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| Introduction |
| Write a brief list of what you will learn in this chapter: |
| CELLS AND MOLECULES  Molecules of Life  In the chart below, name the four basic types of molecules and describe each one briefly.    Describe DNA and RNA.  Why do anthropologists care about DNA?  What is the relationship between RNA and amino acids?  What chemical elements characterize an amino acid? |

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| Cells | | **Compare and contrast the cellular organisms Prokaryotes and Eukaryotes. In your comparisons, use the following words: Organelles, Microbiome,** Archaea **and Tissues**   |  |  | | --- | --- | | **Prokaryotes** | **Eukaryotes** | |  |  | | | |
| Animal Cell Organelles  The purpose of this section of the chapter is to help you understand how a cell is structured and how the parts of a cell function. One way to remember new information is to compare the new things you are learning to things or processes that you already know. Below, you will see the chart from page 8 in your chapter. In the third, blank spot, write down what process or object that organelle reminds you of. If you learn better with pictures, draw a picture that will help you remember the organelles purpose.   |  |  |  | | --- | --- | --- | | Cell Structure | Description | Reminds me of . . . . | | Cytoplasm | Fluid substance located inside of cell membrane that contains organelles. |  | | Nucleopore | Pores in the nuclear envelop that are selectively permeable. |  | | Nucleus | Contains the cell’s DNA and is surrounded by the nuclear envelope. |  | | Nucleolus | Resides inside of the nucleus and is the site of ribosomal rRNA) transcription, processing, and assembly. |  | | Mitochondrion | Responsible for cellular respiration, where energy is produced by converting nutrients into ATP (Adenosine triphosphate). |  | | Ribosome | Located in the cytoplasm and also the membrane of the rough endoplasmic reticulum. Messenger RNA (mRNA) binds to ribosomes and proteins are synthesized. |  | | Endoplasmic reticulum (ER) | Continuous membrane with the nucleus that helps transport, synthesize, modify, and fold proteins. Rough ER has embedded ribosomes, whereas smooth ER lacks ribosomes. |  | | Golgi Body | Layers of flattened sacs that receive and transmit messages from the ER to secrete and transport proteins with the cell. |  | | Lysosome | Located in the cytoplasm and contains enzymes to degrade cellular components. |  | | Microtubule | Involved with cellular movement including intracellular transport and cell division. |  | | Centrioles | Assist with the organization of mitotic spindles which extend and contract for the purpose of cellular movement during mitosis and meiosis. |  |   Page 7 discusses itochondrion. Below, describe what mitochondrion do, why they are important and what makes them unique. In your description, use the terms **Adenosine triphosphate** and **mitochondrial DNA**. | | | | |
| INTRODUCTION TO GENETICS | **Mutations**  **Ancient DNA** | | | What does a molecular anthropologists study? |
| SPECIAL TOPIC: Focus on Native American Immunity And European Diseases—A study of Ancient DNA | **Tsimshians**  **HLADQ-1** | | | After reading this special topic inset, do three things:  1) Identify the major questions anthropologists hoped to answer by studying the DNA of Tsimshians.  2) List the major conclusion the anthropologist came to regarding the Tsimshians.  3) Connect the major ideas in the special topic inset to what you learned about the reasons anthropologists study DNA. |
| DNA Carries Hereditary Information | Oswald Avery  Colin McLeod  Maclyn McCarty | | | What major discovery did Avery, McLeod and McCarty make? |
| DNA Structure | Rosalind Franklin  James Watson  Francis Crick  Maurice Wilkins  **Base pairs** | | | Draw a picture and label DNA, or describe it in words.  Name the four DNA nucleotides and indicate which one bonds with which. |
| DNA IS Highly Organized within the Nucleus | **Histones**  **Chromatic**  **Chromosome**  **Euchromatin**  **Centromeres**  **Telomeres** | | Draw a picture or write a paragraph in which you explain how DNA is organized within a nucleus. Use the words in the middle column.  What role do centromeres and telomeres play in cell division? | |
| REPLICATION AND CELL DIVISION | **DNA Replication**  **Cell Cycle** | | What processes are necessary for a cell to undergo if an organism is to remain healthy? | |
| DNA Replication  Using the following words, describe the three steps of DNA replication.  **Semi-conservative replication, Initiation. Elongation, Helicase, Leading strand, Lagging strand, Primer, DNA Polymerases and Okazaki fragments. Write the name of the step in the bubble and describe it in the chart to the right.**   |  |  | | --- | --- | |  |  | |  |  | |  |  | | | | | |
| DNA Mutations | **deleterious** | | What can go wrong during DNA replication?  What process does the boy have in place to try to eliminate mutations? | |
| SPECIAL TOPIC: The Cell Cycle and Immortality of Cancer Cells | **Interphase**  **apoptosis** | | Explain why cancer cells are able to divide indefinitely. Use as many of the words for cells parts and processes that you can. | |
| Mitotic Cell Division | **Somatic Cells**  **Diploid**  **Homologous chromosomes**  **Sister chromatids**  **Mitosis** | | Describe the basic process of mitosis using drawings, a time-line or a paragraph. Use as many words from the middle column as possible. | |
