

Chemical physical and biological evidence biology essay



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There are many different types of evidence that can be found at a crime scene, these can be categorised into chemical, physical and biological evidence. Physical evidence can be collected at the crime scene and are mainly physical objects such as a murder weapon or a broken window.

Chemical evidence is any residue from liquids that could have been used to assist with the crime such as poison and drugs, finally biological evidence is when hair or skin from a persons body has been transferred to a physical surface and then be collected and tested.

When such evidence is collected it can be used to find what exactly happened in the crime, the history behind the crime and who was involved and could have committed it. All evidence can be tested and analysed and is vital when finding out the various incidences that happened at a crime scene, some examples of evidence are shown below:

Chemical

Physical

Biological

Water

Cuts

Blood

Chromatography

Bang on head

Hair

Soil

Finger print

Lip Print

Rain water

Shoe prints

Sweat

Petrol

Murder weapon

Skin

Fluids

Broken windows/doors

Saliva

Poison

Clothing

Nails

Drugs

Fibres

Gun residue

Skeletal remains

Alcohol

DNA

cosmetics

Paint

Serial Numbers

Some evidence can be overlapped into two categories once it has been tested an example of this would be finger prints as it is both physical evidence and biological evidence.

Health and Safety

The Health and Safety at work act all employees have the right to be safe in their working environment to stop them from getting hurt while doing their job, if someone does get hurt while they are doing their job then they will have to receive compensation from the company because they would probably have to take a long time off work and it wouldn't be their fault it would be the company's fault for not providing a safe working environment for their employees to work in.

This act is extremely important for people who work in forensic science and a crime scene this is because employees have to be trained to wear protective equipment to stop them from being contaminated by any substances in a crime scene. Employees also have to be trained to collect evidence properly without contaminating any evidence; this is because evidence cannot be used in a court case or to prosecute somebody.

COSHH – The Control of Substances Hazardous to Health Regulations 2002.

COSHH is there to prevent ill health of company's employees that are carrying out experiments that involve hazardous chemicals. If COSHH was not there then people would not know how to handle experiments and what they should do if an accident arises. COSHH provides eight very important steps that should be placed somewhere in a work place to keep employees informed about what chemicals they are using or could potentially come across.

Step 1:

Assess the risk

Step 2:

Decide what precautions are needed

Step 3:

Prevent or adequately control exposure

Step 4:

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Ensure that control measures are used and maintained.

Step 5:

Monitor the exposure.

Step 6:

Carry out appropriate health surveillance.

Step 7:

Prepare plans and procedures to deal with accidents, incidents and emergencies.

Step 8:

Ensure employees are properly informed, trained and supervised.

COSHH states that employees have to be trained into dealing with bodily fluids and other hazardous substances, this is because the people collecting evidence and moving a body at a crime scene can be contaminated, and to ensure this the employees do not become contaminated by an substances they have to wear gloves, goggles, suits and masks so that no substance can be touched or breathed in.

Management of health and safety at work

The Crime Scene

When a crime scene is discovered, I think this is the series of events that will happen, the cleaner will see the broken glass when they have come into

work and go over to investigate the area, the cleaner will go through the door and see the body of the victim. They will check to see if there are any life signs from the victim and then look around to see if there is anyone else in the area. After this the police will be called to investigate further

When a crime scene of a murder scene is discovered by an individual, the police come to investigate that there is actually a crime scene. When this has been assessed the Scene of Crime Officer will be the first onto the scene and they will cordon off the area, the best point of access will then be chosen and that will also be cordoned off, this is so that no one who should not be there will not gain entry to the crime scene and contaminate the crime scene or the evidence within it the access point has to be so that it is not the same as the access point the suspect has used so the evidence is not contaminated.

The scene of crime officer will then have the responsibility to set up an inner and outer cordon, this is because the inner cordon will be around the evidence to ensure that it will not be touched and contaminated, the outer cordon will be around the area, this is so that evidence such as footprints are not contaminated.

