

Chemistry at the crime scene

Download the teacher notes, technician notes,
station instruction sheets and student workbook
that accompany this resource at
rsc.li/3cjwxc9.



Learning objective

By the end of this session, you will be able to:

- Analyse observations to reach a conclusion.



Forensic scientist

Forensic scientists analyse materials left at crime scenes to provide scientific evidence to support prosecution or defence during criminal investigations.

Meet Joni, a forensic scientist, whose role involves investigating biological samples and evidence seized by the police for the presence of controlled drugs or a possible cause of death.

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MAKING THE DIFFERENCE

Forensic scientist





Case background

- At **3.00am** on **Monday 20 March 2017** police were called to 10 Silky Street in Notterpool, after a neighbour reported hearing a disturbance.
- The same neighbour saw a male suspect running from the property, down Silky Street and turning right into Chestnut Road.
- 10 Silky Street is the address of **Mr A Deal**, who is known to the Notterpool police force as a drug dealer.
- On entering the property, the police found the body of a man, believed to be **Mr A Deal**.



Police report

- The **forensic pathologist** was called and the body was removed to the mortuary for an **autopsy** to be performed.
- The police have two suspects in custody and evidence has been collected from both suspects.



Forensic science apprentice

Meet Jamie, an advanced apprentice in forensics, who works alongside scientists analysing samples collected at crime scenes to provide evidence to support the criminal justice system.

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[Advanced apprentice in forensics](#)





Victim

Name: Mr A Deal

Address: 10 Silky Street, Notterpool

DOB: 14 July 1983

Information: Known to the police as a drug dealer



Extract from autopsy report

Name: Mr A Deal

Cause of death: Blunt force trauma to the head

Time of death: Between 2.30am and 3.00am on Monday 20 March 2017

Toxicology: No drugs or poisons found

Stomach contents: Empty

The mass of each organ was normal.





Suspect 1

Name: Mr S Smith

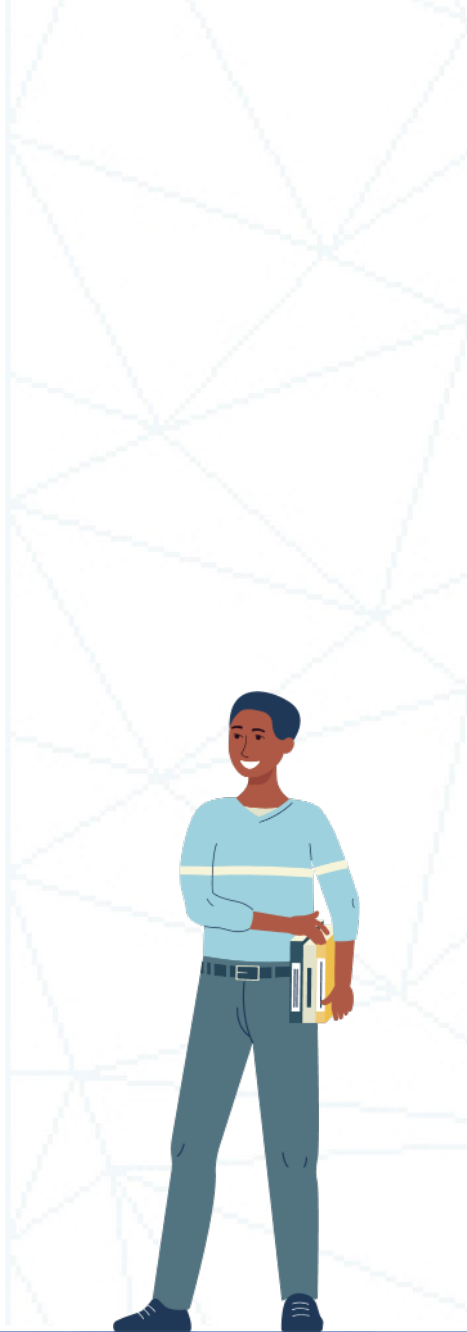
Address: 20 Chestnut Road,
Notterpool

DOB: 22 December 1990

Information: Known to the police
as a drug addict.

Statement

Mr Smith claims he was walking
home via Silky Street after a night
out in the city centre.





