Chapter 5

DRUGS

INTRODUCTION

DRUGS

-A drug can be defined as a substance used to produce physiological or psychological effects

-Psychological dependence- conditioned use caused by underlying emotional needs

-Physical dependence- physiological need, characterized by withdrawal sickness when drug is stopped

NARCOTICS

Analgesics- narcotic substances which lessen or eliminate pain

Narcotic drugs typically used to decrease pain

induce sleep and depress vital functions including blood pressure, pulse rate, and breathing rate

Typically high/medium physical and psychological dependence

OPIATES

most common source for narcotics is opium, extracted from poppies.

Morphine –extracted from opium
Heroin- made from morphine
Codeine- prepared synthetically from morphine

OPIATES

DRUGS

Heroin produces a “high” that is accompanied by drowsiness and a sense of well-being that generally last for three to four hours.

NARCOTICS

DRUGS

OxyContin, active ingredient oxycodone, not derived from opium, but has same physiological effects on the body as opium narcotics.

Methadone synthetic opiate helps eliminate the addict's desire for heroin while producing minimal side effects.

HALLUCINOGENS

DRUGS

Hallucinogens cause marked changes in normal thought processes, perceptions, and moods.

Typically leads to psychological dependence only with long term use, except pcp

MARIJUANA

DRUGS

Marijuana refers to a preparation derived from the plant *Cannabis*.

chemical responsible properties of marijuana is known as *tetrahydrocannabinol*, or THC.

The THC-rich resin is known as *hashish*.

does not cause physical dependency, but the risk of harm is in heavy, long-term use

OTHER HALLUCINOGENS

Other hallucinogens include LSD, mescaline, PCP, psilocybin(mushrooms)

LSD is synthesized from lysergic acid, and can cause hallucinations that can last for 12 hours.

Phencyclidine, or PCP, is often synthesized in clandestine laboratories and is often mixed with other drugs, such as LSD, or amphetamine

Oral intake of PCP first leads to feelings of strength and invulnerability, which may turn to depression, tendencies toward violence, and suicide.

DEPRESSANTS

DRUGS

Depressants are substances used to depress the functions of the central nervous system.

Depressants calm irritability and anxiety and may induce sleep.

DEPRESSANTS

DRUGS

Alcohol (ethyl alcohol) quickly travels to the brain, acts to suppress the brain's control of thought processes and muscle coordination.

Barbiturates, or "downers," are normally taken orally and create a feeling of well-being, relax the body, and produce sleep.

Tranquilizers, unlike barbiturates, produce a relaxing tranquility without impairment of high-thinking faculties or inducing sleep.

STIMULANTS

DRUGS

includes amphetamines, known as “uppers” or “speed,” cocaine

increase alertness or activity, followed by a decrease in fatigue and a loss of appetite.

Amphetamines often injected iv, cause initial “rush,” intense feeling of pleasure.

followed by a period of exhaustion and a prolonged period of depression.

COCAINE

Cocaine, extracted from the leaves of *Erythroxylin coca*, causes increased alertness and vigor, accompanied by the suppression of hunger, fatigue, and boredom.

***Crack* is cocaine mixed with baking soda and water, then heated.**

***Crack* is often smoked**

MDMA (Ecstasy) – both a stimulant and hallucinogen

Synthetic drug mimics the effects of methamphetamine **stimulants and mescaline hallucinogens.**
the user may experience a positive increase in energy levels and a euphoric state of being.
suppression of certain basic physical needs, like eating, drinking and sleeping

CLUB DRUGS

DRUGS

The term *club drugs* refers to synthetic drugs that are used at nightclubs, bars, and raves (all-night dance parties).
Substances that are often used as club drugs include, but are not limited to, MDMA (Ecstasy), GHB (gamma hydroxybutyrate), Rohypnol ("Roofies"), ketamine, and methamphetamine.
GHB and Rohypnol are central nervous system depressants that are often connected with drug-facilitated sexual assault, rape, and robbery.

CLUB DRUGS

DRUGS

Methylenedioxymethamphetamine, also known as MDMA or Ecstasy, is a synthetic mind-altering drug that exhibits many hallucinogenic and amphetamine-like effects.

Ecstasy enhances self-awareness and decreases inhibitions, however, seizures, muscle breakdown, stroke, kidney failure, and cardiovascular system failure often accompany chronic abuse.

Ketamine is primarily used as a veterinary animal anesthetic that in humans causes euphoria and hallucinations.

