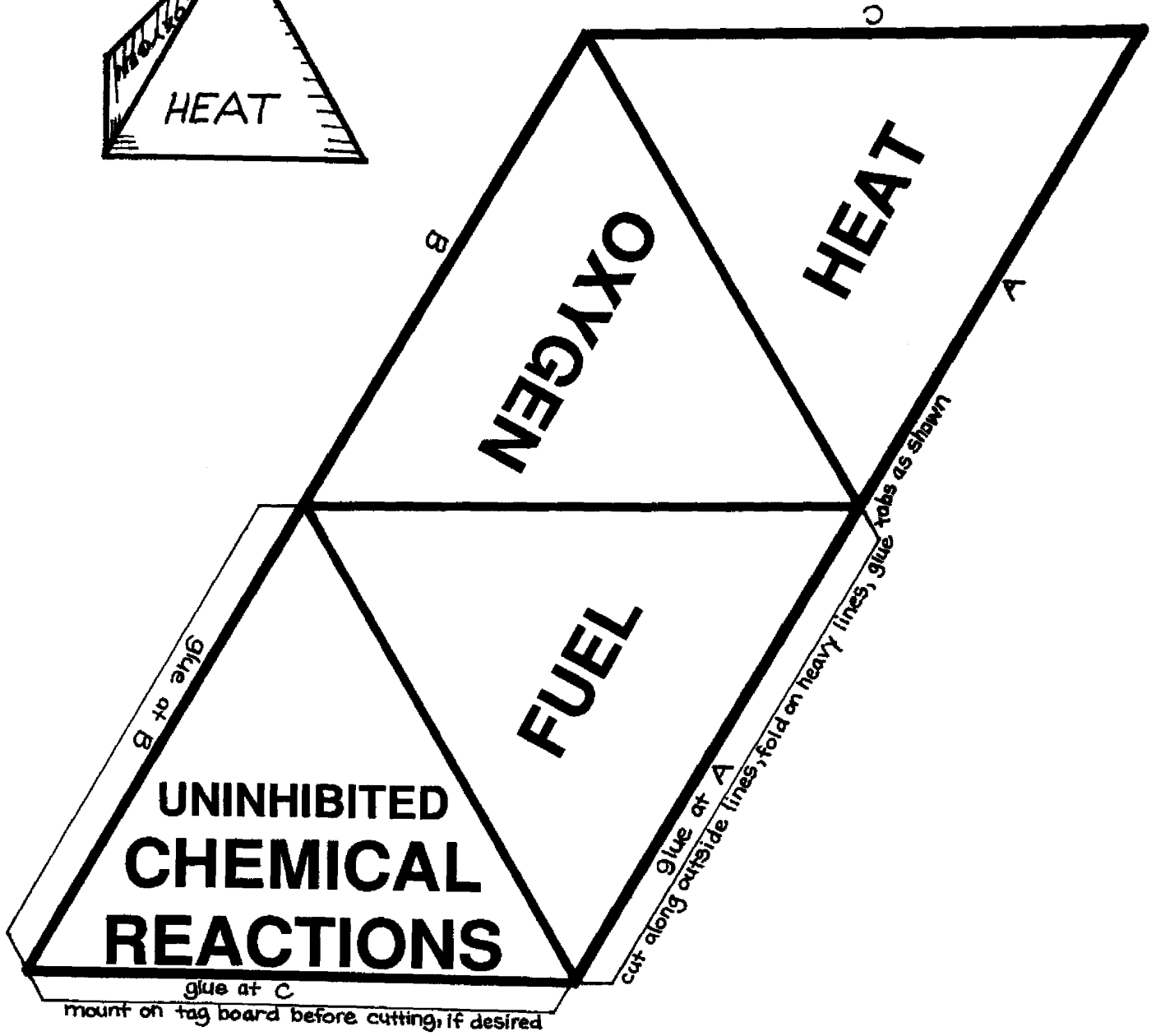
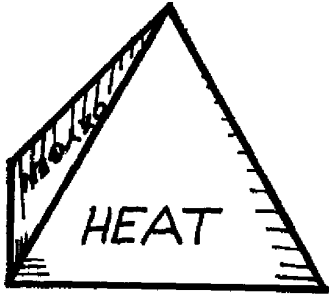


