

Rule Of "Thumb" Worksheet For Unknown Product Sampling©

Specific Gravity/Solubility Test

Unknown liquid separates from water ⇒ a strong indicator that the liquid is organic.

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Floaters</p>	<ul style="list-style-type: none"> ▪ Solubility ⇒ well below 10% ▪ Generally lower B.P. & Fl.P. ▪ Generally higher V.P. <p><u>Liquids:</u></p> <ul style="list-style-type: none"> ▪ Likely LEL present ▪ Hydrocarbons: <ul style="list-style-type: none"> ▪ Alkanes ▪ Alkenes ▪ Aromatics: <ul style="list-style-type: none"> ▪ Benzene, Toluene, Xylene, etc. ▪ Polar organics with generally <u>more</u> than 4 carbons: <ul style="list-style-type: none"> ▪ Ester, Aldehydes, Amines ▪ Long chain alcohols & organic acids. ▪ Mineral oils. <p><u>Solids:</u></p> <ul style="list-style-type: none"> ▪ Plastics, flour, cellulose, wood, pumice, lava rock, etc. 	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Sinkers</p> <ul style="list-style-type: none"> ▪ LEL at chemical ▪ Solubility ⇒ well below 10% ▪ Generally higher B.P. & Fl.P. ▪ Generally lower V.P. <p><u>Organic liquids:</u></p> <ul style="list-style-type: none"> ▪ Halogenated hydrocarbons (Fl, Cl, Br, I_o) ▪ Nitro compound (NO₂) ▪ Organic Peroxides (R-OO-R) ▪ Amine (aniline) ▪ Dimethyl esters (dimethylphthalate) ▪ Carbon disulfide <p><u>Organic Solids:</u></p> <ul style="list-style-type: none"> ▪ Halogenated ▪ Naphthalene
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Mixers</p>	<p><u>Organics:</u></p> <ul style="list-style-type: none"> ▪ Likely LEL present ▪ Solubility ⇒ miscible ▪ Generally higher B.P. & Fl.P. ▪ Generally lower V.P. ▪ Require AR-AFFF or ATC. ▪ Polar organics with generally <u>less</u> than 4 carbons: <ul style="list-style-type: none"> ▪ Alcohol (pH 5-7) (3400 hump & peak 1000) ▪ Organic acid (pH 2-3) (peak 1720-1680) ▪ Acetone (pH 5-7) (peak 1720-1705) <p><u>Inorganics:</u></p> <ul style="list-style-type: none"> ▪ Most all mix in water ▪ Inorganic acids (pH 0-1) sulfuric, hydrochloric, nitric ▪ Ammonia, solids, powders (pH blue) hydroxides 	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Emulsifies</p> <ul style="list-style-type: none"> ▪ Uniform, milky white solutions that do not settle except perhaps after a long time. ▪ Solubility ⇒ well below 10%, requiring suspension agent. ▪ Generally higher B.P. & Fl.P. ▪ Generally lower V.P. <p><u>Organics</u></p> <ul style="list-style-type: none"> ▪ Pesticide/Insecticides: <ul style="list-style-type: none"> ▪ Organophosphate ▪ Organochlorine ▪ Thiophosphate ▪ Some herbicides ▪ Water-soluble cutting oils
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Convincible Mixers</p>	<ul style="list-style-type: none"> ▪ Likely LEL present ▪ Solubility ⇒ over 10% ▪ Require AR-AFFF or ATC. ▪ Polar organics with generally <u>less</u> than 4 carbons: <ul style="list-style-type: none"> ▪ Ketones (pH 5-7) (peak 1720-1705) Example: MEK ▪ Ester (pH 5-7) (peak 1750-1725) ▪ Aldehyde (pH 4-5) (peak 1740-1720) ▪ Amines (pH 11-12) ▪ Natural oils 	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Opalescence</p> <ul style="list-style-type: none"> ▪ An appearance of a dense milky iridescent medium, or like a prism. ▪ Solubility ⇒ over 10% ▪ What would normally be an oily liquid that can dissolve in water ▪ Example: brake fluid
<p>Chillers</p>	<ul style="list-style-type: none"> ▪ Subtle and easily missed ▪ Inorganics: nitrates, ammonium salt, thiosulfates ▪ Example: cold pack 	

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Q-Tip Test

Q-tip does not burn & turns black	Product is non-flammable
Q-tip has to be stuck in the flame and ignites once heated	Product is combustible
Flame jumps or leaps into Q-tip	Product is flammable

Combustibility Test

Ignites before lighter reaches the edge of the watch glass	Extremely flammable Fl.P. below 73°F Inhalation hazard
Ignites either when the lighter is at the edge of the dish or when the lighter touches the liquid	Flammable Fl.P. of 100°F or lower
Large flame that cannot be sustained without the lighter	Fl.P. near 100°F
Small flame that cannot be sustained without the lighter	Fl.P. above 141°F and below 200°F
Flashes and burns but self-extinguishes, leaving a substantial amount of liquid	Indicates a mixture, probably alcohol or acetone and less than 40% water. Water remains after more volatile solvent burns off.
Flashes, but then goes out immediately; no way to sustain flame	Indicates a mixture of a soluble, or miscible, organic compound and water. At about 40% water or less the flame can be sustained.

