EXERCISE 1

Body in a Lab: Murder Mystery "Who Dunnit?"

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INTRODUCTION

Background Information

Story so far...

A body has been found in a lab and an investigation is being conducted to determine the cause of death.

IR Spectroscopy

IR has been used to determine whether Mr Blue's death was caused by any of the various chemicals found around the body. This stage of the investigation concluded that the death was not accidental and identified a bottle of aspirin near the body.

UV Spectroscopy

UV spectroscopy was used to analyse the blood plasma sample from Mr Blue to ascertain whether the quantity of aspirin present was a lethal dose. The result proved that Mr Blue possessed only therapeutic levels of medication in his blood, consistent with the dose prescribed by the doctor.

At this stage the death is looking increasingly suspicious and investigation is focusing on the people who had contact with Mr Blue on the lead up to his death.

Evidence

Extract from scene of Crime Report

Mr Blue, a university researcher, was found dead surrounded by chemical bottles that had been knocked over and spilt. On the bench concentrated acid and various organic chemicals were found. There was also a bottle of unlabelled tablets next to the body. Fingerprints from four other people were found at the scene, Mr Green, the laboratory technician, Mrs Blue (estranged wife) and Mr Maroon, both fellow researchers and Miss Scarlet, a PhD Student. A letter was found in Mr Blues pocket addressed to the university Human Resources Department which claimed that Mr Green had a suspected drug addiction and had been caught ordering chemicals for drug manufacturing and that he should be dismissed immediately.

Extract from the Doctors Report

From the doctors report it could be seen that the victim, Mr Blue had previously had a mild heart attack and was taking aspirin daily as medication.

Witness/Suspect Statements

Mr Green - Laboratory Technician

Mr Green has worked for one year as a technician in the research laboratories. Mr Green said he saw the victim arguing with Mr Maroon about research results. He said the victim had claimed Mr Maroon had stolen the results from him and published it as his own work. Mr Maroon stood to gain significant funding and high profile publicity from this research work. If it got out that the results were stolen from a colleague his career and reputation would be ruined. Mr Green said that he had also seen Mr Blue return from lunch a little earlier with Miss Scarlet. He seemed to have been drinking and Miss Scarlet made him a drink.

Miss Scarlet – PhD Student

Miss Scarlet stated that she had been in a relationship with the victim for the last 6 months, she claimed that they intended to get engaged in the new year. Miss Scarlet was a keen horse rider, she spent her spare time helping at a professional stables where she was good friends with Mrs Silver, the Vet.

Mrs Blue - Researcher and estranged wife

Mrs Blue, who had separated the previous year from Mr Blue, stated that the victim had no intention of getting married to Miss Scarlet, she said that Miss Scarlet had misunderstood Mr Blue's intentions, and that he was in fact, planning to move jobs to another University without Miss Scarlet. She also claimed that Mr Blue had even talked about getting back together with her. Recently Mrs Blue had been on a trip to India for a conference on natural Indian medicines.

Mr Maroon – Professor

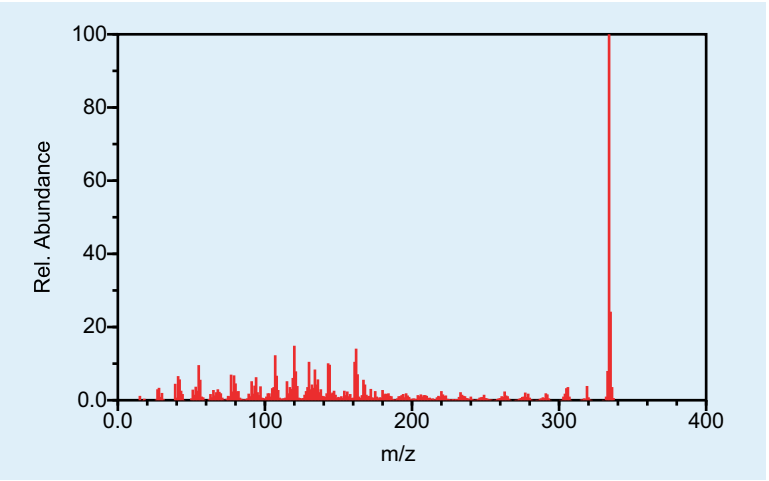
Mr Maroon has worked at the University for twelve years as a high profile research Professor but of late had not made much progress in his field. Mr Maroon needed to secure further funding and was under pressure to produce some results. Mr Maroon also stated that Mr Green had financial problems and had approached him for a loan. Mr Maroon had recently called in the exterminators for a rat problem in one of the basement laboratories.

