Effects of Drugs and Alcohol
Middle School or High School

This guide is for middle and high school students participating in the AIMS Effects of Drugs and Alcohol Demonstration. Programs will be presented by an AIMS Anatomy Specialist. During this session, students will examine major organs and body systems such as the heart, lungs, brain, liver and kidneys, and the impact that drugs and alcohol have on their function.
Students will better understand the effects of smoking, vaping, tobacco, marijuana, cannabis and alcohol on the human body. Included in this guide, you will find additional resources such as important terminology and pre/post tests for your students.

National Science Education (NSES) Content Standards

Content Standard K-12	Unifying Concepts and Processes: systems order and organization; evidence, models and explanation; form and function
Content Standard A	Science as Inquiry
Content Standard B	Physical Science
Content Standard C	Life Science: matter, energy and organization of living systems
Content Standard F	Science in Personal Health and Social Perspectives: personal and community health

Show Me Standards (Science and Health/Physical Education)

Science 1	Properties and principles of matter and energy
Science 3	Characteristics and interactions of living organisms
Health/Physical Education 1	Structures of, functions of and relationships among human body systems
Health/Physical Education 2	Principles and practices of physical and mental health
Health/Physical Education 3	Diseases and methods for prevention, treatment and control
Health/Physical Education 4	Principles of movement and physical fitness
Health/Physical Education 5	Methods used to assess health, reduce risk factors, avoid high-risk behaviors
Health/Physical Education 6	Consumer health issues
Health/Physical Education 7	Responses to emergency situation

Missouri Learning Standards

Life Sciences (6-8.LS1.A.4)	Interacting systems carry out key body functions to provide nutrients, remove waste, control motion and coordination and protect body
Life Sciences (9-12.LS1.A.2)	Interacting systems that provide specific functions within multicellular organisms

Lesson Objectives:

Students will participate in the use of a cadaver as a learning tool for health science education.
Students will increase their understanding of major organs and body systems including the heart, lungs, brain, liver and kidneys.
Students will increase their understanding of the effects of smoking, vaping and alcohol and how their use directly impacts the function of those organs and systems.
Students will increase their foundational knowledge of the human body as it relates to disease prevention, treatment and overall health and wellness.
Students will increase their participation in their own health management by asking questions, seeking out information and/or taking initiative.

Prerequisite Knowledge:

Students should be familiar with terms relating to the major organs and systems.

Materials:

Review of Terminology/Vocabulary Reference Guide
Pre/Post Test

Effects of Drugs and Alcohol
Terminology/Vocabulary Reference Guide

Alcohol	Organic substance; ethanol is type used in beverages. After ingested, the body converts to a sugar-based fuel that acts a depressant to the central nervous system.
Alveoli	Tiny microscopic air sacs of the lungs
Anthracosis	Black discoloration of bronchi due to carbon pigment, often due to inhalation of coal dust and wood smoke; also known as black lung disease
Aorta	Main and largest artery of body, supplying oxygenated blood
Aortic arch	Curved portion between the ascending and descending portion of the aorta; 3 main branches are the brachiocephalic trunk, left common carotid artery and left subclavian artery which supply the head, neck and arms
Arteries	Blood vessels that conduct blood away from the heart and into circulation
Atherosclerosis	Changes in the walls of large arteries consisting of lipid deposits on the artery walls; early stages of arteriosclerosis
Bile	Greenish-yellow or brownish fluid produced in and secreted by the liver, stored in gallbladder and released into the small intestines; helps emulsify fats
Bladder	Smooth, collapsible muscular sac that stores urine temporarily
Brainstem	Portion of the brain consisting of the medulla oblongata, pons Varolii and midbrain; connects spinal cord to forebrain and cerebrum
Bronchioles	Branching air passages inside the lungs
Bronchus	One of the two large branches of the trachea that leads to the lungs
Cardiomegaly	Enlarged heart, indicator of a condition that puts a strain on heart and makes it bigger than normal
Cancer	Large group of diseases that involve normal cells growing uncontrollably, becoming cancerous and multiplying and spreading
Carina	A ridge at the base of the trachea that separates the openings of the right and left main bronchi
Carotid arteries	A pair of major blood vessels that supply oxygen-rich blood from the heart to the brain and face

Effects of Drugs and Alcohol
Terminology/Vocabulary Reference Guide (Continued)

Cerebellum	Tri-lobed structure of brain, lying posterior to the pons and medulla oblongata and inferior to the occipital lobes of the cerebral hemispheres; second largest part of brain. It is responsible for the regulation and coordination of complex voluntary muscular movement as well as the maintenance of posture and balance.
Cerebral Vascular Accident (Stroke)	Occurs when there is a disruption of blood flow to brain, leading to brain cell damage. There are two main types of strokes: ischemic stroke (caused by a blockage) or a hemorrhagic stroke (caused by a rupture of a blood vessel).
Cerebrum	Large rounded structure of brain that occupies most of the cranial cavity, divided into two cerebral hemispheres that are joined at the bottom by the corpus callosum. Controls and integrates motor, sensory and higher mental functions such as thought, reasoning, emotion and memory
Chronic Bronchitis	Inflammation of the airways (trachea, bronchi or bronchioles); form of COPD where lungs fill with mucus
Chronic Obstructive Pulmonary Disease (COPD)	Group of progressive lung diseases, primarily emphysema and chronic bronchitis; cause breathing difficulties due to obstructed airflow
Cannabis	Refers to the leaves, flowers, stems and seeds of cannabis plant and all products derived from plant. Plant contains 500 chemical substances including cannabidiol (CBD) and tetrahydrocannabinol (THC) which has intoxicating mind-altering effects.
Cirrhosis	Severe and advanced scarring of the liver, caused by many diseases and conditions, including hepatitis or alcohol use disorder
Coronary arteries	The two arteries that branch from the base of the aorta and supply the heart muscle with oxygenated blood
Diabetes	Disease caused by deficient insulin release, leading to the inability of body cells to use carbohydrates
Digestion	Chemical breakdown of foods into simpler substances
Emphysema	Chronic lung disease involving permanent enlargement of alveoli, leading to shortness of breath and difficulty in breathing. Primarily caused by smoking but can also result from air pollution and chemical fumes
Endocrine system	Network of glands and organs that produce and regulate hormones

Effects of Drugs and Alcohol
Terminology/Vocabulary Reference Guide (Continued)

Enzymes	Members of the class of proteins that aid in the breakdown of foods
Esophagus	Muscular tube extending from the laryngopharynx through the diaphragm to join the stomach
Fatty Liver Disease	Also known as hepatic steatosis; a condition involving the presence of excess fat in the liver. Over time, that accumulation can impair liver function.
Frontal lobe	Largest of the four major lobes of the cerebral cortex; located at front of brain. Responsible for thinking, reasoning, self-control and motor function
Gallbladder	Sac beneath right lobe of liver used for bile storage
Hepatitis	Inflammation of the liver; can result from various causes, including viral infections, chemicals, drugs, alcohol and autoimmune responses
Hippocampus	Small, curved formation deep in the temporal lobe of the brain; part of the limbic system responsible for forming new memories, learning and emotions
Inferior vena cava	Major vessel that returns oxygen-depleted blood to the right atrium of the heart from body regions inferior to the diaphragm
Insulin	Hormone that enhances the carrier-mediated diffusion of glucose into tissue cells, thus lowering blood glucose levels
Kidneys	Pair of organs located in the right and left side of the abdomen which clear poisons from the blood, regulate acid concentration and maintain water balance in the body by excreting urine
Left atrium	Chamber on the left side of the heart that receives oxygenated blood from the pulmonary veins
Left ventricle	Inferiorly-located chamber on the left side of the heart that receives oxygenated blood from the left atrium and pumps it into the systemic circulation via the aorta
Liver	Lobed accessory organ that overlies the stomach; produces bile to help digest fat and serves other metabolic and regulatory functions
Lungs	Pair of vital respiratory organs that facilitate gas exchange; supply oxygen to the bloodstream and remove carbon dioxide, a waste product of metabolism
Marijuana	Psychoactive part of hemp or cannabis plant that contains high levels of THC; can be smoked, vaped or ingested

Effects of Drugs and Alcohol
Terminology/Vocabulary Reference Guide (Continued)

Meninges	Three layers of tissue that cover and protect the brain and spinal cord
Myocardial Infarction (MI)/Heart Attack	Damage that occurs to the heart when one of the coronary arteries is occluded
Nervous system	Network of nerve cells and fibers that transmits nerve impulses between parts of the body; body's main communication system
Nicotine	An addictive organic compound found in tobacco plants
Oxidative stress	Imbalance between free radicals and antioxidants, leading to cell and tissue damage; associated with various chronic diseases and induced by viral infections, environmental toxins, drugs, alcohol and diet
Pancreas	Gland located behind the stomach, between the spleen and duodenum; produces both endocrine and exocrine secretions
Pancreatitis	Inflammation of the pancreas, can be acute (sudden onset) or chronic (ongoing)
Pathology	Study of disease and its causes, mechanisms and effects; can be used to describe characteristics of a disease itself
Pericardium	Double-layered membrane or serosa that surrounds the heart and roots of the great vessels
Prefrontal cortex	Part of the frontal lobe located at the front of the brain, responsible for various essential functions such as executive functioning, memory, attention and emotion regulation. Influences behavior, personality, and decision-making
Pulmonary trunk	Vessel that leaves the right ventricle and routes blood to the lungs where gas exchange occurs
Right atrium	Chamber on the right side of heart that receives oxygen-depleted blood returning to the heart from the superior vena cava, the inferior vena cava and coronary sinus
Right ventricle	Inferiorly-located chamber on the right side of the heart that receives oxygen-depleted blood from the right atrium and pumps it to the lung

