If you have always been fascinated by Sherlock Holmes or Dexter Morgan, join us by reading on as we explore all about this intriguing field. Look out for the games at the end!
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“Change is the only constant”, the famous Greek philosopher Heraclitus once said. In a fastpaced world like ours, we experience change every single day and in every other aspect of our lives. The past year, more than ever has changed the way we live, yet the only thing that has remained constant through all this change is science and its influence on our day to day lives. Whether it be in finding out about the structure of the virus that sabotaged the world or the vaccine, that we have been waiting for since long, we realise the importance of chemistry and its influence.

We, at Alchemy, thrive to increase awareness and interest within the students of the campus about chemistry and related fields through our own eventful ways, to achieve our goal of enhancing the chemistry culture. This time, we have come forward with our annual chemistry magazine, Elixir. This edition of elixir focuses on forensic chemistry and developments in the related fields. Forensic chemistry has been an important part of the legal system, different kinds of investigation, determining the criminal besides other fields. While being started off in London, England, the science has expanded beyond and has risen to heights making it miraculous in many senses.

Our team has put in a lot of efforts into this and we hope that you like this issue. As we always say, our motto is to create an environment that facilitates free exchange of views, encourages ideation, and brings together perspectives, however varied, critiques and suggestions are always welcome.

Samreen Pathan,
Editorial head,
Alchemy, The Chemistry Association
Professor's Column

Chemistry is life and is everywhere.... This iconic statement of my college professors motivated me to take up a career in chemistry. Teaching has always been my passion and on completion of PhD in the year 1995, I got a teaching position in a small college at Chennai.

After spending couple of years, I felt that I should shift to a large university campus in order to expand my academic horizon. I sent a plain paper application with a brief CV for a faculty position at BITS Pilani campus. On a beautiful Sunday morning, I got a call from the then Dean, Practice School Division, Prof. V.S. Rao (who was also a chemistry professor and the founder Director of Hyderabad campus) inviting me for a talk the following week. I took a morning flight from Chennai and reached Delhi. It was a four hour scenic countryside drive from Delhi to this desert town Pilani. I gave a talk on metal toxicity and analysis which evoked good response and my recruitment was confirmed. As I was in a hurry to catch a late evening return flight I could not explore much the campus. After a month, I relocated with family from our native Chennai to Pilani. Wow, we were thrilled to see the beautiful landscape, dancing peacocks and an iconic clock tower in this green campus. This campus is indeed an oasis in the desert. But summers are very hot reaching 112 oF and winter temperatures drop to 35oF. It took considerable time for me in adapting to these climate extremes.
I was assigned to teach the first year multisection course in chemistry. The first day when I entered the class I could see just five students. Well, this was expected as I was a new faculty in the midst of established senior colleagues. Slowly, the numbers started to swell and over a period of one month I could find my lecture classes crowded. Gradually, I also started to teach few CDC courses for M.Sc chemistry (B2) students.

Those were the times wherein, teaching was primarily through blackboard. I enjoyed the excellent rapport with students and it gives me immense pride to say that good number of them have completed their higher studies abroad involving a synergy between chemistry and their engineering discipline. After 10 years, I shifted to this sprawling rock garden BITS campus at Hyderabad. I was happy to move to this “City of Pearls” since it is near to Chennai and the climate is also salubrious. Being a new campus, initial few years were quite challenging.

The campus had to be developed from scratch and it was really demanding for the faculty who relocated to Hyderabad. The admission process for the first batch of students was done in the “A” block car parking cellar with torrential rains lashing the city. Yet, I enjoyed the challenging assignment as Faculty in charge, Admissions and as first HOD of chemistry with the cooperative efforts from just three new faculty colleagues and a lab technician we devoted long hours in setting up the basic teaching and research labs from conception to completion. It is also noteworthy that Alchemy-the chemistry assoc. It was the foremost to be formed at Hyderabad campus and the first batch (2008) of students contributed significantly towards organizing the association activities with minimal infrastructure.
Over a period of time, the department blossomed and thanks to the amazing faculty in our department who played a major role in upgrading the various labs and facilities that we witness today.

The students also started to enjoy the department ambiance and many evinced interest in doing projects and thesis. With rapid development in technology, undeniably, chemistry has become truly interdisciplinary and many students from our department are pursuing their MS and PhD in reputed institutions overseas with a good blend of chemistry and engineering.

It is gratifying to hear from the students abroad that the chemistry courses they studied at BITS were quite handy in their course work for MS program.

