Title: Unit V: Immunity & Cancer **Subject/Course:** Human Genetics

Topic: Immunity Genetics, Cancer Genetics **Grade:** 11/12 **Designer(s):** Erin Gallagher

Stage 1- Desired Results

Established Goals:

Student knowledge & understanding of…

- Explanation of cell cycle and its regulatory mechanisms
- Description of cancer
- Role of gene inheritance in immunity and cancer
- Impact of environmental factors on genetics of immunity and cancer
- Interaction between genes and immune system
- Relationship between cell cycle and cancer

PA Standards for Science & Technology:

3.1.10.B1. Describe how **genetic** information is inherited and expressed.
3.1.B.B1. Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in **DNA** molecules.
Explain how **mutations** can alter genetic information and the possible consequences on resultant cells.
3.1.12.B3. Explain the impact of environmental factors on gene **expression.**
3.1.B.C2. Describe how mutations in sex cells may be passed on to successive generations and that the resulting **phenotype** may help, harm, or have little or no effect on the offspring's success in its environment.
Describe the relationship between environmental changes and changes in the gene pool of a population.
3.1.12.A4. Explain how the **cell cycle** is regulated.
3.1.B.A4 Summarize the stages ofthe **cell cycle**.
3.1.10.A4. Describe the **cell cycle** and the process and significance of **mitosis**.

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…

- Explain the roles of genes in the immune response, and how personal choices can affect immunity and health
- Explain how genetic errors caused by environmental factors and health choices can disrupt immunity and cell controls, leading to cancer
- Reflect on health and lifestyle decisions to make informed choices to enhance quality of life

Meaning:

Understandings: *Students will understand that…* • The immune system enables us to share the planet with other organisms. Genes control the immune response. We can alter immunity to enhance health. • A few cells probably escape the controls of the cell cycle in each of us, but are usually squelched by the immune system. In one of three of us, though, such errant cells continue to divide and invade healthy tissue, causing cancer. The many forms of cancer reflect the mutations in particular cell types.	**Essential Questions:** 1. How does the immune system work to protect health? 2. What is the role of genetics in determining immune responses? 3. What are the impacts of abnormal or altered immunity? 4. What is the role of genetics in cancer? 5. How do cancers originate and then affect human systems? 6. How does the interplay of environment and genetics contribute to cancer development?
Acquisition:	
Students will know… • Importance of cell surfaces in immune responses • The parts and types of immune responses • Conditions that result from abnormal immunity • Technologies that influence immunity and their effects • Role of pathogen genetics in immunity • Genetics of cancer • Characteristics and causes of cancer cells • Genetic contribution to cancer • Environmental factors' contribution to cancer	*Students will be skilled at …* 1. Identifying the components of the immune system 2. Explaining surface antigens in in terms of leukocytes and health 3. Distinguishing among physical barriers, innate immunity and adaptive immunity, as well as humoral and cellular responses 4. Discussing effects of abnormal immunity (underactive, overactive, misdirected) 5. Describing technologies that can boost or suppress immunity for disease prevention/treatment 6. Discussing importance of understanding pathogenic genomics 7. Relating cell cycle control to cancer occurrence 8. Describing characteristics and origins of cancer 9. Identifying gene mutations' contribution to cancer 10. Identifying environmental factors that contribute to cancer
Stage 2- Assessment Evidence	
Unit-Based Project <u>Immunity and Cancer</u> Students will select & research a type of cancer and create a class presentation on, and be evaluated on: • Description of cancer (signs, symptoms, outcomes, organ/system affected) • Genes involved in cancer type • Genetic influences on cancer occurrence • Description of cell controls and cancer development • Immune system responses and failures • Environmental influences on cancer type • Rate of occurrences, fatality stats, affected groups	**Other Evidence:** Chapter quizzes: • Ch17: Genetics of Immunity • Ch18: Genetics of Cancer Unit test: Immunity and Cancer Laboratory Activities Chapter Case Studies

• Possible preventions • Available treatments Additional evaluations: • Project quality (neatness, layout, organization) • Explanations' accuracy and quality of information • Diagrams and images • Physical and oral presentation • Bibliography	

Stage 3- Learning Plan

Pre-Assessment

Learning Events	**Progress-Monitoring**
Vocabulary: CH17: Genetics of Immunity *Antibodies, cytokines, antigens,major histocompatibility complex (MHC), human leukocyte antigens (HLAs), antigen presenting cell, B cells, T cells, innate immunity, adaptive immunity, inflammation, complement sytem, collectins, cytokines, interferons, interleukins, humoral immune response, cellular immune response, primary immune response, secondary immune response, plasma cells, memory cells, light chains, heavy chains, antigen binding sites, idiotypes, epitopes, autoimmunity, autoantibodies, vaccine* Vocabulary Chapter topic scenario questions/discussion • Chap 17: "Changing the Genotype to Vanquish HIV" p.325 Chapter outline Lecture presentation/notes/discussion Animations/videos Exercises: • Venn Diagram: Innate immunity vs. Adaptive immunity • Comparison chart & diagram: Humoral vs. Cell Mediated Immunity Chapter Review Questions • Chap 17: pp.346-347 Online activities/webquests • Chap 17 p.347 Chapter readings with 5 sentence synopsis • Reading 17.1: "Viruses" p.327 • Reading 17.2: "A Special Immunological Relationship: Mother-to-Be and Fetus" pp.338-339 Laboratory exercises (online & hands-on) • Viral Transmission Lab • Rh typing between mother and fetus Chapter Applied Questions • Chap 17: pp.346-347 Bioethics reading and discussion questions • Chap 17: "Pig Parts" p.343	✓ 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

Forensics Focus and/or Case Studies
- Chap 17: p.347

Guided reading/Review handouts

CH18: Genetics of Cancer
Cancer, somatic mutations, germline mutations, dedifferentiated, metastasis, invasiveness, angiogenesis, cancer stem cells, proto-oncogenes, oncogene, fusion protein, tumor suppressor gene, population study, case-control study, prospective study

Vocabulary
Chapter topic scenario questions/discussion
- Chap 18: "Microarrays Illuminate Thyroid Cancer" p.348

Chapter outline
Lecture presentation/notes/discussion
Animations/videos
- Wit

Exercises:
- Cancer genetic causes concept map

Chapter Review Questions
- Chap 18: pp.368-370

Online activities/webquests
- Chap 18 p.370

Chapter readings with 5 sentence synopsis
- Reading 18.1: "Erin's Story: How Gleevac Treats Leukemia" pp.358-359

Laboratory exercises (online & hands-on)
Chapter Applied Questions
- Chap 18: pp.368-370

Forensics Focus and/or Case Studies
- Chap 18: p.370

Guided reading/Review handouts

Technology
- 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

Pacing Guide
Chapters 17-18 = 1 ½ weeks
Approx:
4 days: Chap 17 (quiz)
4 days: Chap 18 (quiz)
Review/reteach
Unit test / Unit Project due