

G625: Forensic Science – Sample Assignment B

Unit Name: Forensic Science	Unit Number: G625
Assignment Title: Recording and Preserving the Crime Scene	Assignment: G625 Sample Assignment B
Date Set:	Due Date:
Assessment Objective(s): AO1 & AO2	

Vocational Brief:

Forensic work includes a number processes from examining the crime scene to presenting a report in court. These include examining the scene of the crime, collecting samples, analysing the evidence collected, preparing a full report and presenting suitable evidence in court. The importance of collecting uncontaminated evidence is therefore the key to ensuring the correct verdict is made. When forensic scientists collect evidence at a crime scene they must follow a strict and thorough procedure.

Task 1:

Recording & Preserving the Scene of the crime - AO1(a)

Write a report on the need to record and preserve a crime scene. You may use some of the guidance given to support your research.

What needs to be done:

- on arrival at the crime Scene – by the police need to do, in the use of protective clothing, in order to follow health & safety guidelines, for safety of the professionals etc.
- to ensure correct sealing of the crime scene – using perimeter tape etc
- to ensure accurate recording in and around the crime scene – use of sketches, video, thermography etc.
- when searching and finding evidence – use of search patterns and markers.

[Max marks possible for this task: 5]

Task 2:**Collecting & Visualising Evidence - AO1(b)**

Write an information sheet on the ways in which the forensic scientists collect and visualise evidence using:

- chemical techniques
- biological techniques
- physical techniques.

[Max marks possible for this task: 12]

For Mark Band 3 you need to show that you understand the science behind the techniques you have chosen and your spelling punctuation and grammar is correct.

Task 3:**Ethical issues involved in Forensic Science - AO1(c)**

A presentation or report could be completed to cover this discussion topic.

Guidance to help you:

- the code of ethics – what is it and why is it needed?
- acceptable scientific methods – opinions, limitations
- DNA – how much weighting should this have
- witness testimonies
- media intervention
- fees.

[Max marks possible for this task: 4]

Resources / Notes:

Forensic science Andrew R. W. Jackson Julie M. Jackson ISBN 0-13-043251-2
(good reference book)

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EXEMPLAR MATERIAL WITH COMMENTARY

Teacher Notes

G625 Sample Assignment B has been used to generate sample coursework on the following pages. A commentary on the mark allocation has also been provided alongside the work.

AO1 and AO2 can be marked from the report on the case study.

Assessment objectives AO1 and AO2 are subdivided as shown on the assessment evidence grid in the unit specification (and reproduced at the end of this document). These subdivisions are indicated by (a), (b) and (c) in the commentary.

The exact mark given within the Mark Band will depend on the detail in the written coursework.

A list of resources will be needed if Mark Bands 2 and 3 are to be obtained.

Additional resources to those given in the specifications:

- *The Forensic Science World*, a booklet with ideas for experiments sponsored by Pfizer.
- Television programmes such as CSI (there is also a CSI interactive CD-ROM in which crimes are solved using evidence. Also there are CSI DVDs for sale commercially). CSI is on Channel 5.
- The number of reference books is increasing rapidly owing to the popularity of Forensic Science courses at Universities. A look at those available from Amazon might be helpful.
- Bio-Rad produce a DNA Fingerprinting Kit amongst other kits (www.explorer.bio-rad.com).

Candidate Portfolio Work (Work is in note form)	Commentary on Mark Allocation.
<p><u>Initial action after the fire had been put out.</u></p> <p>The scene is cordoned off with tape.</p> <p>No unauthorised person is allowed on the scene.</p> <p>Investigators wear personal protective clothing including gloves, breathing masks and gloves etc. to prevent contamination of the crime scene and for their own safety.</p> <p>Photos are taken of the fire damage, recording time and site of damage and date. (video recording would have been another possibility).</p> <p>A detailed plan of the fire damage is made.</p> <p>Plan of the building before the fire obtained.</p> <p>Samples of the burnt material taken and placed in plastic bags which are then sealed to prevent contamination before analysis, as well as deterioration and the effect of air.</p> <p>Bags labelled with the position of the sample (both where in the building and at what depth), date and the name of the investigator. This is to provide the link between evidence and location.</p> <p>Search of the area surrounding the classrooms and staff room carried out. (This was when the plastic bottle, cigarette ends, footprints and empty drink cans were found).</p> <p>Teachers and site staff asked to describe the rooms before the fire.</p> <p>Tapes from the CCTV removed. Tapes will have to be signed for as school property. Guidelines on use of CCTV in schools obtained from school of LEA.</p> <p>Evidence is collected ensuring that there is no contamination and that any deductions from analysis of the evidence can be directly linked to that piece of evidence.</p> <p>The jury needs to be sure that each piece of evidence shown in court came from the crime scene.</p>	<p>AO1(a) – Mark Band 2 possible if there is a discussion on necessity of not contaminating the crime scene.</p> <p>AO1(a) Mark Band 2 possible if reason for sealing and labelling bags mentioned. AO2(a) Mark Band 2/3 may be possible.</p> <p>AO1(a) Mark Band 2 given if this range of techniques mentioned.</p> <p>AO1(a) Mark Band 3 given if reasons mentioned for the collection of each bit of evidence.</p> <p>AO1(c) Mark Band 2; Mark Band 3 will be given if there is more relevant detail.</p>

Analysis of evidence.

