Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Science	Course:	IB Biology 11 SL (H)	Unit Title:	Genetics	Grade Level(s):	11
Assessed Trimester:		Pacing:		Date Created:		Last Revision Date:	9/2/2014

Course Understandings: *Students will understand that:*

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DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

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Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

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Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: ● How geneticists use principles of probability to predict results of breeding ● How meiosis creates gametes for sexual reproduction ● The structure of DNA ● What a gene is in relation to DNA ● How gene mutations cause mutations in the organism ● How and why scientists manipulate DNA ● The human karyotype ● The reasons why the human genome has been decoded ● How DNA relates to forensic investigations ● How genetically modified crops/animals will help to solve nutrition problems around the world	**Students will keep considering:** ●

Acquisition

Knowledge - Students will:	Skills - Students will:
● The relationship between DNA, genes and chromosomes ● The structure and function of DNA ● That different species of multicellular organisms have a characteristic number of chromosomes, and that in typical humans there are 22 autosomal pairs and 2 sex chromosomes ● How genetic information is transmitted from parents to offspring through the processes of meiosis and fertilization as they relate to chromosome recombination and sexual reproduction ● The difference between dominant, recessive, codominant, incomplete dominant, polygenic, multiple allele and sex-linked traits ● About mutations, their types and causes and their role in genetic variation. ● How gel electrophoresis is used in DNA profiling	● State that eukaryotic chromosomes are made of DNA and proteins ● Define gene, allele and genome ● Define gene mutation ● Explain the consequence of a base substitution mutation in relation to the processes of transcription and translation, using the example of sickle-cell anemia ● State that meiosis is a reduction division of a diploid nucleus to form haploid nuclei ● Define homologous chromosomes ● Outline the process of meiosis, including pairing of homologous chromosomes and crossing over, followed by two divisions, which results in four haploid cells ● Explain that non-disjunction can lead to changes in chromosome number, illustrated by reference to

- That the genetic code for humans is universal
- The potential benefits and possible harmful effects of genetic modification

Reasoning - Students will:

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Down Syndrome
- State that in karyotyping, chromosomes are arranged in pairs according to their size and structure.
- Analyse a human karyotype to determine gender and whether non-disjunction has occurred
- Define genotype, phenotype, dominant allele, recessive allele, codominant alleles, locus, homozygous, heterozygous, carrier and test cross
- Determine the genotypes and phenotypes of the offspring of a monohybrid cross using a Punnett grid
- State that some genes have more than two alleles
- Describe ABO blood groups as an example of codominance and multiple alleles
- Explain how the sex chromosomes control gender by referring to the inheritance of X and Y chromosomes in humans
- State that some genes are present o the X chromosome and absent from the shorter Y chromosomes in humans
- Define sex linkage
- Describe the inheritance of color blindness and hemophilia as examples of sex linkage
- State that a human female can be homozygous or heterozygous with respect to sex-linked genes
- Explain that female carriers are heterozygous for X-linked recessive alleles
- Predict the genotypic and phenotypic ratios of offspring of monohybrid crosses involving any of the above patterns of inheritance
- Deduce the genotypes and phenotypes of individuals in pedigree charts
- Outline the use of polymerase chain reaction to copy and amplify minute quantities of DNA
- State that in gel electrophoresis, fragments of DNA move in an electric field and are separated according to their size
- State that gel electrophoresis of DNA is used in DNA profiling, and describe the application of profiling to determine paternity and also in forensic investigations
- Analyse DNA profiles to draw conclusions about paternity or forensic investigations
- Outline three outcomes of the sequencing of the complete human genome
- State that when genes are transferred between species, the amino acid sequence of polypeptides translated from them is unchanged because the genetic code is universal
- Outline a basic technique used for gene transfer involving plasmids, a host cell, restriction enzymes and DNA ligase
- State two examples of the current uses of genetically modified crops or animals
- Discuss the potential benefits and possible harmful effects of one example of genetic modification
- Define clone
- Outline a technique for cloning using differentiated animal cells
- Discuss the ethical issues of therapeutic cloning in humans

Common Misunderstandings
- Dominant traits are always more common in human populations
- Crossing organisms with a particular trait will always produce a mix of that trait
- There are only two types of a trait, dominant and recessive
- Chromosomes in the cells are in the shape of an “X”
- Scientists can see DNA. This is how we know it’s structure and is how we map where we find certain genes.

Essential new vocabulary
- Gene
- Allele
- Genome
- Gene mutation
- Meiosis
- Homologous chromosomes
- Crossing over
- Karyotyping
- Amniocentesis
- Non-disjunction
- Genotype
- Phonotype

	• Dominant allele • Recessive allele • Co-dominant alleles • Lucus • Homozygous • Heterozygous • Carrier • Test cross • Monohybrid • Punnett Grid • ABO blood groups • Sex chromosomes • Sex linkage • Genotypes • Phenotypes • Polymerase chain reaction • Gel electrophoresis • Plasmids • Host cell • Restriction enzymes • Clone