| Meiotic Cell Division | **Gametes**  **Meiosis**  **Genetic Recombination**  **Haploid** | | What tissue is Meiotic cell division specific to?  Explain how meiosis is similar to mitosis. Next, explain how it is different. | |
| PUTTING IT TOGETHER:  You learned that most cells in the body undergo mitotic cell division when they need to repair themselves or grow. However, gametes undergo Meiosis. Why do you suppose the process of meiosis is specific to gametes? How does this fact affect offspring? | | | | |
| Chromosomal Disorders | **Aneuploid**  **Karyotyping** | | What problems sometimes happen during mitosis or meiosis? | |
| PROTEIN SYNTHESIS | **Amino acids**  **Enzymes** | | Explain how amino acids can create proteins in the human body that perform many different functions. | |
| Transcription and Translation | **Protein Synthesis**  **Transcription Translation**  **Messenger RNA**  **Gene**  **Introns**  **Exons**  **Splicing** | | What is the purpose of Transcription?  Describe the basic process of transcription using as many words in the middle column that you can.  Describe the basic process of translation using as many words in the middle column as you can. | |
| SPECIAL TOPIC: Genetic Regulation of the Lactase (LCT) Gene | **Promotor**  **Transcription factor**  **RNA polymerases**  **Ribosomal RNA (rRNA)**  **Transfer RNA (tRNA)** | | Explain how a cell gets “turned on” (transcribed?)  What are the roles of tRNA and rRNA in making sure a person can digest lactose?  Why are some adults able to digest milk while others cannot? | |
| MENDELIAN GENETICS AND OTHER PATTERNS OF INHERITANCE | **Mendelian Genetics** | | Mendel’s work wasn’t recognized right away because his finding didn’t support the common thinking about heredity at the time. How were his ideas different?  What ideas did he introduce into the world of genetic inheritance? | |
| Mendelian Genetics | **Phenotype**  **Genotype**  **Alleles**  Punnett square  **Heterozygous**  **Homozygous**  **Dominant**  **Recessive**  *Law of Segregation* | | Explain the relationship between a phenotype, a genotype and an allele.  Explain the concepts of heterozygous and homozygous as it relates to dominant and recessive traits.  What does it mean that a human disease follows a Mendelian pattern of inheritance? | |
| Example of Mendelian Inheritance: The ABO Blood Group System | **Cell Surface Antigens**  **Antibodies**  **Codominance** | | Why was Karl Landsteiner’s work important?  What is the relationship between antibodies and antigens?  Explain why a person with the AO genotype is phenotypically type A.  How does a person end up with type O blood?  Why are people with O- blood universal donors? | |
| Mendelian Patterns of Inheritance and Pedigrees | **Carrier**  **Autosomal**  **X-Linked**  **Autosomes** | | This section discusses three scenarios regarding diseases and inheritance. What general conclusions can you draw about inheritance from these three scenarios? Use the words in the middle column in your answer. | |
| Complexity Surrounding Mendelian Inheritance | Incomplete dominance  **Penetrance** | | This section’s purpose is to help you understand that Mendelian Inheritance can be more complicated than simply passing along a certain gene to offspring.  Explain how incomplete dominance works  Explain what penetrance means. What factors might impact whether or not a person develops a condition for which they have a genetic predisposition? | |
| POLYGENIC TRAITS | **Polygenic traits**  **Complex diseases** | | Contrast polygenetic traits with Mendelian traits.  Why don’t complex diseases have a clear pattern of inheritance? | |
| GENOMICS AND EPIGENETICS | **Genome**  **Epigenetics** | | Define epigenetics and discuss its importance. | |
| Genomics | Non-coding DNA  **Sequencing**  **Genotyping** | | Why was non-coding DNA considered “junk DNA?” How has that perception changed? (use the human- chimpanzee example in your answer.)  What might a student of genomics regulatory elements mean for human health in the future? | |
| Epigenetics | Epigenetics  **DNA methylation**  Histone modifications  **Epigenetic profile** | | How is it that cells can have the same DNA but difference morphologies?  What does it mean to say that DNA methylation makes chromatin more compact?  What impact can environmental stressors have on human DNA? | |
| SPECIAL TOPICS: Epigenetics and X Chromosome Inactivation | Mary Lyon | | Explain why calico and tortoiseshell cats are nearly always female. | |
| GENETIC TESTING |  | | What benefits might genetic testing have on human health? | |
| Polymerase Chain Reaction (PCR) and Sanger Sequencing | **Polymerase chain reaction (PCR)**  **Sanger Sequencing** | | Describe the impact of PCR on studies of ancient humans and criminal investigations.  What does Sanger sequencing enable scientists to do? | |
| Genetic Biotechnology and Clinical Testing | **Microarray technology**  **Next generation sequencing** | | Describe microarray technology and next generation technology. What will this technology enable scientists to with human DNA? | |
| Direct-to Consumer (DTC) Genetic Testing |  | | What can consumers learn from Direct to Consumer Genetic Testing?  What are some controversies surrounding the work of companies like 23andMe?  Why might ancestry percentage tests not be as accurate as people think they are? | |
| *PUTTING IT TOGETHER:*  The Direct-to-Consumer Genetic Testing section of this chapter discusses the “Burden of Knowing.” Do you think it is overall good or bad that people receive information about their genetic risk for diseases like Alzheimer’s? Why? | | | | |