Suspect 2

Name: Mr B Roberts

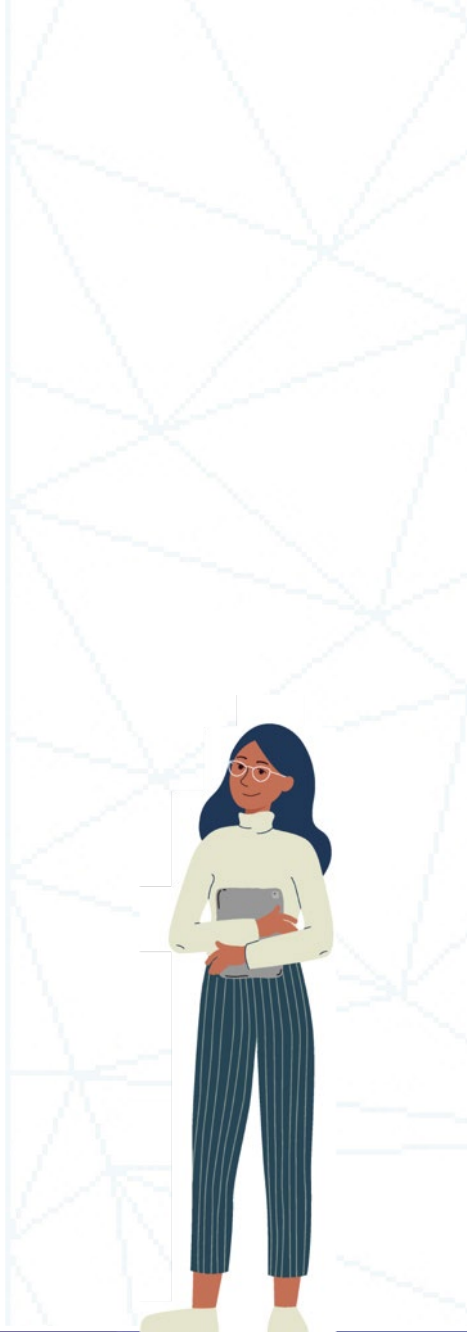
Address: 24 Oak Lane, Notterpool

DOB: 28 February 1989

Information: Not known to the police

Statement

Mr Roberts claims he had been celebrating a friend’s birthday that evening and was running along Silky Street to catch the late bus home.



Evidence collected at and around the crime scene

Evidence reference number	Description
EV1	Screwdriver cast from around the lock of the victim's back door
EV2	Photo of a flathead screwdriver found in Suspect 1's shed
EV3	Photo of a crosshead screwdriver found in Suspect 1's shed
EV4	Photo of a flathead screwdriver found in Suspect 2's dishwasher
EV5	Fingerprint lift taken from the back door of 10 Silky Street
EV6	Fingerprint lift taken from the handle of the baseball bat found in the garden of a house in the street near to the victim's house
EV7	Ten-print fingerprint card from Suspect 1
EV8	Ten-print fingerprint card from Suspect 2
EV9	Plastic bag containing white powder collected from the kitchen top in the victim's house
EV10	Plastic bag containing white powder from Suspect 1
EV11	Plastic bag containing white powder from Suspect 2



Evidence collected from both suspects and their homes

Evidence reference number	Description
EV12	Clothing from victim suspected to be contaminated with blood
EV13	Swab of red substance taken from the edge of the baseball bat found in the garden of a house in the street near to the victim's house
EV14	Clothing from Suspect 1 suspected to be contaminated with blood
EV15	Clothing from Suspect 2 suspected to be contaminated with blood
EV16	Hairs found on victim's clothing
EV17	Hair from Suspect 1
EV18	Hair from Suspect 2
EV19	Fibres found on victim's clothing
EV20	Fibres from clothing of Suspect 1
EV21	Fibres from clothing of Suspect 2



Solving the crime

**Who was responsible and could the individual be prosecuted?
You decide.**

Circulate around the six stations, exploring the evidence and keeping notes in your workbook.

Once you have evidence from all six stations, use this to make conclusions about what happened.



Forensic toxicologist

Meet Calum, a forensic toxicologist, who helps to ensure public safety through the toxicological testing of everyday items such as food, cosmetics, electronics, medicines and textiles to make sure they are safe to use and consume.

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Forensic toxicologist





Station 3: white powder

During their investigation, the forensic scientists found a bag of unidentified white powder on one of the kitchen surfaces in the victim's house (**EV9**). It is suspected that this white powder contains lithium.

The police found similar bags of white powder on Suspect 1 (**EV10**) and Suspect 2 (**EV11**).

You will conduct flame tests to identify the metal present in the white powder found in the victim's house and on each of the two suspects.

Metal	Flame colour
lithium	red
sodium	yellow/orange
potassium	lilac
copper	green





Conclusions

Station 1: screwdriver cast

The imprint seen in the screwdriver cast (**EV1**) matches that made by the flathead screwdriver found in Suspect 2's dishwasher (**EV4**).

This provides a link between Suspect 2 and the screwdriver that was used to break open the victim's back door.



Station 2: fingerprints

The fingerprints lifted from the back door (**EV5**) and from the baseball bat (**EV6**) match the print provided by Suspect 2 (**EV8**). This provides a link between Suspect 2 and the baseball bat and back door of the victim's house.





