

Title: Unit I: Introduction

Subject/Course: Human Genetics

Topic: Overview of Genetics,
Cells, Meiosis

Grade: 11/12 **Designer(s):** Erin Gallagher

Stage 1- Desired Results

Established Goals:

Student knowledge & understanding of...

- What genetics is and is not
- Basic genetic mechanisms and their outcomes
- Explanations of cell cycle & sexual reproduction and their roles in genetics
- Recognition of importance and impact of study of genetics

PA Standards for Science & Technology:

3.1.10.B1. Describe how **genetic** information is inherited and expressed.

3.1.B.A3. Explain how all organisms begin their life cycles as a single cell and that in multicellular organisms, successive generations of embryonic cells form by cell division.

3.1.B.A4. Summarize the stages of the **cell cycle**.

3.1.10.A4. Describe the **cell cycle** and the process and significance of **mitosis**.

3.1.C.A4. Relate **mitosis** and **meiosis** at the molecular level.

3.1.B.A5. Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc).

3.1.12.A5. Analyze how structure is related to function at all levels of biological organization from **molecules** to **organisms**.

3.1.B.B2. Describe how the process of **meiosis** results in the formation of haploid gametes and analyze the importance of **meiosis** in sexual reproduction.

Compare and contrast the function of **mitosis** and **meiosis**.

Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.

3.1.12.B2. Evaluate the process of **sexual reproduction** in influencing genetic variability in a population

PA Keystone Anchors/Eligible Content:

BIO.B.1.2 Explain how genetic information is inherited.

BIO.B.2.3 Explain how genetic information is expressed.

BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.

BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics.

Transfer:

Students will be able to independently use their learning to...

- Identify the many aspects of life that are affected by genetics
- Describe how cell structures and functions depend on specific parts of the genome
- Describe the processes of cell reproduction and the significance of outcomes
- Recognize how sexual reproduction maintains the chromosome number and promotes genetic diversity

Meaning:

Understandings:

Students will understand that...

- Genes affect nearly all aspects of our lives, from our identities, to our health, to what we eat, and how we interact with others
- Our bodies are built of trillion of cells that interact in complex ways to keep us alive. All cells in the body use the same genome, but have different structures and functions because they access the different parts of the genome.
- Our reproductive systems enable us to start a new generation. First our genetic material must be halved, so it can combine with that of a partner to reconstitute a full diploid genome. Then genetic programs unfold as their initial cell divides and its daughter cells specialize. The forming tissues fold into organs and the organs interact, slowly building a new human body

Essential Questions:

1. Why do we study genetics?
2. How do genes dictate the organization of structure and function?
3. What are processes and outcomes of the cell cycle?
4. Why is cell differentiation important?
5. How are the male and female reproductive systems involved in gamete formation?
6. Why is meiosis important in human reproduction?
7. What affects cell development and differentiation?

Acquisition:

Students will know...

- Overview of the science of genetics
- Levels of genetics
- Impact of environment on genetics
- Genetic applications
- Cell structure and function
- Cell cycle and mitosis
- Cell interactions
- Human reproductive systems
- Process of meiosis and gamete formation
- Cellular development from fertilization to whole body
- Factors affecting cell structure and function

Students will be skilled at ...

1. Explaining what genetics is and is not
2. Defining bioethics
3. Describing the levels of genetics, from nucleic acids to chromosomes to cells, body parts, families and populations
4. Discussing how genes and environmental factors interact to affect genes
5. Providing examples of how genetics can be applied in the modern context
6. Explaining cell differentiation
7. Describing cell structures and functions
8. Describing cell cycle events and control
9. Describing the male and female reproductive systems
10. Explaining the process and purpose of meiosis
11. Identifying stages of prenatal development
12. Discussing specific factors that affect genetics of human development

Stage 2- Assessment Evidence

<p>Unit-Based Project</p> <p><u>Genetics Graphic Organizer/Concept Map</u></p> <p>Using unit key terms, students will create a visual organizer including:</p> <ul style="list-style-type: none"> • Key terms • Descriptions • Relationships <p>Student will be evaluated on:</p> <ul style="list-style-type: none"> • Term inclusion • Description accuracy • Accuracy and logic of relationships • Quality of project (neatness, layout, organization) 	<p>Other Evidence:</p> <p>Chapter quizzes:</p> <ul style="list-style-type: none"> • Ch1: Genetics Overview • Ch2: Cells • Ch3: Meiosis & Development <p>Unit test: Introduction to Genetics</p> <p>Laboratory Activities</p> <p>Chapter Case Studies</p>
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Stage 3- Learning Plan

