Fire Prevention and Safety Answer Sheet

LEVEL 1

Answers to *Fire Triangle*

Heat: flame, spark, lit match, candle, electric cord, heater and stove
Oxygen: air
Fuel: paper, wood, cloth, cardboard and plastic

Answers to *Fire's Dangerous Behavior and My Safe Behavior*

Fire is fast matches the picture of the child rushing out of a house.
Fire makes smoke and gases matches the picture of the child crawling with a cloth over his mouth and nose.
Fire is hot matches the picture of the child testing the bedroom door with the back of her hand.
Fire is dark and loud matches the picture of the child with a bright cloth signaling from the bedroom window.

LEVEL 2

Answers to *Extinguishing the Match*

- Putting the match in water eliminates the heat source.
- Blowing on the match removes the heat source from the fuel.
- Shaking the match removes the heat source from the fuel.
- Dropping the match onto a noncombustible surface allows the match to burn until the fuel is used up.
- Putting the match into sand smothers the fire by removing the supply of oxygen.

Answers to *The Secret Fire Message*

Destructive fires happen when kids play with fire. Playing with matches and lighters is not an accident. It's a choice you make. When you play with matches and lighters you put yourself and others in danger.

Answers to *Helpful and Harmful Fires*

Ways in which this helpful fire could become harmful:

- The wind could pick up and supply more oxygen to the fire, causing the flames to flare higher and the tree limb to catch fire.
- Dry and fallen leaves, which could easily catch fire from a stray spark, are too close to the grill.
- The children are playing too close to the grill. They could run into the grill, knock it down or spill the lighter fluid.
- The lighter fluid is too close to the grill.

- The grill is too close to the tree and the wooden fence.
- There is a towel draped over the grill that could easily catch fire if the wind changed direction.
- If the fire in the grill spreads, the open gas can and gas lawn mower could supply additional fuel to the fire.

The effects of this fire becoming harmful:
- The tree and the wooden fence could catch fire.
- Flames could reach the lawn mower and the gas can, causing an explosion.
- The lighter fluid could also catch fire and the can explode.
- Flames could jump onto the children's clothing.
- The wooden bench and table could catch fire.
- If not caught in time, the fire could reach the children's home.

Things that could be done to prevent the fire from becoming harmful:
- An adult could be supervising the fire and the children.
- An adult must be ready to close the lid of the grill and turn off the grill to cut off the fuel.
- Move the grill away from the tree and the wooden fence.
- Sweep dry leaves away from the grill.
- Move the lighter fluid and towel far away from the grill.
- Keep children far away from the grill.
- Put away the lawn mower and gas can.
- Fill the bucket with sand or dirt to be used in case the fire threatens to become harmful.

Possible Answers to *Arranging for Fire Safety in the Kitchen*

- Keep flammable and combustible items at least three feet from heat sources.
- Keep appliances away from water sources.
- Do not store items where a person must reach over a heat source to reach them.
- Do not overload electrical circuits.
- Do not put things, such as pet food bowls, where people could trip on them and fall onto a hot stove.

Answers to *Fire Safety Equipment*

Definitions:
- Volt: the basic unit of electrical energy
- Battery: a device that produces electricity
- Ionization chamber: a device for detecting particles in the air
- Electronic horn: relating to technology having electrical, digital, magnetic, wireless, optical, electromagnetic or similar capabilities which sounds to make a noticeable and loud noise to signal
- an emergency
- Printed circuit board (PCB): a board that interconnects electronic components without wires

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1. Smoke alarms are warning systems, because they detect smoke and sound an alarm but do nothing to help put out the fire.
2. The ionization chamber detects the smoke. The printed circuit board controls the action of the smoke alarm like a computer, and it tells the electronic horn to sound a warning. The 9-volt battery is the power source. The cover keeps the inner workings of the smoke alarm clean.
3. To ensure that smoke alarms are working properly—
   - Test them each month.

