BREAD AND BUTTER HAZMAT CALLS

Risk Bases Response

1. The systematic process based upon facts, science and the circumstances of the incident by which responders analyze a problem involving a hazardous material/weapon of mass destruction (WMD), assess the hazards, and consequences, develop an incident action plan, and evaluate the effectiveness of the plan.
2. (NFPA 470,2022)

Systematic Approach of the Terminology

- Temperature of the Material
- State of the material
- Vapor Pressure
- Vapor Density
- Flash Point
- Flammable Range
- Reactivity/Incompatibilities
- Specific Gravity
- Solubility
- pH

NIOSH

Guidebook

PHYSICAL & CHEMICAL PROPERTIES

Temperature of the Material

- What can affect the temperature of the material?

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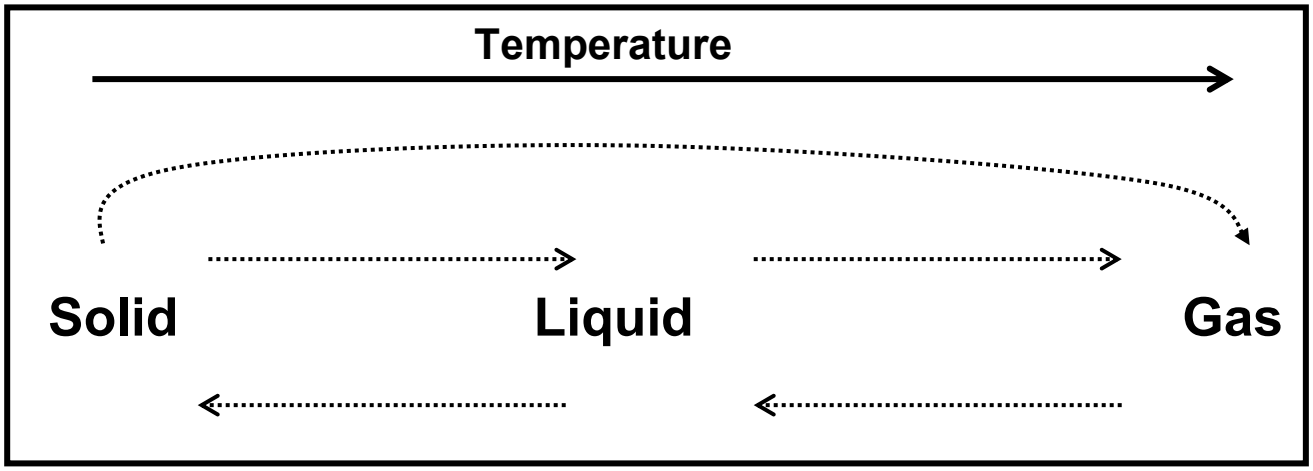
- The various physical changes that a substance can undergo, temperature dependant, include the following:



State of the Material

- **Solids**
  - Blocks
  - Shavings
  - Prills
  - Powders
  - ***Sublimation*** - Direct passage of a substance from the solid state to the vapor state without appearing in the liquid state.

- **Liquids -**
  - Most common state of hazardous materials
  - Remember – *All liquids want to be gases but due to their physical properties and their temperature remain in the liquid state.*
  - Liquids are concentrated gases

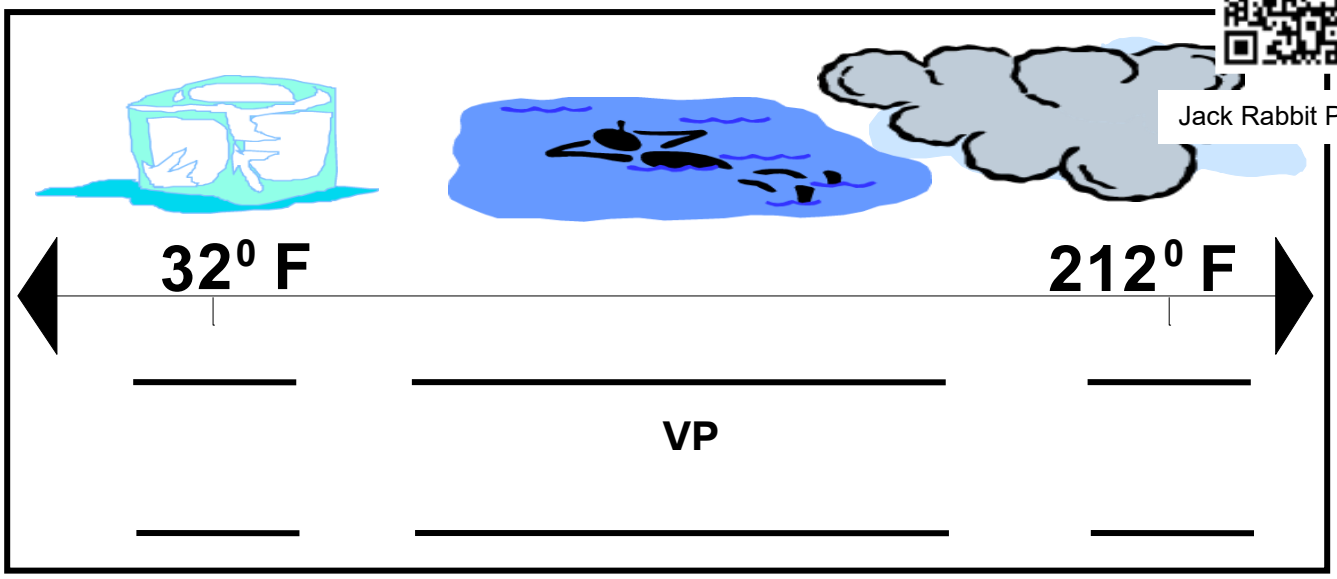
- **Gases** -
  - Gas releases are **ALWAYS** an emergency.
  - Pressurized gas
  - Liquefied gas

