

### Section A: True/False

**Directions:** Write True or False on the blanks provided; if False, write the correct statement on the lines provided.

1. \_\_\_\_\_ After the potential origin has been determined, the investigator next determines the cause of the fire or explosion. (383)

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2. \_\_\_\_\_ The list of likely first fuels ignited can be narrowed down based on fire effects. (384)

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3. \_\_\_\_\_ Gaseous fuels have to change physical state before ignition. (385)

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4. \_\_\_\_\_ The fire investigator should also evaluate the distance the ember had to travel before landing on the combustible surface because the ember regain heat energy as it travels. (386)

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5. \_\_\_\_\_ As the distance from the source to the target increases, the potential for ignition increases. (386)

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6. \_\_\_\_\_ Solder is more likely an ignition source since the melting temperature is at or below the ignition temperature of wood and paper. (387)

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7. \_\_\_\_\_ Heating from purpose-built electrical appliances such as stoves, heaters, and lightbulbs, at ranges within their respective normal operation, is expected and would be considered an electrical source of ignition. (389)

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8. \_\_\_\_\_ Batteries can become a competent heat source when overcharged. (391)  
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9. \_\_\_\_\_ Explosive materials can be a competent ignition source for low-mass fuels. (392)  
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10. \_\_\_\_\_ Laboratory analysis cannot identify trace explosive or firework materials. (392)  
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11. \_\_\_\_\_ Spontaneous heating is a process through which a material increases in temperature (oxidizes) without an external source of heat energy. (395)  
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12. \_\_\_\_\_ Fire exposure is not a viable source of heat energy to ignite additional fuels at some distance from the material first ignited. (396)  
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13. \_\_\_\_\_ The post-scene investigation occurs between when the investigator leaves the site and before the incident scene is released. (400)  
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14. \_\_\_\_\_ A systematic approach to data organization allows the fire investigator to obtain a better overview of the available data. (401)  
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15. \_\_\_\_\_ Opportunity alone indicates guilt. (411)  
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## Section B: Fill in the Blank

**Directions:** Write the correct answer on the blanks provided.

1. The fire investigator should document, collect, and \_\_\_\_\_ evidence that supports removal.  
(384)

2. The fire investigator must remember that \_\_\_\_\_ from liquid fuels may travel some distance before encountering an ignition source capable of igniting the vapors. (385)
3. The fire investigator's knowledge that \_\_\_\_\_ work was conducted in the area before the ignition of the fire can inform an inference of the ignition source. (387)
4. The improper installation of a device or its chimney that places a hot surface (device or chimney) too close to combustible materials may be a(an) \_\_\_\_\_ ignition source through radiant heat transfer. (389)
5. A forensic examination of an electrical system and wiring can help determine whether damage resulted from arcing, \_\_\_\_\_, or alloying. (390)
6. Generally speaking, a(an) \_\_\_\_\_ most often ignites upholstered furniture when located partially between the cushions with a sufficient air supply to allow it to burn. (393)
7. For ignition to occur as a result of a static electricity, a \_\_\_\_\_ of sufficient energy to cause ignition of the fuel must exist. (394)
8. An ignition sequence brings a competent ignition source, a fuel package, and an \_\_\_\_\_ together under circumstances that allow combustion to occur. (396)
9. To determine the ignition sequence, an investigator should develop a series of \_\_\_\_\_ and test each one by asking questions and gathering more information if necessary. (397)
10. When testing the fire cause hypothesis, the investigator must decide which hypotheses are \_\_\_\_\_ versus which are probable. (400)
11. The investigator must continually \_\_\_\_\_ the current hypothetical ignition scenarios, and remain willing to change the scenario based on new or conflicting information. (402)

## Section C: Matching

**Directions:** Write the correct answers on the blanks provided.

### Part I: Electric Components Common Failures

Match the common electrical failure with the appropriate description.

