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| **TEXAS CTE LESSON PLAN**  [www.txcte.org](http://www.txcte.org) | |
| **Lesson Identification and TEKS Addressed** | |
| **Career Cluster** | Law, Public Safety, Corrections & Security |
| **Course Name** | Forensic Science |
| **Lesson/Unit Title** | Controlled Substances |
| **TEKS Student Expectations** | **130.339. (c)** **Knowledge and Skills**  (2) The student, for at least 40% of instructional time, conducts laboratory and/or field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:  (A) demonstrate safe practices during laboratory and field investigations; and  (B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.  (3) The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:  (F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;  (H) communicate valid conclusions supported by the data through methods such as investigative reports, lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.  (4) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:  (A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, to encourage critical thinking;  (C) draw inferences based on data related to criminal investigation; |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | The student will be able to:   1. Compare the types of drug dependence. 2. Characterize types of drugs. 3. Differentiate between screening and confirmation tests for drugs. 4. Identify proper collection and preservation methods for drug evidence. |
| **Rationale** | The term “drug” can have different meanings to different people. To some, drugs are a means of escaping the pressures of life; to others, they are a necessity for prolonging health and life; and to yet others, they are a means of ending it. This unit will identify and categorize controlled substances and common drugs, and show how forensic science is used to fight crimes of this type. |
| **Duration of Lesson** | 4 ½ hours total   * 45 min. Engage Activity * 2¼ hr. lecture * 45 min. White Powder Lab * 45 min. assessment |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* |  |

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| **Materials/Specialized Equipment Needed** | **Materials**   * Analysis of White Powders Lab (Note: refer to the lab handout for the amounts; the amounts needed are based on student lab groups, and the number of groups depends on the class size.) * Analysis of White Powders Lab handout * Analysis of White Powders Teacher’s Notes and Key * Popcorn salt * Powdered (confectioner’s) sugar * Starch * Baking soda * Plaster (of Paris) * Vinegar in a dropper bottle * Iodine in a dropper bottle * Distilled water in a dropper bottle * Petri dishes (tops and bottoms) * Plastic spoons * Grease pencil * Toothpicks * Magnifying glasses * Gloves * Safety goggles * Controlled Substances Exam and Key * Discussion Rubric * Individual Work Rubric * Presentation Rubric |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | Do an Internet search for the following news report: DEA Announces Emergency Ban on ‘Bath Salts’. Watch the news report and use the following questions for a class discussion. Use the Discussion Rubric for assessment. *(Note: this activity may be adapted into a debate, and the Debate Rubric may be used for assessment).*   * What are the dangers of this new “legal” drug that is sweeping the country? * In your opinion, will it become illegal to sell or purchase? * In the video, there is an interview with a gentleman who owns several of the stores that sell the drug. What is your opinion of his statements? |
| **Direct Instruction \*** | 1. Drug Dependence    1. A drug is a natural or synthetic substance that is used to produce physiological or psychological effects; an illicit drug is a substance considered to be illegal    2. Controlled substances are those that can only be administered with a doctor’s prescription    3. Psychological Dependence       1. The conditional use of a drug caused by underlying emotional and/or psychological needs       2. Psychological needs can come from numerous social and personal factors that increase an individual’s desire to escape from reality and/or for a sense of well-being       3. The intensity of dependence depends upon the nature of the drug used       4. The desire for emotional well-being is the main motive leading to repeated use and intensive drug abuse   D. Physical Dependence   * + 1. Physiological need for a drug is        1. Caused by its regular use        2. Characterized by withdrawal sickness when the drug stops being administered     2. Some of the more widely used drugs have little potential for physiological dependence     3. Physiological dependence develops when the user has a regular schedule of drug intake   1. Social Aspects of Dependence      1. The more occupied users become in their daily lives with using, the more they will neglect their individual and social responsibilities, such as personal hygiene or maintaining a job   II. Types of Drugs   * 1. Narcotic      1. A drug that induces sleep and depresses vital body functions such as blood pressure, pulse, and breathing      2. Society inappropriately classifies a narcotic as any drug that is socially unacceptable      3. Opiates come from the Asian poppy         1. Include heroin, morphine, and codeine         2. Considered analgesics (substances that lessen or eliminate pain)      4. Synthetic opiates         1. Not naturally derived from opium, but have similar effects         2. Methadone            1. Pharmacologically related to heroin            2. Administered to heroin addicts when it was found to eliminate the addicts’ desire for heroin with minimal side effects         3. Oxycodone            1. Closely related to morphine and heroin            2. Prescribed by doctors for chronic pain   2. Hallucinogens      1. Drugs that can cause alterations in normal