FIRE SCIENCE

Fire Science Vocabulary

- **Fire** - Produced when a substance undergoes rapid oxidation involving heat and light.
- **Fire Triangle** – Shows the three elements needed to produce and sustain a fire.
- **Flash Point** – The lowest temperature to which a substance must be heated in order for the substance to give off vapors which will burn when exposed to a flame or ignition source.
- **Point of Origin** – The location where the fire started.
- **Burn patterns** –Noticeable patterns created by the fire as it burns.
- **Accelerants** – Substances, such as gasoline, paint thinner, and alcohol, that accelerate the burning process.
- **Arson** – A fire started deliberately

Fire Triangle

The **FIRE TRIANGLE** represents the **three** elements needed for fire to occur: heat, fuel, and oxygen.

☆ ***Fill in the fire triangle.***

Can be any **combustible material** in **any state of matter** - solid, liquid, or gas. Most solids and liquids become a **vapor or gas** before they will burn.
Examples: Clothing, furniture, curtains, and flammable liquids

The energy necessary **to increase the temperature of the fuel** to a point where sufficient vapors are given off for **ignition** to occur.
Examples: Stoves, heating appliance, fireplaces, and damaged wiring

The air we breathe is about **21% oxygen**. Fire requires an atmosphere with at least **16% oxygen.**

Fire Science Vocabulary

Point of Origin – Burn patterns and other damage can help determine the point of origin, or the location where the fire started.

Char Patterns – Created by very hot fires that burn very quickly and move fast along its path, so that there can be sharp lines between what is burned and what isn't.

V-Patterns - Fire burns up, in a V-shaped pattern, so a fire that starts at an outlet against a wall leaves a char pattern that points to the origin.

Heat Shadows - Occur when heavy furniture shields part of a wall; can help determine the origin point.

Glass - Glass fragments, windows, and light bulbs can provide clues to a fire.

Chimney Effect - Since fire burns upwards, there can be a "chimney effect" where the fire ignites at a point, the superheated gases rise upward and form a fireball, which continues straight up to burn a hole in the ceiling.

Color of smoke – Determine what type material was burning

Color of flames – Indicates at what temperature the fire was burning.

Accident or Arson?

Accidental Nature

- Heating System
- Electrical appliances
- Lightning
- Children playing with matches
- Smoking

Non-Accident

- Odors – Gas – Kerosene
- Furnishing – Removal of personal objects and valuables
- Clothing – Check debris for buttons, zippers, etc
- Locked windows, blocked doors
- Two or more points of origin
- Look for inverted v-patterns (can be a sign that an accelerant was used)
- Floors charred –Can indicate use of an accelerant
- Trailers that lead the fire from one place to another

Accident or Arson?

1. Work from the least damaged areas to the most heavily damaged areas.
2. Document with notes, photographs, and videos.
3. Collect evidence (accelerant samples, fire items, and other crime scene evidence.)
4. Interview witnesses
5. Determine the point of origin.
6. Determine the heat source(s).
7. Hypothesize the reasons for the fire.

Did you know? Heat is more threatening than flames!

A fire's heat alone can kill. Room temperatures in a fire can be 100 degrees at floor level and rise to 600 degrees at eye level. Inhaling this supper hot air will scorch your lungs and can melt clothes to your skin. In five minutes a room can get so hot that everything in it ignites at once: this is called flashover.

What evidence can you find in each picture that would provides clues about the fire?

Fire Basics

Name _____

1. Identify the following terms used in fire investigations.

_____ - Produced when a substance undergoes rapid oxidation involving heat and light.

_____ _____ – Shows the three elements needed to produce and sustain a fire.

_____ _____ – The lowest temperature to which a substance must be heated in order for the substance to give off vapors which will burn when exposed to a flame or ignition source.