Pre-Assessment

<p>Learning Events</p> <p>Vocabulary:</p> <p><u>CH1: Overview of Genetics</u></p> <p><i>genes, genome, cell, DNA, genomics, RNA, alleles, mutation, genome-wide association studies, gene expression profiling, chromosomes, autosomes, sex chromosomes, differentiate, stem cells, genotype, phenotype, dominant, recessive, gene pool, multifactorial traits, genetic determinism, biotechnology</i></p> <p>Vocabulary</p> <p>Chapter topic scenario questions/discussion</p> <ul style="list-style-type: none"> • Chap 1: “Direct-to Consumer Genetic Testing” p.1 <p>Chapter outline</p> <p>Lecture presentation/notes/discussion</p> <p>Animations/videos</p> <p>Chapter Review Questions</p> <ul style="list-style-type: none"> • Chap 1: pp.16-17 <p>Online activities/webquests</p> <ul style="list-style-type: none"> • Chap 1 p.17 <p>Chapter readings with 5 sentence synopsis</p> <ul style="list-style-type: none"> • Reading 1.1: “Introducing DNA” p.3 <p>Chapter Applied Questions</p> <ul style="list-style-type: none"> • Chap 1: pp.16-17 <p>Bioethics reading and discussion questions</p> <ul style="list-style-type: none"> • Chap 1: “Genetic testing & Privacy” p.14 <p>Forensics Focus and/or Case Studies</p> <ul style="list-style-type: none"> • Chap 1: p.17 <p>Guided reading/Review handouts</p>	<p>Progress-Monitoring</p> <ul style="list-style-type: none"> ✓ Do Nows ✓ Vocabulary quizzes ✓ Outlines check ✓ Online activities completion and accuracy check with discussion on results ✓ Accuracy of review and applied questions, guided reading handouts, chapter reading synopses ✓ Bioethics scenarios discussion ✓ Forensic focus/case studies analyses ✓ Lab exercises execution & data analyses ✓ Unit project progression monitoring
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CH2: Cells

somatic cells, diploid, haploid, stem cells, nuclei, organelles, nucleus, carbohydrates, lipids, proteins, nucleic acids, cytoplasm, ribosomes, endoplasmic reticulum, golgi apparatus, plasma membrane, lysosomes, peroxisomes, mitochondria, cytoskeleton, mitosis, apoptosis, cell cycle, interphase, prophase, chromatids, spindle, metaphase, centromeres, anaphase, telophase, telomere, signal transduction, cellular adhesion, embryonic stem cells (ES), induced pluripotent stem cells (iPS)

Vocabulary

Chapter topic scenario questions/discussion

- Chap 2: “A Disease in a Dish” p.18

Chapter outline

Lecture/ notes/ discussion

Animations/video

Exercises:

- Cell diagrams
- Cell cycle diagrams
- Mitosis diagrams

Chapter Review Questions

- Chap 2: p.42

Online activities/webquests

- Chap 2 p. p.42

Chapter readings with 5 sentence synopsis

- Reading 2.1: “Inborn Errors of Metabolism Affect the Major Biomolecules” p.21

Laboratory exercises (online & hands-on)

- Online cell lab (cellsalive.com)
- Observing cells (microscopes)
- Mitotic cell lab online
- Observing mitotic cells (microscopes)

Chapter Applied Questions

- Chap 2: p.42

Bioethics reading and discussion questions

- Chap 2: “Banking Stem Cells” p.40

Forensics Focus and/or Case Studies

- Chap 2: p.43

Guided reading/Review handouts (Chap 1, 2, 3)

CH3: Meiosis & Development

gonads, oocytes, sperm, meiosis, diploid, haploid, independently assorting, cross over, reduction division, equational division, homologous pairs, spermatogenesis, oogenesis, polar body, zygote, cleavage, morula, blastocyst, blastomeres, inner cell mass, ectoderm, endoderm, mesoderm, primary germ layers, monozygotic, dizygotic, neural tube, embryo, fetus, teratogen, critical period

Vocabulary

Chapter topic scenario questions/discussion

- Chap 3: “Selling Eggs: Vanessa’s Story” p.44

<p>Chapter outline Lecture presentation/notes/discussion Animations/videos Exercises:</p> <ul style="list-style-type: none"> • Meiosis diagrams • Meiosis interactives online <p>Chapter Review Questions</p> <ul style="list-style-type: none"> • Chap 3: pp.67-68 <p>Online activities/webquests</p> <ul style="list-style-type: none"> • Chap 3 p.68 <p>Chapter readings with 5 sentence synopsis</p> <ul style="list-style-type: none"> • Reading 3.1: “Genes and Longevity” p.65 <p>Laboratory exercises (online & hands-on)</p> <ul style="list-style-type: none"> • Observing meiotic cells (microscopes) • Modeling meiosis (creation of meiotic phases and outcomes) <p>Chapter Applied Questions</p> <ul style="list-style-type: none"> • Chap 3: pp.67-68 <p>Bioethics reading and discussion questions</p> <ul style="list-style-type: none"> • Chap 3: “Why a Clone is not an Exact Duplicate” p.54 <p>Forensics Focus and/or Case Studies</p> <ul style="list-style-type: none"> • Chap 3: p.68 <p>Guided reading/Review handouts</p>	
<p>Technology</p> <ul style="list-style-type: none"> • Laptops and Internet for online activities and project research • Powerpoint/LCD projector for lecture/discussion • Laboratory equipment & materials for lab exercises • McGraw-Hill Connect Genetics (teacher): online assignments, quizzes, tests, online activities, questions, presentations, animations, student performance tracking • McGraw Hill ConnectPlus Genetics (student): eBook, assignments, quizzes, tests, questions, activities, vocab flashcards, animations • Text companion website: www.glencoe.com/lewis10 or www.mhhe.com/lewisgenetics10 • Discovery Streaming videos 	<p>Pacing Guide Chapters 1-3 = 2 ½ weeks Approx: 1 day: Includes course overview, classroom protocols, safety, textbook distribution & layout, course expectations 3 days: Chap 1 (quiz) 4 days: Chap 2 (quiz) 5 days: Chap 3 (quiz) Review/reteach Unit test / Unit Project due</p>