Ketamine can also cause impaired motor functions, high blood pressure, amnesia, and mild respiratory depression.

ANABOLIC STEROIDS

DRUGS

Yet another category of drugs is the anabolic steroids.
These are synthetic compounds that are chemically related to the male sex hormone testosterone.
Anabolic steroids are often abused by individuals who are interested in accelerating muscle growth.
Side effects include unpredictable effects on mood and personality, depression, diminished sex drive, halting bone growth, and liver cancer.

DRUG-CONTROL LAWS

DRUGS

The U.S. federal law known as the Controlled Substances Act will serve to illustrate a legal drug-classification system created to prevent and control drug abuse.

This federal law establishes five schedules of classification for controlled dangerous substances on the basis of a drug's

potential for abuse

potential for physical and psychological dependence

medical value

SCHEDULES OF CLASSIFICATION

DRUGS

Schedule I drugs have a high potential for abuse and have no currently accepted medical use such as heroin, marijuana, methaqualone, and LSD.
Schedule II drugs have a high potential for abuse and have medical use with severe restrictions such as morphine
Schedule III drugs have less potential for abuse and a currently accepted medical use such as all barbiturate prescriptions not covered under Schedule II, such as codeine and anabolic steroids.

SCHEDULES OF CLASSIFICATION

Schedule IV drugs have a low potential for abuse and have a current medical use such as darvon, phenobarbital, and some tranquilizers such as diazepam (valium) and chlordiazepoxide (librium).

Schedule V drugs must show low abuse potential and have medical use such as opiate drug mixtures that contain nonnarcotic medicinal ingredients.

DRUG IDENTIFICATION

The challenge or difficulty of forensic drug identification comes in selecting analytical procedures that will ensure a specific identification of a drug.

This plan, or scheme of analysis, is divided into two phases.

Screening test that is nonspecific and preliminary in nature to reduce the possibilities to a manageable number.

Confirmation test that is a single test that specifically identifies a substance.

PRELIMINARY ANALYSIS

DRUGS

unknown substance may be any one of a thousand or more commonly encountered drugs

color tests that will produce characteristic colors for the more commonly encountered illicit drugs.

Microcrystalline tests can also be used by studying the size and shape of crystals formed when the drug is mixed with specific reagents.

CONFIRMATIONAL DETERMINATION

DRUGS

Forensic chemists will employ a specific test to identify a drug substance to the exclusion of all other known chemical substances.

infrared spectrophotometry or gas chromatography-mass spectrometry is used to specifically identify a drug substance.

QUALITATIVE VS. QUANTITATIVE

Another consideration in selecting an analytical technique is the need for either a qualitative or a quantitative determination.

CHROMATOGRAPHY

Chromatography separates components of a mixture. Substances that interact with the moving phase will slowly pull ahead and separate from those substances that prefer to interact with stationary phase.

DRUGS

TLC Thin layer chromatography

DRUGS

TLC uses a solid stationary phase coated onto a glass plate and a mobile liquid phase to separate the components of the mixture. Most materials must be visualized by placing the plates under ultraviolet light or spraying the plate with a chemical reagent. The distance a spot travels up a thin-layer plate can be assigned a numerical value known as the R_f value.

$$R_f \text{ value} = \frac{\text{distance substance travels}}{\text{distance solvent travels}}$$

☆ initial screening

THE SPECTROPHOTOMETER

The spectrophotometer is the instrument used to measure and record the absorption spectrum of a chemical substance.

The components of a spectrophotometer are:

A radiation source

A monochromator or frequency selector

A sample holder

A detector to convert electromagnetic radiation into an electrical signal

A recorder to produce a record of the signal

Absorption spectra can be done in the visible, ultraviolet (UV) or infrared (IR) regions.

