Ganado Unified School District
(PLTW MEDICAL INTERVENTIONS /11-12)

ALL INFORMATION TAKEN DIRECTLY FROM PLTW COURSE MATERIAL AS POSTED ON THE MI ONLINE CURRICULUM

PACING Guide SY 2017-2018

Timeline & Resources	AZ Science Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
Q1 Lesson 1.1 The Mystery Infection 1.1.1 Medical Interventions Inventory 1.1.2 Investigating and Outbreak 1.1.3 Using DNA to Identify pathogens 1.1.4 What's the Concentration? 1.1.5 ELISA 1.1.6 Final Diagnosis	**Strand 4: Life Science** Concept 2: Molecular Basis of Heredity Understand the molecular basis of heredity and resulting genetic diversity. PO 1. Analyze the relationships among nucleic acids (DNA, RNA), genes, and chromosomes. PO 2. Describe the molecular basis of heredity, in viruses and living things, including DNA replication and protein synthesis. PO 3. Explain how genotypic variation occurs and results in phenotypic diversity. **Strand 1: Inquiry Process (ALL concepts and POs-ongoing)**	1. What is a medical intervention? 2. What are the main categories of interventions that function to maintain human health? 3. How do scientists gather evidence during the potential outbreak of an infectious disease? 4. What is bioinformatics? 5. How can DNA sequences be used to identify disease pathogens? 6. What is an antibody? 7. How do antibodies identify and inactivate antigens? 8. How can the ELISA assay be used to detect disease? 9. Why is it important for doctors to know the	It is expected that students will: • Recognize that medical interventions are measures to improve health or alter the course of an illness and can be used to prevent, diagnose, and treat disease. • Describe how bioinformatics, the collection, classification, storage, and analysis of biochemical and biological information using computers, can be used to identify disease pathogens. • Describe the applications of bioinformatics in health and wellness. • Recognize that diagnostic tests for infectious diseases can provide qualitative results, indicating the presence or absence of disease, as well as quantitative results, indicating the concentration of the infectious agent or of an	Antibody Antigen Bioinformatics Concentration ELISA (Enzyme-linked Immunosorbant Assay) Enzyme Genome Medical Intervention Outbreak Pathogen Primer Serial dilution Solute Solution Solvent Substrate

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		concentration of disease antigen present in a patient's system? 10. What steps do scientists take to diagnose, treat, and prevent future spread of a disease outbreak?	antibody produced in response to the disease agent. • Explain the principles of the Enzyme-linked Immunosorbant Assay (ELISA) test and describe how antibodies can be used to detect disease. • Analyze connections between individuals in a disease outbreak. • Use publically available molecular databases to search for DNA sequences and identify pathogens. • Compute serial dilutions and calculate resultant concentrations. • Perform ELISA testing to determine the concentration of infectious bacteria in simulated body fluids and identify infected patients.	
Q2 Lesson 1.2 Antibiotic Treatment Activity 1.2.1 Antibiotic Therapy Activity 1.2.4 When Antibiotics Fail		1. How do antibiotics work to fight bacterial infections? 2. What methods do bacteria use to share antibiotic resistant genes? 3. What actions are humans taking that are contributing to bacteria becoming	It is expected that students will: • Label the structures of a bacterial cell. • Explain the method of action for different classes of antibiotics. • Describe the pathways through which bacterial cells transfer genes. • Explain the importance of taking antibiotics as prescribed.	Antibiotic Antibiotic Resistance Conjugation Nucleoid Plasmid Transduction Transformation Nucleoid Plasmid Ribosomes

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		resistant to commonly used antibiotics?	• Use proper laboratory techniques to "mate" a streptomycin resistant strain of E. coli with an ampicillin resistant strain of E. coli. • Simulate the effects of antibiotics on a bacterial population during an infection. • Simulate the effect of a missed dose of antibiotics on a bacterial population during an infection.	Cell wall Plasma membrane (cell membrane) Capsule Flagella Pili Endotoxins
<u>Lesson 1.3 The Aftermath:Hearing Loss</u> Activity 1.3.1 Good Vibrations Activity 1.3.2 Can You Hear Me Now? Activity 1.3.3 Cochlear Implant Debate		1. How do frequency and amplitude affect how humans interpret sound? 2. What causes different types of hearing loss? 3. How is hearing loss diagnosed? 4. What interventions are available for patients with hearing loss? 5. What are the bioethical concerns related to the use of cochlear implant technology?	It is expected that students will: • Identify the structures of the ear and describe their function in hearing. • Describe the pathway of sound vibrations from the time a sound is generated to the time the brain registers the sound. • Recognize that there are bioethical concerns and considerations related to the use of cochlear implant technology. • Demonstrate sensorineural versus conductive hearing loss on a model of the ear. • Perform several simple tests, such as Rinne Test and the Pure Tone Test, to evaluate hearing. • Interpret audiograms to identify different types of hearing loss.	Audiogram Cochlear Implant Conductive Hearing Loss Hearing Aid Inner Ear Middle Ear Outer Ear Sensorineural Hearing Loss Sound Pinna Auditory canal Eustachian tube Ossicles (malleus, incus, and stapes) Tympanic membrane (eardrum) Cochlea Sensory hair cells Cochlear nerve