Forensic Laboratory Report

Sample:
Post mortem urine sample from Mr Blue

Analysis Requested:
GC-Mass spectrometry analysis for common drugs or poisons

Results: Mr Blue Urine sample



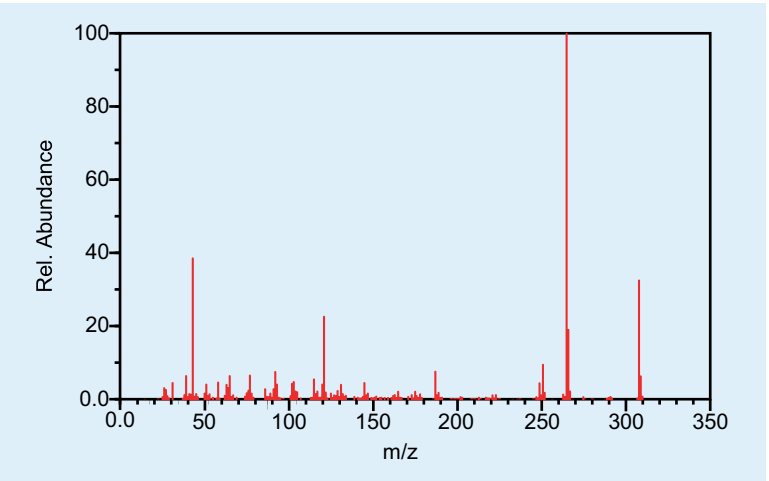
Ref NIST Chemistry webbook

Forensic Laboratory Report

Sample:
Rat Poison Sample from Laboratory

Analysis Requested:
GC-Mass spectrometry analysis

Results: Rat Poison Sample



Ref NIST Chemistry webbook

METHOD

Who did it?

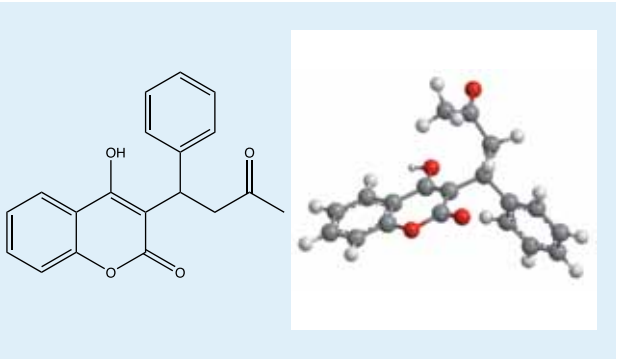
Objective

Use the small database of common poisons and forensic report provided to identify the chemical found in the urine sample of the victim. From this evidence identify what further information would be necessary to establish that this poison was the cause of death, then use the witness statements to identify the most likely suspect.

