



ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

Working Together For a World Free of Chemical Weapons

Physicochemical Properties & Relative Toxicity of Chemical Warfare Agents

Lethal Concentration, LC_{50} in $mg \cdot min/m^3$
Decreasing acute toxicity

Nerve Agents¹

Median Lethal Dose, LD_{50} in mg/kg (Skin Exposure)
Decreasing acute toxicity

Hydrogen Cyanide AC



Molecular Weight: 27.02 $g \cdot mol^{-1}$
State at 20°C: Colourless gas or liquid
Odour: Bitter almonds
Density: 0.687 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 25.7°C
Vapour Pressure: 742 mm Hg at 25°C
Volatility: 108000 mg/m^3 at 25°C
 LD_{50} : 100 mg/kg
 LC_{50} : 3000 $mg \cdot min/m^3$

Blood Agent³

Nitrogen Mustard HN2



Molecular Weight: 156.07 $g \cdot mol^{-1}$
State at 20°C: Dark Liquid
Odour: Soapy (Low concentration), Fruity (high concentration)
Density: 1.15 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 75°C at 15 mmHg
Vapour Pressure: 0.29 mm Hg at 20°C
Volatility: 3580 mg/m^3 at 25°C
 LD_{50} : 10 mg/kg
 LC_{50} : 3000 $mg \cdot min/m^3$

Nitrogen Mustard HN3



Molecular Weight: 204.54 $g \cdot mol^{-1}$
State at 20°C: Dark Liquid
Odour: None
Density: 1.24 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 256°C
Vapour Pressure: 0.0109 mm Hg at 25°C
Volatility: 121 mg/m^3 at 25°C
 LD_{50} : 10 mg/kg
 LC_{50} : 1500 $mg \cdot min/m^3$

Nitrogen Mustard HN1



Molecular Weight: 170.08 $g \cdot mol^{-1}$
State at 20°C: Dark Liquid
Odour: Fishy or Musty
Density: 1.09 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 194°C
Vapour Pressure: 0.24 mm Hg at 25°C
Volatility: 1520 mg/m^3 at 20°C
 LD_{50} : 20 mg/kg
 LC_{50} : 1500 $mg \cdot min/m^3$

Lewisite L



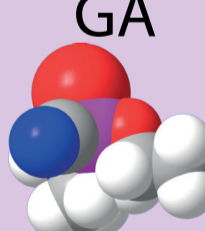
Molecular Weight: 207.35 $g \cdot mol^{-1}$
State at 20°C: Colourless to brownish liquid
Odour: Varies; may resemble geraniums
Density: 1.89 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 190°C
Vapour Pressure: 0.394 mm Hg at 20°C
Volatility: 4480 mg/m^3 at 20°C
 LD_{50} : 30 mg/kg
 LC_{50} : 1400 $mg \cdot min/m^3$

Sulfur Mustard HD



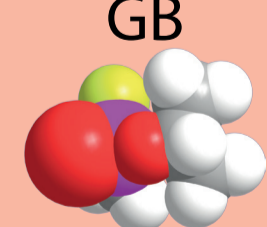
Molecular Weight: 159.08 $g \cdot mol^{-1}$
State at 20°C: Colourless to pale yellow liquid
Odour: Garlic or horseradish
Density: 1.27 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 217°C
Vapour Pressure: 0.72 mm Hg at 20°C
Volatility: 610 mg/m^3 at 20°C
 LD_{50} : 100 mg/kg
 LC_{50} : 900 $mg \cdot min/m^3$

Tabun GA



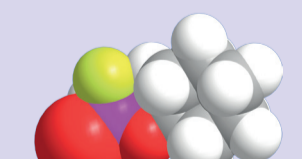
Molecular Weight: 162.3 $g \cdot mol^{-1}$
State at 20°C: Colourless to brown liquid
Odour: Faintly Fruity; none when pure
Density: 1.073 $g \cdot cm^{-3}$ at 25°C
Boiling Point: 240°C
Vapour Pressure: 0.037 mm Hg at 20°C
Volatility: 610 mg/m^3 at 25°C
 LD_{50} : 21.42 mg/kg
 LC_{50} : 70 $mg \cdot min/m^3$

Sarin GB



Molecular Weight: 140.1 $g \cdot mol^{-1}$
State at 20°C: Colourless liquid
Odour: Almost none when pure
Density: 4.86 $g \cdot cm^{-3}$ at 25°C
Boiling Point: 158°C
Vapour Pressure: 2.10 mm Hg at 20°C
Volatility: 22000 mg/m^3 at 25°C
 LD_{50} : 24.28 mg/kg
 LC_{50} : 35 $mg \cdot min/m^3$