SPECTROPHOTOMETRY

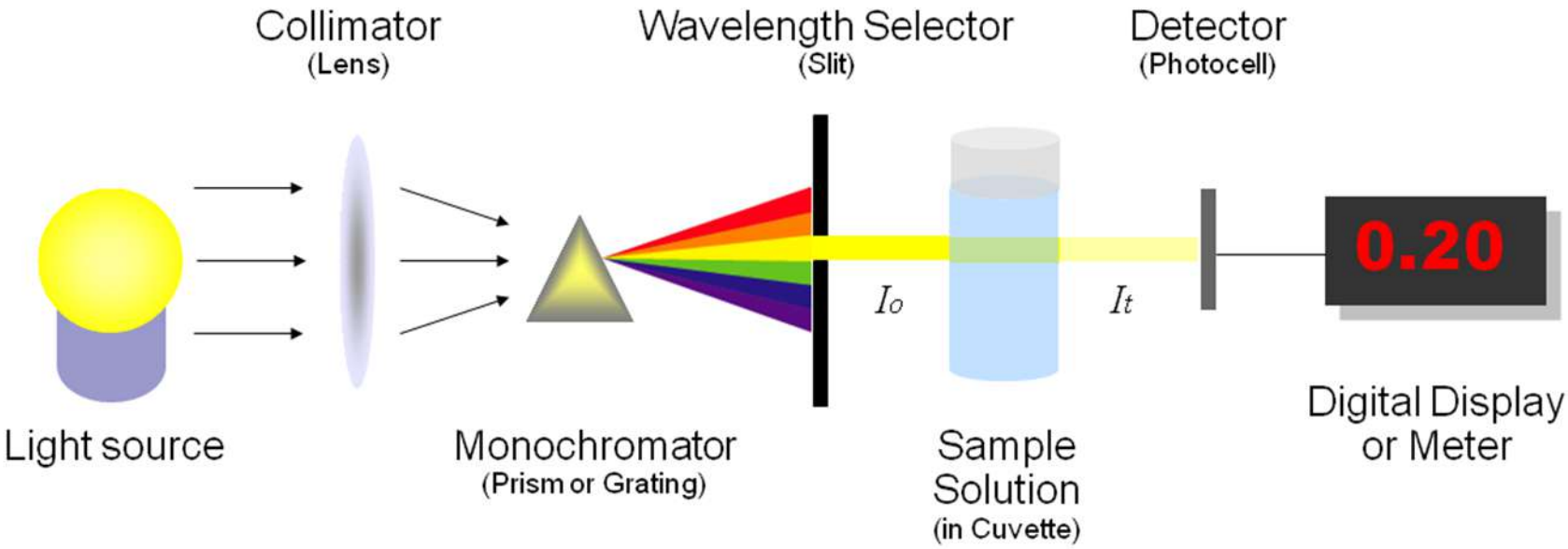
Spectrophotometry measures the quantity of radiation that a particular material absorbs

Different materials absorb different amounts of energy (IR and UV spectroscopy), this can be used to determine identity

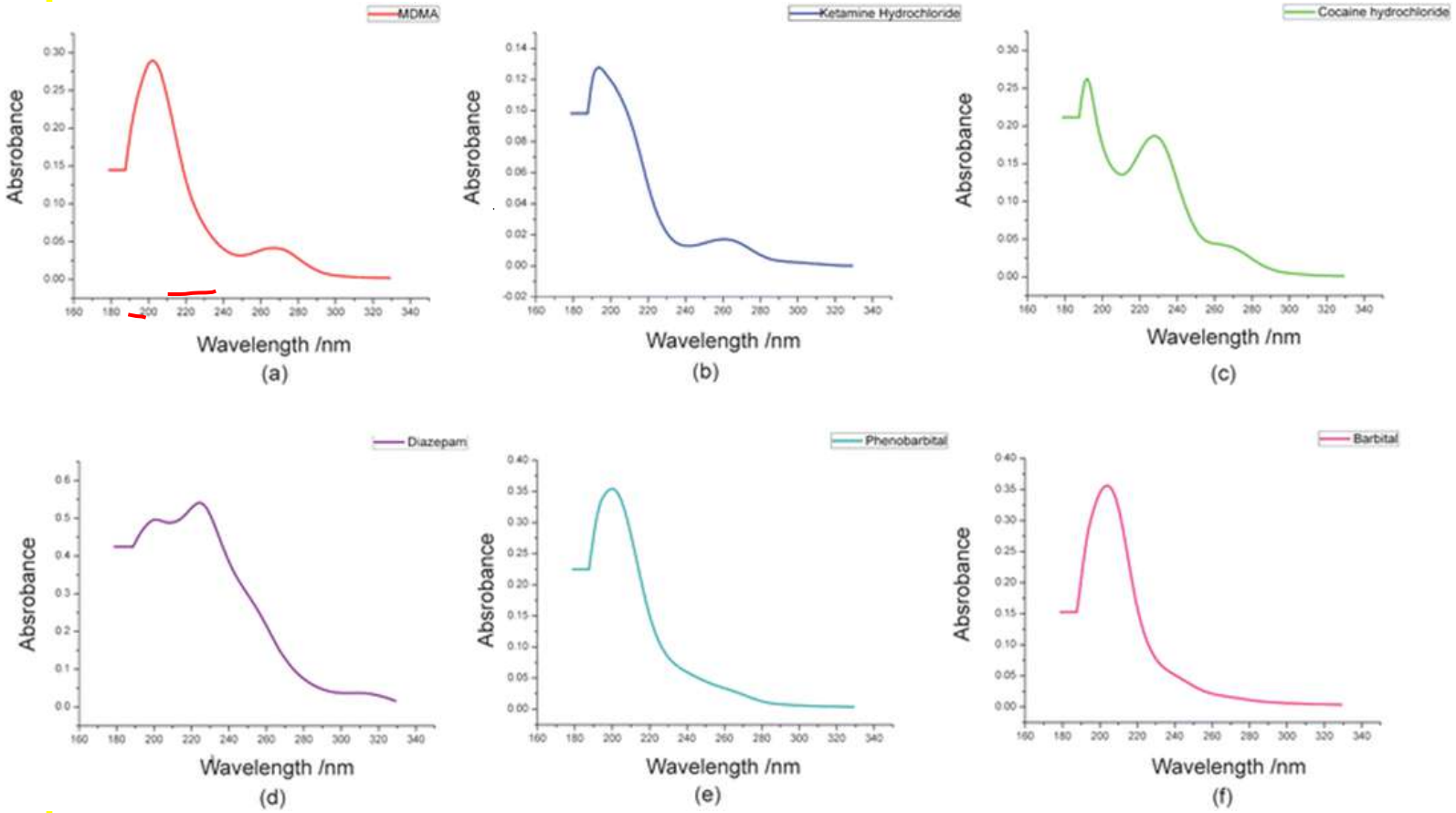
The quantity of light absorbed at any frequency is directly proportional to the concentration, this is used to quantify the amount of substance