## The Science of Fire

1. What is fire? What is the scientific definition?
  - a. A chemical reaction of combustion that makes light, flames, and heat.
2. How is fire made? We need three things, what are they? Some even add in a fourth thing what is it?
  - a. Heat
  - b. Fuel
  - c. Oxygen
  - d. Chemical reaction
3. What happens if you do not have one of those 3 things?
  - a. Oxygen – candle and lid
  - b. Fuel – fire wood/ paper
  - c. Heat – stove turned off
4. Case studies of if a fire will burn
  - a. #1 A nice cool sunny day, Abby decides to get her bike in the garage, when she notices the gasoline can next to her bike. Abby opens the airtight container and leaves on her bike. Will a fire start?
    - i. No, there is no heat to start the fire
    - ii. Should Abby open a gas can for no reason?
  - b. #2 Working in his oxygen-free fume hood, Clark has obtained some alcohol and matches to conduct an experiment. He must return to the stockroom to obtain a few more items. Will a fire start while Clark is away?
    - i. No, Neither heat nor oxygen is present
  - c. #3 The lights have gone out in Veronica's house and it is very dark. Veronica has gone to get a candle and some matches. She strikes the match near the wick of the candle. Will the candle light?
    - i. Yes
    - ii. Remember never to leave a candle unattended
  - d. #4 Cole is camping for the weekend and has brought along his propane gas stove. He did not notice that the tank was empty when he left home. Cole turns on the gas supply and strikes a match. Will the propane gas stove ignite?
    - i. No, there is not fuel
    - ii. Check your camping supplies before you leave
  - e. #5 Jen and Sarah are going to bake a birthday cake for Jen's mother. AS they put the cake in the gas oven, they notice that the oven is not warm. Looking under the gas oven, they notice that the pilot light is out. Jen makes sure the gas is on and strikes a match near the pilot light. Will the pilot light catch on fire?
    - i. Yes
    - ii. Do not relight a pilot light unless a parent has shown you and you are comfortable with doing so.
5. Candle in a glass jar experiment
6. Which part of the fire triangle do firefighters get ride of to put a fire out?

- a. Correct – heat. They cool the fire with water, why because it is cheap and easy to find. Can you imagine putting a lid on a house like you do a grease fire?
7. How long does a small fire in a house go until the smoke alarms go off?
  8. How long does a small fire in a house go until it is not survivable?
  9. Watch Fire Power
    - a. How long until the smoke alarm went off?
    - b. Were the smoke alarms placed in the correct location?
    - c. How long till it was not longer survivable?
  10. Fire Spread
    - a. Conduction
      - i. Heat transfers from greatest energy to least energy, through the molecules. Energy always transfers from hotter object to cooler object.
      - ii. A camp fire one log catches the other log on fire
    - b. Convection
      - i. Heat transferred through energy.
      - ii. Boiling water. The water on the bottom of the pan is getting hotter and rises. The cooler water is pushed to the bottom and heats up and moves up.
    - c. Radiation
      - i. Transfer of energy through electromagnetic waves.
      - ii. The sun heating the earth.
    - d. Watch Fire Power
      - i. Did you see conduction, convection, or radiation occur to assist in the spread of the fire?
  11. What is smoke?
    - a. The gaseous products of burning materials especially of organic origin made visible by the presence of small particles of carbon.
  12. How do you know if there is smoke in your house?
    - a. Smoke alarms.
    - b. Why do we no longer call it a smoke detector?
      - i. Smoke detectors only detect smoke then they tell other thing to make the sound.
      - ii. A smoke alarm detects and alarms all in 1 unit. In your house you have a smoke alarm, I hope.
    - c. Where are the smoke alarms in your house?
      - i. Bedrooms and 1 on each level
      - ii. Why not in the bathroom?
        1. A smoke alarm can only detect that a small particle is inside the alarm. Steam is a small particle and sets the alarm off.
        2. Same it your smoke alarm is too close to your stove in your kitchen the steam from cooking can set it off.

3. Were the smoke alarms placed in the correct location in Fire Power the movie?
  - d. There are 2 types of smoke alarms
    - i. Ionization
    - ii. Photoelectric
    - iii. What is the difference
    - iv. Ionization-has a small amount of radiation inside the alarm that creates a barrier of particles. Smoke will come in and disrupt the barrier and make the alarm sound.
    - v. Photoelectric-Has small beams of light that go from one side of the chamber to the other. If smoke comes in to the chamber it will reflect the light to sound the alarm.
    - vi. The Aquarium test? Photoelectric are better in smoldering fire.
13. Juvenile Fire Setters
- a. What happens if you are caught starting a fire intentionally?
    - i. You can be charged...
    - ii. Arson, jail, felony, loss of job opportunities
    - iii. Lighter and Axe spray
    - iv. School bus and smilies
    - v. Movie on JFS