BOILING POINT

- Temperature at which the ***vapor pressure*** of a liquid is equal to or greater than the ambient air pressure. Reference materials refer to the boiling point at sea level.

VAPOR PRESSURE

- Pressure created inside a closed container when the molecules escape from the liquid or solid phase into the *gaseous phase.*
- Vapor pressures for liquids are usually measured in **mmHg**.
- Vapor pressures for gases are usually measured in **atm** (atmospheres)
- Liquids with high vapor pressures are referred to as **volatile.**



VAPOR DENSITY

- Weight of a vapor in relation to air
- Air = 1
- Vapor density significantly <1 are gases – 4H MEDIC ANNA
  - **Hydrogen** **0.07**
  - **Helium** **0.14**
  - Hydrogen Fluoride 0.69 - 1.9
  - Hydrogen Cyanide 0.93
  - **Methane** **0.55**
  - Ethylene 0.97
  - Diborane 0.96
  - Illuminating Gas 0.96
  - Carbon Monoxide 0.96
  - **Ammonia** **0.59**
  - **Neon** **0.70**
  - Nitrogen 0.97
  - Acetylene 0.91

- ***Materials that are found in the liquid state have a vapor density >1***

FLASH POINT

- Minimum **temperature** of a **liquid** where sufficient vapors are produced to form an ignitable mixture. *There must be an ignition source to have a fire.*
- ***Fire Hazard No Fire Hazard***
- 1st parameter of fire
- Affected by the same properties as boiling point

APPLICATION:

FLAMMABLE RANGE

- Concentration of vapor in air where combustion **must** occur
- 2nd parameter of fire
- LEL – Lower Explosive Limit – minimum concentration of vapor in air where combustion can occur. Less that the LEL is too lean to burn
- UEL – Upper Explosive Limit – maximum concentration in air where combustion can occur. Concentrations greater than the UEL are too rich to burn
- Wide flammable range materials are most dangerous

APPLICATION:

IGNITION TEMPERATURE

- Minimum temperature a substance must be heated for self-sustained combustion
- Rapid Oxidation
- Types of ignition temperatures
  - Pilot ignition – external source such as a spark or flame
  - Autoignition – heat from radiation or conduction

APPLICATION:

Reactive/Incompatibilities

- Incompatabilities

- Reactivity

- Specific Gravity
  - Weight of a material compared to the weight of water, Water = 1
  - **Street Meaning**

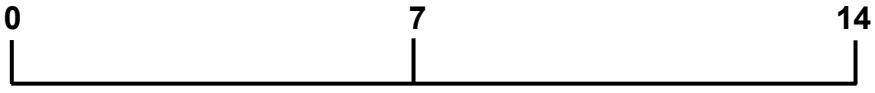
- Solubility
  - Is the ability (solute) to mix into a liquid, the (solvent), It measures the highest amount of substance mixed into a liquid solvent while they are at equal amounts.
    .
  - **Street Meaning**

pH

- **pH**
  - is based upon the dissociation of water molecules into protons or hydrogen and hydroxide ions
  - **Tactical Application**
  - ½ the problem
  - <2 or >12.5

Concentration

- refers to the quantity of a solute dissolved in a solution
- **Tactical Application**
- Other ½ of the problem
- Must be considered with pH



_____ pH _____ pH

_____ burns _____ burns

_____ decon _____ decon

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