Smoke Color Test

Clear smoke	Indicates simple, single-bonded organic with low carbon number	
Some black smoke; no spider-webs	Indicates a longer carbon skeleton, or a mixture of materials	
Many black spider-webs, considerable black soot remains on the watch glass	Benzene, Toluene, Ethyl benzene, Xylene	

Watch Glass Flame Test

Orange flame; no blue base; dirty smoke; spiderwebs	Benzene, Toluene, Ethyl Benzene, Xylene
Luminous, tall orange flame; invisible or blue base	May be saturated hydrocarbons, ketones, or ethers
Blue flame (invisible in bright light)	Alcohol, if unknown sank in water, may be carbon disulfide
Green flame	Ketones and other polar solvents <i>may</i> give a green tinge to a ketone-type flame
Turquoise flame, self-extinguishing flame	Turquoise flame, self-extinguishing flame
Gray or pink/purple flame may be almost white	Nitro or alcohol containing a nitro group. Likely engine fuel
Pink stripe near the top of the flame	May indicate amines or other nitrogenated compounds including nitriles
Orange flame with faint blue white edges	Indicates phosphides. Noxious odor may be noted. Pesticide likely

Other Combustibility Reactions

Liquid creeps away, leaving a clear area around the burning lighter; solid material remains after the flame goes out	Indicates a solid dissolved in a liquid
The flame burns at the edge of the puddle initially, then moves across the entire puddle, or goes out	This usually indicates a mixture of flammable and nonflammable

Melting Point Test

Below 1000°F	<ul style="list-style-type: none"> ▪ Typically indicates an organic ▪ Combustible; generally pH 7 or lower
Above 1000°F	<ul style="list-style-type: none"> ▪ Typically indicates an inorganic ▪ Non-flammable; generally pH blue

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pH Test

pH 0-1	<p><u>Likely inorganic or mineral acid:</u> (fumers)</p> <ul style="list-style-type: none"> Hydrochloric/muriatic acid (foil test) Nitric acid (penny test) Sulfuric acid (sugar test) Phosphoric, boric, hydrofluoric, hydrobromic Spylfiter test #4, M8, M9 ⇒ beads up, may destroy test papers. Q-tip test ⇒ non-flammable Miscible to highly soluble; likely to produce heat when placed into water 	pH 5-7	<p><u>Possible water:</u></p> <ul style="list-style-type: none"> Spylfiter test #4, M8, M9 ⇒ beads up. Q-tip test ⇒ nonflammable Alka-seltzer ⇒ fizzer <p><u>Possible organic peroxide:</u></p> <ul style="list-style-type: none"> Spylfiter test #4, M8, M9 ⇒ absorbs in Potassium Iodide strip ⇒ black, purple, blue Q-tip test ⇒ combustible to energetic flammable Alka-seltzer ⇒ non-fizzer Sinker <p><u>Possible hydrocarbon:</u></p> <ul style="list-style-type: none"> Alkane, alkene, aromatic, alcohol, ketone, ether, ester, halogenated, organic peroxide, etc. Commonly "halo" pH paper. Spylfiter test #4, M8, M9 ⇒ absorbs in. Q-tip test ⇒ flammable to combustible Alka-seltzer ⇒ non-fizzer Floater, mixer, or sinker
	<p><u>Possible organic acid:</u> (non-fumer)</p> <ul style="list-style-type: none"> Formic, acetic, propionic, butyric acid Spylfiter test #4, M8, M9 ⇒ absorbs in. Q-tip test ⇒ mostly combustible, few flammable Miscible to highly soluble 		<p><u>Possible amine:</u> (the organic bases)</p> <ul style="list-style-type: none"> Spylfiter test #4, M8, M9 ⇒ absorbs in. Q-tip test ⇒ flammable to combustible Alka-seltzer ⇒ non-fizzer Short chain ⇒ mixer; long chain ⇒ floater
pH 1-3	<p><u>Possible oxidizer:</u></p> <ul style="list-style-type: none"> Spylfiter test #4, M8, M9 ⇒ beads up. Potassium Iodide strip ⇒ black, purple, blue Q-tip test ⇒ nonflammable Alka-seltzer ⇒ fizzer <p><u>Possible organo-pesticide:</u></p> <ul style="list-style-type: none"> Spylfiter test #4, M8, M9 ⇒ absorbs in. Emulsifier <p><u>Possible aldehyde:</u></p> <ul style="list-style-type: none"> Spylfiter test #4, M8, M9 ⇒ absorbs in. Miscible to highly soluble 	pH 11-12	<p><u>Likely inorganic base:</u> (some liquids, mostly solids)</p> <ul style="list-style-type: none"> Possibly ammonia May contain "hydroxide" in chemical name Q-Tip test non-flammable Miscible to highly soluble
pH 4-6		pH 12 & ↑	

M8 Paper Test

Beads up:

- Typically non-flammable, inorganic

Absorbs in:

- Red color change, generally indicates hydrocarbon
- Orange color change, common for some corrosives to do.

