Chapter 7
Drugs

"Having sniffed the dead man's lips, I detected a slightly sour smell, and I came to the conclusion that he had poison forced upon him."

—Sherlock Holmes, in Sir Arthur Conan Doyle's *A Study in Scarlet*

Drugs

Students will learn:

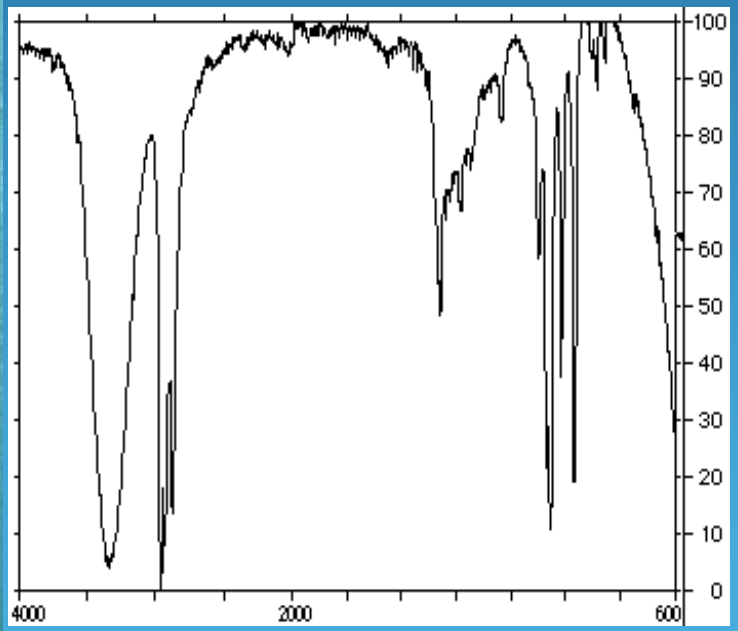
- How to apply deductive reasoning to a series of analytical data.
- The limitations of presumptive (screening) tests.
- The relationship between the electromagnetic spectrum and spectroscopic analysis.
- The dangers of using prescription drugs, controlled substances, over-the-counter medications, and illegal drugs.

Drugs

Students will be able to:

- Chemically identify illicit drug types.
- Classify the types of illicit drugs and their negative effects.
- Discuss the federal penalties for possession and use of controlled substances.
- Explain the need for confirmatory tests.

Drugs



- Describe IR, UV-VIS spectroscopy, and GC-MS
- Present and interpret data with graphs.
- Use the Physicians' Desk Reference (PDR) to identify pills.
- Use technology and mathematics to improve investigations and communications.

Drugs and Crime

75% of all forensic science lab analysis is related to drugs

- A **drug** is a natural or synthetic substance designed to affect the subject psychologically or physiologically.

A. **OTC (over the counter)**– drug that can be bought without a prescription

B. Prescription – drug prescribed by doctor

C. Illicit – illegal drug. Classified under Drug Schedule I-V.

D. Controlled substance – drug restricted by law

Controlled Substances Act

- Controlled Substances Act is a law that was enacted in 1970; it lists illegal drugs, their category and their penalty for possession, sale or use.

Controlled Substances Act Schedules of Drugs

- **Schedule I**—high potential for abuse;marijuana has no current accepted medical use in the US with severe restrictions. Abuse may lead to severe psychological or physical dependence. Ex: heroin (diacetylmorphine), LSD, marijuana, ecstasy (MDMA)
- **Schedule II**—high potential for abuse; a currently accepted medical use with severe restrictions; abuse may lead to severe psychological or physical dependence. Ex: cocaine, morphine, amphetamines (including methamphetamines), PCP, Ritalin
- **Schedule III**—lower potential for abuse than the drugs in I or II; a currently accepted medical use in the US; abuse may lead to moderate physical dependence or high psychological dependence. Ex: Intermediate acting barbiturates, anabolic steroids, ketamine

Schedules cont'd

- **Schedule IV**—low potential for abuse relative to drugs in III; a currently accepted medical use in the US; abuse may lead to limited physical or psychological dependence relative to drugs in III. Ex; other stimulants and depressants including Valium, Xanax, Librium, phenobarbital, Darvon
- **Schedule V**—low potential for abuse relative to drugs in IV; currently accepted medical use in the US; abuse may lead to limited physical or psychological dependence relative to drugs in IV. EX; codeine found in low doses in cough medicines