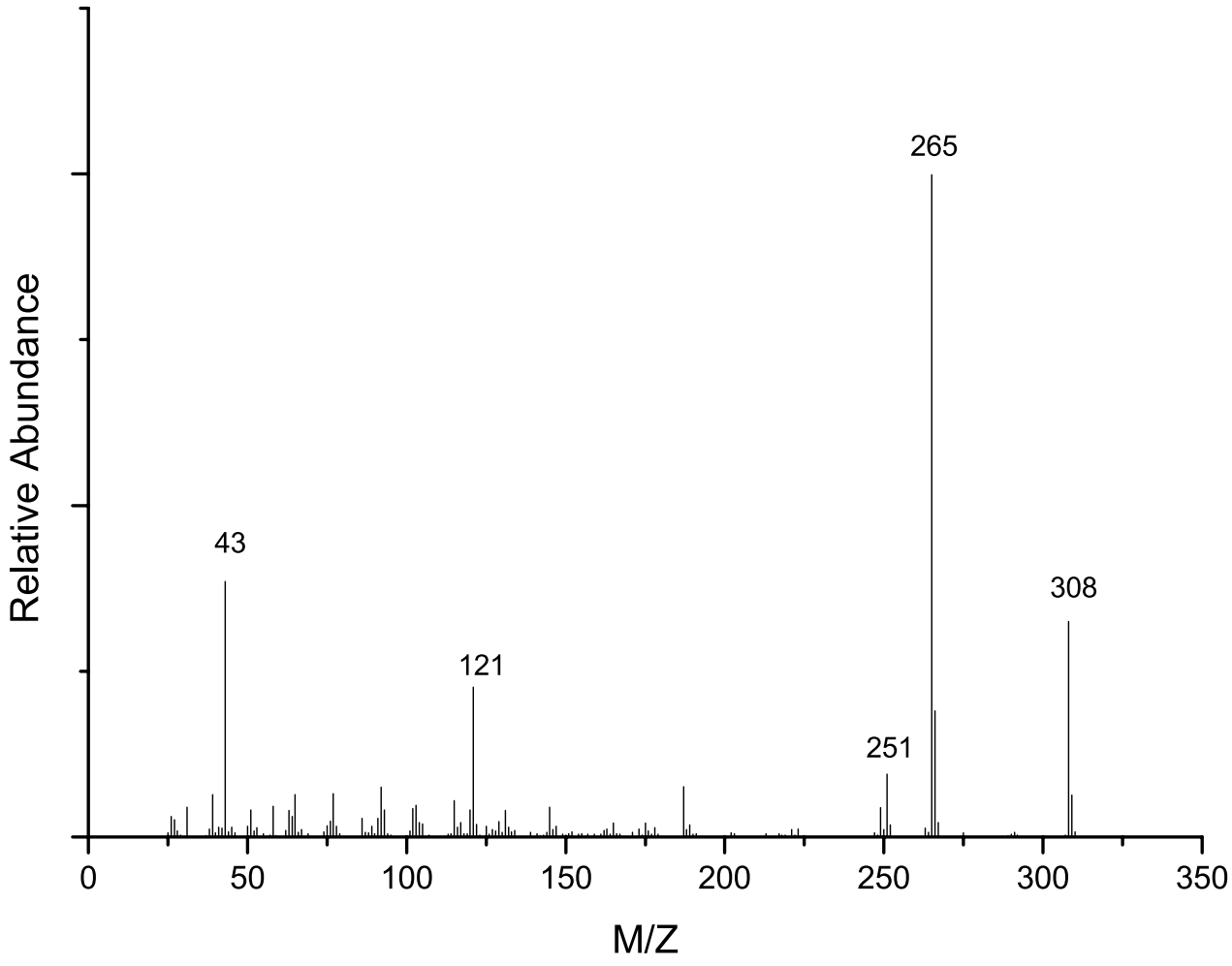
MASS SPECTROMETRY BACKGROUND INFORMATION

Common Drugs and Poisons

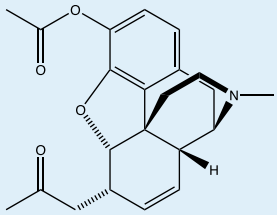
Warfarin $C_{19}H_{16}O_4$ RMM: 308.33

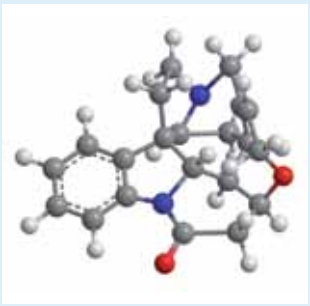


- Is a widely prescribed anticoagulant drug used to prevent thrombosis and blood clots.
- Is commonly used as a pesticide for rats and mice.
- Overdose can cause death by internal bleeding such as gastrointestinal haemorrhage.