thought processes, perceptions, and moods      2. Marijuana         1. Qualifies as the most widely used illicit drug in the U.S.         2. Derived from the cannabis plant         3. Leaves, flowers, stems, and seeds are mixed in varying proportions         4. Contains tetrahydrocannabinol (THC)         5. Has potential medical uses            1. Reduces eye pressure in glaucoma patients            2. Lessens nausea caused by anticancer drugs   3. Other hallucinogens      1. Psilocybin (mushrooms)      2. LSD (lysergic acid)      3. PCP (phencyclidine)  1. Depressants    1. Drugs that slow, or depress, the central nervous system (CNS)    2. Alcohol       1. With more production and more consumers, alcohol is unquestionably the most widely used and abused drug       2. Effects range from inhibited judgment and concentration in low doses to extreme irritability or even coma, and possibly death in extreme doses    3. Barbiturates       1. Commonly known as “downers” because they relax the user and may produce sleep       2. Some examples that are commonly used in medicinal practices are          1. Amobarbital          2. Secobarbital          3. Phenobarbital       3. Methaqualone is an illicit barbiturate    4. Antipsychotics and anti-anxiety drugs       1. Produce tranquility without altering higher level thinking faculties       2. Some examples that are commonly prescribed to deal with everyday tensions are          1. Meprobamate          2. Chlordiazepoxide          3. Diazepam    5. Huffing/Inhalants       1. Sniffing volatile solvents such as model cement, glues, and cleaners       2. Inhaling aerosol propellants such as spray paint and refrigerant       3. Produces feelings of exhilaration and euphoria, then drowsiness and stupor 2. Stimulants    1. Stimulate, or speed up, the CNS    2. Amphetamines       1. Known as “uppers,” or “speed”       2. Produce increased alertness and feelings of well-being, followed by a decrease in fatigue and loss of appetite. These effects are accompanied by restlessness, instability, and oftentimes depression    3. Cocaine   Comes from the “coca” plant in tropical Asia and South America   * + - 1. Has effects similar to amphetamines       2. Found in powder form, or “cooked” to its freebase form, known as crack       3. It is very difficult to overcome addiction to this drug   1. Club Drugs      1. Synthetic drugs that are often used at nightclubs, raves (all night dance parties), and bars; they are used as a way to stimulate the “rave” experience      2. GHB and Flunitrazepam (aka “Roofies”) are CNS depressants often associated with drug-facilitated sexual assaults, rapes, and robberies         1. GHB can produce dizziness, sedation, muscle relaxation, and increased libido         2. Flunitrazepam can produce loss of consciousness and an inability to remember what happened during the hours after ingestion      3. Methylenedioxymethamphetamine (aka MDMA or Ecstasy)         1. Is a mind-altering drug that has hallucinogenic effects         2. Chronic use can cause body system breakdown, severe brain damage, memory loss, and seizures      4. Ketamine (aka Special K)         1. Is an animal anesthetic used by veterinarians         2. However, when it is used on humans, it causes feelings of euphoria, visual hallucinations, impaired motor function, and amnesia   2. Anabolic Steroids      1. Chemically related to the male sex hormone, testosterone, that develops secondary male characteristics (androgenic effects) and accelerates muscle growth (anabolic effects)      2. Often used by athletes, from amateur to professional      3. Side effects include liver malfunction, cancer, masculinizing effects in females, diminished sex drive in males, unpredictable moods, personality changes, and depression   III. Drug Control Laws   * 1. There are varying levels and penalties based on manufacture, distribution, possession, or use of a drug as well as the drug’s weight, type, and concentration   2. The Controlled Substances Act – the federal law that establishes five classifications of controlled dangerous substances on the basis of each drug’s potential abuse, potential for physical and psychological dependence, and medical value; the U.S. Attorney General has the authority to add, delete, or reschedule a drug as needed      1. Schedule I   High potential for abuse and no currently accepted medical use in the U.S.   * + 1. Examples: heroin, marijuana, methaqualone, LSD   1. Schedule II      1. High potential for abuse, currently accepted medical use with severe restrictions, potential for severe physiological and psychological dependence      2. Examples: opium and its derivatives, cocaine, methadone, PCP, most amphetamine preparations, most barbiturate preparations, and dronabinol (the synthetic equivalent of marijuana, prescribed for medical use)   2. Schedule III      1. Less potential for abuse, currently accepted medical use, potential for low to moderate physiological and high psychological dependence      2. All barbiturates not included in Schedule II, such as codeine preparations and anabolic steroids   3. Schedule IV      1. Low potential for abuse, current medical use, limited dependence related to Schedule III      2. Example: tranquilizers   4. Schedule V      1. Low abuse, medical use, less potential for dependence than Schedule IV      2. Non-narcotic medicinal ingredients and some opiate drug mixtures  1. Criminal penalties under the Act    1. The most severe penalties are associated with Schedule I and II    2. The Controlled Substance Act controls substances such as analogs and designer drugs that are chemically similar or related to controlled substances    3. Regulates the manufacture and distribution of precursors which are the chemical compounds used by clandestine labs to synthesize drugs   IV. Forensic Drug Analysis  A. Screening and