Human Components Used for Drug Analysis

- Blood
- Urine
- Hair
- Gastric Contents
- Bile
- Liver tissue
- Brain tissue
- Kidney tissue
- Spleen tissue
- Vitreous Humor of the Eye

Types of Drugs

Most drugs fit into one or more of the following categories:

- ®Narcotics
- ®Hallucinogens
- ®Depressants
- ®Stimulants

Narcotics & analgesics- induce a state of lethargy or sluggishness and are used to relieve pain. Most come from the poppy plant.

Examples:

- Morphine
- Methadone
- Heroin
- OxyContin
- Codeine

Hallucinogens-cause marked alterations in normal thought process, perceptions, and moods .

Examples:

Marijuana
LSD
PCP
Acid

Depressants – depress (slow down) action in the Central Nervous System

Examples:

- Alcohol
- Barbiturates (downers)
- Inhalants

Stimulants – stimulate (speed up) action in the Central Nervous System

Examples:

Cocaine
Crack
Crystal Meth
Amphetamines

Identification of Drugs

PDR—a physicians' desk reference is used to identify manufactured pills, tablets and capsules. It is updated each year. This can sometimes be a quick and easy identifier of the legally made drugs that may be found at a scene. The reference book gives a picture of the drug, whether it is a prescription, over the counter, or a controlled substance; as well as more detailed information about the drug.

Drug Identification Presumptive Field Tests

Spot Tests: Presumptive DrugTests

- **Marquis**—turns purple in the presence of most opium derivatives and orange-brown with amphetamines
- **Dillie-Koppanyi**—turns violet-blue in the presence of barbiturates
- **Duquenois-Levine**—turns a purple color in the presence of marijuana
- **Van Urk**—turns a blue-purple in the presence of LSD
- **Scott test**—color test for cocaine, blue

Identification of Drugs
Field Tests

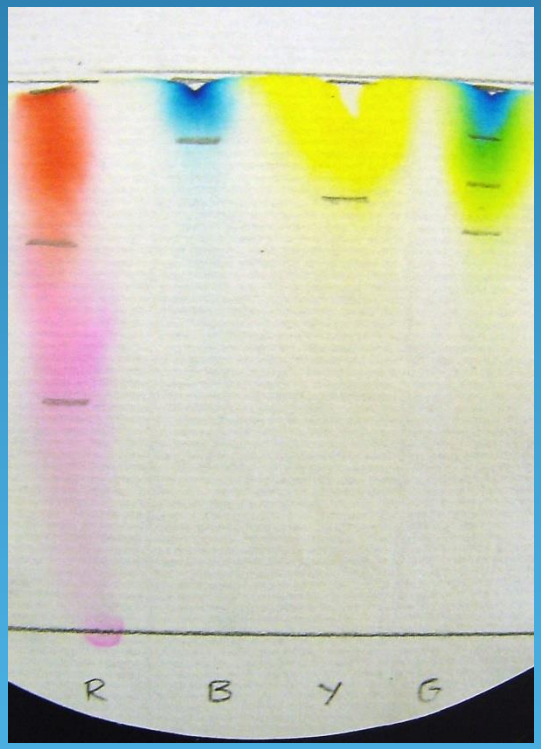
Chromatography

- A technique for separating mixtures into their components
- Includes two phases—a mobile one that flows past a stationary one.
- The mixture interacts with the stationary phase and separates.