Our students have shown major involvement in the biennial CCM (Convergence of chemistry and materials) departmental conference and also presented papers in such a forum amidst a galaxy of nationally reputed academic fraternity. I would say to my young students to view chemistry as a subject that opens its doors to wonderful opportunities encompassing science and engineering. Explore the subject further through projects and elective courses by interacting with your qualified faculty having diverse expertise.

It is indeed great to see the metamorphosis of this campus and the chemistry department in particular. It has been an enjoyable academic voyage with young and energetic students and such kind of wow moments go a long way in making one’s profession a pleasant experience.

Prof. N Rajesh
Professor, Dept. of Chemistry
BITS Pilani, Hyderabad Campus
Introduction

Forensic Chemistry

By Aryan Somani

Television shows and movies such as Dexter and CSI have romanticised the field of forensic chemistry in people’s minds and heroized forensic chemists. So what exactly is forensic chemistry? Sit back and read along while we dwell into this question and how the field has developed and evolved through history!

Throughout history, poison has been used to commit murders and more often than not, the culprit got away with it. All until the early 19th century in 1836, when British chemist James Marsh made the first contribution to the field that is now known as forensic chemistry. He created the marsh test for arsenic detection ensuing a successful murder trial. During the same time, the seed of another similar field was sown - namely forensic toxicology. Mathieu Orfila, a pioneer in the development of forensic microscopy, popularly known as “father of toxicology”, contributed to the advancement of this method for the detection of blood and semen. He was one of the first chemists to successfully classify different chemicals into categories such as corrosives, narcotics and astringents.
Forensic chemistry is the application of chemistry and its subfield, forensic technology, in a legal setting. Simply put, it is the practice of application of our knowledge in the field of chemistry to solve crimes. It is a culmination of various methods which we can adopt from chemistry to help solve complex crime scenes with ease, such as liquid chromatography, gas chromatography, atomic absorption spectroscopy to name a few.

The analysis given by forensic chemists can provide leads for investigators to deny or confirm their suspicions. Identification of various chemicals in a crime scene can help the investigators to narrow down the suspect list. For example, forensic chemists can help determine whether the accelerant used to cause a fire was gasoline or kerosene and hence determine if it was intentionally set or not, or in explosive investigations the identification of RDX or C-4 would confirm a military connection as they are military grade explosives.

The 20th century saw many advancements in technology which laid the path of modernization in the field of forensic chemistry among others. Forensic chemists nowadays rely on various instruments which help them in the identification of numerous chemical substances and speeds up their process of investigation.

The first breakthrough came in the 1930s with the invention of spectrometers, which could measure the signal produced with infrared light. This was followed by the invention of the gas chromatograph in the year 1953 by Anthony T James and Archer John Porter Martin, which could help in the separation of volatile liquid mixtures with similar boiling points.

These were succeeded with one of the most important advancements in this field, gas chromatography-mass spectroscopy (GC-MS) by Fred McLafferty and Roland Gohlke, which helped in the differentiation and identification of a wide range of gases. These three major inventions culminated to form what we call as modern day forensic chemistry.

This field of science though majorly linked with crime solving, is not confined to just that. Lately, it has also been used to describe many scientific investigations even if no crime solving was suspected. More often than not these investigations are of historical importance and may or may not have legal consequences. For example, a forensic chemist may work on the discovery of composition of ancient pottery, the detection of Renaissance art techniques or the identification of ancient human remains. This particular branch of forensic chemistry is more popularly known as forensic history, that is use of chemistry to answer historical questions.

Having read this far while learning a great deal about this old yet interesting field surely a question pops up, “what does it take for one to become a forensic chemist?”. Well worry not, we’ve got you covered as we take on the studies and scope in forensic chemistry in the succeeding article.
Right, now that you know what forensic chemistry is, how does one go about studying it? What are the jobs that Sherlock and all those TV characters we've come to love really do? It sure seems cool and all, a bunch of fancy instruments, and “Eureka!” moments from clues as random as the mud on the sole of a shoe to catch a criminal; but it doesn’t come easy. It requires years of study and apprenticeship. Let’s see how.