- Replace the batteries when necessary, and at least once a year.
- Vacuum them regularly to keep them clear of cobwebs and dust.

4. The number of smoke alarms necessary in a home depends on its size and the number of levels. A good rule is to have smoke alarms outside and inside every sleeping area, right outside the kitchen and on every level of your home. Interconnected smoke alarms are also helpful because they will all sound if and when only one detects smoke.

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- Safety pin: keeps the fire extinguisher closed until it is used
- Actuating rod: pierces the gas cylinder release valve when pushed down by the spring-mounted valve
- Spring mounted valve: pushes the actuating rod down
- Gas cylinder release valve: releases the compressed carbon dioxide gas
- Handle: to hold the fire extinguisher while using
- Gauge: tells you how much pressure is currently compressing the carbon dioxide gas
- Discharge nozzle: directs the flow of the fire suppressant
- Fire suppressant reservoir: holds the fire suppressant
- Plastic siphon tube: provides a path for the suppressant to the top of the fire extinguisher
- Carbon dioxide cartridge: compresses and stores carbon dioxide gas that will propel the fire suppressant when released by the gas cylinder release valve,
- Operating lever: operates the fire extinguisher

Answers to *The Firefighter's Equipment*

- SCBA (self-contained breathing apparatus): an integrated air breathing system that protects the airway for the oxygen coming from the air pack and keeps smoke and heat away from the face and throat. It also provides a warning when a firefighter's air supply is running low. The mask is connected to the air pack by the hose. The air pack provides air the firefighter can breathe inside a burning structure.
- Gloves: gear to protect the hands from heat, liquid or chemical burns, cuts and scrapes
- Turnout (bunker) coat: a protective coat made with special material to withstand hot temperatures and fire. It has pockets for equipment (radio, gloves), reflective stripes and the firefighter's name to ensure recognition by co-workers in a burning structure.
- Boots: footwear to keep the firefighter from slipping or from burning his or her feet
- Helmet: a special hard hat that protects the head from fire and falling debris.
- Hood: a garment to protect the neck, ears and head
- Radio or personal alert safety system: a device for communicating with other firefighters
- Flashlight: a light source in dark smoke
- Ax: a tool used to force quick entry into a burning structure, to open spaces to let out heat or smoke, and to break up fuel

Answers to *The Temperatures of Fire*

- Boiling water: 212° F (100° C) at sea level
- Flashover for a typical room: 1300°–1400° F (704.4°–760° C)
- Freezing: 32° F (0° C)
- Ignition temperature of butane in a butane lighter: 75.2° F (24° C)
- Ignition temperature of cotton sheeting: 464° F (240° C)
- Ignition temperature of hardwood floors: 250°–500° F (121°–260° C)

- Ignition temperature of matches: 325° F (162.7° C)
- Ignition temperature of paper: 451° F (232.7° C)
- Ignition temperature of plastic: 482°–1,112° F (250°–600° C)
- Ignition temperature of safety matches: 446° F (230° C)
- Ignition temperature of the wood framing in a home: 400°–600° F (204.4°–315.6° C)
- Ignition temperature of wool: 442.4°–446° F (228°–230° C)
- Windows and light bulbs burst: 900° F (482.2° C)

