Human Body Systems Pacing Guide (59 instructional days)

Lesson	Recommended Number of Periods	Focus Questions	Concepts
Lesson 1: Human Body Systems: Preassessment	**3**	• What do we know about the organs and systems that comprise the human body?	• The human body is made up of systems, which are made up of organs, which are made up of tissues, which are made up of cells.
Lesson 2: Moving Through The Digestive Tract	**3**	• How is food moved through the digestive tract? • What is the order of the parts of the digestive tract? (not system)	• Food passes through the digestive system by the process of peristalsis. • The digestive tract is lined with mucus, a slippery secretion that helps food pass through the system. • Models can have limitations. The tennis ball model does not illustrate chemical or mechanical breakdown of food.
Lesson 3: Exploring Carbohydrates	**3**	• How are indicators used to determine the presence of starches and sugars? • How are carbohydrates used in the body?	• Carbohydrates are one of the three basic food types. (SG, p. 14) • Carbohydrates are the major source of energy for the body. (SG, p. 20-21) • Benedict's solution is an indicator for sugar; it changes color based on concentration. • Lugol 's solution is an indicator for the presence of starch.
Lesson 4: Digestion in the Mouth	**2**	• How does the mouth physically and chemically change food? • What is the purpose of mechanical digestion?	• Mechanical digestion is the process of breaking food into smaller pieces. • Chemical digestion is the process of breaking the chemical bonds in nutrients and changing them into simple forms that can be absorbed into the bloodstream. • Mechanical digestion helps prepare food for chemical digestion by increasing the points of contact (surface area) between digestive chemicals (enzymes) and nutrients (food). • Digestive enzymes are specific; in other words, they act only on one type of nutrient. • Saliva contains salivary amylase, an enzyme that begins the chemical digestion of starch.
Lesson 5: Digestion in the Stomach	**3**	• What is the role of gastric juice on proteins in the stomach? • How effective are HCl and pepsin when they work alone to chemically digest and change protein? • How do our bodies use proteins?	• Mechanical digestion occurs in the stomach through peristalsis. • The chemical digestion of protein begins in the stomach as a result of the action of gastric juices, which is a mixture of pepsin and HCl. • Pepsin is an enzyme. • Some enzymes require special conditions to function; for example, the chemical digestion of protein by pepsin can occur only in the acid environment created by HCl. • Digestive enzymes are specific: They digest only one type of nutrient.

Lesson 6: Diffusion and Active Transport	**3**	• What is the role of diffusion and active transport in the small intestine? • How are fats mechanically and chemically digested in the small intestine? • How does the body use fats?	• Diffusion, or passive transport, is a process by which molecules spread out from places where they are more concentrated to places where they are less concentrated. It is an important concept when considering how nutrients and waste pass into the blood and how gases are exchanged between the lungs and blood. • Some substances pass through a semi-permeable membrane by diffusion and some do not. • Some nutrients need help in passing through the walls of the small intestine. This is done by ***active transport***. Certain substances are able to move through a semi permeable membrane only if a living cell supplies the energy.
Lesson 7: Surface Area and Absorption	**2**	• How does changing the surface area affect the amount of contact points for nutrients to be absorbed in the small intestines? • What happens to water and undigested food that cannot diffuse into the circulatory system?	• Nutrients pass through the walls of the small intestine by absorption (diffusion and active transport). • The amount of nutrients that pass into the bloodstream depends in part on the amount of surface area available for their absorption. • The human digestive system has a large surface area to absorb large amounts of nutrients. • The small intestine has folds (villi and microvilli) that increase its surface area. (SG, p 54-55) • Excess water is absorbed into the bloodstream from the large intestine. (SG, p. 57) • Solid waste is stored in the large intestine until it is eliminated from the body. (SG, p. 56-57)
Lesson 8: The Digestive System: Assessment	**2**	• How would you determine which unknown starch solution has an enzyme present?	
Lesson 9: Anchor Activity: Diseases and Health Careers	**3**	• What can we learn about diseases that affect human body systems? • What health careers are concerned with the treatment and/or cure of human disease?	
Lesson 10: Assessing Breathing Models	**2**	• What are models and why are they used? • How does air move into and out of the lungs? • Why do humans breathe?	• Breathing is the mechanical process of moving air into and out of the lungs. • The bloodstream releases waste carbon dioxide into the lungs while picking up oxygen, via diffusion and surface area. • Models have strengths and limitations.

