertilization involves the fusion of two gametes, increases genetic variation in populations, and restores the diploid number of chromosomes. ○ Follow chromosomes through the steps. ● linked genes ● 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 ● proteins determine phenotypes ● 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. ● Sex-linked genes ○ The Y chromosome is very small and carries	● apply mathematical routines to determine Mendelian patterns of inheritance provided by data sets. ● calculate expected ratios of phenotype when give parental or F1 genotypes ● predict parental genotypes when given F2 data ● determine the type of inheritance of a trait when given the F1 and/or F2 data ● use a Chi Squared test to determine if the data is following the expected ratios ● make predictions of individuals' genotypes and phenotypes by using a pedigree	● using data and mathematical calculations to make predictions ● graphical analysis ● organizing information and creating visual models to display the information ● plan and implement data collection strategies appropriate to a particular scientific question ● connect and relate knowledge across various scales, concepts and representations in and across domains ● perform data analysis using statistical tests and evaluate evidence

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 ● Chloroplast and mitochondrial DNA ● heterozygote advantage ● pedigrees		

Common Formative/Summative Assessments:

- ➢ **Unit 4.1 Cells Exam -- Chapters 9 & 10**
- ➢ **Unit 4.2 Genetics Exam -- Chapters 11, 12**

Interim Assessments (Informal Progress Monitoring checks):

- ➢ **HHMI Biointeractive Cell Cycle Click & Learn:** Students will Explore the phases, checkpoints, and protein regulators of the cell cycle.

- **Mitosis & Meiosis Lab:** students model how eukaryotic cells divide to produce genetically identical
- **Chi-Squared Using M&M's:** Students will determine if there is any statistical significance between the colors in a bag of M&M's.
- **The Making of the Fittest: Natural Selection in Humans:** Students will study mendelian genetics, probability, pedigrees & chi square
- **The Making of the Fittest: Evolving Switches & evolving bodies:** Students will use genetic crosses to analyze a stickleback trait.
- **Genetic Linkage Tutorial:** Students will create gene maps based on frequencies of recombination.
- **Karyotype Activity:** Students will diagnose patients for abnormalities and learn the correct notation for characterizing karyotypes.

STAGE 3 – LEARNING PLAN (INSTRUCTIONAL PLANNING)

Suggested Resources/Materials/Informational Texts

Suggested Research-based Effective Instructional Strategies

Identifying Similarities and Differences - The ability to break a concept into its similar and dissimilar characteristics allows students to understand (and often solve) complex problems by analyzing them in a more simple way. Teachers can either directly present similarities and differences, accompanied by deep discussion and inquiry, or simply ask students to identify similarities and differences on their own. While teacher-directed activities focus on identifying specific items, student-directed activities encourage variation and broaden understanding, research shows.

Summarizing and Note Taking - These skills promote greater comprehension by asking students to analyze a subject to expose what's essential and then put it in their own words. According to research, this requires substituting, deleting, and keeping some things and having an awareness of the basic structure of the information presented.

Cues, Questions, and Advance Organizers Cues - Questions, and advance organizers help students use what they already know about a topic to enhance further learning. Research shows that these tools should be highly analytical, should focus on what is important, and are most effective when presented before a learning experience

Cooperative Learning - Research shows that organizing students into cooperative groups yields a positive effect on overall learning. When applying cooperative learning strategies, keep groups small and don't overuse this strategy-be systematic and consistent in your approach.

Reinforcing Effort and Providing Recognition - Effort and recognition speak to the attitudes and beliefs of students, and teachers must show the connection between effort and achievement. Research shows that although not all students realize the importance of effort, they can learn to change their beliefs to emphasize effort.

Taken from: *Marzano's Nine Instructional Strategies for Effective Teaching and Learning*

Academic Vocabulary/ Word Wall	Enrichment/Extensions/ Modifications
Essential Vocabulary: true breeding monohybrid cross chromosome gene allele homozygous heterozygous dominant recessive dihybrid cross test cross genotype phenotype P generation F1 F2 diploid haploid homologous chromosomes Law of Segregation Law of Independent Assortment linked genes epistasis pleiotropy co-dominance incomplete dominance polygenic inheritance sex-linkage pedigree Chi-Squared test autosomes p-value degrees of freedom nondisjuction deletion translocation duplication inversion cell cycle somatic cells gametes G1 S	Cancer and the Loss of Cell Cycle Control Lab Modeling Meiosis Virtual Fly Lab with Chi Squared

G2 mitosis cytokinesis interphase cell cycle control system cyclin dependent kinases cancer asexual reproduction binary fission heredity variation karyotype sperm egg zygote crossing over random fertilization **Worth-Knowing Vocabulary:** heterozygote advantage sister chromatids trisomy monosomy chromatin prophase metaphase anaphase telophase cleavage furrow cell plate density dependent inhibition anchorage dependence benign malignant metastasis spermatogenesis oogenesis	