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Question 1

The type of bloodstain evidence at the scene is a cast off pattern. According to Becker (2005), a cast-off pattern normally results in blood striking nearby surfaces such as walls, floors and ceilings. A cast-off pattern indicates that a blunt force trauma to the head. The large wound on top of the head is indicative of repeated use of the blunt force weapon on the victim.

The first step in the documentation process of the room would involve conducting an initial scan of the room to ascertain the evidence present. This would then be followed by photographing of the scene in both video and still pictures. Detailed information regarding the crime scene would be documented without touching anything. Then a sketch of the room is done with all the objects in their respective positions. Once this is done, a recheck of the room is done before collecting all the evidence.

Documentation of the bloodstain evidence would involve documenting the size, shape and distribution of the stains and patterns (Dutelle, 2011).

Pictures will then be takes both with and without a scale of reference for purposes of recreating the events that led to the bloodshed (Dutelle, 2011).

Once the photos and sketches are done, notes concerning the overall bloodstains will be made. Sketches need to be made to represent the actual situation that was present at the crime scene.

Question 2

The purpose of the Controlled Substances Act is to control the illegal use of and trafficking of controlled substances.

Under the Controlled Substances Act, drugs are classified into five schedules.

That is schedule I, II, III, IV and V (Brown, 2001). Schedule I drugs are normally drugs that have the highest likelihood of being abused and have no medical use (Brown, 2001). These include drugs such as heroin and marijuana. Schedule II drugs are the drugs that have high abuse chances and can be used for medical purposes (Brown, 2001). These include drugs such as cocaine and morphine. Schedule III drugs have low chances of abuse and are used for medical purposes. Schedule IV drugs usually have a lower change of abuse than the drugs in the first three schedules. Schedule V drugs have the least chances of abuse.

Knowledge of the CSA helps forensic scientist to provide accurate information concerning drugs in evidence. From this analysis, law enforcement can be in a better position to conduct through investigations. Schedule I and II receive the most severe penalties. Drugs include heroin and cocaine respectively. Prison sentence for first offence ranges between 0- 20 years with a maximum fine of \$1, 000, 000. For subsequent offenses, the prison sentence is between 0-30 years with a maximum fine of \$2, 000, 000. The CSA is not effective in controlling drug abuse because it does not provide for search and seizures. In most cases, drug cases normally lead to seizures, which tend to violate the Fourth Amendment rights of suspects. Thus in the end case may end up being dismissed.

A law that can help increasing the effectiveness of the CSA inclusion of clauses that allow for search and seizures in cases where a suspect is found in possession of a controlled substance.

Question 3

The first step will involve labeling the exhibit to ensure a chain of custody is observed. A screening test will be conducted on the unknown substance to establish whether it falls among the commonly current chemicals. A small quantity will be obtained from the sample. The screening test will involve the use of colored reagents without the use of other equipment. The method applied will be Thin-Layer Chromatography. The screening test helps to narrow the likelihood of the chemicals present. After the screening test, quantitative analyses will be done on the sample to establish its mass and identity of the drug. This will involve the use of infrared spectrophotometry and mass spectrometry to establish the mass of the sample. Prior to using the infrared spectrophotometry, the sample has to be purified.

Question 4

One of the challenges a forensic toxicologist encounters is the analysis of samples from bodies that have been buried or embalmed. Normally, in cases where the forensic toxicologist has to establish excess poisoning from insulin levels, blood needs to be used. Additionally, the forensic toxicologist may be faced with a challenge in cases where reference standards are not adequate. Further, in cases where drugs metabolite rapidly it becomes difficult for the toxicologist to obtain the real drug or poison.

During drug extraction from the biological samples, the forensic toxicologist has to take into account the absorption of the material, metabolism and movement of the drug through the system (Bell, Fisher and Shaler, 2008).

Common examples of drugs encountered include marijuana, alcohol, crack cocaine and methamphetamine.

A screening test is normally carried out using colored reagents to establish the presence of certain chemicals in the sample (Girard, 2013). A Thin-Layer Chromatography is based on the solubility and physical properties of the sample. The compounds present will be separated based on their size, shape and solubility in a solvent and their interaction with a thin-layer plate. The thin layer plates are normally coated with silica (Girard, 2013). A small quantity of the sample is applied as a spot on one end of the plate. The plate is then placed in a chamber with the lower edge immersed in a solvent. The solvent ascends by capillary action causing the dissolved sample to be dispersed in the solvent and the silica layer. Once the separation occurs, distances traveled by the solvent and the separated compounds are recorded. Based on earlier tests of known compounds the distance travelled can be established for unknown compounds based on the screening test results.

A confirmatory test involves the removal of diluents and unwanted material from a sample (Girard, 2013). An infrared spectrophotometry is then performed on the sample to identify the controlled substance presence in the sample. The selective absorption of infrared spectrophotometry helps to identify organic molecules present in a sample.

Question 5

DNA is a molecule or genetic material, which contains genetic blueprint of an individual.