There are six different types of people that can appear at the scene of the crime to investigate the area and scan the scene for evidence, these are:

The Public: the public are most likely to appear on the scene of the crime first, this is because they generally want to know exactly what is going on, when the scene turns into an investigation the area has to be specially

cordoned off to prevent the public from entering the area and accidentally destroying evidence.

First Officer: The first officer or constable checks the scene for any visible evidence and has to take note of the environment such as the weather and any strange smells in the area. The First Officer also cordons off the evidence from public view.

Crime Scene Manager/Investigating Officer is responsible for the crime until the case is ended such as someone being convicted or the case being dropped.

The Scene of Crime Officer cordons off the inner and outer area and collects the evidence.

Scientific Support: The scientific support put the evidence in bags and labelled them and then sends it to the forensic scientists for further analysis. Scientific Support is paid by the Scene of Crime Officer.

Others: The other people that can appear on the scene is the media to report to the public on what happened. The army, fire arms experts, paramedics and anthropologists can also be present on a crime scene.

Our crime scene:

After school has finished, every Thursday evening between the hours 4:00pm - 6:00pm there is a rock climbing club that takes place in the school gym. On Friday 13th November at 7:26am the school cleaner discovers the body of 18 year old Harriet Oaks who is a consistent member of the rock

climbing club. Various evidence was found at the crime scene, the body was found on the floor next to the rock climbing wall with a rope around the neck which have caused strangulation marks, fibres from a jumper was found in her mouth and throat, these fibres were from a jumper that was also left at the crime scene. It was also found that there was pollen on the jumper which will be used for further evidence.

The body was found still wearing rock climbing clothing, in the pockets of her tracksuit bottoms a fine white powder was found, in the alternative pocket a letter was found addressed to one of the suspects, the rock climbing teacher Mr Ross Hill who it was also found that they were having an affair. Outside of the crime scene there were other various evidence that can contribute to the finding of the suspect. The evidence that was found was paint on a bollard which is assumed to be from a car, maybe the car of the suspect, the other evidence was found was soil footprints that was found inside of the building and also a blood splatter that could have been from the suspect when they had broken in. CCTV footage was also found that could contain evidence from the crime scene.

This was the evidence that was found:

-Pollen

-Letter

-White powder in the pocket

-Finger Prints

-CCTV footage

Evidence

How its collected

Why was it collected

How is it stored

Blood on the window

I would use a cotton bud to scrape the blood from the surface.

It can be DNA tested and find instant evidence on who the suspect could be.

Tyre marks and footprints

Tyre and footprints are collected in the same way by me; a plaster cast is taken of the soil.

Footprints are very important because it can be used to tell what type of shoes the suspect was wearing, if the suspect was male or female, how tall they are and how much the suspect weights.

When the cast has dried it is sealed in a plastic bag and then labelled, this is to prevent cross contamination. The bag that will be used is made out of strong plastic and is used to keep the evidence safe and intact.

Paint

Paint on a surface can be scraped from the surface, the flake of paint can be used to be analysed. I would also use a cotton bud to collect wet paint.

The police would use this as evidence because it can be used to tell which car was used to commit the crime, this is because most cars have different paint on them so it can be used to decipher what car was used.

The paint will be placed inside of a bag and then labelled. This is because the bag will prevent the paint from being cross contaminated or damaged.

Soil

If the footprint is found inside then I would have to take a photograph of the footprint because it can be psychically collected.

The photo of the footprint can be used to decipher what type of shoe the suspect was wearing at the time of the crime.

The photo will be placed in a plastic bag so that it can be examined and looked at with out the photo being damaged or contaminated.

Fibres

If I found fibres in the victims throat would be taken out with tweezers and placed in a container. However if fibres are found on clothing then the whole piece of clothing would be collected.

Fibres can be analysed to see if the fibres match any items worn by the suspect.