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			• Recommend the most appropriate type of intervention for a patient with hearing loss, given the patient's audiogram.	Oval Window Vestibule Vestibular nerve
<u>Lesson 1.4 Vaccination</u> Activity 1.4.1 Disease Prevention Through Vaccination Activity 1.4.3 Life of An Epidemiologist		• Describe how vaccines interact with the human immune system. • Recognize that many diseases have been eradicated by large-scale vaccination campaigns. • Describe the various laboratory methods that are used to manufacture vaccines. • Recognize that plasmids can be employed as an important tool in genetic engineering and can serve as vectors, vehicles for the movement of genetic information. • Explain how molecular tools such as ligase and restriction enzymes are used to cut and paste DNA from different sources.	1. What is vaccination? 2. How does a vaccine activate the body's immune system? 3. How has vaccination impacted disease trends in our country? 4. What methods are used to produce vaccines in the laboratory? 5. What is recombinant DNA technology? 6. What are the molecular tools used to assemble recombinant DNA? 7. How can recombinant DNA and bacterial cells be used to produce vaccines? 8. How can engineered plasmids be inserted into bacterial cells? 9. What is epidemiology? 10. How can epidemiologists assist with the detection, prevention, and treatment of both chronic and infectious disease?	Case-control study Cohort study DNA ligase Epidemic Epidemiology Herd immunity Inoculation Plasmid Recombinant DNA Restriction enzyme Vaccination Vaccine Tuberculosis Hantavirus pulmonary syndrome (HPS) Mad cow disease Avian influenza (bird flu) Malaria Lyme disease Cervical cancer Legionnaire disease Plague Measles Ebola hemorrhagic fever AIDS

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		• Describe how recombinant DNA technology can be used to produce vaccines. • Identify the appropriate steps in an outbreak investigation. • Assume the role of an epidemiologist to analyze disease data, design an epidemiologic study, and evaluate prevention and therapy for chronic and infectious diseases.		Smallpox Polio Anthrax West Nile Virus SARS

Ganado Unified School District
(Insert Subject/Grade Level)

PACING Guide SY 2014-2015

Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
Q3 Lesson 2.1 Genetic Testing and Screening Activity 2.1.1 Chronicles of a Genetic Counselor DNA Detectives (from HBS) Activity 2.1.5 Maternal and Child Health		What is genetic testing? What are the duties of a genetic counselor? What is the goal of PCR? What are the steps of the PCR process? What is the relationship between phenotype and genotype? What are SNPs? How can restriction enzymes and electrophoresis be used to identify SNPs and determine genotype? What medical interventions and lifestyle modifications can help a pregnant	It is expected that students will • Recognize that the polymerase chain reaction (PCR) is a laboratory procedure that produces multiple copies of a specific DNA sequence. • Explain how single base pair changes called single nucleotide polymorphisms (SNPs) can be identified through genetic testing and often correlate to specific diseases or traits. • Describe proper prenatal care and the medical interventions that function to monitor a pregnancy. • Compare the process of amniocentesis and chorionic villus sampling. • Analyze a genetic counseling case file and provide feedback	Amniocentesis Anneal Carrier screening Chorionic villus sampling (CVS) Denaturation Gene Genetic counseling Genetic testing Genome Genotype Karyotype Newborn screening Phenotype Polymerase chain reaction (PCR) Preimplantation Genetic Diagnosis (PGD) Primer Restriction enzyme

		woman have a healthy pregnancy? What can amniocentesis and chorionic villus sampling tell a couple about their developing fetus?	regarding potential genetic outcomes. • Use laboratory techniques such as DNA extraction, PCR, and restriction analysis to identify single base pair differences in DNA. • Analyze genetic testing results to predict phenotype. • Analyze a karyotype.	Single nucleotide polymorphism (SNP) Supernatant Taq polymerase Thermal cycler Ultrasonography
Q4 <u>Lesson 3.1 Detecting Cancer</u> Activity 3.1.1 Who is Affected by Cancer? Activity 3.1.2 Diagnostic Imaging Career Activity Activity 3.1.3 When Cells Lose Control Activity 3.1.4 DNA Microarray Project 3.3.3 Design of a Prosthetic Arm		1. What fundamental characteristics do all cancers have in common? 2. In what ways are diagnostic imaging technologies used to diagnose and treat disorders? 3. What do DNA microarrays measure? 4. How is DNA microarray technology used to determine the differences in gene expression between different tissue samples? 5. How are the similarities of gene expression patterns between different individuals calculated?	It is expected that students will: • Recognize that there are many different types of cancer, each with specific risk factors, manifestations in the body, and treatment options. • Describe the different uses for X-rays, CT scans, and MRIs as well as how each technology works. • Describe the differences in the appearance of normal cells and cancer cells. • Recognize that DNA microarrays measure the amount of mRNA for genes that is present in a cell sample. • Use a microscope to compare normal cells and cancer cells. • Perform a simulated DNA microarray to analyze gene expression patterns.	Apoptosis Biopsy Bone Scan Cancer Cell Cycle Computed Tomography Scan (CT or CAT Scan) Diagnostic Imaging DNA Microarray Magnetic Resonance Imaging (MRI) Oncogene Osteosarcoma Proto-oncogene Radiology Risk Factor Tumor Suppressor Gene X-ray Apoptosis Blood vessels Cell cycle

				Cell division Metastasis Mutations Oncogenes Proto-oncogenes Regulated Signals Tumor Suppressor Genes