

POSITION DESCRIPTION FORM (PD-102A-92)

EFFECTIVE

DATE:

ANALYST:

(This space for Personnel Department Use Only)

1.	Present Classification Title of Position
2.	Usual Working Title of Position Forensic Molecular Geneticist Technician
3.	Requested Classification of Position (GB)
4.	Name of Immediate Supervisor Michael J. Budzynski
5.	Supervisor's Position Title & Position Number Mol. Gen. Supervisor 3613-0000-0002-100
6.	Name of Employee

7. Pres. 15 Digit Pos. No.	Prop. 15 Digit Pos. No.
8. Department, University, Commission, or Agency Department of Justice	
9. Institution & Division State Bureau of Investigation	
10. Section and Unit Molecular Genetics Section	
11. Street Address, City and County 121 East Tryon, Raleigh Wake County	
12. Location of Workplace, Bldg., and Room No. Crime Lab Bldg, Room 2250 U-V	

I. A. PRIMARY PURPOSE OF ORGANIZATIONAL UNIT:

The primary purpose of the Molecular Genetics Section is to accept, find, preserve and analyze evidence in criminal cases for the presence and source of body fluids and to report these findings to requesting Law Enforcement officers and to the courts.

B. PRIMARY PURPOSE OF POSITION:

The primary purposes of this position include:

- Assisting Agent analyst(s) with the examination of forensic DNA evidence
- Maintaining chain of custody on evidence and preparing laboratory reports stating the results of analysis under the direction of an Agent
- Prepare various solutions and reagents for use by the section for forensic analysis

C. WORK SCHEDULE:

40 hours per week. Regular work hours will be 8:00am through 5:00pm Monday - Friday.

II. A. DESCRIPTION OF RESPONSIBILITIES AND DUTIES:

Method used (Check One): Order of Importance: ☒ [x]
Sequential Order: []

Place an asterisk (*) next to each essential function.

<u>Time</u>	<u>Description of duties</u>
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*a. 90%	- Analyzing evidence to determine the presence of blood and/ or other body fluids on Molecular Genetics cases
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The Molecular Geneticist is responsible for analyzing evidence using DNA typing tests to compare unknown body fluids with known standards. This involves receiving evidence in the form of blood and other body fluids, performing the PCR STR form of forensic DNA analysis on that evidence, writing a report based upon that analysis and then testifying to the findings in court.

This position will conduct the examinations detailed below under the direction and supervision of a qualified Agent analyst.

Forensic DNA analysis is conducted because it provides the best method of determining differences between two individuals. Therefore, forensic DNA analysis provides the best method of excluding individuals who have been falsely accused of committing a crime.

Forensic DNA analysis using the PCR STR method involves basically a five-step process. The first step in this process is the isolation and purification of DNA from evidentiary samples as well as known standards. Because of the extreme sensitivity of this DNA technology, great care must be exercised to ensure that there is no cross contamination between any forensic samples. For this reason, the DNA extraction procedure for the evidentiary samples is separated by time and/or space from the known standards. Also, each piece of evidence is placed into its own separate test tube and the entire procedure is performed using strict aseptic techniques. To perform the DNA extraction, chemicals are added to the samples which break open the cells releasing the DNA into solution. The DNA for each sample is concentrated using a membrane filtration system.

Quantitation of extracted DNA is required using a slot-blot apparatus. Chemiluminescent technology is utilized to effectively determine the amount of human DNA present. This process involves taking extracted DNA from known and question samples and fixing them to a membrane through a slot-blot apparatus. The apparatus uses a vacuum to pull the sample through a well and onto a membrane. Once the DNA is on the membrane, it is probed with a human specific probe and treated with a luminescent chemical. After the luminescent chemical is modified, it will release energy in the form of light and be detected on x-ray film. The x-ray film is developed in a large film processing machine. The relative signal strength of the image compared to known standards allows the quantitation of DNA to be performed.

Small sequences of the DNA are then copied utilizing the polymerase chain reaction process. Polymerase chain reaction (PCR) is a laboratory process where small regions of DNA are copied millions of times. The regions that are copied are called Short Tandem Repeats (STRs). To perform PCR, the DNA samples are mixed with specific primer sequences of DNA that are fluorescently tagged, enzyme, and buffer, and amplified using thermocyclers. The thermocycler acts as a molecular Xerox machine for the DNA. The thermocycler must be programmed for different temperatures and times in order to accomplish the copying process. Essentially, the DNA is "unzipped" and the primers attach to the DNA. The enzyme in the reaction mixture then allows a copy of the DNA to occur. The result is millions of copies of the DNA that is specific to the primers.

Following PCR, the amplified DNA is separated by size through a process known as electrophoresis. Electrophoresis is the separation of charged particles in an electric field. A polyacrylamide gel is

prepared with wells formed in one end into which the forensic samples are injected. When placed into an electric field, the DNA fragments present in these wells separate by size forming banding patterns.

