APPLIED SCIENCE

USING MATHS IN FORENSIC SCIENCE

SUMMER PROJECTS

YEAR 11 STUDENTS

CHEMICAL ANALYSIS IN FORENSICS

HEART OF WORCESTERSHIRE COLLEGE

KICK START YOUR STUDY AT HOW COLLEGE WITH ONE OF OUR CURRICULUM BRIDGING PROJECTS

Background

In applied science and forensics numeracy skills are essential to analyse data and form valid conclusions. In this task you will be investigating if glass fragments collected from a hit and run come from the suspects' car. You will develop and demonstrate the use of algebra and unit conversions that can be applied in forensics but also in applied science.

What you should hand-in: You will need to read over the information and complete the tasks in The L3 Forensics Maths Booklet- Use of Formulae in Forensics.

Resources: The L3 Forensics Maths Booklet - Use of Algebra Formula in Forensics

Objective:

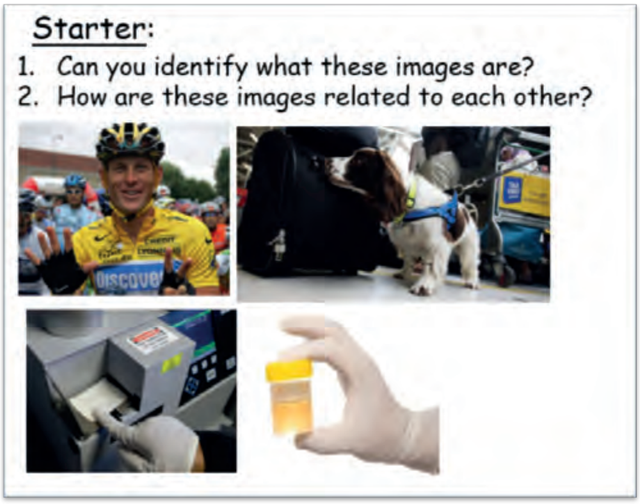
Understand Chemical Analysis in Forensics.

Outcomes:

MUST:
State examples of substances that can be used for chemical analysis (Pass).

SHOULD:
Describe how to carry out a chemical analysis (Merit).

COULD:
Analysis results from a chemical analysis (distinction).



Methods of analysis

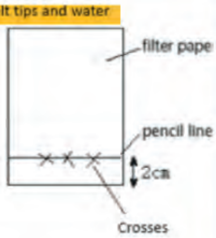
- Chemical analysis is used to identify chemical compounds associated with crimes such as drugs, explosives and gunshot residues
- Forensic toxicologists are concerned with substances that can cause harm to the body. They identify substances found at crime scenes or detect their presence in the body including:
  - Illegal drugs such as heroin
  - Performance-enhancing drugs used by athletes
  - Legal drugs such as aspirin or alcohol
  - Chemicals used as poisons, such as arsenic or cyanide
- Chromatography is a technique used to identify many chemicals including dyes and drugs

Using chromatography

Method

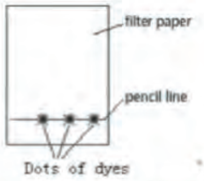
You could trial this method with felt tips and water

1) Draw a pencil line 2cm from the bottom of your chromatography paper.



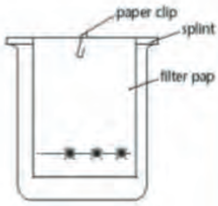
2) Draw 3 pencil crosses on this line. Label one cross as "R" for river water, the second cross as "S" for safe purple dye and the third cross as "P" for toxic purple haze

3) Make dots on the crosses by placing one drop of river water onto the cross labelled as "R", one drop of safe purple dye onto the cross labelled as "S" and one drop of toxic purple haze onto the cross labelled as "P"



Sample results are in the student booklet

4) Set up your chromatography paper so that it just touches the bottom of the beaker.



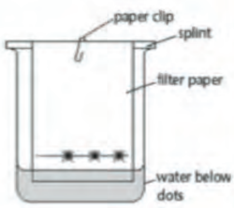
5) Fold the paper over a splint and make sure the top is held firmly in the paper clip.

6) Take your chromatography paper out of the beaker.

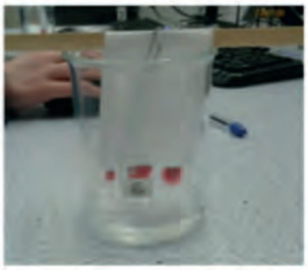
7) Place the beaker in a suitable undisturbed work area (e.g. side or back desk).