M9 Tape Test

Beads up:

- Typically non-flammable, inorganic

Absorbs in:

- Typically flammable/combustible, organic

Potassium Iodide Paper (KI) Test

- It is recommended to put 1 to 2 drops of HCL (muriatic acid) on the KI paper before applying product to increase sensitivity.
- No color change, no oxidizer present

Black then to white

- If strip turns black immediately, then quickly returns to white, this is a *very strong* oxidizer.

Possibilities:

- Hypochlorites, hypobromites, concentrated nitric.

Black to purple

- If strip turns black or dark purple immediately this indicates a *strong* oxidizer.

Blue to dark purple

- If strip turns blue or dark purple in a few seconds, continue testing but be aware you may be dealing with a very hazardous chemical.
- If strip turns blue or purple after time, weak oxidizer.

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Spylfiter Test Strip

<p>Test #1 <u>Acid/Base</u> <u>Risk:</u></p>	<ul style="list-style-type: none"> ▪ Red = Strong Acid <ul style="list-style-type: none"> ▪ Typically non-flammable ▪ Inorganic or mineral acid ▪ Orange = Moderately Acidic <ul style="list-style-type: none"> ▪ Possible flammable/combustible ▪ Yellow = Weak Acid <ul style="list-style-type: none"> ▪ Possible flammable/combustible ▪ Green = Neutral ▪ Dark Green = Moderately Basic ▪ Dark Blue = Strong Basic <ul style="list-style-type: none"> ▪ Typically non-flammable ▪ Likely inorganic (ammonia, hydroxide)
<p>Test #2 <u>Oxidizer</u> <u>Risk:</u></p>	<ul style="list-style-type: none"> ▪ Light or Dark Blue = Present <ul style="list-style-type: none"> <u>Note:</u> KI paper is a much more sensitive test ▪ White = Not Present
<p>Test #3 <u>Fluoride</u> <u>Test:</u></p>	<ul style="list-style-type: none"> ▪ Pink = Not Present ▪ Yellow = Present <ul style="list-style-type: none"> ▪ Possible hydrofluoric acid present
<p>Test #4 <u>Petroleum</u> <u>Product:</u></p>	<ul style="list-style-type: none"> ▪ Light Blue = Not Present <ul style="list-style-type: none"> ▪ If product beads up on the strip it is typically not flammable. ▪ Dark Blue = Present <ul style="list-style-type: none"> ▪ If product absorbs in, it indicates carbon is present.
<p>Test #5 <u>Iodine/</u> <u>Bromine/</u> <u>Chlorine:</u></p>	<ul style="list-style-type: none"> ▪ Peach = Not Present ▪ Violent = Present

Inorganic Acid Test

<p>Hydrochloric Acid Test</p>	<ul style="list-style-type: none"> ▪ Add 6 to 7 drops of unknown to aluminum foil. ▪ Give it a couple of minutes. ▪ If it fizzes it moderate to high concentration of HCL or muriatic acid.
<p>Nitric Acid Test</p>	<ul style="list-style-type: none"> ▪ Add 2 to 3 drops of unknown to a pre-1982 copper penny. ▪ If it turns green, nitric acid is present.
<p>Sulfuric Acid Test</p>	<ul style="list-style-type: none"> ▪ Add 5 to 6 drops of unknown to granulated sugar. ▪ A high concentration of sulfuric will turn sugar black. ▪ A moderate concentration of sulfuric will turn sugar yellowish to dark brown. ▪ A lower concentration of sulfuric may only wet the sugar cube.

Alka-Seltzer Test

<p>Non-Fizzer</p>	<ul style="list-style-type: none"> ▪ Likely a hydrocarbon/flammable
<p>Fizzer</p>	<ul style="list-style-type: none"> ▪ Likely: <ul style="list-style-type: none"> ▪ Water or water based (example: 70% isopropyl alcohol) ▪ Acidic or basic solution

Ketone Test

<p>Styrofoam doesn't melt</p>	<p>Probably:</p> <ul style="list-style-type: none"> ▪ Not a ketone or halogenated hydrocarbon
<p>Styrofoam melts</p>	<p>Likely:</p> <ul style="list-style-type: none"> ▪ Ketone ▪ Halogenated hydrocarbon