The generation of data for interpretation of the DNA samples requires the use of laser imaging equipment and extensive computer programs to evaluate the profile and compute statistical calculations. First, the DNA in the gel is then analyzed on a FMBIO gel scanner. The polyacrylamide gel containing the fluorescently-labeled DNA fragments is placed in the scanner and the laser driven fluorescent imaging equipment scans the gel and produces an image of the DNA banding patterns in the gel. The image may be further analyzed using advanced Hitachi software. The computer compiles the data and assigns allelic values to the DNA banding patterns as well as determines the relative intensity of each band. This computer analysis aids the analyst in determining stutter (a PCR artifact), band intensity differences that aid in the determination of mixtures, and allelic values of microvariants and off-ladder variants. After computer analysis, the allelic designation for each STR locus is determined for each sample by the analyst, independent of the computer. From the results of the analysis, a match/non-match determination is made. If a match of a forensic sample to a known individual is made, the allelic designations are entered into complex computer programs that enable the analyst to estimate the frequency of the particular DNA profile in the population and enter the DNA profile into the Combined DNA Indexing System (CODIS) for comparison with DNA profiles from other cases and from convicted offenders within the State and across the United States. If there is a non-match between a forensic sample and a known sample, then the CODIS system is used to perform a search for a matching profile in the SBI DNA Database.

- * b. 10% -Maintaining documentation of chain of custody, quality control and reports stating the results of analysis.**

Chain of Custody

The Forensic Molecular Geneticist Technician will assist the Section Agent in maintaining the chain of custody by careful and accurate documentation to ensure the admissibility of the evidence in a court of law.

Chain of custody is a legal term which applies to the accounting of all the successive steps involved in the handling of a specimen from the time of collection to the time of trial. This process includes four major steps (1) the initial possession of the specimen or object; (2) transport to the laboratory; (3) the method of storage at the laboratory prior to analysis; and (4) possession of the unused portion of the specimen or object after analysis and up to the time of trial.

Maintenance of the chain of custody includes the following duties which the Forensic Molecular Geneticist Technician must be able to perform under the direct supervision of an Agent.

- A. Note taking, sketching and/or photographing of the location of blood spatters, luminol reactions, visible blood and various articles of evidence at the crime scene.
- B. Proper packaging and identification of any evidence collected from the crime scene.
- C. Noting the condition (sealed or unsealed) and how the evidence is received at the lab if not hand delivered (FCM, Certified, UPS).
- D. Identification of the evidence submitted by marking the case number, item number, date received, analyst's initials or other marks of identification on the packaging and/or container as well as the item.
- E. Providing proper storage (refrigeration for blood) and security for evidence while in the lab.
- F. Recording the transfer of evidence within the lab by computer records.
- G. Ensuring the correct lab report and evidence are returned to the submitting officer in a sealed and secure manner.

Laboratory records

The Forensic Molecular Geneticist Technician must maintain records in the lab which provide information about the evidence submitted to the laboratory, procedures and methods used in analysis of the evidence and quality control of these procedures and methods.

- A. Note taking - Forensic Molecular Geneticist Technician must maintain detailed notes describing the physical characteristics of the evidence submitted (color, size), the location of various stains and the general condition of the evidence submitted (contamination and deterioration). The Molecular Geneticist Technician must denote which stains are to be tested (location and number) and also the control areas on the article of evidence. The specific test performed, number of areas tested and results of the test must be recorded. All tests performed must be done in accordance with the methods and procedures as outlined in the Molecular Genetics Section Procedure Manual. The Molecular Geneticist's Technician's notes are subject to being taken and reviewed by court officials and may be entered into evidence.
- B. Quality Control - Records must be maintained which document that the tests were performed under the appropriate conditions (pH, time, voltage), that the reagents used in the performance of these tests worked correctly and that the control samples gave the correct results. Temperature charts on incubators, refrigerators and other equipment are also maintained.
- C. Laboratory reports - Laboratory reports serve as official documents which state what evidence was submitted to the lab, what type of analysis was requested, the results of the analysis, and the disposition of the evidence. Copies of these reports are sent to submitting officers and district attorneys.

II. B. OTHER POSITION CHARACTERISTICS:**1. ACCURACY REQUIRED IN WORK**

One hundred percent (100%) accuracy is required in all results. Determinations must be conclusive and unequivocal since an error can cost an innocent individual his liberty and allow a guilty offender to possibly commit his crime again. Also, the reputation of the Technician, his/her job and the credibility of the lab is in jeopardy when one is not exact in his/her work. Constant proficiency testing is undergone to assure that each Technician produces accurate results and interpretations.

2. CONSEQUENCE OF ERROR

As noted above, the greatest error is to report an erroneous result which could result in the conviction of a falsely-accused individual. This could deny the person of several years of freedom and could also result in a lawsuit for the State.