UV SPECTROMETRY

- simplicity of the UV spectrum can be used as a screening test, different substances absorb different wavelengths of light

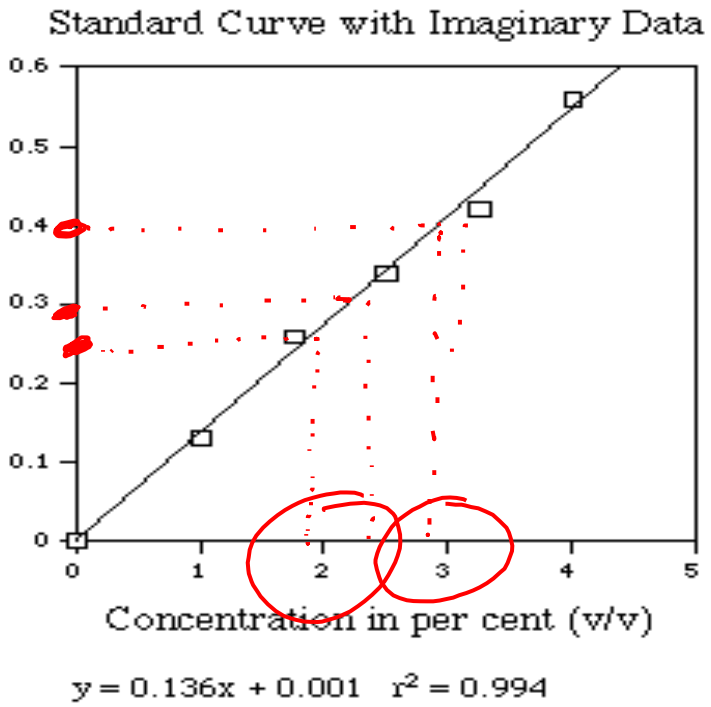


WAVELENGTHS OF DIFFERENT DRUGS



A standard curve is produced by graphing concentration (x axis) vs absorbance (y axis)
Test unknown sample for absorbance
Read concentration from graph