Fibres are stored in a brown paper bag this is so that they do not become contaminated and so that the clothing can breathe as it will be stored for a long period of time.

Pollen

Pollen that was found in the victims throat would be taken out with a cotton bud and placed in a container. However if the pollens are found on clothing then the whole piece of clothing would be collected.

Pollen is collected because it can be used to tell where the suspect has been at the time the crime had taken place or how they have escaped the crime scene. This is because pollen is different from different flowers so it can easily be used to decipher which flowers the suspect has been near to.

Pollen that has been found on clothing will be stored in a brown paper bag to allow the clothing to breath and prevent cross contamination.

Finger prints

Finger prints are invisible to the naked eye, so to collect them a light has to be shone onto the finger print with a powder sprinkled on it. This is so the print becomes visible and then I would have to take a photograph.

Everyone has different fingerprints so the print can be used to tell exactly who committed the crime.

The photo will be placed in a plastic bag so that it can be examined and looked at with out the photo being damaged or contaminated.

White Powder

The powder is placed into a pot and then experiments are conducted on it to see what kind of powder it was

The powder can be analysed to see what it was and it may be able to help contribute to the crime case.

It is put in a pot and sealed to prevent cross contamination or lost.

Letter

The letter will be taken out of the victims pocket and then placed in a paper bag

The letter is collected to give further evidence about the victims personal life and also the victims handwriting can also be analysed.

The letter will be kept in a plastic bag to ensure that it does not become damaged or contaminated. It also means that the letter can be read and analysed without being taken out of the bag

Searching for evidence

There are a variety of different ways to search for evidence at a crime scene, if a crime has taken place in a large field or open area a large amount of police are gathered into a series of parallel lines to scan the area for evidence, this will ensure that every inch of space is searched so no evidence can go amiss.

If a crime has taken place in an indoor area the spiral method will be used to search for evidence, this means the police will go from the outer cordon and spiral inwards to cover the whole area; this is so that no evidence can be contaminated or broken.

The last search method is dividing into grids, this ensures that each section is covered so no evidence can be missed or contaminated. The grid division method is mainly used in indoor environments because it means every inch of area will be searched.

Collecting evidence - pollen

Testing pollen is essential to finding out who could have possibly committed a crime. A Forensic Botanist which is a plant scientist extracts grains of pollen from a piece of clothing that could have been worn by the suspect, pollen is used because the suspect rarely even remembers that pollen could be used as a piece of evidence. The forensic Botanist can therefore use key identification to understand what type of pollen has been on the suspect and from which species of flower, this will then be used to identify if the suspect has been at the crime scene at any given time.

Analysing footprint and tyre prints

Distinction - Justify why the procedure is done?

Possible Errors:

- Don't get the whole imprint of a clear footprint

-If you spray hairspray too close the soil will be moved.

- weather can affect the footprint.

- If you do not move quickly enough the plaster will set before it is poured into the footprint.

-If the plaster is of the wrong consistency then it will not set if there is too much water and if there is too much plaster the liquid will not pour over footprint

Experiment

- I first mixed three parts of plaster of Paris and two parts water, then mixed thoroughly together to create the plaster and it is completely liquefied.

I put a dam around the plaster so it does not run out of it

As the soil is loose I put hairspray on so the soil does not move away. If I put it too close to the hairspray will move the soil.

I then poured the plaster slowly and evenly over the footprint by not pouring directly on the footprint, this is done by holding a spatula underneath the plaster and letting the plaster run over it smoothly before it falls onto the footprint.

I then waited for the plaster to set

When the cast has been set the forensics analyst looks at various things within the footprint to help them in catching the suspect. This is done by

looking at the size of the shoe which can help determine the gender and the height of the culprit. The type of print can also help tell if the culprit was running or walking through the scene of the crime and whether or not there is any definitive aspects to the shoe the suspect was wearing such as the make of the shoe and any ridges or other features on the shoe.