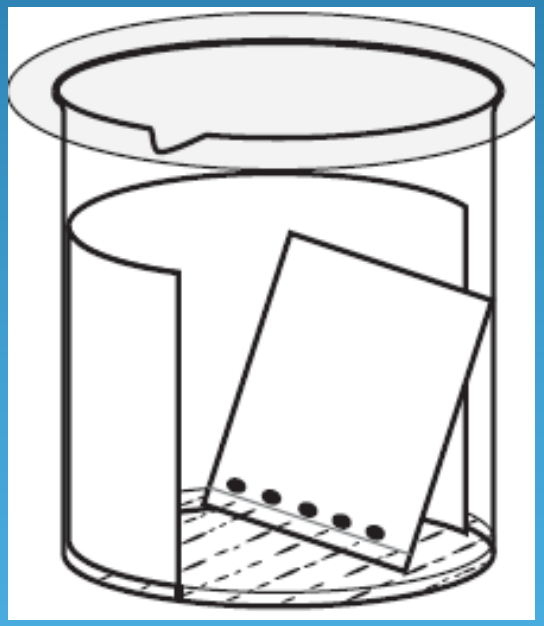
Paper Chromatography

- **Stationary phase**—paper
- **Mobile phase**—a liquid solvent

Capillary action moves the mobile phase through the stationary phase



Thin Layer Chromatography

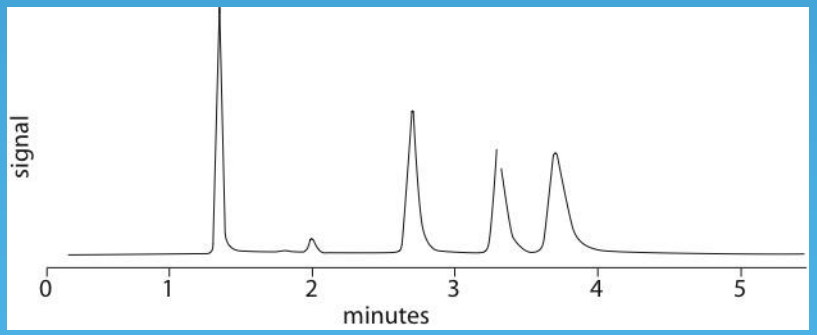


- **Stationary phase**—a thin layer of coating (usually alumina or silica) on a sheet of plastic or glass
- **Mobile phase**—a liquid solvent

Gas Chromatography

Phases

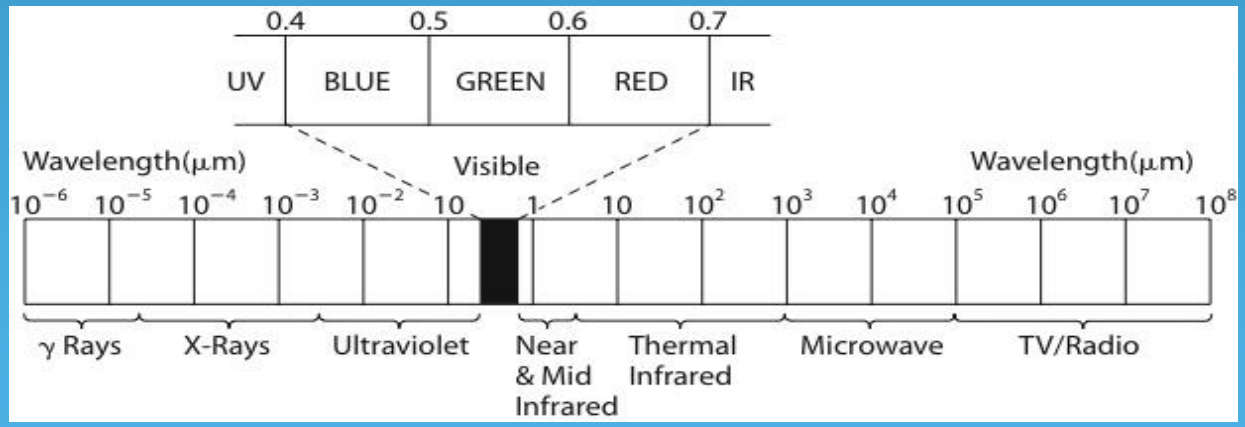
- **Stationary**—a solid or a viscous liquid that lines a tube or column
- **Mobile**—an inert gas like nitrogen or helium



® **Used to** measure the concentration of a sample or to separate mixtures for later analysis using mass spectrometry.

Identification of Drugs Confirmatory Tests

- **Spectroscopy**—the interaction of electromagnetic radiation with matter.
- **Spectrophotometer**—an *instrument* used to measure and record the absorption spectrum of a chemical substance.



Mass Spectrometry

Gas chromatography has one major drawback, it does not give a specific identification. Mass spectrometry cannot separate mixtures. By combining the two (**GCMS**), constituents of mixtures can be specifically identified.