Fire damage.

The pattern in which the fire spread is deduced using photographic evidence of the fire damage and comparing the plan of the damage with the plan of the rooms and their contents before the fire. The state of the rooms before the fire obtained from verbal accounts from the teachers and site staff.

Fires burn so that the flames go upwards. The blackening due to burning on the walls will be like an inverted cone. The tip of the cone is the source of the fire. Diagram should be inserted.

When the ceiling is encountered the flames spread out. Any burnable material encountered by the flames will start to burn. The burning material could then fall down to the ground and then the burning cycle is repeated. These points are known as secondary sources.

Different materials have different flash points e.g. (flash point data).

Examination of burnt samples will give an indication of the temperature of the fire.

Evidence will have been damaged by water used to put out the fire so other evidence will be needed.

Analysis of the liquid in the plastic bottle

using Gas Liquid Chromatography as the liquid may be the accelerant.

Calibration with known substances is essential as the retention time depends on the flow of the carrier gas, as well as the type of carrier gas, the length of the column, the adsorbing material in the column and the temperature of the column.

This method is very sensitive. For example it is possible to identify the grade and the production company of a fuel.

As the exact type of fuel is known then a survey of the local area for sources of this fuel is made. The sources can then be questioned and a description of a person who brought the fuel obtained.

Identification would not be sufficient evidence for a conviction.

Physical technique.

AO1(b) Mark Band 3 – actual data.

AO2(a) Mark Band 3.

Chemical technique
(Detailed description of gas liquid chromatography needed for AO1(b) Mark Band 2 or 3).

Discussion of limitations.
AO2(a) Mark Band 2 or 3 depending on detail.

AO2(a) Mark Band 2. More detail and discussion needed for Mark Band 3.

In a chromatogram, the area under each peak depends on the amount of that compound present in the mixture so relative amounts of components can be obtained. If the peak is broad, then the formula for the area under the peak can be used.

Area of triangle = $0.5 \times \text{base} \times \text{height}$

And the ratio of the areas calculated.

If the peak is sharp then the heights can be used to obtain relative amounts.

Plastic bottles were tested for finger prints

The fingerprints are matched using computer technology with the database. At present in England a match of 16 points is needed. (even identical twins do not have the same fingerprints). There is a national database of fingerprints of those who have been convicted / suspected of a crime. However not everyone's fingerprint is in the database. At present there is a discussion about whether there should be a national database as other organisations e.g. commercial organisations might use it. If everyone had their fingerprint taken it would feel like a dictator state.

Cigarette ends

Analysis by DNA.

The cigarette ends were analysed for DNA.

DNA samples were taken from suspects.

Suspects have to be willing to give DNA samples.

The samples were analysed and compared with DNA fingerprints in the police database. However not everyone's DNA fingerprint is in the database. At present there is a discussion about whether there should be a national database as other organisations e.g. commercial organisations might use it.

DNA is a very sensitive method as 10 sites are compared.

Chance of an error is now 1 in 10^{13} .

A match does not necessarily prove that the fire was started by that person. Although an explanation of why the cigarette ends were present at the scene of the fire would be needed.

AO2(b) Mark Bands 1 or 2 possible.

AO2(a) Mark Band 2.

Biological technique.

(Detailed description of the technique of obtaining a DNA fingerprint needed for AO1(b) Mark Band 2 or 3).

AO2(a) Mark Band 1.

Guilt

One piece of evidence alone is not considered sufficient to convict a suspect. There will need to be several pieces of evidence. Also there must be chain that links the evidence to the suspect. In the case, the fingerprints on the bottle which contained a flammable fuel which had a flash point that could cause the fire damage would provide the chain of evidence.

It must be proved in court that the evidence was collected in such a manner that it was not contaminated. Additional evidence could come for the tapes from the CCTV and casts made from the footprints, which are then matched with known footprints. The depth of the footprint indicates whether the person was heavy or light.

Analysis of the soil outside the classroom and the soil in the footwear of the suspect could provide yet more evidence.

Resources

AO2(a) Mark Band 1

More detail would be required for AO2a Mark Bands 2 and 3. More focus needs to be on bullet points and the assessment evidence grid (see below).

Resources must be listed for the higher Mark Bands.