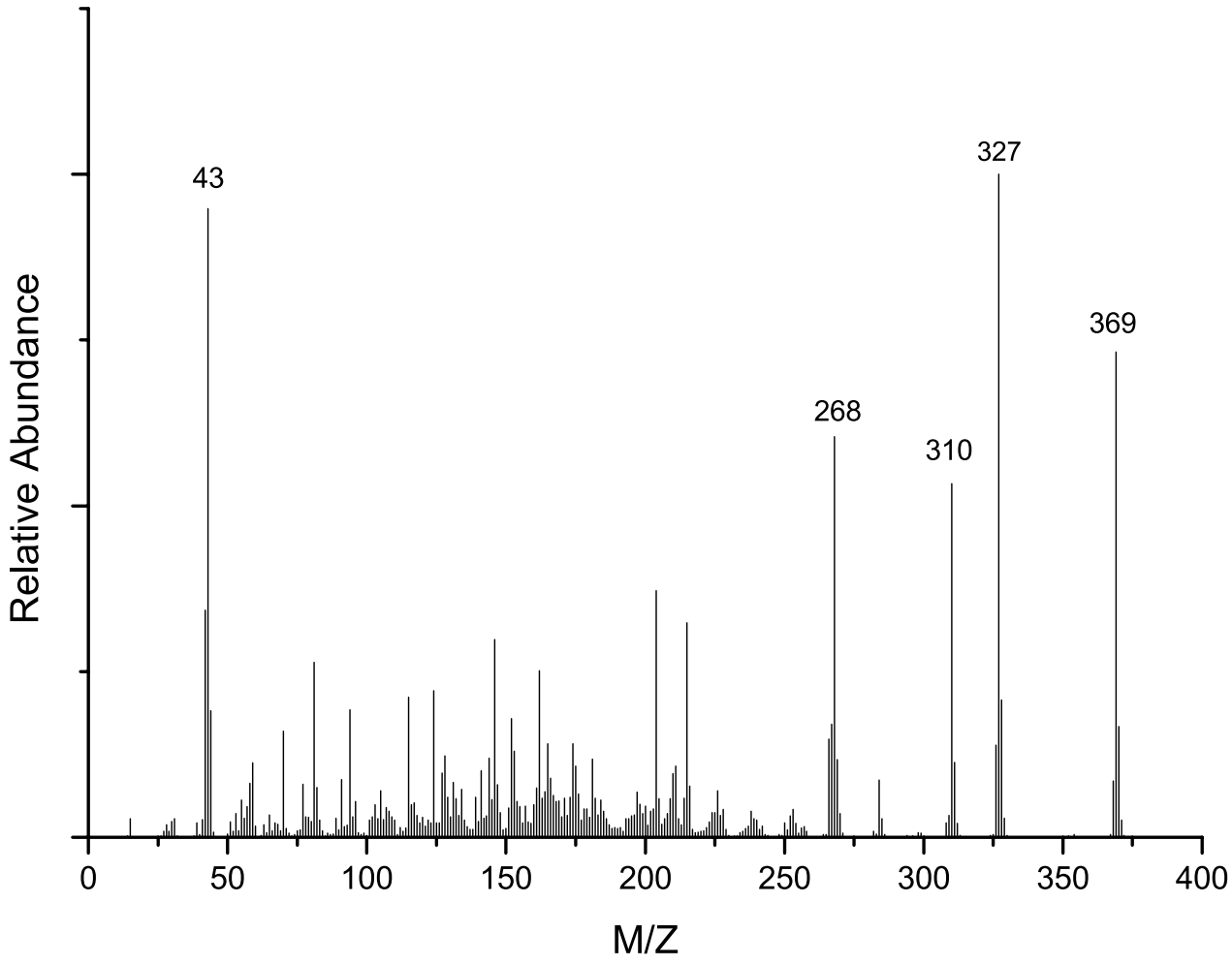


Heroin $C_{21}H_{23}NO_5$ RMM: 369.41

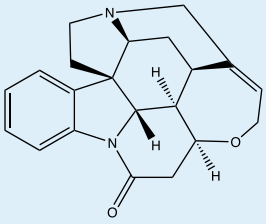


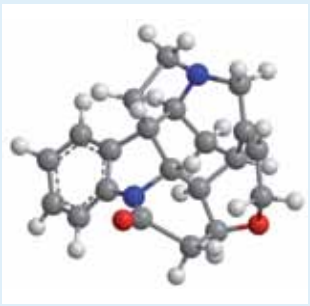


- Is used as a painkiller and illegal, highly addictive recreational drug.
- Large doses of heroin can cause fatal respiratory depression, and the drug has been used for suicide or as a murder weapon.

