1. Toxicology is concerned with the chemical and physical properties of toxic substances, their physiological effects on living organisms and methods for their analysis.
2. A poison may be regarded as any substance which, when taken in sufficient quantity, will cause ill health or death.
3. The medical examiner collects fluids and tissues from the body that the toxicologist analyzes for the presence or absence of toxins.
4. The science of toxicology has expanded to include a wide range of interests, including: the evaluation of the risks involved in the use of pharmaceuticals, pesticides, and food additives, the study of occupational poisoning, exposure to environmental pollution, the effects of radiation, and, biological and chemical warfare.
5. The forensic toxicologist is concerned primarily with the detection and estimation of poisons in tissues and body fluids obtained at autopsy or, occasionally, in blood, urine, or gastric material obtained from a living person.
6. The complete investigation of the cause or causes of sudden death rests with the medical examiner, coroner, or pathologist.
7. Most drugs and poisons do not produce characteristic or observable lesions in body tissues, and their presence can be demonstrated only by chemical methods of isolation and identification.
8. In instances where death is not due to poisoning, the forensic toxicologist can often provide valuable evidence concerning the circumstances surrounding a death.
9. Most accidental poisonings occur in the home and often involve children.
10. Accidental poisoning in adults most often occurs because a product is mislabeled, usually because someone placed it in a container other than its original one.
11. Accidental poisonings may occur in industry due to carelessness or mishaps which expose workers to toxic substances.
12. The "drug culture" that began in the mid-1960s, deaths due to illicit drug use are still the most common fatal poisonings investigated by toxicologists today.
13. Numerous accidental deaths occur from the concurrent ingestion of potent prescriptions drugs and alcohol.
14. Suicide is a common manner of death in cases of poisoning.
15. In all types of cases involving suicide, about twice as many men successfully commit suicide as women.
16. The most common suicidal agent used is carbon monoxide.
17. Cyanide and arsenic may be occasionally used as suicidal agents but most deaths result from prescription drugs.
18. By analyzing the gastric and bowel contents, blood, urine, and the major organs of the body, the toxicologist can determine the minimum quantity of the poison ingested.
19. Homicidal poisonings occur most often at home, meaning that the killer usually knows about the victim's habits and has access to the victim's food, drink, and medications.
20. Strong acids and alkalis may cause extensive burns around the mouth or the surface of the body, with severe destruction of the internal tissues.
21. In most cases, toxicological analysis produces evidence for murder by poison.
22. In an average year, the toxicology laboratory of a medical examiner's office will perform analyses on tissues for such diverse poisons as: prescription drugs (analgesics, antidepressants, hypnotics, tranquilizers), drugs of abuse (hallucinogens, narcotics, stimulants), commercial products (antifreeze, aerosol products, insecticides, rubbing compounds, weed killers), and gases (carbon monoxide, cyanide).
23. The collection of specimens for toxicological analysis is usually performed by the pathologist during the autopsy.
24. The toxicologist, when receiving the specimens, gives the pathologist a written receipt and stores the specimens in a locked refrigerator until analysis.
25. Prior to analysis the toxicologist must consider several factors: the amount of specimen available, the nature of the poison sought, and the possible biotransformation of the poison.
26. The kidneys are the major organ of excretion for most poisons and high concentrations of toxicants are often present in urine, therefore the urine is usually analyzed next.
27. Biotransformation is a term used to denote the conversion by the body of a foreign chemical to a structurally different chemical.
28. The toxicologist must begin the autopsy or toxicological analysis as soon after death as possible.
29. Natural decomposition processes may destroy a poison initially present at death.
30. The best places to get samples of toxins for testing are the locations where chemicals enter the body, where chemicals concentrate within the body, and along the routes of elimination.

31. Potential sources of illicit toxins include the following: Blood by far is the toxicologist's most useful substance. Urine because kidneys are situated along one of the body's major drug and toxin elimination routes, toxicologists can often find such substances in greater concentrations in the urine than in the blood. Liver: The liver is closely involved in drug and toxin metabolism (destruction). Vitreous humor is the liquid in the eyeball. Insects: Toxicologists test insects that feed on corpses for drugs in cases of severely decomposed bodies.

32. Clues at the scene often point toward a particular drug or poison.

33. When testing for drugs, toxins, or poisons, the toxicologist typically follows a two-tiered approach.

34. Presumptive tests are used for initial screening and typically are easier and cheaper to perform.

35. Confirmatory tests are used only after presumptive tests find the possible presence of a drug or toxin.

36. Common toxicological screening, or presumptive testing, include the following:
   - **Color tests** are chemical tests in which a reagent (chemical solution) is added to the substance (usually blood, urine, or tissue) being tested.
   - **Immunoassays** involve an antigen-antibody reaction. The substance being sought is the antigen, and the testing reagent is the antibody.
   - **Thin-layer chromatography** is an inexpensive screening test that presumptively identifies hundreds of compounds at once.
   - **Gas chromatography** is a method of separating compounds according to their respective sizes, shapes, and chemical properties.
   - **Ultraviolet spectroscopy** takes advantage of the fact that different compounds absorb or reflect light in differing amounts and at varying wavelengths.

37. A good confirmatory test is sensitive and specific, recognizes the chemical in question, and can identify it to the exclusion of all others.

38. The most important confirmatory test used by the toxicologist is mass spectrometry.

39. Infrared spectroscopy also determines the chemical fingerprint of the substance being tested but exposes the substance to infrared light instead of electrons.

40. The toxicologist must evaluate each of the drugs present, identifying routes of administration, and determine whether concentrations that are present played a role in the subject's behavior or death.

41. If a drug was injected into a person who had no means of injecting it or into a site that makes self administration unlikely, homicide may be a stronger consideration.

42. The concentration of the drug or poison is greatest at the site where it's administered. For example:
   - **Ingested toxins** show up in the stomach, intestines, or liver.
   - **Inhaled gases** are concentrated in the lungs.
   - **Toxins that are injected** intramuscularly linger in the tissues around the injection site.
   - **Drugs that are given intravenously** bypass the stomach and liver, entering the bloodstream directly.

43. After determining a blood level of a certain chemical, the toxicologist assigns the level for one of these four broad categories:
   - **Normal**: This level is the one that is expected in the general population under normal circumstances.
   - **Therapeutic**: This is the level that your doctor wants you to reach when you're taking a prescription medication.
   - **Toxic**: A toxic level is one that may cause harm - nausea, vomiting, or a drastic change in the heart's rhythm, for example - or death.
   - **Lethal**: This is the level at which the drug in question consistently causes death.

44. At times, toxicologists are called upon to determine whether a poisoning is acute (quick but intense) or chronic (drawn out in small doses).

45. Arsenic can kill when it's given in a single large dose or when it's given in repeated small doses during the course of weeks or months.

46. Toxicologists use the victim's hair to determine whether a poisoning was acute or chronic.

47. Although few toxicologists have medical degrees, they are frequently permitted to state in court the effects of drugs or poisons on the human body.

48. The written chain of custody establishes that all specimens received were stored in a manner which prevented unauthorized persons from tampering with the specimens.

49. As an expert witness the forensic toxicologist must present all testimony with honesty and integrity.

50. The toxicologist's interpretation of the facts must reflect a knowledge of professional literature, as well as his own experience with similar cases.

51. The toxicologist may disagree with other experts in the field, but all his conclusions must be based on sound scientific or medical knowledge.