3. INSTRUCTION PROVIDED TO EMPLOYEE

The procedures used by the employee are well-characterized in a detailed, written format.

4. GUIDES, REGULATIONS, POLICIES AND REFERENCES USED BY EMPLOYEE

The policies, guidelines and procedures used by the employee include the N. C. General Statutes, the SBI Policy and Procedures Manual, the SBI Crime Laboratory Policy Manual, the DOJ Safety and Health Manual, N. C. Department of Justice Policy and Procedures Manual, ASCLD-LAB Certification Standards, TWGDAM Quality Assurance guideline, CALEA Accreditation guidelines and state laws governing search, seizure and arrest.

5. SUPERVISION RECEIVED BY EMPLOYEE

The work of the employee is formally reviewed by the Molecular Genetics Section Supervisor twice a year. However, informal review by a senior analyst in the Molecular Genetics Body Fluid Unit is conducted on a daily basis by observing the employee conducting his/her analysis and reviewing data on all samples completed. All lab reports undergo a technical review by an analyst and an administrative review by the team leader.

6. PHYSICAL EFFORT

The employee may be required to perform light to medium work at times.

7. WORK ENVIRONMENT AND CONDITIONS

A large percent of the Technician's time involves working with blood and body fluids from individuals who may be carrying HIV, herpes, VD, hepatitis, TB, etc. In addition, contact is also made with several carcinogens and embryo toxins on a routine basis.

8. MACHINES, TOOLS, INSTRUMENTS, EQUIPMENT, AND MATERIALS USED

Sophisticated computers and software, Ultraviolet/Visible Spectrophotometer, Electrophoresis tanks and

power supplies, Ultraviolet illuminator, Polaroid cameras, Nikon SLR camera, carousel slide projector, photographic film processor, film duplicator, autoclave, incubators, vacuum oven, microwave oven, hot plates/stirrers, heat blocks, vortex, rotators, balances, centrifuges, pipettors, pouch sealer, solution dispensers, hybridization incubators, FMBIO Imager, thermalcycler, gene sequencers and lasers.

9. VISUAL ATTENTION, MENTAL CONCENTRATION AND MANIPULATIVE SKILLS

In performing casework, the visual senses are used predominately and require close attention. This is primarily the case when examining evidence and test results. This position requires that the individual be attentive and mentally alert at all times for a mistake can be dreadfully consequential. One must continually check the work being performed to make sure each task is correct and can be accountable before superiors and courts of law.

10. SAFETY OF OTHERS

Extreme care must be taken to prevent the spread of biological agents (viruses) and proper disposal of hazardous materials.

11. DYNAMICS OF WORK

The forensic analysis of evidence using DNA typing techniques is currently in a state of change and most likely will remain so for several years to come.

III. KNOWLEDGE, SKILLS & ABILITIES AND TRAINING & EXPERIENCE REQUIREMENTS

A. KNOWLEDGE, SKILLS AND ABILITIES

1. A minimum educational requirement of a Bachelor's Degree in a Biological Science for a background to understand the specialized area of forensic molecular genetics and other related tests.
2. Laboratory skills demonstrating the manual dexterity and ability required to conduct forensic tests.
3. Skill in organizing work and time to maintain production during periods of work overload.
4. Ability to use computer hardware/software to manipulate and integrate data generated.
5. A working knowledge of the field of Forensic Molecular Genetics.
6. Ability to organize, analyze, and present data with scientific accuracy.

B. 1. REQUIRED MINIMUM TRAINING

A minimum educational requirement would be a Bachelor's Degree in a Biological Science. Technicians in this position will have completed additional hours of in-house training in their specialty area.

2. ADDITIONAL TRAINING/EXPERIENCE

Formal education does not fully prepare an individual for entry into this position. This formal education is a minimum level for a Technician. In order to become a fully trained Technician, an individual with a college degree must undergo an in-house training program.

3. EQUIVALENT TRAINING AND EXPERIENCE

No training and/or experience can substitute for this educational requirement, especially the in-house training in the area of specialization.

IV. CERTIFICATION: Signatures indicate agreement with all information provided, including designation of essential functions.

Supervisor's Certification: I certify that:

- a. I am the Immediate Supervisor of this position; that
- b. I have provided a complete and accurate description of responsibilities and duties; and
- c. I have verified (and reconciled as needed) its accuracy and completeness with the employee.

Signature:

Title:

Date:

Employee's Certification: I certify that I have reviewed this position description and that it is a complete and accurate description of my responsibilities and duties.

Signature:

Title:

Date:

Section or Division Manager's Certification: I certify that this position description, completed by the above named immediate supervisor, is complete and accurate.

Signature:

Title:

Date:

Department Head or Authorized Representative's Certification: I certify that this is an authorized, official position description of the subject position.

Signature:

Title:

Date:
