Key Concepts of Chapter 16:

- The arson investigator needs to begin examining a fire scene for signs of arson as soon as the fire has been extinguished. The investigation must focus on finding the fire’s origin.
- Telltale signs of arson include evidence of separate and unconnected fires, the use of “streamers” to spread the fire from one area to another, and evidence of severe burning found on the floor as opposed to the ceiling of a structure.
- Porous materials at the suspected point of origin of a fire should be collected and stored in airtight containers.
- Fire occurs when oxygen combines with a fuel to produce noticeable quantities of heat and light (flames).
- For combustion to be initiated and sustained, a fuel must be present, oxygen must be available, heat must be applied to initiate the combustion, and sufficient heat must be generated to sustain the reaction.
- A fuel achieves a reaction rate with oxygen sufficient to sustain a fire only when it is in the gaseous state.
- Most arsons are initiated by petroleum distillates such as gasoline and kerosene.
- The gas chromatograph is the most sensitive and reliable instrument for detecting and characterizing flammable residues. A gas chromatograph separates the hydrocarbon components and produces a chromatographic pattern characteristic of a particular petroleum product.
- By comparing select GC peaks recovered from fire-scene debris to known flammable liquids, a forensic analyst may be able to identify the accelerant used to initiate the fire.
- Explosives are substances that undergo a rapid oxidation reaction with the production of large quantities of gases. The sudden buildup of gas pressure leads to the explosion.
- The speed at which an explosive decomposes determines whether it is classified as a high or low explosive.
- The most widely used low explosives are black powder and smokeless powder. Common high explosives include ammonium nitrate-based explosives.
- Among the high explosives, primary explosives are ultrasensitive to heat, shock, and friction and provide the major ingredients found in blasting caps. Secondary explosives normally constitute the main charge of a high explosive.
- The entire bombsite must be systematically searched to recover any trace of a detonating mechanism or any other item foreign to the explosion site. Objects located at or near the origin of the explosion must be collected for lab examination.
- Debris collected at explosion scenes is examined microscopically for unconsumed explosive particles.
- Recovered debris may be thoroughly rinsed with organic solvents and analyzed by testing procedures that include color spot tests, TLC, HPLC, and GC/MS.

- It is helpful to look at the coloring of small pebbles in explosives material; this may yield valuable information as to possible components of the explosive.
- Be aware that *Cause and Origin* requires a different investigative mindset when reviewing whether a case is Accidental or Arson.
• High detonations can occur with small explosives
• Burglary, Fraud, Homicide, and Domestic Violence are all valid reasons/excuses for arson
• When photographing an arson/explosives crime scene, make certain to photo-document EVERY step you take in the scene so as not to miss anything; you can’t go back to this scene once it’s completed
• Photograph each item after every stage of collection ~ BE CONSISTENT!
• Pay attention to what firefighters do; they may help or hinder your investigation
• Collection of items should be related to photographs taken
• Golf tees are sometimes used to identify evidence K9 arson dogs have tracked through the scene
• K9 arson dogs can smell at a ratio of 1:100,000; scent detector machines can identify at a ratio of 1:10,000
• It is important to always go half the distance from the event in your “safety zone” area; also, when searching for and collecting evidence, you should search at least half the distance from the last known piece of evidence collected
• Arson/Explosives cases that offer proof of explanation in how explosives debris can travel
  o Space Shuttle Explosion
  o TWA Flight 800
• Collection/Processing: Does it happen at lab or at scene? Check with the crime lab analysts and Bomb Squad team
• Collect known standards from the scene and submit to the lab for accurate comparison
• Process one item at the scene at a time ~ Potential for cross-contamination
• Process items once deemed safe from Bomb Squad
• Common household items can create small (high) explosives; use caution when collecting and treat as a hazmat item

REFERENCES