Electrical failures:

- A. Loose connections
- B. Damaged insulation on conductors
- C. Damaged electrical appliance cords

**Descriptions:**

- \_\_\_\_\_ 1. Occurs due to wear or mechanical fracture. Signs of damage include microarcing on the male plug blades and damage where the cord attaches to the appliance. (390)
- \_\_\_\_\_ 2. Common damage results from manufacturing defects, rodent activity, and pinching, stretching, or penetration from an overdriven nail or screw. Conductors that touch can result in a short circuit or electrical arc. (390)
- \_\_\_\_\_ 3. May result in resistance heating, as an oxide interface forms on the terminal screw, conductor, and metal plate. Resistance heating may cause the terminal screw and associated components to eventually glow red hot and fail. (390)

**Part II: Spontaneous Heating**

**Match the factor that influences the ignition of combustibles via self-heating with its appropriate description.**

**Factors:**

- A. Rate of heat generation
- B. Effects of ventilation
- C. Insulation properties of the immediate surroundings

**Descriptions:**

- \_\_\_\_\_ 1. The material must be insulated so that the heat generated by the oxidation process does not dissipate. (395)
- \_\_\_\_\_ 2. The material must generate heat at a rate greater than the heat dissipation rate. Material stored warm or hot will self-heat faster than cooler materials. (395)
- \_\_\_\_\_ 3. The material must have sufficient air supply to support oxidation. However, too much air supply will dissipate heat via convection. (395)

**Part III: Forensic Testing**

**Match the types of forensic analysis with the appropriate description.**

**Types of Analysis:**

- A. Fire debris analysis
- B. Microanalysis
- C. Latent fingerprint identification

**Descriptions:**

- \_\_\_\_\_ 1. Compares fingerprints found at a fire scene to those of a suspect. (404)
- \_\_\_\_\_ 2. Examines physical evidence that may be too small to differentiate without magnification. Examples: damaged electrical wiring, tool marks, impressions from tires and shoes, broken glass, smoking materials and matches, and hair or fibers. (403)
- \_\_\_\_\_ 3. Identifies trace materials found at the fire scene, such as ignitable liquids. (403)

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## Part IV: Data Analysis

Match the analytical investigative techniques with the appropriate description.

**Techniques:**

- A. Link Analysis
- B. Financial Profiling
- C. Inference Development
- D. Event and Commodity Flowcharting

**Descriptions:**

- \_\_\_\_\_ 1. An investigative tool that allows the investigator to organize and display the financial data of an individual or organization onto a graph or chart. (404)
- \_\_\_\_\_ 2. A conclusion derived from a set of premises. Inferences may take the form of a hypothesis, conclusion, prediction, or estimate. (405)
- \_\_\_\_\_ 3. A method of computing, organizing, and utilizing data relating to an investigation. (404)
- \_\_\_\_\_ 4. Chronologically displays the movements of events or occurrences either over time or through a system. (406)

## Part V: Incendiary Fires Indicators

Match the categories of evidence, and their tests with the appropriate description.

**Categories:**

- A. Multiple points of origin
- B. Trailer
- C. Incendiary devices
- D. Ignitable liquid evidence

**Descriptions:**

- \_\_\_\_\_ 1. An investigator may test for this evidence after observing patterns that could have been caused by pooled ignitable liquid foreign to a particular location. (407)
- \_\_\_\_\_ 2. Most incendiary devices leave evidence of their use, especially the metal parts of electrical or mechanical devices. More than one device may have been used, and sometimes a faulty device can be found. (407)
- \_\_\_\_\_ 3. Ignitable materials used to spread fire usually leaves char or burn patterns and may be used with incendiary devices. An investigator should consider whether patterns that resemble trailers were instead caused by factors related to heavy traffic areas or flashover. (407)
- \_\_\_\_\_ 4. The investigator must prove that the multiple separate and distinct points of origin, such as lightning strikes, electrical failures, flying brands, or the flow of hot gasses from the upper layer, did not result from normal fire dynamics. (407)

## Part VI: Motives

Match the common motives, and motive indicators with the appropriate description.