Answers to *Staying Safe*

1. (a) A boy is fixing a snack in the kitchen when he sees that something on the stove is on fire and has caught the curtains on fire as well.
   (b) Since the curtains are already on fire, the boy does not have the choice of trying to smother the flames in the pan. The curtains are very good fuel that will feed the flames and help the fire spread quickly. The door to the outside is very close to the flames, and if he opens it, the wind could cause the flames to grow and blow toward him.
   (c) The best solution is to take an alternate exit from the room to outside the home, shouting "Fire!" to alert others as he goes. He must then call 9-1-1 from outside the home and go to his family's outside meeting place.
2. (a) A girl wakes up to find smoke coming through the bottom of her bedroom door.
   (b) Since smoke is coming through the bottom of the door, she cannot open it to escape. She must use an alternate exit.
   (c) Since smoke rises on convection currents, she will "crawl low and go." If she is on the ground floor in her home, she can climb out the window. If she is on the second floor and has an escape ladder, she can climb out the window safely. If she is in a high-rise, she will put a blanket under the door to keep more smoke from coming in and wave the bed sheet out the window to attract the firefighters' attention. If she has a phone in her room, she must call 9-1-1 to explain the situation and describe her location.
3. (a) An older child and younger child are in the living room with a smoldering rug in front of the fireplace.
   (b) The younger child is closer to the burning rug. A window is next to the fireplace, and opening it could let in a gust of wind that could cause the smoldering rug to burst into flames.
   (c) The older child must take charge immediately. She must take the younger child's hand and guide him quickly from the room to an alternate exit, shouting "Fire!" to alert others as she goes. They will then go to the family's outdoor meeting place. Only after they are outside their home will the older child call 9-1-1.
4. (a) The boy is in the basement and sees the smoke coming from the dryer.
   (b) The door in the basement to the outside is next to the dryer. Many flammable items are stored in the basement laundry room. It is important to get out fast, but exiting near the fire could be dangerous.
   (c) The boy must go up the inside stairway and exit the home from the first level, shouting "Fire!" to alert others as he goes. Once outside the home, he will call 9-1-1 and go to the family's outdoor meeting place.

Answers to *Firefighters in Action*

- A firefighter is climbing a ladder to rescue a man still in the home, while another carries a dog to safety.
  Reason: Firefighters rescue people and pets first. Never go back into a burning building. It is a firefighter's job to rescue people and pets, not your job.
- Firefighters are attaching a hose to the fire hydrant.

Reason: Water removes the heat side of the fire triangle.

- Firefighters with axes are on the roof of the home; another signals from the ground to wait.
  Reason: Ventilating the fire can relieve conditions for firefighters and prevent some forms of extreme fire behavior, rapid fire progress, etc. It may also help firefighters control the horizontal spread of the fire through the building. However, ventilation may cause the burning rate of the fire to increase as more air flows into the structure. The fire could speed rapidly out of control. The firefighter on the ground is telling his colleagues to wait until the man is rescued from the second-story window before ventilating.
- A firefighter is giving the young boy oxygen.
- **Reason:** Fire uses the oxygen in a room, and smoke and carbon monoxide are released into the air. The young boy needs oxygen after being rescued from the burning building.
- A firefighter checks on a mother and her baby to make sure they are okay and do not need the paramedics or an ambulance.
  Reason: Sometimes victims of a fire are in shock, have burns or suffer from smoke inhalation or other trauma. Paramedics are part of the firefighting team.
- Red Cross workers guide a young boy away from the fire and give a firefighter something to drink.
  Reason: Red Cross workers provide food and drink for the firefighters, who may have to stay at a fire all day or night. They also provide food and shelter for families who have lost their homes and possessions.

LEVEL 3

Answers to *Understanding the Chemistry of Fire*

1. Answers will vary, but may include the following facts:
   - Fire, or combustion, occurs when heat, fuel and oxygen (O2) combine in a chemical reaction.
   - Since oxygen is present in the air, the campfire will continue to burn as long as fuel is added.
   - Fire is a process of rapid oxidation, an exothermic reaction, because heat is always released. An endothermic reaction absorbs heat.
   - To start a campfire, use flammable items or fuel with a low ignition temperature.
   - When a log burns, it produces heat and light, as well as carbon dioxide, water and ash.
   - Heat energy is released as the log burns. This means that the products of combustion contain less energy than the reactants.

2. The fire is safe because flammable objects are not near it. The fire is contained in a pit surrounded by stones and adults are supervising. Children are well back from the flames. A bucket of water is close by in case there is a problem. The amount of oxygen reaching the fire depends on the wind. If the wind picks up, the flames could blow out of control.