First, are the forensic sciences really for you? Well, if you have a strong desire to shape the world of justice by using science to solve crime puzzles, then a career in forensic science could be worth pursuing! It’s imperative for a forensic chemist to be detail oriented, because even the slightest detail can massively affect interpretation. They must be able to spend hours rigorously applying analytical techniques to evidence and meticulously documenting each step. Additionally, critical thinking and quick problem solving skills are crucial along with an excellent experimentation technique and a strong background in qualitative and quantitative analysis. "Forensics" means "of or having to do with questions of law," so written and oral communication skills to prepare reports and then defend their work in a court of law should come easy to them.
Also, this goes without saying, but integrity is an important characteristic because often either party involved in the crime may try to influence the forensic chemist to manipulate their findings. Have these traits resonated with your personality yet? If so, maybe you should consider it!

Alright, is there a degree in forensic chemistry, or how else do we study it? A strong background in chemistry and instrumental analysis and a good grounding in criminalistics are vital. (B2 students unite!) An undergraduate degree in forensic science or a natural science is required for work in crime laboratories, with extensive coursework in mathematics, chemistry, and biology. It's essential that you gain some laboratory work experience in order to prove you have the necessary skills, such as attention to detail and accuracy, as well as having knowledge of laboratory techniques. This is usually derived from working in hospital environments or with the police.

More advanced positions, such as lab managers and supervisors, might require a master's degree. A Ph.D. is often preferred for advancement to positions such as lab director, but it is required for forensic research positions at academic institutions. Those interested in working with trace evidence, such as glass, hairs, and gunshot residue, should focus on instrumentation skills and take courses in geology, soil chemistry, and materials science. If forensic biology, such as DNA analysis, is preferred, take microbiology, genetics, and biochemistry courses. Those interested in the toxicological aspects of this work, such as obtaining and interpreting toxicology reports, should study physiology, biochemistry, and chemistry.

What do forensic science graduates do, what does the workspace look like? Well, most forensic chemists work in labs associated with a police department, though there are a few private labs that carry out forensic analyses. They make use of their expertise across diverse domains in a single day, including chemistry, biology, materials science, and genetics to analyze evidence found at crime scenes or in the bodies of crime suspects. The results of their work are used in police investigations and court trials, at which they may be called upon to provide expert testimony and explain their findings to a jury.

There are a tremendous number of opportunities in forensic science, and we’ve looked at a few of them. It’s a great career option with various different niches to pick from. Definitely not as easy as you initially thought it was, yeah? No worries, read on to the next article to find out how forensic chemists conduct their life’s work and the methods they follow!
HOW?

STEPS AND TECHNIQUES

By Kanishk Yadav

Crime scenes can often be mind-boggling and confusing! Developments in the field of Analytical chemistry have widened the scope of forensic science. The challenge of analytical chemistry is actually about how to trace them back to their origin. Obviously, one would never want to accuse the wrong person for a crime committed by someone else! Appropriate and accurate techniques are thus paramount. Let’s go on and find out how any forensic crime investigation is carried out!

- First, a key step in tracking down evidence during any forensic investigation is preserving the evidence and preventing contamination by any foreign substances like dust or fingerprints. For this, chemists suggest using nitrile gloves to touch any substance at the crime scene and using clean poly bags to contain them.

- Second step involves collecting evidence from the crime scene which is then sent to a forensic lab where a forensic team performs experiments to determine the composition of evidence collected. Let’s look at some interesting chemistry-related techniques.
Say you are a new recruit to the forensic team.
You are present at the crime scene of a bank forgery. In order to analyse the fingerprints, present on smooth and clean surfaces like glass or marble, dark powder or light can be used to study them. But how does one study the ones embedded on paper or bank documents which are hidden like in this case? Various chemicals and high-powered lasers can be used to study them. Ninhydrin(C9H6O4) on reacting with amino acids present in perspiration turns purple making the fingerprints visible.

Do you remember watching the Netflix Series ‘Delhi Crime’ and how the police were able to collect blood and semen samples from the bus where the crime took place? Crime scenes involving sexual assaults, road accidents, murders usually have blood stains and their careful study can be of significant use. Serological examinations are conducted on cloth articles, weapons and vehicles to find any blood or semen traces. Blood stains are then sent for blood-stain pattern observation followed by DNA analysis. Semen traces on the other hand are detected by light sources and are tested for seminal fluids by chemical tests and microscopic study of sperm cells. Other than blood and sperm traces at any crime scene, traces containing saliva can also be found. Saliva presence in these samples can also be confirmed by tracing the chemical component of the enzyme, Amylase and further testing them by DNA analysis.

Well, considering your contributions to the forensic team you have been assigned with the task of solving a crucial but a gripping mystery in which the crime scene now involves a murder. Upon reaching the crime scene, no sign of blood is to be found.