Effects of Drugs and Alcohol
Terminology/Vocabulary Reference Guide (Continued)

Second hand smoke	Smoke inhaled involuntarily by non-smokers when near sources of tobacco smoke; consists of smoke exhaled by smokers and smoke from the burning end of tobacco products. There is no safe level of exposure to it; sometimes referred to as passive smoking or environmental tobacco smoke.
Seizures	Abnormal electrical activity in the brain, which causes changes in awareness, muscle control and can lead to various symptoms affecting behavior and senses.
Small intestine	Long tube-like section of the digestive tract where most food digestion and absorption occur
Smoking	Act of inhaling and exhaling the fumes of burning plant material
Spinal cord	Tube of tissue that runs through center of spine from brainstem to lower back. Composed of nerves and cells that carry messages from brain to rest of body; one of the main parts of nervous system
Spleen	Largest lymphoid organ; provides for lymphocyte proliferation, immune surveillance and response and blood-cleansing functions
Stomach	J-shaped muscular organ that stores and helps digest food
Subclavian artery/vein	Pair of major vessels located below the clavicle that supply blood to the head, neck, chest, shoulders and upper extremities. Left subclavian artery branches off the aortic arch; right subclavian artery off the brachiocephalic trunk.
Superior vena cava	Major vessel that returns oxygen-depleted blood to the right atrium of the heart from body regions superior to the diaphragm
Temporal lobe	One of the four major lobes of the brain, located near the temples; primarily responsible for processing auditory information, forming memories, comprehending language and regulating emotions
THC	Also known as tetrahydrocannabinol which is the primary psychoactive compound found in cannabis; activates neurons responsible for pleasure, memory and thinking, leading to the sensation of being "high"
Tobacco	Plant with leaves that contain nicotine that are smoked, chewed or used in other ways
Trachea	Fibrocartilaginous tube, lined with mucous membrane, passing from the larynx to the bronchi

Ureter	Either of the paired ducts that carry urine from kidneys to bladder

Effects of Drugs and Alcohol
Terminology/Vocabulary Reference Guide (Continued)

Valves	Allows blood to flow in one direction through the chambers of the heart; act like one-way doors, opening and closing to ensure that blood moves at the right time and in the correct direction
Vaping	Inhaling vapor from an electronic device that heats up and vaporizes a liquid or solid
Veins	Blood vessels that return blood toward the heart from the circulation
Vertebral arteries	A pair of blood vessels that supply blood to the brain and spine

AIMS ADVENTURES IN MEDICINE AND SCIENCE
SAINT LOUIS UNIVERSITY

Effects of Drugs and Alcohol
Pre/Post Test

1. The primary agent in cigarettes, cigars and e-cigarettes that is highly addictive is known as: _____
2. Name 4 ways that smoking affects your lungs:
   - _____
   - _____
   - _____
   - _____
3. Name 3 ways that smoking affects your heart:
   - _____
   - _____
   - _____
4. Vaping impacts two areas in the brain. Name these areas:
   - _____
   - _____
5. Fatty liver disease involves excess buildup of fat in the liver. This condition is also known as: _____.
6. Marijuana damages or irritates the lungs and can cause a pneumothorax which is also known as : _____.
7. Why are the effects of marijuana use in the adolescent brain long lasting or permanent? _____ _____
8. What is often used as a thickening and delivery agent for ENDS (Electronic Nicotine Delivery Systems)? _____
9. Vaping is often associated with a serious lung disease that affects the bronchioles. It can cause inflammation and scarring of the bronchioles. This is known as:
   - _____ OR
   - _____
10. Quitting smoking can have some significant reverse effects. Name 3 of these:
    - _____
    - _____
    - _____
11. The term cardiomegaly refers to what? _____
12. What is the leading cause of cancer death in the US? _____

Bonus: Are you interested in a career in medicine, science or healthcare?

_____

Effects of Drugs and Alcohol
Pre/Post Test Answers

1. Nicotine
2. Damages trachea, bronchus, bronchioles
   Kills alveoli
   Can lead to Chronic Obstructive Pulmonary Disease (COPD), chronic bronchitis, emphysema, smoker's cough, pneumonia, pleural effusion, pulmonary embolism
3. Enlarged heart/cardiomegaly
   Damages heart/blood vessels, increases risk of heart disease and stroke
   Can lead to Coronary Heart Disease (CHD), Heart Attack/MI, Peripheral Arterial Disease, Peripheral Vascular Disease, Aortic Aneurysm
4. Prefrontal cortex; hippocampus
5. Hepatic Steatosis
6. Collapsed lung
7. Frontal lobe is not fully developed, causes changes to prefrontal cortex and connections for certain functions, higher risk for mental health disorders
8. Vitamin E
9. Popcorn lung or bronchiolitis obliterans
10. Normalizes BP/HR, heart does not have to work so hard, taste/smell get sharper, lungs clear up
    Decreased risk of heart disease, heart attack, stroke, cancer
11. Enlarged heart
12. Lung cancer