James Watson and Francis Crick discovered the structure of the DNA. The

structure of DNA consists of two chains that form a double helix. Each chain consists of chemicals referred to as bases, which are AT, T, C and G. In each gene in a molecule of DNA, there exist different sequence of bases and codes for a particular protein.

Types of DNA used in forensics include mitochondrial DNA and STR DNA.

Mitochondrial DNA is inherited maternally or from the mother while STR DNA is inherited paternally.

Mitochondrial DNA is found in the cytoplasm while STR DNA is found in the nucleus.

STR DNA is more discriminating. This is because they can provide reference beyond a single generation.

The complimentary strand for 3' A-T-G-C-C-G-A-T-C-C-A-A-T-C-G-A 5'

is 5' T-A-C-G-G-C-T-A-G-G-T-T-A-G-C-T 3'

Question 6

CODIS stands for Combined DNA Index System.

CODIS was developed by the FBI.

Databases in CODIS include the forensic database, criminal profiles databases and missing person database.

- D3S1358 ,
- vWA
- FGA
- D8S1179

- D21S11
- D18S51
- D5S818
- D13S317
- D7S820
- D16S539
- THO1
- TPOX
- CSF1PO

Each of these loci has four base pair repeats.

Presence of the X and the Y chromosome refers to male.

CODIS provide DNA profiles for biological evidence that is obtained from crime scenes. Additionally, it has the offender database that can be linked up with the forensic biological profiles to indentify the perpetrator.

Question 7

The technique for copying the DNA outside the living cells is referred to as Polymerase Chain Reaction cloning.

The polymerase chain reaction involves denaturation, annealing and extension. During denaturation, the double-stranded DNA is melted into single strands (McMillan and Oski, 2006). The second step involves lowering of the temperature, which allows the annealing of two oligonucleotide primers to form complimentary sequences on the target DNA (McMillan and Oski, 2006). This then becomes a template. During the third step, Taq polymerase enzyme extends the primers in the presence of

deoxyribonucleoside triphosphates, the building blocks of new DNA synthesis (McMillan and Oski, 2006)

After 30 cycles, 1 billion identical molecules are obtained (Cagle and Allen, 2009).

According to Turvey and Petherick (2010), the application of Polymerase Chain Reaction allows the analysis of evidence samples of limited quality and quantity by making millions of copies of small amounts of DNA.

Question 8

The numbers indicate the alleles tested at each locus.

Having the same number twice in a row indicates that a person inherited similar alleles from both parents.

The victim's profile matches exhibit #Q1 at location 8 and #Q2 at location all the locations. There is a match since the number of alleles of the victim's profile match the number of alleles at the respective loci exhibit #Q1 and Q2.

The suspect's profile matches to exhibit #Q1. Exhibit #Q2 does not match the suspect's profile. The suspect's profile matches to exhibit #Q1 at 11 of the 13 loci while exhibit #Q2 only matches the suspect's profile at only one location.

Based on the DNA analysis, there was a struggle for the knife between the suspect and the victim.

Question 9

Questioned documented refers to forensic documents that have been disputed in a court of law.

Examples include:

- anonymous letters,
- fake cheques,
- fraudulent contracts and
- Graffiti on letters and walls

A document examiner has to have a bachelor's degree in any of the following forensic science, criminal justice chemistry or a related field (Echaore-McDavid and McDavid, 2008). Document examiners also need to be certified by the American Board of Forensic Document Examiners (Echaore-McDavid and McDavid, 2008). According to Echaore-McDavid and McDavid (2008), document examiners need to have experience in working in crime scene units and forensic lab. Other important skills relevant to a document examiner include strong writing skills, good communication and interpersonal skills and good observation skills.

Obliteration refers to the writing over text for purposes of hiding or destroying the original text (Fisher and Woytowicz, 2009). Erasure involves the process of removing original text from a document using either abrasive or chemical means (Fisher and Woytowicz, 2009).

Types of documents a document examiner may examine include handwritten correspondence, electronic documents and documents that contain impressions of other documents written on top of them.

Document examination of a passport begins with the identification of the authenticity of the passport (United Nations, 2010). The document examiner needs to have knowledge of the various printing processes that are used to make counterfeits. The counterfeit passport is then compared with the

original passport. The document examiner assesses the quality and type of paper used in the document in question. Additionally, the examiner will compare the security backgrounds on both documents.

Question 10

One of the variations between the handwriting can be seen in the writing of the number two. In the first sample, the number two is clear and indicates that it was not written in a rush. For the other two the style of the two indicates rushing in writing. The 't' in the second sample has its middle horizontal stroke starting at the edge of the vertical stroke while for the rest the middle stroke cuts across the vertical stroke. The letters in the words in the first sample are separated or do not touch each other. In the two other samples, letters in a word tend to be connected to each other.

A person cannot write the same way each time because of reasons such as natural variations, slips of pen and different levels of application of pressure when writing each time.

Variation in a person's handwriting comes from the inherent inability of the human hand to write with mechanical precision (Koppenhaver, 2002).

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