3. The wind could increase; materials with a low-ignition temperature could be brought near the fire; risk-taking behavior by the adults or children could result in a fire that is out of control. To extinguish the fire, remove the oxygen by smothering the flames with the dirt that surrounds the pit, or douse the flames with water to deprive the fire of heat and oxygen.

Answers to ***Melting and Ignition Temperatures***

Material	Melting or Ignition Temperature	In a Fire This Material Would Probably….
wood framing	Ignites at 400°–600° F (200°–215° C)	Burn quickly if O_2 is present
concrete	Incombustible	Not burn, but would conduct heat to combustible materials
plastic	Melts at 140°–335° F (88°–168° C) depending on the type of plastic Ignites at 480°–1100° F (250°–600° C)	Melt or burn quickly
hardwood floors	Ignites at 250°–500° F (120°–260° C) depending on the type of finish	Burn quickly
wool blanket	Ignites at 440°–445° F (228°–230° C)	Burn quickly if not treated with flame retardant
steel	Ignites at 2000°–2900° F (1100°–1600° C)	Not burn but would fail to support as it approaches melting point and would readily conduct heat to combustibles
wood paneling	Ignites at 250°–500° F (120°–260° C), depending on the type of finish	Burn quickly
cotton curtains	Ignites at 480° F (250° C)	Burn quickly
leather furniture	Ignites at 212° F (100° C)	Burn quickly if not treated with flame retardant

Answers to Identifying ***Safety Procedures to Follow During a Fire***

1. The girl sees smoke and immediately drops to the floor to crawl on her knees.
   Reason: Due to convection currents, less dense smoke and gases will rise. Since hot gases can damage the air passages and lungs, and smoke can cause hypoxia—death from lack of oxygen—it is safer to "crawl low and go" in smoke than to walk upright.

2. The boy hears the smoke alarm, sees that his first exit is blocked and immediately looks for an alternate exit. Always have two exits from a room.
   Reason: If smoke is behind the door, your exit is blocked. Hot gases can damage the air passages and lungs, and smoke can cause hypoxia—death from lack of oxygen. The closed door will help keep the fire out of the room for a while, providing time to reach another exit. If the boy is trapped in the room, he will need to use a bright-colored cloth or flashlight to signal firefighters and let them know where he is. If there is a phone in the room, the boy must also call 9-1-1 or the local emergency service number to describe the situation and give the exact location of his home.
3. Staying low to the ground, the young man tests the door with the back of his hand. He uses the back of his hand because, if the door is hot, he does not want to burn the palm, which he might need to help his escape. If the door is not hot, he will open the door carefully, and if the path is clear, continue to crawl quickly toward the exit.

   Reason: Heat radiates during a fire. If the door is hot, the fire is too close to allow for escape from that exit. The closed door will help keep the fire outside the room for a while, providing time to reach another exit. If the boy is trapped in the room, he will need to use a bright colored cloth or flashlight to signal firefighters and let them know where he is. If there is a phone in the room, the boy must also call 9-1-1 or the local emergency service number to describe the situation and give the exact location of his home.

4. The woman sees smoke, looks back at the valuables on the counter, but continues to walk quickly toward the exit. If you are in a fire, never stop to pick up possessions or go back into the building to get something.
   Reason: Fire grows and spreads quickly, depending on the ignition temperature of the furnishings and the structure. Ventilation might cause backdraft that could cause a violent explosion of flame. As the fire progresses, all the items in the room and the structure could reach their ignition temperatures and flashover could occur. Firefighters will not enter a structure if backdraft or flashover is imminent.5. The family has left the burning home and come immediately to the agreed-upon outdoor meeting place. The young girl is calling 9-1-1.

   Reason: It is important that all the members of the household go to the same place so that everyone is accounted for. When the firefighters come, they will immediately go to the family and ask if there are any people or pets left in the burning home. Fire spreads quickly. Get out and stay out. Use a cell phone or pay phone outside or go to a neighbor’s home to call 9-1-1. Describe clearly your situation and give the exact location of your home.