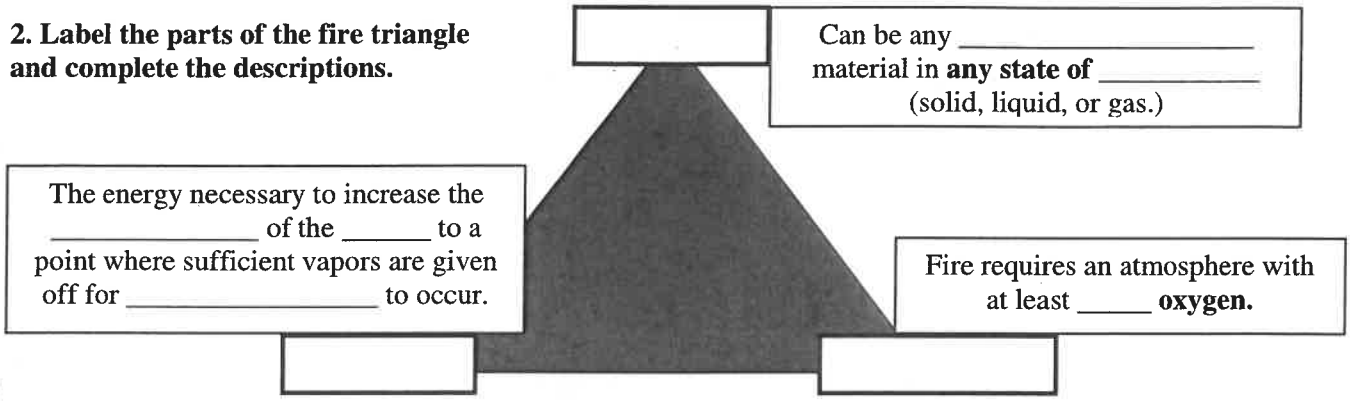
_____ **of** _____ – The location where the fire started.

_____ _____ –Noticeable patterns created by the fire as it burns.

_____ – Substances, such as gasoline, paint thinner, and alcohol, that accelerate the burning process.

_____ – A fire started deliberately.

2. Label the parts of the fire triangle and complete the descriptions.



3. Identify the clues below that might help an investigator analyze a fire scene.

Point of Origin – Burn patterns and other damage can help determine the point of origin, or the _____ where the fire _____.

_____ Patterns – Created by very _____ fires that burn very quickly and _____ fast along its path, so that there can be sharp lines between what is burned and what isn't.

- A char pattern on a _____ would help an investigator determine which side of the door the fire was on.
- A char pattern on the _____ would help investigators determine the use of an accelerant and its path.

____ - Patterns - Fire burns ____, in a V-shaped pattern, so a fire that starts at an outlet against a wall leaves a char pattern that points to the origin.

- A very _____ V-shape might indicate a fire that was hotter than normal, such as one helped along by an accelerant.
- A _____ V-shape might indicate a fire that was slow burning.
- A _____-shape could indicate that there was a "pool of origin" rather than a point of origin, such as might be caused by, say, a puddle of gasoline.

_____ Shadows - Occur when heavy furniture shields part of a wall; can help determine the origin point.

_____ - Glass fragments, windows, and light bulbs can provide clues to a fire.

- Light bulbs tend to melt _____ the heat source, so the "direction of melt" can indicate the direction of the fire.
- The shattered or cracked glass of the windows can provide indications as to how the fire _____.
- A dark _____ layer on the glass could indicate a slow, smoldering fire.
- Clear glass with an abnormal pattern of cracking could imply a very ____ fire, possibly due to an accelerant.

_____ Effect - Since fire burns _____, there can be an effect where the fire ignites at a point, the superheated gases _____ upward and form a _____, which continues straight up to burn a _____ in the ceiling. If the roof is not entirely burnt, and the fire investigator finds such a hole, the _____ of the fire could be directly underneath.

Color of _____ – Determine what type material was burning.

Color of _____ – Indicates at what temperature the fire was burning.

4. Give two examples of accidental fires. _____ _____

5. How would odors help an investigator determine the use of an accelerant?

6. How should an investigator manage a fire scene?

- Work from the least damaged areas to the most heavily damaged areas.
- Document with notes, _____, and videos.
- Collect _____ (accelerant samples, fire items, and other crime scene evidence.)
- Interview _____.
- Determine the point of _____.
- Determine the _____ source(s).
- Hypothesize the _____ for the fire.

7. What can you do to help prevent arson or arson damage?

- Report suspicious _____ and activities that may result in arson.
- If you have a friend or classmate that has set fires in the past or plans to set a fire, tell an _____– parent, teacher, counselor, police officer, or a fireman.
- Start or participate in a _____ _____ program with your parents.
- Install and properly maintain _____ _____ in your home and encourage friends and relatives to do the same. Your family should also have a _____ _____ plan for your home.