Motives:

- A. Revenge
- B. Vandalism
- C. Profit
- D. Crime concealment
- E. Excitement
- F. Extremism

Descriptions:

- \_\_\_\_\_ 1. Arsonists set fires as a mechanism to destroy evidence of a crime. (409)
- \_\_\_\_\_ 2. Firesetters commit arson to have the private satisfaction of instigating a fire service and law enforcement response. (410)
- \_\_\_\_\_ 3. Protestors may create fires or explosions to advertise or advance the arsonist's purpose. (411)
- \_\_\_\_\_ 4. Firesetters motivated by fraud often attempt to cause the most possible damage in the least possible amount of time. Monetary gain is the primary motivator. (408)
- \_\_\_\_\_ 5. These types of fires are usually set by two or more individuals (usually juveniles), often with no given or apparent reason. (408)
- \_\_\_\_\_ 6. Often a history of domestic disputes precedes this type of fire. In most cases occur as an impulsive reaction to some other situation. Account for fifty percent of arson cases. (408)

## Section D: Multiple Choice

**Directions:** Write the correct answers on the blanks provided.

- \_\_\_\_\_ 1. What must an investigator know to determine whether any potential heat source could ignite the first fuel ignited? (384)
  - A. The heat index of the last fuel ignited
  - B. The heat index of the first fuel ignited
  - C. The ignition temperature of the last fuel ignited
  - D. The ignition temperature of the first fuel ignited
- \_\_\_\_\_ 2. Which is an example of liquid-fueled equipment? (387)
  - A. Coal heater
  - B. Propane fueled stove
  - C. Electric cutter
  - D. Gasoline or diesel storage container

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- \_\_\_\_\_ 3. When analyzing electrical components involved in a fire, the investigator first determines whether the: (389)
- A. cables were new or old.
  - B. transformers were new or old.
  - C. electrical components were of excellent quality.
  - D. structure received power at the time of the fire.
- \_\_\_\_\_ 4. What kind of testing must be done to determine eutectic alloying in electrical conductors? (390)
- A. Chemical
  - B. Resistance
  - C. Conductivity
  - D. Metallurgical
- \_\_\_\_\_ 5. An abnormal path of current in a circuit that normally leads to an overcurrent condition is known as a(an): (390)
- A. a short circuit.
  - B. overheating.
  - C. an electrocution.
  - D. a magnetic discharge.
- \_\_\_\_\_ 6. According to laboratory burn tests, what is the duration a smoldering ignition requires? (393)
- A. Several days
  - B. Less than two minutes
  - C. No more than 15 seconds
  - D. Two minutes to several hours
- \_\_\_\_\_ 7. An investigator evaluating an area with candle evidence should indicate plausible materials first ignited, and: (394)
- A. the candle's brand.
  - B. the candle's burning duration.
  - C. any associated burn patterns.
  - D. all chemical content of candles.
- \_\_\_\_\_ 8. Which is considered a natural competent ignition source? (394)
- A. Thunder
  - B. Spontaneous heating
  - C. Chemical chain reaction
  - D. Electromagnetic battery bank

- \_\_\_\_\_ 9. What must the fire investigator evaluate to determine the ignition sequence? (396)
- A. Combustible load and its location
  - B. Combustibles and ignition sources
  - C. Each fuel, fire effect, and fire pattern
  - D. Each fuel, ignition source, and oxidant
- \_\_\_\_\_ 10. Investigators evaluate each ignition source found within the origin area against the \_\_\_\_\_ within the origin area. (399)
- A. fuels
  - B. photos
  - C. oxidants
  - D. heat sources

## Section E: Short Answer

**Directions:** Write the correct answers on the lines provided.

1. What four pieces of information should the investigator identify to determine the cause of a fire? (383)

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2. What is a characteristic of a first material that complement the ignition source? (383)

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3. What are the three qualities a competent ignition source must have? (384)

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4. What is one component intended to regulate a heat source's range of temperature and prevent malfunctions that can result in temperatures that exceed the anticipated range for that heat source? (385)

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5. What supporting data can indicate the presence of an ignition source? (386)

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6. What are two conditions that must be met to consider an electrical event as a competent ignition source? (389)

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7. On an electrical system, what two factors can generate localized high temperature conditions atypical in a fire environment? (391)

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8. What four factors are necessary for ignition to occur as a result of static discharge? (394)

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9. List two type of fuels most susceptible to ignition from static electricity. (394)

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10. What five factors should a fire investigator consider when determining whether an appliance could serve as a competent ignition source? (398)

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11. List two experts qualified to assist the fire investigator when evaluating investigative information. (402)

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12. When choosing a forensic laboratory, what four criteria should an investigator consider? (403)

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13. To make a final determination of the origin and cause of a fire, what six questions should a fire investigator consider? (406)

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