8) Pour water in the beaker until it is less than 1 cm deep.

9) Carefully put your paper back into the beaker so that the bottom is in the water, but the dots are above it.



10) Leave for 10 minutes (or until the water moves up the paper and near to where the paper clip of the paper is)



Sample results are in the student booklet

11. Take the paper out of the beaker water

12. While the paper is still wet, use a pencil to draw a line to show where the water has travelled up to (This line is called the solvent front)

13. Dry the paper using a hair dryer (use low heat setting and hold paper up in air while drying)

14. Mark the different separated components on your paper with lines

Sample results are in the student booklet

15. Label the following on your dried chromatogram (dried paper):

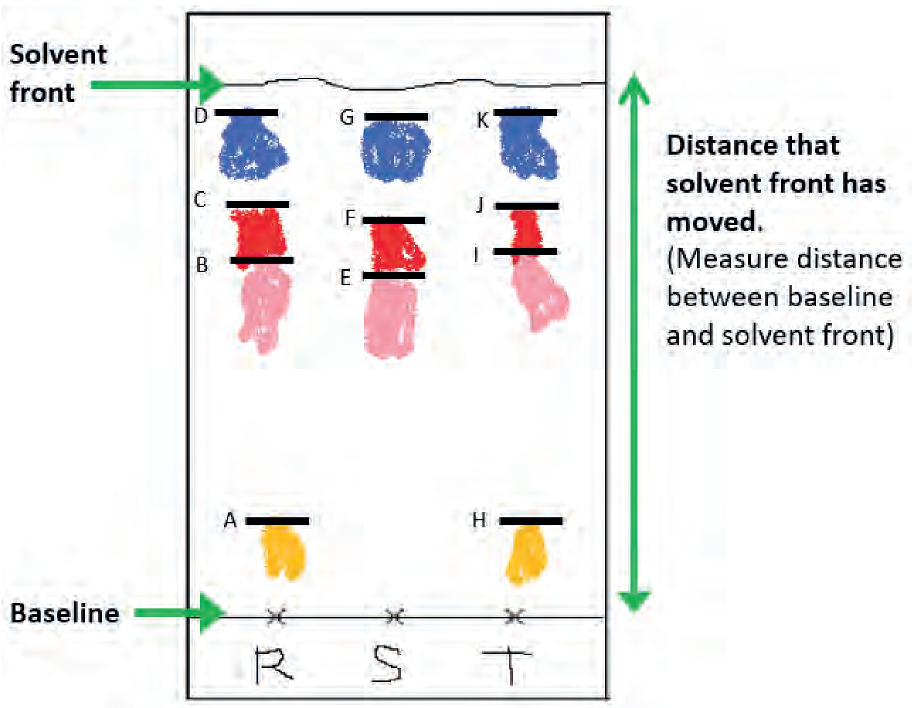
- Solvent front
- Baseline

16. Allocate each separated component with a letter

Case Study

A paint manufacturing company has been accused of dumping into a local river a paint known as “Toxic purple haze”, which is dangerous to local wildlife. Hence this is illegal and is grounds to prosecute the paint company. While the paint company has admitted that they have dumped paint into the river, the paint company have claimed that it is a “Safe purple dye” which is not harmful to local wildlife, hence not illegal.

Chromatography was used to analyse the river water (R), and it was compared to Safe purple haze (S) and Toxic purple haze (T). The following chromatogram was produced:



1. Measure the distance the solvent front has moved = ... cm

2. Measure the distance the components have moved and record in the table on the next page.

3. Determine the retention factor (Rf) for each separated component (complete table on next page)

Rf = __distance moved by component_____

distance moved by solvent front

	Component	Distance moved from baseline (cm)	Rf value (show working out)
R: River water	A		
	B		
	C		
	D		
S: Safe purple dye	E		
	F		
	G		
T: Toxic purple haze	H		
	I		
	J		
	K		

4. Recommend if a criminal investigation and prosecution should or should not take place. Give reasons for your recommendation.

Indicative time for this project:

Up to 3 hours.

Instructions on how to submit this:

Please submit all work to:

Neil Tabram
Curriculum, Resource & Quality (CRQ) Leader – Hospitality and Applied Science

e. science@howcollege.ac.uk
t. 01905 743515

How will I benefit from this project:

The project will help you understand what to expect when you come to College and also give you a head start in working on topics and content that will be relevant when you begin your journey with us.

What can I expect to get back after I submit my project work:

The receipt of your work will be acknowledged and a member of the team will give you some feedback.

Key information you should include:

Your name

Your email address

A contact telephone number