Abs of 0.25= 1.9
Abs of 0.4= 2.9
Abs of 0.3= 2.5



GAS CHROMATOGRAPHY

DRUGS

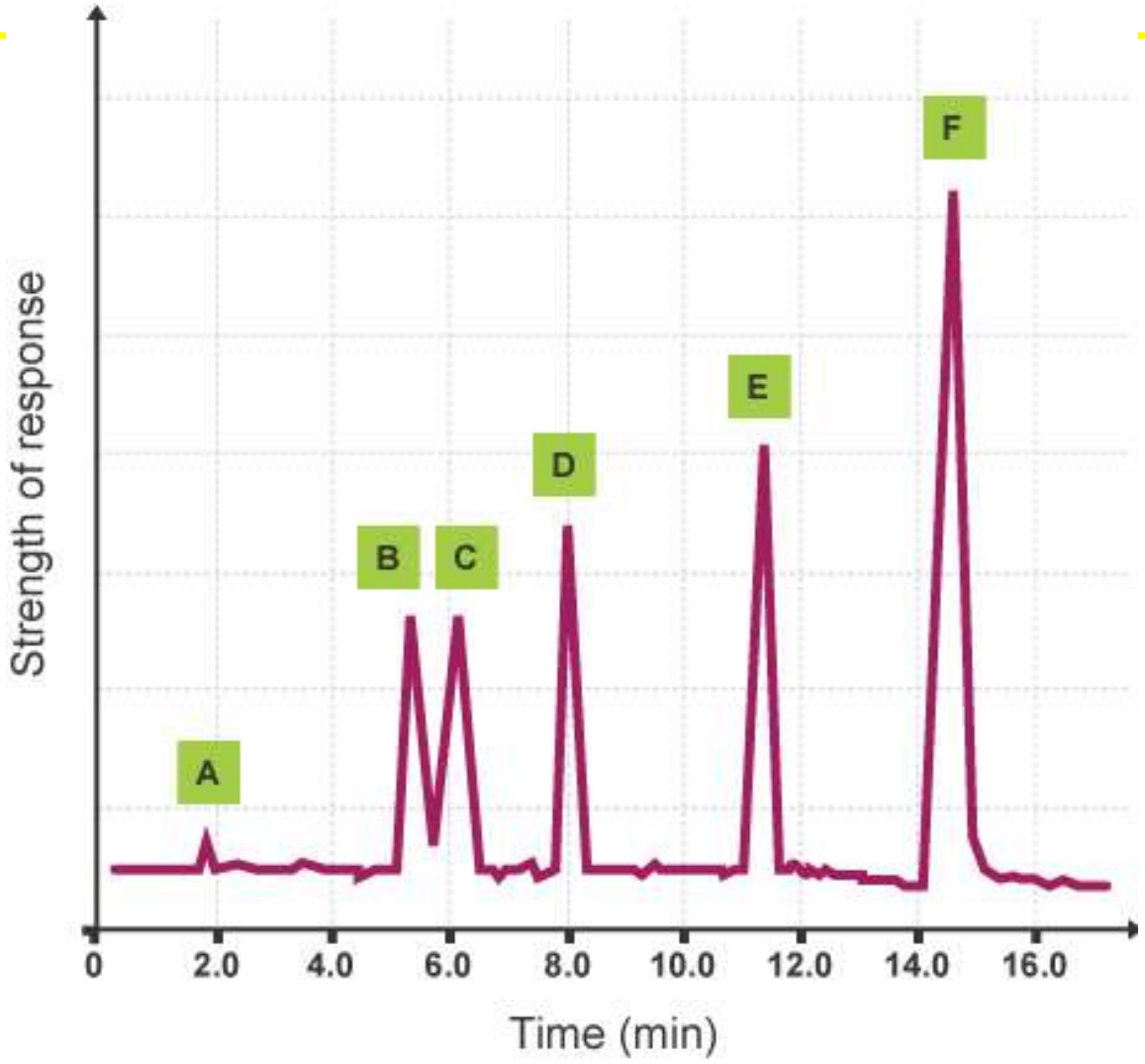
moving phase is a gas which flows through a column.

stationary phase is a thin film of liquid contained within the column.

some substances move slower than others down the column

time required for a component to come out of GC column is known as retention time and recorded in a chromatogram