Confirmation   1. Screening test – a preliminary test used to reduce the number of possible identities of an unknown substance 2. Confirmatory test – a single test that specifically identifies a substance 3. Color test – drugs yield characteristic colors when mixed with certain chemicals    1. Marquis – turns purple with heroin, morphine, and most opium derivatives; it turns orange/brown with amphetamines and methamphetamines    2. Dillie-Koppanyi – turns violet-blue with barbiturates       * 1. Duquenois-Levine – turns purple with marijuana (with chloroform)         2. Van Urk – turns blue-purple with LSD         3. Scott Test – turns blue with cocaine (after a series of steps)       1. Microcrystalline Test          1. More specific than a color test          2. Identifies a substance based on the color and shape of crystals formed when the substance is mixed with specific reagents       2. Chromatography          1. Separates complex mixtures into specific components by attraction to a stationary phase while being propelled by a moving phase          2. Thin Layer Chromatography uses a solid stationary phase and a moving liquid phase; can be used to compare an unknown sample with known samples          3. Gas Chromatography uses a stationary liquid phase and a moving gas phase (called a carrier gas) which flows through a stainless steel or glass column             1. Components separate by moving through the column at different rates             2. The retention time is how long it takes for a component to emerge from the column; the retention times of known and unknown substances can be compared       3. Spectrophotometry exposes substances to electromagnetic radiation          1. UV and Visible Spectrophotometry measures and records absorbance of UV and visible light as a function of wavelength or frequency          2. Infrared Spectrophotometry is similar to UV, but because absorption bands are so numerous, it is far more capable of identifying a substance specifically       4. Mass Spectrometry          1. Gas chromatography is one of the most important measurements in a crime lab, but it cannot always produce specific identification. However, when it is coupled with mass spectrometry, the problem is overcome          2. A mixture’s components are first separated with gas chromatography which is sensitive to minute amounts          3. With data obtained from gas chromatography and mass spectrometry, an analyst can separate components of a complex drug mixture and identify each substance present 4. Collection and Preservation of Drug Evidence    1. Packages must prevent loss and cross-contamination of evidence   If it is a volatile solvent (glue sniffing compounds), it must be in an airtight container to prevent evaporation  C. Mark with information to ensure identification by the officer and maintain a chain of custody  D. Investigator should provide any background information of the drug’s identification, such as the screening tests, to the lab analyst  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  none |
| **Guided Practice \*** | For reinforcement, students should research the drug nicotine, found in cigarettes. After understanding the type of drug and its effects, compare those to the characteristics of each of the five schedules of drugs to determine under which schedule it would fall. Use the Individual Work Rubric for assessment.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  none |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Analysis of White Powders Lab. Have students simulate drug testing in a lab. Use common white powders to represent controlled substances. Have them test samples (known and unknown), review their physical and chemical properties, and analyze the results. Use the Analysis of White Powders Lab handout for the activity and the Analysis of White Powders Teacher’s Notes and Key for assessment. |
| **Lesson Closure** |  |
| **Summative/End of Lesson Assessment \*** |  |
| **References/Resources/**  **Teacher Preparation** | Saferstein, Richard. *Forensic Science: An Introduction.* New Jersey:  Pearson Prentice Hall, 2008  Saferstein, Richard. *Forensic Science: An Introduction.* 2nd ed.  New Jersey: Pearson Prentice Hall, 2011  Saferstein, Richard. *Criminalistics: An Introduction to Forensic Science.* 8th ed. Upper Saddle River, NJ; Pearson Prentice Hall, 2004  Do an Internet search for the following: DEA Announces Emergency Ban on ‘Bath Salts’ |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** | Science Standards   1. Foundation Skills: Scientific Applications of Communication    1. Presentation of scientific/technical information       1. Prepare and present scientific/technical information in appropriate formats for various audiences.    2. Research skills/information literacy       1. Use search engines, databases, and other digital electronic tools effectively to locate information. |
| **Recommended Strategies** | |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy**  **Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies**  **Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication**  **90 Second Speech Topics** |  |
| **Other Essential Lesson Components** | |
| **Enrichment Activity**  (e.g., homework assignment) | For enrichment, students will go back to the Engage Activity of this unit. Allow students to research more on the topic of bath salts. Explain the following scenario: “Let’s pretend that bath salts immediately become an illicit drug here in the US. It is your job to create a campaign poster or a computer-based presentation to warn the public about the dangers and seriousness of the drug. Present your poster or campaign to the public (class).” Use the Presentation Rubric for assessment. |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | Skills USA |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)