The crime scene is clean and the thought of poisoning strikes your mind. Blood and urine samples are collected from the dead body and are sent to the Toxicologist who then examines the blood gases and the urine samples through the process of gas chromatography or thin-layer chromatography for any trace amount of poison. Studies and investigations often indicate the use of heavy metals like antimony, arsenic for poisoning.

In a very similar manner, crime scenes involving road accidents caused by intoxicated drivers can also be investigated by taking their blood samples and calculating the blood-alcohol concentration. How can one prevent such accidents? You might have noticed how police authorities near clubs or hotels regularly check the blood-alcohol level of people passing by using a Breathalyzer. Now, when a person blows air through this device containing sulphuric acid, potassium dichromate, silver nitrate and water, the oxidation of alcohol in the breath is followed by reduction of dichromate to chromic ion, colour changes from orange to green. The photocell present then compares the colour with the standard solution and displays a relative numerical value depending on how intoxicated the person is.

We have thus seen how forensic investigations are carried out stepwise and how science and technology have made this process of solving crimes futuristic with accurate results almost like a science-fiction thriller.
INSPECTING

TECHNIQUES AND SCOPE

By Aastha Singh

We’ve looked enough at what forensic chemistry really is. Now we’ve got one thing left. We know that every field requires constant innovation, and cannot stay stagnant. The forensic sciences is no exception. Let’s take a look at a few marvelous developments in this area!

• Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS): When broken glass is involved in a crime, putting together even tiny pieces can be key to finding important clues like the direction of bullets, the force of impact, or the type of weapon used in a crime. Through its highly sensitive isotopic recognition ability, the LA-ICP-MS machine breaks glass samples of almost any size down to their atomic structure. Then, forensic scientists are able to match even the smallest shard of glass found on clothing to a glass sample from a crime scene.

• Alternative Light Photography: For a forensic nurse, being able to quickly ascertain how much physical damage a patient has suffered can be the difference between life and death.
Although they have many tools at their disposal to help make these calls quickly and accurately, Alternative Light Photography is one of the coolest tools to help see the damage even before it is visible on the skin. A camera such as the Omni chrome uses blue light and orange filters to clearly show bruising below the skin's surface.

- High-Speed Ballistics Photography: You might not think of it right away as a tool for forensic scientists, but ballistics specialists often use high-speed cameras in order to understand how bullet holes, gunshot wounds, and glass shatters are created. Being able to identify and match bullet trajectories, impact marks and exit wounds must be done by someone with at least a Bachelor’s of Science in Forensic Science.

- Video Spectral Comparator 2000: For crime scene investigators and forensic scientists, this is one of the most valuable forensic technologies available anywhere. With this machine, scientists and investigators can look at a piece of paper and see obscure or hidden writing, determine the quality of paper and origin and “lift” indented writing. It is sometimes possible to complete these analyses even after a piece of paper has been so damaged by water or fire that it looks unintelligible to the naked eye.

- 3D Forensic Facial Reconstruction: Although this forensic technology is not considered the most reliable, it is definitely one of the most interesting available to forensic pathologists, forensic anthropologists, and forensic scientists.

In this technique, 3D facial reconstruction software takes real-life human remains and extrapolates a possible physical appearance.

- Forensic Carbon-14 Dating: Carbon dating has long been used to identify the age of unknown remains for anthropological and archaeological findings. Since the amount of radiocarbon (which is calculated in a Carbon-14 dating) has increased and decreased to distinct levels over the past 50 years, it is now possible to use this technique to identify forensic remains using this same tool.

Is there really enough scope in forensic chemistry? What does the future of this field look like? Compared to the growth in crimes in India, there's a large gap and ergo a high demand for forensic consultants. This is why career prospects are currently pretty high on the scale. Lack of awareness regarding the course is another reason for the demand for forensic experts to be high within the market. The majority of forensic science candidates are employed by government agencies equivalent to the Central Bureau of Investigation. Several legal corporations and personal investigators also rent Forensic consultants to strengthen their investigations and cases. Teaching is additionally a decent earning possibility for Forensic Science experts. Going ahead, there could be a lot of demand for extremely qualified and trained forensic science consultants in India. We hope that over the course of these articles, you've learnt and now know much more about the fascinating but mostly elusive field of forensic science. Who knows, maybe one day you might be doing cooler stuff than that on Dexter and Forensic Files!
PIONEERS IN FORENSIC CHEMISTRY