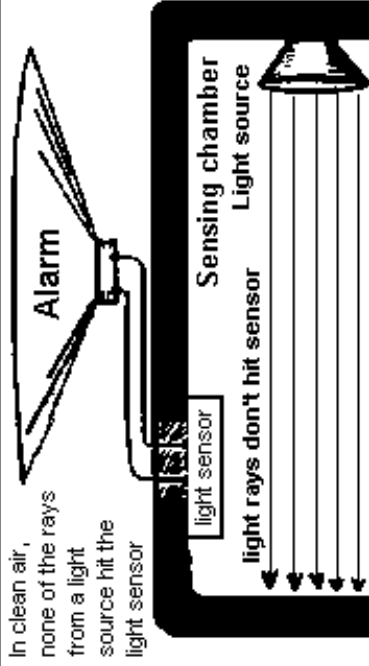
## **How Smoke Alarms Work**

**Both types of smoke alarms need electricity to operate. They may use batteries or may be directly connected to the building's electrical wiring (called "hard-wired").**

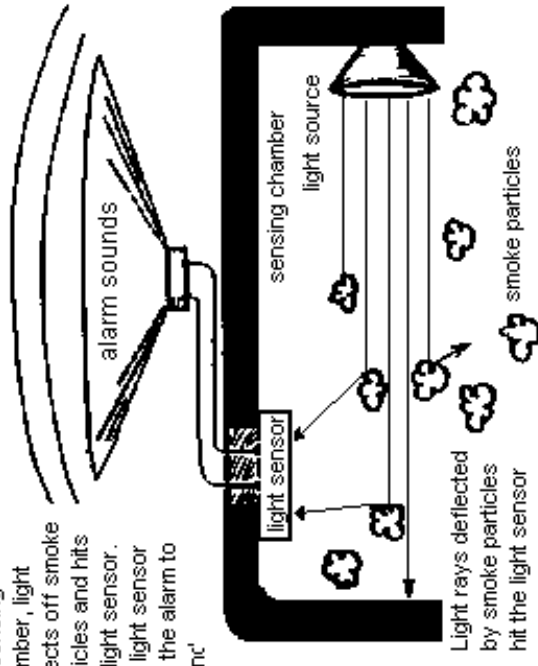
**How do the technologies differ?**

A: Because of the different detection technology, ionization sensors are more likely to detect smaller, less visible fire particles, like those produced by flaming fires, sooner than photoelectric sensors. However, photoelectric sensors are more likely to detect larger, more visible fire particles, such as those produced by smoldering fires, sooner than ionization sensors.<sup>[1]</sup>

## Photoelectric Smoke Alarm



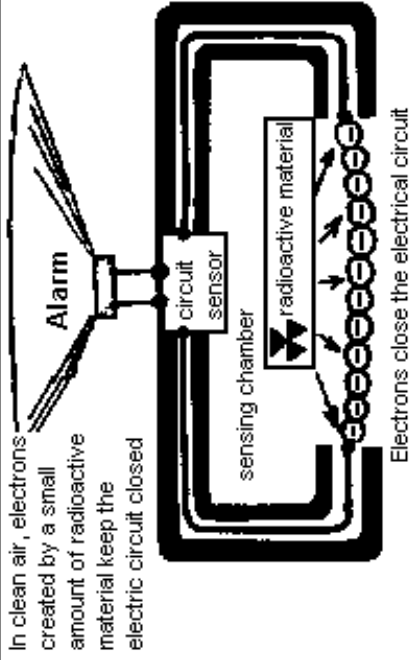
When smoke enters the sensing chamber, light reflects off smoke particles and hits the light sensor. The light sensor tells the alarm to sound'



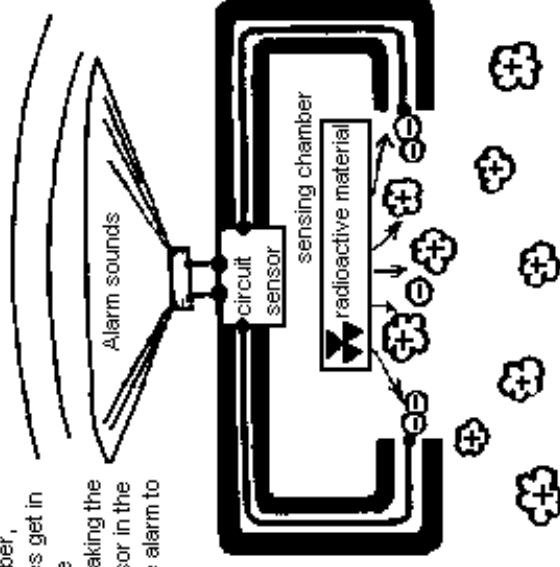
Light rays deflected by smoke particles hit the light sensor

Responds faster to larger smoke particles produced by smoldering fires

## Ionization Smoke Alarm



When smoke enters the sensing chamber, smoke particles get in the way of the electrons, breaking the circuit. A sensor in the circuit tells the alarm to sound



Responds faster to small smoke particles from a flaming fire