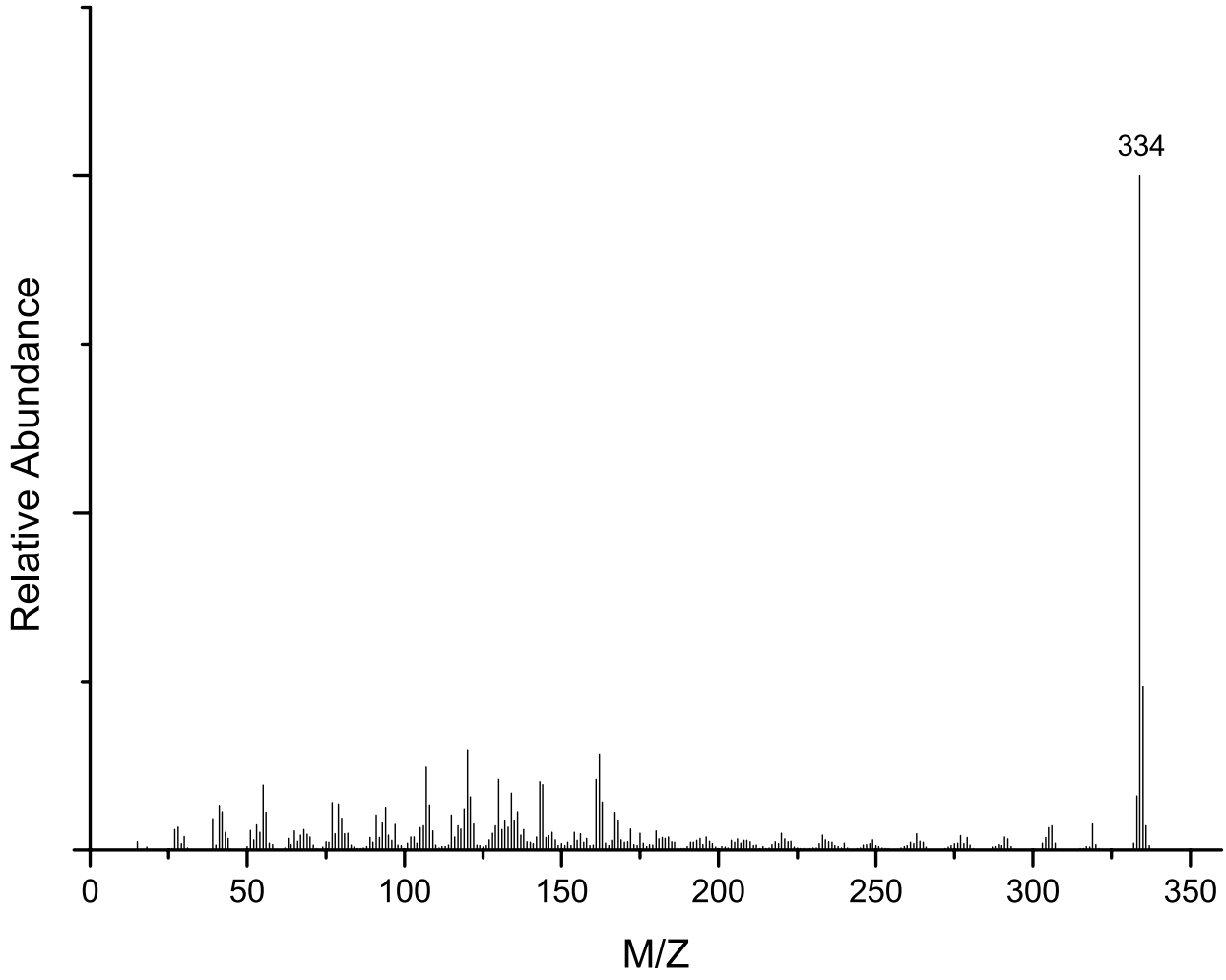


Strychnine $C_{21}H_{22}N_2O_2$ RMM: 334.41

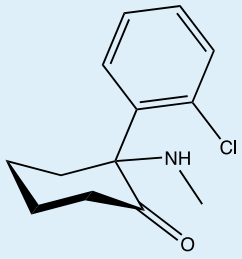


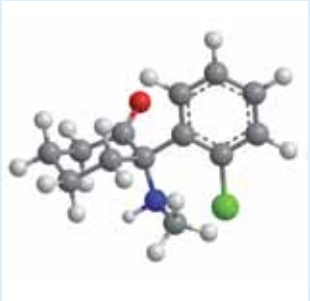


- Is used as a pesticide for killing small mammals, birds and rodents.
- Strychnine causes muscular convulsions and eventually death through asphyxia or exhaustion.
- The use of strychnine as a medicine was abandoned once safer alternatives became available.
- The most common source is from the seeds of the Strychos nux vomica tree found in Asia.



Ketamine $C_{13}H_{16}ClNO$ RMM: 237.73





- Is a drug used in medicine as an anesthetic or analgesic.
- It is also widely used in veterinary medicine as an anesthetic.
- It is a chiral compound and exists as two enantiomers, the (S) enantiomer being more active.
- Deaths have been attributed to ketamine due to chocking, vomiting and overheating.