FIND THE NAMES

PLI WILLIAM BASS
OOAOWFOLYSMLIP
RLLLNJIIJOTFAILE
OMEAOAKOASEYFFD
LOCIMSEEOJREM
FCJLEOEHLMYIO
FLELSHPHRIEUEN
LEFIMAHELADDEAD
OAFTADBALALIEL
HKRRREWELUYCHMO
LOEEENLMRREATAC
CFYBH EHNALIALA
BFSLHEEEIAULMLR
MBDEO OH HATEJSID

James Marsh, Henry Lee, Clea Koff, William Bas, Allec Jeffreys, Joseph Bell, Mathieu Orfila, Edmond Locard, Bertillion
1) The "Sherlock Holmes test" in the story “A Study in Scarlet” concerns “Blood”. The chemical that can be used to detect blood even if it’s been wiped from a surface is
a) Ninhydrin
b) Cyanide
c) CO2
d) Luminol

2) In “The Adventure of the Norwood Builder” (1903), the appearance of a fingerprint is the key piece of evidence in the solution of the crime. In forensics, criminologists use AFIS to search an online database for fingerprint matches. What does AFIS stand for?
a) Actual Fingerprint Identification System
b) Automated Fingerprint Identification System
c) Auto Fingerprint Intelligence System
d) Automated Foot & Fingerprint Identification System

3) Such is his brilliance, Dr Salunkhe can look at a bullet and tell you who shot it. There are two types of wounds people can get when they are shot. What are they?
a) Enter wound, Out wound
b) Valid wound, Invalid wound
c) Entry wound, Exit wound
d) Big wound, Small wound

4) In the Film “Trial by Fire” after the fire, the police investigation determined that the fire had been started using some form of a liquid accelerant. If there is a case of arson, the easiest way to find and identify an accelerant is to use what?
a) Your nose
b) A sniffer
c) Tweezers
d) Latex gloves

5) Forensic files: A series featuring detailed accounts on how notable crimes and diseases were solved through forensic science. The term “Forensic” derives from which language?
a) Latin
b) Hebrew
c) Greek
d) Sanskrit

6) The Film “The Silence of the Lambs” used the concept of forensic _______ which is the study of bugs and their development on human corpses to determine time of death.
a) Odontology
b) Pathology
c) Entomology
d) Archaeology

7) The major plot points of the movie “Demolition Man” include involuntary manslaughter which generally means
a) Killing someone without meaning to
b) Killing someone because you’re jealous
c) Killing someone on purpose
d) Killing someone because you feel like it

8) If you are investigating a crime, what should be the correct order of investigation of a crime at a crime scene?
a) Collection of clue material
b) Protection of scene of crime
c) Packing and labelling
d) Sketching and photographing of crime
i) b, c, d, a
ii) b, d, a, c
iii) a, d, b, c
iv) d, b, c, a
9) In India, narco-analysis was first used in 2002 in the Godhra carnage case. It was also in the news after the famous Arun Bhatt kidnapping case in Gujarat wherein the accused had appeared before NHRC and the Supreme Court of India against undergoing the narco-analysis. Narco-analysis technique is against which Article of Indian Constitution?  
   a) Article 7  
   b) Article 21(3)  
   c) Article 22(3)  
   d) Article 20(3)

10) Methanol is a highly toxic alcohol that is found in a variety of commercial products, including antifreeze, windshield wiper fluid, some racing car fuels, paint thinner, and canned solid fuel for keeping food warm. What is the correct anti-dote methyl alcohol that you will use if one intake it?  
   a) Atropine  
   b) Ethanol  
   c) Nalmorhine  
   d) Caffeine

11) Fireworks displays have been cancelled in 2020 due to the pandemic. Still, it’s fun to contemplate the fact that the beautiful colours in fireworks – so good at stirring our emotions – are created by chemistry. The colours in fireworks come from a simple source: pure chemistry. On what principle does colour pattern of firework?  
   a) Electromagnetic force  
   b) Electromagnetic radiation  
   c) Thermodynamics - 3rd law  
   d) None of these

12) The blood of a drunken driver is drawn to know the concentration of alcohol is preserved with:  
   a) Sodium Chloride  
   b) Sodium Fluoride  
   c) EDTA  
   d) Phenylmercuric Nitrate

13) Norman Bates used strychnine to kill his mother and her lover in the infamous thriller film Psycho. Strychnine can lead to an atrocious death... Doses of ten to twenty milligrams lead to dyspnoea and unbearable feelings of anxiety. In a suspected case of poisoning by strychnine, which organ should be preferred to preserve for toxicological analysis?  
   a) Brain  
   b) Kidney  
   c) Spleen  
   d) Liver

14) Assertion (A): Blood stains on cloth should be collected after drying in shade under room heater.  
   Reason (R): It causes disintegration of blood stains.  
   a) Both (A) and (R) are correct.  
   b) Both (A) and (R) are incorrect.  
   c) (A) is correct, but (R) is incorrect.  
   d) (A) is incorrect, but (R) is correct.