Cyclosarin GF



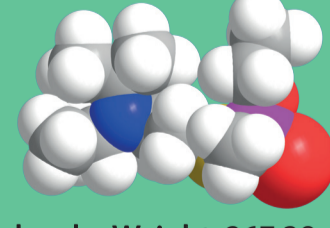
Molecular Weight: 180.2 $g \cdot mol^{-1}$
State at 20°C: Colourless Liquid
Odour: Sweet; musty; peaches; shellac
Density: 1.133 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 239°C
Vapour Pressure: 0.044 mm Hg at 20°C
Volatility: 438 mg/m^3 at 20°C
 LD_{50} : 0.42 mg/kg
 LC_{50} : 35 $mg \cdot min/m^3$

Soman GD



Molecular Weight: 182.18 $g \cdot mol^{-1}$
State at 20°C: Colourless to brown liquid
Odour: Fruity; camphor when impure
Density: 1.022 $g \cdot cm^{-3}$ at 25°C
Boiling Point: 198°C
Vapour Pressure: 0.4 mm Hg at 20°C
Volatility: 3900 mg/m^3 at 25°C
 LD_{50} : 0.71 mg/kg
 LC_{50} : 35 $mg \cdot min/m^3$

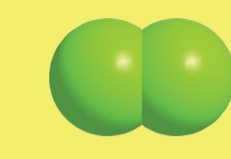
VX Nerve Agent



Molecular Weight: 267.38 $g \cdot mol^{-1}$
State at 20°C: Colourless to amber liquid
Odour: None
Density: 1.0083 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 298°C
Vapour Pressure: 0.0007 mm Hg at 20°C
Volatility: 10.5 mg/m^3 at 25°C
 LD_{50} : 0.071 mg/kg
 LC_{50} : 15 $mg \cdot min/m^3$

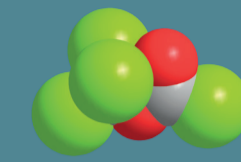
Choking Agents⁴

Chlorine CL



Molecular Weight: 70.90 $g \cdot mol^{-1}$
State at 20°C: Pale yellow-green gas
Odour: pungent suffocating odor
Density: 3.2 $g \cdot cm^{-3}$ at 25°C
Boiling Point: -34.04 °C
Vapour Pressure: 4788 mm Hg at 20°C
 LC_{50} : 6000 $mg \cdot min/m^3$

Diphosgene DP



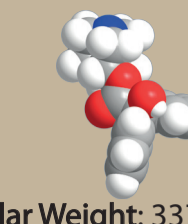
Molecular Weight: 197.85 $g \cdot mol^{-1}$
State at 20°C: Colourless gas
Odour: New-mown hay; green corn
Density: 1.65 $g \cdot cm^{-3}$ at 20°C
Boiling Point: 127°C
Vapour Pressure: 4.2 mm Hg at 20°C
Volatility: 45000 mg/m^3 at 20°C
 LD_{50} : 800 mg/kg
 LC_{50} : 3200 $mg \cdot min/m^3$

Phosgene CG



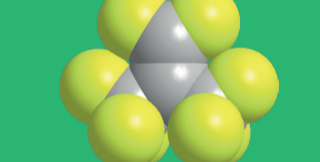
Molecular Weight: 113.94 $g \cdot mol^{-1}$
State at 20°C: Colourless solid or liquid
Odour: Sharp, Penetrating
Density: 4.25 $g \cdot cm^{-3}$ at 25°C
Boiling Point: 53-54°C at 28 mmHg
Vapour Pressure: 11.2 mm Hg at 25°C
Volatility: 1800 mg/m^3 at 20°C
 LD_{50} : 800 mg/kg
 LC_{50} : 3000 $mg \cdot min/m^3$

3-Quinuclidinyl benzilate⁶ BZ



Molecular Weight: 337.41 $g \cdot mol^{-1}$
State at 20°C: White crystalline solid
Odour: Odourless incapacitating agent
Density: 1.3 $g \cdot cm^{-3}$ at 25°C
Boiling Point: 320 °C
Vapour Pressure: 0.03 mm Hg at 70°C
Volatility: 0.5 mg/m^3 at 70°C
 LC_{50} : 200,000 $mg \cdot min/m^3$

Perfluoroisobutene⁵



Molecular Weight: 200.03 $g \cdot mol^{-1}$
State at 20°C: Colourless gas
Odour: Pungent metallic smell
Density: 1.592 $g \cdot cm^{-3}$ at 0°C
Boiling Point: 7 °C
Vapour Pressure: 2.6x10¹⁰ mm Hg at 25°C
 LC_{50} : 870 $mg \cdot min/m^3$

Skin exposure LD_{50} is not available or not applicable

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