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eCurriculum System eMAP Licensed to: TRUMBULL PUBLIC SCHOOLS

COURSE: Honors Biology CODE:

UNIT: Unit 6: Genetics & Recombinant DNA MAP LEVEL:

CONTACT: Doug Winters; Denise Weed; Marty Schaivone GRADE: 10

TIME FRAME: 5 weeks

PERFORMANCE STANDARDS

27.3 SCIENCE - LIFE SCIENCE (V,VI,VII)

27.3.7.10.36 Students will explain the usefulness of meiosis in maintaining organisms genetic variability.

27.3.7.10.37 Students will use the Punnet Square technique to predict the distribution of traits in mono- and di-hybrid crossings.

27.3.7.10.38 Students will deduce the probable mode of inheritance of traits (e.g., recessive/dominant, sex-linked) from pedigree diagrams showing phenotypes.

27.3.7.10.39 Students will describe the difference between genetic disorders and infectious diseases.

27.3.7.8.25 Students will explain the similarities and differences in cell division in somatic and germ cells.

27.3.7.8.27 Students will describe the structure of the genes on chromosomes, and explain sex determination in humans.

27.3 SCIENCE - LIFE SCIENCE (V,VI,VII)

27.3.7.8.27 Students will describe the structure of the genes on chromosomes, and explain sex determination in humans.

27.3.6.10.31 Students will describe the differences in the structure of yeasts, bacteria and viruses.

27.5 SCIENCE - SCI TECH IN SOCIETY (XI)

27.5.11.10.34 Students will describe, in general terms, how the genetic information of organisms can be altered to make them produce new materials.

27.5.11.10.35 Students will explain the risks and benefits of altering the genetic composition and cell products of existing organisms.

ESS/FOCUS QUESTIONS

Essential Question:

What processes are responsible for life's unity and diversity?

Focus Questions:

1. How are characteristics inherited by sexually reproducing organisms?
2. How does the cell use genetic information?
3. What patterns of inheritance are exhibited in sexually reproducing orgaisms?
4. How can DNA be manipulated?

CONTENT

1. Reproduction can be asexual or sexual.
2. Asexual reproduction occurs by means of binary fission or mitosis.
3. The purpose of asexual reproduction is to maintain genetic continuity.
4. DNA must be replicated prior to meiotic cell division.
5. The purpose of meiosis is to reduce the total number of chromosomes (diploid number) to one half the number of chromosomes (haploid number) from the parent cell, thereby, producing sex cells (gametes).
6. Haploid gametes unite in the process of fertilization to restore the diploid number of chromosomes in the new individual (zygote).
7. Chromosomes inherited by offspring contain genes that determine their traits.
8. The expression of traits involve the processes of transcription and translation.

9. Data showing patterns of inheritance were first investigated by Gregor Mendel.

10. Alleles (alternate forms of a gene) determine different expressions of traits.

11. Crossing-over, segregation and independent assortment of alleles during gamete production results in genetic diversity.

12. Inheritance of genetic traits follows rules of probability.

13. Some patterns of inheritance go beyond simple Mendelian genetics. Other patterns include codominance, multiple alleles, multifactorial inheritance, non-disjunction, linkage, and X-linked inheritance.

14. Mutations can occur at both allele and chromosome levels.

15. DNA can be manipulated via genetic engineering techniques.

SKILLS

Students will be able to:

1. Explain how mitosis maintains genetic continuity prior to asexual reproduction and is responsible for maintenance, growth, and repair in a multicellular organism.
2. Explain how meiosis contributes to the genetic variabilty of organisms.
3. Compare and contrast the phases of mitosis and meiosis. Discuss the results of these processes with respect to chromosome behavior and number, number of daughter cells formed, and their genetic content.
4. Explain how fertilization restores the diploid number of chromosomes.
5. Construct and interpret Punnett squares (monohybrid and dihybrid) to predict the

distribution of traits.

6. Recognize and describe various modes of inheritance of genetic traits (recessive/dominant, sex linked, incomplete dominance, co-dominance, etc.)
7. Interpret pedigrees to identify the genotypes and phenotypes of the members involved.
8. Construct a karyotype to diagnose possible chromosomal abnormalities inherited by an individual.
9. Transcribe and translate DNA and RNA sequences as they relate to the process of protein synthesis.
10. Explain how a genetic mutation may occur, is inherited, and the result.
11. Construct a model of recombinant DNA via a simulation of gene splicing.

ASSURED EXPERIENCES

Modeling of chromosome behavior during meiosis with pop-it beads.

Genetic problem solving.

Construction of Punnett squares and pedigrees.

Modeling of transcription and translation with pop-it beads.

Online construction of karyotypes.

Simulation of recombinant DNA via splicing a gene to a plasmid to create a transgenic organism.

Bill Nye DVD on genetically modified foods.

ASSESSMENTS

Unit/chapter quizzes and tests

Modeling activites of replication, meiosis, transcription, translation and gene splicing

GMO labeling assessment

OPTIONAL ACTIVITIES

Fast Plants (dihybrid cross lab)

RESOURCES

BSCS Blue Text

GMO literature

University of Arizona (Biology Project) website

ADDITIONAL NOTES