Lesson 11: How Much Air Can You Exhale?	**3**	• How much air can your lungs hold? • What factors affect lung capacity?	• There is always some air left in the lungs; this is called residual volume. • Total lung capacity is greater than the amount of air you can inhale or exhale. • Many internal and external factors influence lung capacity.
Lesson 12: Recipe for Energy — Cellular Respiration	**4**	• How are combustion and respiration alike and how are they different? • What are the ingredients for cellular respiration and where do they come from? • How does the body convert food into energy?	• Oxidation occurs when substances combine with oxygen • Combustion is a form of oxidation that is accompanied by a rapid release of energy in the form of heat. • Cellular respiration is the process by which nutrients are oxidized to release energy. • Energy, carbon dioxide, and water are products of cellular respiration. • Carbon dioxide and a small quantity of heat are eliminated from the body during exhalation. • Exhaled air contains a higher percentage of carbon dioxide than inhaled air does. • Both breathing and respiration involve the reactant of oxygen and the product of carbon dioxide. • Carbon dioxide can pass through a membrane.
Lesson 13: Releasing Energy From Food	**2**	• How does the amount of energy released from one nutrient (protein/fat, carbohydrates) compare to the amount of energy released from a similar quantity of a different nutrient?	• A calorie is a unit of measure of heat energy. • Oxidation occurs when substances combine with oxygen. • Combustion is a form of oxidation that is accompanied by a rapid release of energy in the form of heat and light. • One phase of cellular respiration is when nutrients are oxidized to release energy. • Different foods have different caloric values.
Lesson 14: The Pumping Heart	**3**	• Why does the blood flow from the heart, to the lungs, back to the heart, and out to the body? • What is the role of the heart in transporting the raw materials and waste products of cellular respiration?	• The heart consists of two pumps: the right pump sends blood to the lungs and the left pump sends blood to the rest of the body. • The valves of the heart prevent the backward flow of blood. • Humans have a closed circulatory system. • The respiratory and circulatory systems are dependent on each other • Models have strengths and limitations.
Lesson 15: Factors Affecting Heart Rate	**3**	• What are some factors that affect heart rate? • What are the jobs of different types of blood?	• One's pulse is the rhythmic expansion and recoil of arteries (measured by pressing an artery over a bone) that is caused by the contractions of the heart. • Heart rate can be determined by measuring one's pulse. • Heart rate can be influenced by a variety of factors, including exercise and weight.
Lesson 16: The Heart Meets Resistance	**2**	• What factors limit the flow of blood through the body?	• Blood pressure is a measure of the resistance of vessel walls to the flow of blood generated by contractions of the ventricles of the heart. • When arteries are narrowed by plaque, or hardened by age, the heart must work harder to pump blood through them.

Lesson 17: The Respiratory and Circulatory Systems—Assessment	**3**	• How is exercise and breathing rate related? • How do the digestive, respiratory, and circulatory systems work together to keep humans alive and functioning efficiently?	• The functions of the respiratory and circulatory systems are closely linked.
Lesson 18: The Musculoskeletal System—An Overview	**3**	• How do muscles and bones work together? • How does the structure of a chicken wing compare with that of a human arm? • Why is it important to build bone mass now? How do you do this?	• Muscles, bones, and nerves are interdependent and work closely together. • Skeletal muscles can only contract, or pull. Therefore skeletal muscles work in opposing pairs. • The wing of a chicken is similar in structure and design to a human arm. • The following tissues can all be found in a chicken wing: muscle, epithelial, connective, and nervous tissue. • Joints are places where bones meet. • Connective tissue includes tendons and ligaments.
Lesson 19: Joints and Movement	**3**	• What types of movements do different joints allow? • How do muscles work with bones to move the body?	• Joints are where bones meet. Movement is enabled, and limited by, the different types of joints in the human body. • Models enable us to understand the anatomy of the human arm, spinal column, and types of joints found in these parts of the body. • Skeletal muscles work in opposing pairs and allow humans to bend and extend their bodies in various ways.
Lesson 20: Muscle Size and Strength	**3**	• How can you measure muscle strength? • Is muscle size an indication of muscle strength?	• The size of a muscle group may be an indication of its strength. • The force exerted by muscles is a measure of their strength.
Lesson 21: Exploring Muscle Fatigue	**2**	• How and why do muscles fatigue? • How do muscles feel when they are fatigued? • What controls the movement of the muscles?	• Skeletal muscles have limited endurance; they tire unless allowed to rest, refuel, and eliminate waste products.
Lesson 22: The Body in Balance	**2**	• How does the body maintain its homeostasis with regards to body temperature?	• Homeostasis is the ability of an organism to maintain a relatively stable internal environment; e.g. temperature. • The nervous, excretory, and circulatory systems play major roles in maintaining a constant body temperature in warm-blooded animals.