



Pearson



Chemistry Modules

On this Liberal Studies Forensic Chemistry course, students play the part of forensic investigators solving a murder in the fictional town of Cloudsville. The case is based on a real murder committed in Tallahassee in the early 1970s. Much of the evidence students analyze in the modules is based on evidence collected during the actual murder investigation.

The final module requires students to read transcripts of witness and suspect interviews from the Tallahassee investigation. Because these statements often contradict the forensic evidence, students must use what they have learned to decide whether the evidence supports an arrest.

Module 1: Introduction to the Facility and Lab Safety

Students are taken on a tour of Cloudsville, the town in which the modules are set. They meet key non-player characters and are introduced to the virtual laboratory, where they receive instruction on the basic rules of lab safety, including the use of lab safety equipment.

Module 2: Tools of the Trade

In the virtual lab, students are familiarized (via a Heads-Up Display) with techniques and equipment commonly used in chemistry laboratories to

measure density, mass, volume and concentration. They use and explore common lab glassware and techniques, an analytical balance, centrifuge, microscope, and UV-Vis spectrometer.

Module 3: A Gruesome Crime

Students visit a crime scene in a forest clearing outside Cloudsville, where they collect all evidence present using safe techniques and the proper storage containers for different kinds of evidence. The speed at which they collect evidence is controlled in order to prevent them rushing through the process. For example, if they attempt to pour a cast or remove the cables used to tie the body too quickly, the system resets and they must start again.

Module 4: Lab Rat

Students sit in at an autopsy in the virtual lab, then conduct experimental analysis on debris found at the crime scene to determine if an accelerant was used to start fires. Students complete a charcoal extraction followed by GC Mass spectrometry to determine the presence and identity of the accelerant. The module teaches them to prepare chemical solutions and explains the basic principles of gas chromatography and mass spectrometry.

Lab 5: Invisible Prints

In a police station garage, students use Luminol to swab the victim's car for blood and collect evidence which they analyze in the lab. The module introduces them to the proper use of Ninhydrin spray and Superglue fuming to develop prints on the materials collected. The students are asked to determine the owners of the prints, if possible.

Module 6: Toxicology is In Students screen the blood samples for toxic substances such as barbiturates or heavy metals, using liquid-liquid extraction, followed by LC Mass spectrometry for analysis. Students are shown typical spectra and asked to identify the blood's drug content by comparison; they use Reinsch screening to search for heavy metals in the blood.

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Modules cont.

Module 7: Blood Types

In this module, students are guided through the process of preparing blood samples for later analysis. This delay in completing the process is deliberate, so students understand that not all processes can be completed in one sitting. The module's second part involves the Fourier Transform Infrared Spectroscopy analysis of fibers found on the victim's clothing and car. The goal is to see if there are matching fibers that provide evidence to place the victim in the trunk of the car.

Module 8: DNA

Students receive samples from a suspect and run DNA analysis to match blood and semen samples from the victim at autopsy to the possible suspect, alongside a reference sample from the husband. They prepare both samples, run a Polymerase Chain Reaction and then initiate a Short Tandem Repeat analysis to match the samples. Again, the final processing and results are given in a later lab to demonstrate the time demands of real processing.

Module 9: Conclusions

In the last module, students complete the analysis of the blood and DNA samples prepared in Module 7. They are shown slides of the

the prepared blood samples under a microscope and given instructions on how to determine blood type from coagulation results. The DNA samples previously prepared are now given as STR DNA fingerprints for comparison. This completes the work conducted in the virtual environment.

In the final post-lab exercise, students use all they have learned from the laboratory experiments, combined with witness and suspect statements, to determine whether they think there is enough evidence to take the case to the District Attorney.

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