https://www.youtube.com/watch?v=q0pM-k0SvOQ



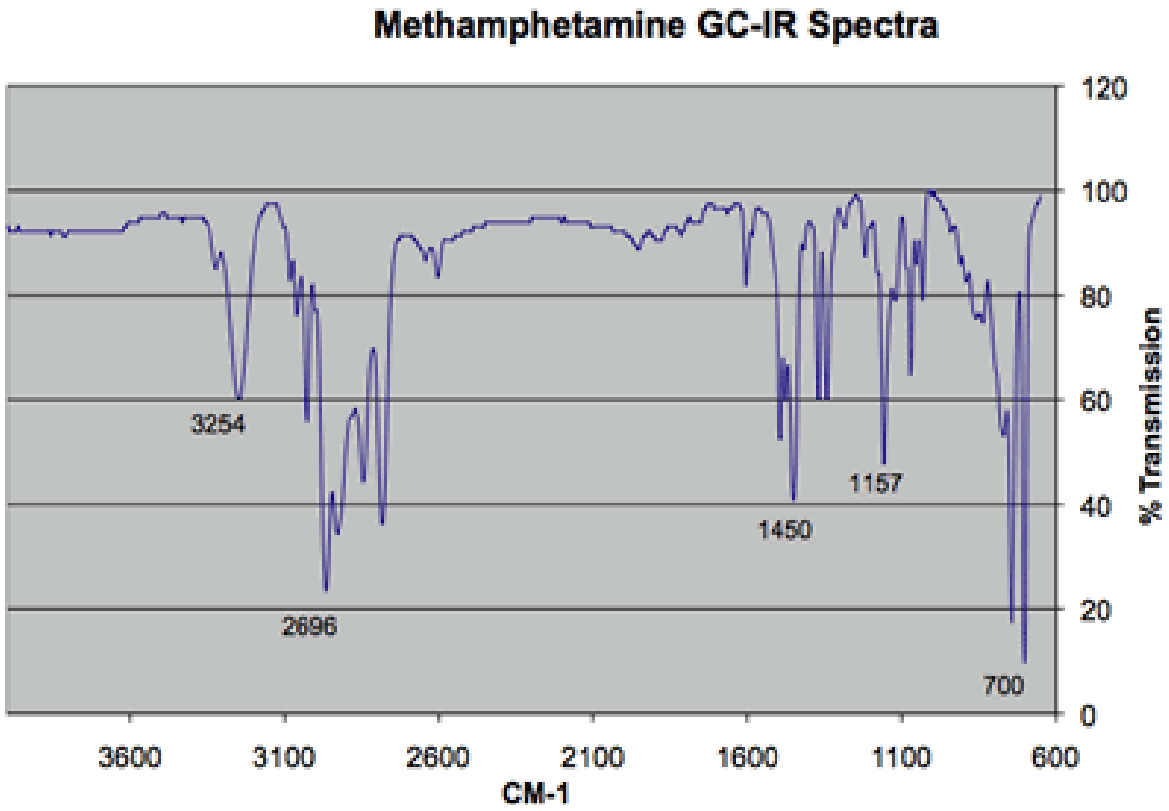
IR SPECTROMETRY

DRUGS

The IR spectrum provides a confirmation test

materials always have different infrared spectra; each IR spectrum is therefore equivalent to a "fingerprint" of that substance.

Different amounts of energy are absorbed by a substance



MASS SPECTROMETRY

Compound is broken down into pieces by high energy electrons

Mass of each ion is given in a graph

used to determine the pieces that make up a whole compound

no two substances produce the same fragmentation pattern.

DRUGS

GC - MASS SPEC

direct connection allows each component to flow into the mass spectrometer as it emerges from the GC/or HPLC(high performance liquid chromatography).

This separates components of a mixture AND performs a confirmation test on all components of the mixture

COLLECTION AND PRESERVATION

DRUGS

The field investigator has the responsibility of ensuring that the evidence is properly packaged and labeled for the laboratory.
Generally common sense is the best guide, keeping in mind that the package must prevent the loss of the contents and/or cross-contamination.
Often the original container in which the drug was seized will suffice.
All packages must be marked with information that is sufficient to ensure identification by the officer in the future and establish the chain of custody.

Summarize the schedule of drugs on p.169

I-V

Legal or illegal
Medical use/no medical use
Potential for physical dependence
Potential for psychological dependence
Pg 170-Rx

WHICH SCHEDULE OF DRUGS WOULD THE FOLLOWING BELONG?

1) High risk for physical and psychological dependency, accepted medical use, no prescription refills
2) Low risk for dependency, no prescription required, may be sold over the counter
3) Moderate risk for physical dependency or high risk for psychological dependency, accepted medical use, may get prescription refills
4) High risk for physical/psychological dependency, no accepted medical use
5) Low risk for physical dependency, accepted medical use, prescription required, may get prescription refills

TURN TO PAGE 183 AND USE FIGURE 5-20 (TOP GRAPH) TO ANSWER THE QUESTIONS

1) How many substances are in the drug mixture in the top graph?
2) Which drugs make up the mixture?
3) Which drug is most abundant?
4) Which drug has the longest retention time?

***Review which tests are screening and confirmation and their differences**

***Review classification and schedule of drugs**