15) Who serves as expert witness in the court of law testifying in a variety of civil and criminal cases involving death or injury?  
   a) Medical doctor  
   b) Police officer  
   c) Forensic pathologist  
   d) Forensic science
ACROSS
1. You should have faster fingers to get this.
3. Newest addition in campus.
7. It is not just a lingo... It is an emotion
10. Karma doesn't matter here.
12. which place name appears to be derived from 3 languages when split into 3?
14. Stone used to create Elixir of Life.
18. Best way to record attendance.
19. U.S.-Netflix, BITS-.....

DOWN
2. Time when we reaches to our roots.
4. It is fully functional during admissions.
5. Best place to find doctors....
6. Freshers First Fever.
7. A bird sees me wearing a octagonal hat.
8. Best place to spend saturday night with wingies.
9. Event which haunt us the most in tut.
11. Inconvenience is regretted cause it's BITS, it's.....
13. It's name is enough to create horror and distress.
15. Not call it Ragging, call it....
17. The best place to escape mess food.
Solutions

Quiz

1. Luminol
   Reason: Luminol is a chemical agent that reacts to the iron present in haemoglobin.

2. Automated Fingerprint Identification System
   Reason: Although AIFS has many fingerprints on file, it only has prints of people convicted of felonious crimes.

3. Entry wound, Exit wound
   Reason: The entry wound is where the bullet entered and the exit wound is where the bullet left.

4. A Sniffer
   Reason: An accelerant is used to get a fire going. A sniffer takes examples of fumes and tests them to see what they are.

5. Latin
   Reason: Origin: 1650-60; L forêns(is) of, belonging to the forum, public (see forum, -ensis) + i.c. History records indicate that the first known use of forensic science was in 44 B.C.

6. Entomology
   Reason: Forensic entomologists study the larvae growth on human corpses to determine when this person died.

7. Killing someone without meaning to
   Reason: An example of manslaughter is if you hit and kill a pedestrian while driving a car in an accident. The driver did not mean to kill the pedestrian.

8. b, d, a, c

9. Article 20(3)
   Reason: Narco-analysis, brain mapping and lie detector tests against the will of the accused would be violative of Article 20(3) of the Constitution.

10. Ethanol
    Reason: Ethanol has been used as an inhibitor of alcohol dehydrogenase in methanol intoxication for 50 years but has not been approved by the FDA.

11. None of these
    Reason: They’re created by the use of metal salts. These salts are different from table salt, and in chemistry ‘salt’ refers to any compound that contains metal and non-metal atoms.

12. EDTA
    Reason: Ethanol was measured with a reference GC technique in whole blood and EDTA plasma, and a commercial enzymatic assay in EDTA plasma.

13. Brain
    Reason: The portion of brain, the heart and spinal cord should be preserved if poisoning by nux vomica or strychnine is suspected.

14. (A) is incorrect, but (R) is correct
    Reason: Blood stain should be dried in shade under room temperature, not in the room heater; otherwise causes the disintegration of the bloodstains.

15. Forensic pathologist
    Reason: The term “expert witness” is used to describe a person who is called upon to testify during a trial due to his knowledge or skills in a field that is relevant to the case. For example, an expert witness may be a blood spatter analyst who can testify as to the type of weapon that was used to commit a murder.

Crossword

Across

1. MESSONE
2. SWIMMINGPOOL
3. LITE
4. IMPARTUS
5. CHIPOTLE
6. PHILOSOPHERS
7. BATCHSNAPS
8. BIOMETRIC
9. DC++

Down

1. SANSKRITI
2. WATERFALL
3. MEDC
4. FERVEUR
5. LIBRARY
6. AUDITORIUM
7. SURPRISETEST
8. MAGIC
9. DISCO
10. INTERACTION
11. TANDOOR
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