Fibres

Another experiment that I have conducted is collecting evidence that consist of fibres from clothing items and seeing what they look like under a microscope. The method is exactly the same as the pollen collection however instead of brushing the fibres onto a piece of fabric, I had to pull the fibres off one by one and spread them out as thinly as possible so that I could get a clearer look. The polyester and acrylic fibers looked exactly the same however but the cotton fibre looked very different. Fibres will be used as evidence as clothing from the suspect could rub off onto the victim or the environment.

Fingerprints

I also conducted a fourth experiment to evaluate the collection of evidence by taking fingerprints.

The fourth experiment that I conducted to research the taking of evidence was by taking fingerprints. The class had two community police officers in to explain the processes on a crime scene in which the ways all types of evidence is collected. They gave us sheets that are used when taking fingerprints and they also gave us ink pads. Fingerprints are taken by

making one rolling movement with each finger on the ink pad then the same movement onto the sheet. The first set of fingerprints taken is of the tips of each finger on both hands, it is then done with the four pads of the fingers together and the pads of the thumbs separately. Finally, the side print of the hand is taken. Although this experiment that I conducted has been used a lot in the past and is still used, there is new technology that allows police to scan the criminal's fingerprints without the use of ink and paper. This means it is much more reliable, less messy and easy to do if the criminal refuses. Below are images of different types of finger prints;

Police Notes:

The police were called into the school lab; the evidence that was found was hairspray, cigarette butt, coat and a coffee cup. The hairspray that was found was sprayed with aluminium powder and a fingerprint was found, however this fingerprint cannot be used as evidence as it is known that the fingerprint is that of a police person, this is known because every member of the police force have to have their fingerprints taken when they first join the police. However if a gloved had of been used they would not know if the evidence from the glove belonged to the suspected criminal or a member of the police collecting evidence.

The coffee cups that have been found have to be emptied of their contents and sealed into packaging for later testing, the packaging has to be marked as fragile because if the cup is destroyed the DNA will be harder to obtain.

When collecting evidence from the coat it has to be done quickly as the coat could go mouldy if it is placed into an evidence bag, so the coat is therefore <https://assignbuster.com/chemical-physical-and-biological-evidence-biology-essay/>

taken to the station and hung to dry and then placed into a brown paper bag, this will therefore allow the coat to breath. Both shoes and clothing items are packed in this way, however shoes will have to be packed separately as different shoes may have different evidence on them, this will stop both of the shoes from cross contaminating one another so they can be used in court.

A knife is found with blood on it, it was found that the offender was suicidal and tried to commit suicide by cutting their wrists as they were addicted to drugs, it was then discovered that the crime was committed as the offender needed money to buy drugs. This is called acquisitive crimes and consists of a total of 7 out of 10 crimes committed today; these are crimes such as theft, burglary and shop lifting just to get money to feed a drug addiction. However, if a serious crime was committed with this knife such as a stabbing the community police will have no involvement as SOCO will have to be called in to deal with proceedings.

The knife will be collected by placing it into a plastic tube and then that is placed inside of a bag and secured safely. If a tube is not available then SOCO have to improvise by securing the weapon in a box with wire then in a bag. Bags will always be reused and every piece of evidence is secured inside of one to be taken back to the station for further analysis.

Method for coffee cup collecting and packaging:

- Pour liquid contents into the sink holding the handle with one finger hooked through to make liquid pour out the opposite side.

- Get bag and fill in the outside labels.
- Put mug into the bag the same way the cup was held when being emptied of any content.
- Remove the blue tape and seal.

Blood Splatter Experiment

I conducted an experiment to test the way a person can tell which way blood has splattered on to a surface. The experiment was tested with watered down poster paint. I tested the drips on five different angles. These were 25°, 45°, 60°, 70° and 90°.

If there is blood found at a crime scene the people responsible for testing it would look at the evenness as well as the course in which the blood had come from, this is because if the blood appears to be of a thick consistency it will mean that the blood has been on the surface for a long period of time, However if the blood appears to be very thin it will mean that the blood has been splattered onto the surface recently. The forensic analysis would want to look for the direction in which the drops had come in to identify where the victim had been attacked from, as this could also help to find out what the casualty was hit with depending on the quantity of blood and the distance from the impact it is.

Equipment:

A retort stand

A clamp

One pipette

A wood block with slits in at each degree angle

15 sheets of A5 paper

1 sheet of A5 card

Red poster paint

1 beaker

1 newspaper sheet

Ruler

Group Results:

Angle

Distance travelled 1

Distance travelled 2

Distance travelled 3

Average

25

2.5cm

2cm

3cm

2.5cm

45

2.5cm

1cm

2cm

1.8cm

60

1.2cm

2.3cm

1cm

1.5cm

70

1.8cm

1.9cm

1cm

1. 6cm

90

1. 5cm

1cm

0. 8cm

1. 1cm

Class Results:

1

2

3

4

5

6

7

Average

25

2. 33

1. 3

2. 5

2. 06

1. 6

1. 23

2. 5

1, 93

45

0. 83

0. 93

2. 1

1. 36

0. 9

1

1. 8

1. 27

60

0. 67

1. 06

0. 9

1. 2

1. 13

0. 8

1. 5

1. 03

70

1

1

0. 6

1. 36

0. 8

0. 93

1. 6

90

0.9

1.2

0.7

1.13

1.03

0.73

1.1

I first started by setting up the apparatus, this was a retort stand with the clamp attached and the pipette held insecurely in the clamp as this would ensure an precise drop of paint. By putting the pipette loosely in the clamp an error may be caused as the pipette will be able to move too freely and the blood will get splattered inaccurately. This error is hard to prevent because if the clamp is twisted tighter to secure the pipette firmly then it will cause the pipette to be bent and the drop will fail to drop as the pipette will be blocked or the splatter may not end up in the same place. To recover this error, the clam should be left in a loose position and should also be kept steady when the drop is being made, this will therefore prevent the drop from being inaccurate

The clamp was placed at 50 cm along the retort stand to make the experiment more accurate as it would not be moved after each drop.

Underneath I placed some newspaper down onto the table to prevent it from

becoming contaminated and to also so I could draw around a wooden block that I had placed over it. An error that could occur here is that if the newspaper moves through the experiment it may move the apparatus on the top which will mean the experiment will be in a different angle and will therefore make the experiment less accurate. This error can be prevented by sticking the newspaper down securely to prevent the apparatus from moving; the apparatus should also be constantly checked throughout the duration of the experiment to ensure that it has not been misplaced.

I placed a wooden block under where the pipette will drip and drew around the bottom of it to make sure it is placed back in the same place every time the paper is changed around, this will ensure that the experiment is more accurate and ensure valid results. Next, I poured paint into a beaker and then used the pipette which is secured in the clamp to gather the paint and to then create a drop. I then wrote on each piece of paper the degree it will be used on and the number it was on that angle. After this I set up the paper in the wood block by taking the piece of card and a piece of paper fitting to the number and angle and securing them both together in the 25° slot.

The card is used to make sure the paper does not move around when the drop hits the surface which will mean the results of the experiment will be reliable. Once all apparatus was set up and put in the right places I made the first drop onto the paper, waited for it to stop running down the sheet and then prepared to make the next drop. An error could be made if the paint is not left running because it will render the results inaccurate.

I then carried this method out again three times each but at different angles, this was done so it would be easier to find an average length for each angle.

The class then took their results and put them up on the board to create an overall average.

Main techniques for analysing chemical, physical and biological evidence

Chemical Evidence

UV spectrometer

UV/visible spectrometry is used for the determination of the concentration of UV or light-absorbing substances in a solution. It works by a light passing through a solution; the higher the Mol concentration of the solution the more light is absorbed. The percentage of transmittance helps analysing the Mol concentration. This specific piece of kit is used because it is simple and effective to use because it is all used on computers and therefore anyone can use it with minimal training.

There are some problems and variables to using a UV spectrometer to measure light absorbing substances in a solution and that is that it cannot transfer light through glass because glass does not absorb any of the light. Furthermore when the substance is being tested it will need to have a covering placed over it to ensure that the substance does not evaporate when the UV light is shined onto it. Another problem that could arise is that there may not be enough samples to carry the test so a large substance will be needed. Furthermore, there is a chance that the machine could break down.

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I chose this piece of equipment because this piece of equipment is reliable as it gives accurate results, however there is a great chance of human error because the plates can be touched which will therefore give unreliable results.

Risk Assessment:

The UV spectrometer can cause electrical shock, chemical spillage and contact with moving parts. When using this equipment, make sure that you wear gloves to avoid skin contact with chemicals. Do not touch any of the wires while the machine is turned on to avoid electrical shocks and do not touch the inside of the machine while it is determining the concentration of UV. Also when using this piece of equipment, make sure that it is placed in the middle of the working surface to ensure that the machine cannot be knocked off and hurt somebody. The user of this machine should also wear gloves to protect the skin from absorbing any of the UV and visible light frequencies.

Sulphuric Acid: Sulphuric acid is a corrosive chemical that can severely burn the eyes and skin if it comes into contact. At worst, it can cause third-degree burns and blindness to the victim. In its vapour form, it can cause damage to the eyes, nose, throat and lungs; this can be very dangerous, especially for asthmatics, because the vapour can cause a build-up of fluid in the lungs. If sulphuric acid is ingested, vomiting should not be induced; the victim should be given large quantities of water and should seek immediate medical attention. In case of skin contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. The victim should then seek medical attention. If sulphuric acid contaminates the eyes, then the eyes should be washed with a constant flow of water for 15 minutes occasionally lifting the lower and upper eyelids.

To prevent these accidents from happening the user of this chemical should wear goggles, gloves and protective clothing to prevent any contamination.

Potassium Manganate: This chemical is very corrosive. Harmful if inhaled, swallowed or absorbed through the skin. Inhalation may result in spasm, inflammation and oedema of the larynx and bronchi, chemical pulmonary oedema. Symptoms of exposure may include burning sensation, coughing, wheezing, and laryngitis, shortness of breath, headache, nausea and vomiting. In case of skin contact, immediately flush skin with copious amounts of water

for at least 15 minutes while removing contaminated clothing and shoes. If this chemical is inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. If swallowed, wash out mouth with water provided person is conscious. Seek medical attention and do not induce vomiting. If the chemical is spilt on clothing wash contaminated clothing before reuse.

Method

1. Take 3 plastic cuvettes. Fill one (~3/4 full) with 1M sulphuric acid solutions, fill one with potassium manganate (VII) solution and fill the third with potassium dichromate (VI) solution.
2. Place the cuvette containing the acid into the spectrophotometer. Ensure that the clear/transparent sides of the cuvette are in the beam (not the opaque sides)
3. Set the absorbance wavelength to 400nm.
4. Set the reading to zero. (This is the baseline in which all measurements are made against)
5. Place the cuvette containing potassium manganate (VII) solution into the spectrophotometer and record the absorbance reading in Table 1.
6. Place the cuvette containing potassium manganate (VII) solution into the spectrophotometer and record the absorbance reading in Table 1.

UV- visible Spectrophotometry

Table 1: Absorbance Data

Wavelength (nm)

Absorbance Manganate (VII)

Absorbance Dichromate (VI)

400

0.076

1

420

0.035

1.157

440

0.062

1.061

460

0.162

0.848

480

0.408

0.490

500

0.763

0.219

520

1. 114