Station 3: white powder

The white powder found at the victim's house (**EV9**) produces a red flame, showing that it contains lithium.

The white powder found on Suspect 1 (**EV10**) produces a yellow/orange flame, showing that it contains sodium.

The white powder found on Suspect 2 (**EV11**) produces a lilac flame, showing that it contains potassium.

As the white powders found on Suspect 1 and Suspect 2 do not match that found at the victim's house, no link can be made between the victim and either suspect. Therefore, this piece of evidence is not conclusive and cannot be used to link either suspect to the crime.



Station 4: bloodstained clothing

By comparing the observations from the baseball bat swab (**EV13**) with the swabs taken from the clothing of the victim (**EV12**), Suspect 1 (**EV14**) and Suspect 2 (**EV15**), you should conclude that there was blood present on the baseball bat and on both the victim's clothing and Suspect 2's clothing.

Station 5: hair samples

The hair sample found on the victim (**EV16**) matches that taken from Suspect 2 (**EV18**).

Station 6: fibre samples

The fibre samples found on the victim (**EV19**) match those taken from Suspect 2's clothing (**EV21**).



Assistant analyst

Meet Nicola, an assistant analyst at a drug control centre. She used chemical analysis techniques and instruments to test for the presence of drugs and banned substances in the body fluids of athletes during the London 2012 Olympic Games.

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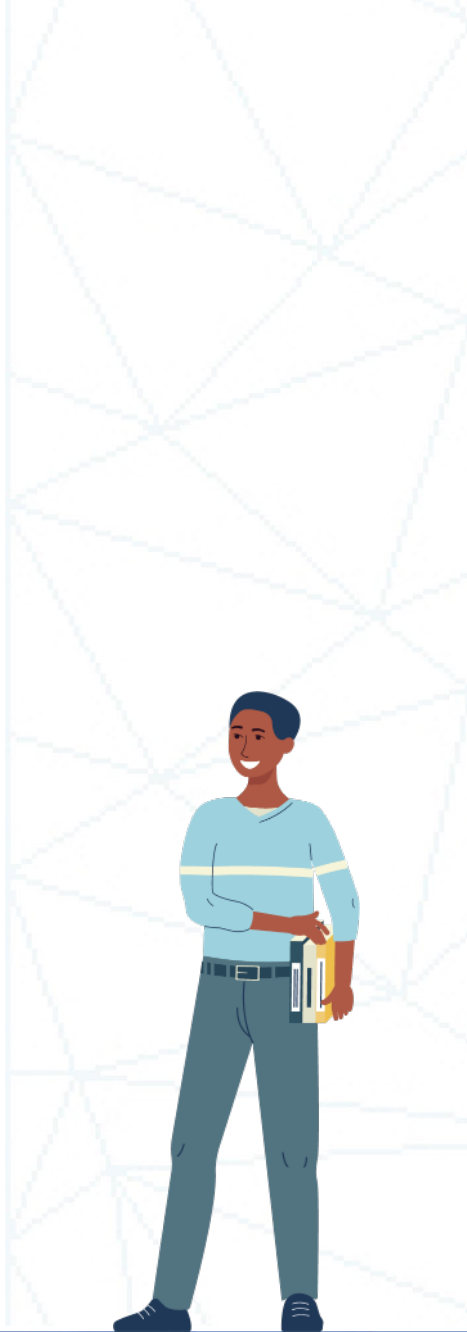
Assistant analyst



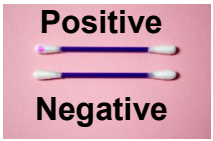



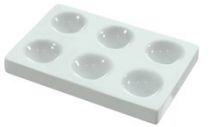




Overall conclusion

The conclusions from each of the six stations show that Suspect 2 is more likely to have committed the crime than Suspect 1.



Key terms quiz answers

Evidence bag		a paper or plastic bag containing evidence from a crime scene; the bag labels the item and details the chain of custody
Kastle–Meyer test		a small, flat, rectangular piece of glass on which specimens can be mounted for microscopic study
Hair cuticle		a hard layer of overlapping cells which forms the outermost part of a hair shaft
Corrosive		a ceramic or plastic tile with 12 cavities or 'wells', used for low volume reactions involving a colour change
Pipette		the warning sign used for a substance with the power to cause irreversible damage or destroy another substance by contact
Microscope slide		a glass or plastic tube with a suction bulb, used for the transfer of small volumes of liquids
Spotting tile		a chemical test, commonly used by forensic crime labs in the chemical identification of blood; a pink swab shows a positive result



Acknowledgements

This resource was originally developed by Liverpool John Moores University to support outreach work delivered as part of the Chemistry for All project.

To find out more about the project, and get more resources to help widen participation, visit our Outreach resources hub: [rsc.li/3CJX7M3](https://www.rsc.li/3CJX7M3)

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