

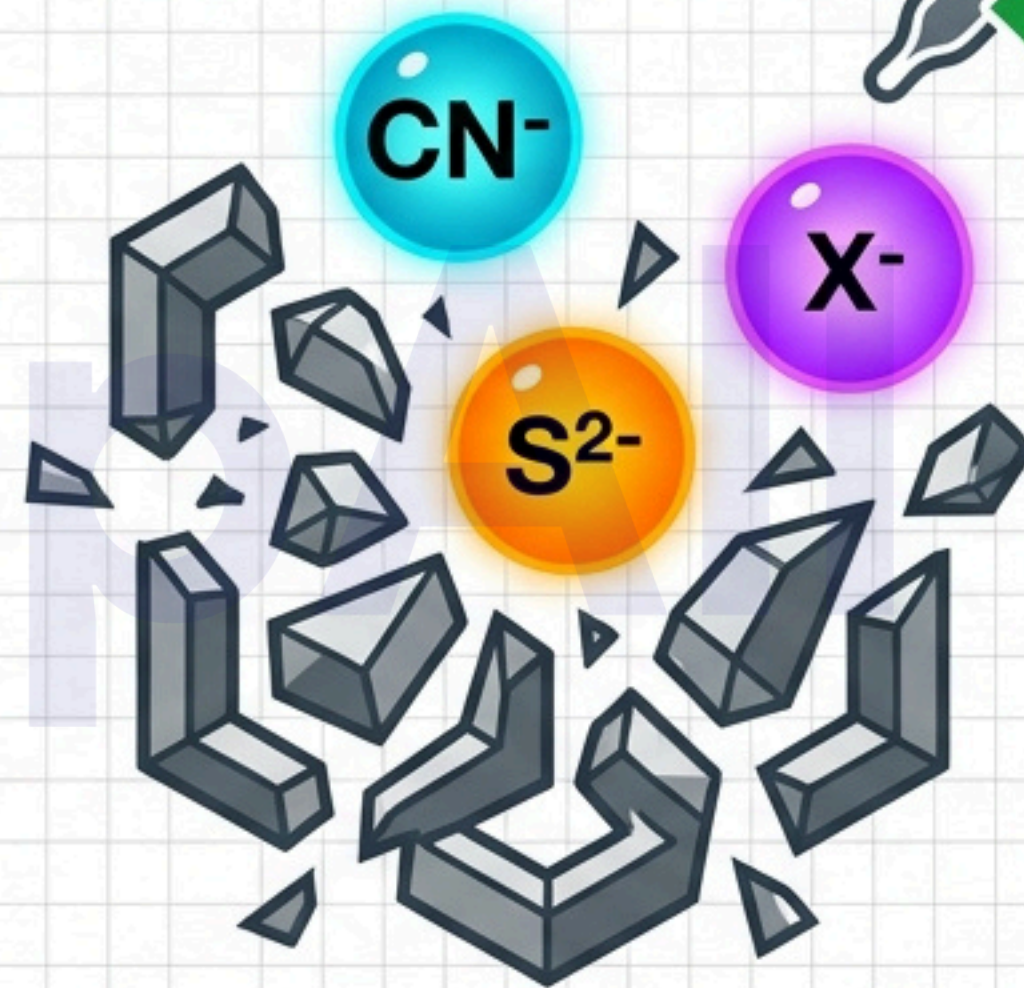
Unlocking Elements from Covalent Bonds

The Problem: Organic Compound



The Analytical Barrier: Elements in organic compounds are covalently bonded. They will not react with standard aqueous testing reagents.

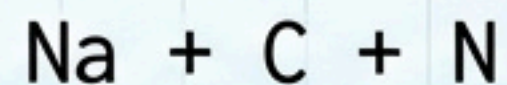
The Solution: Ionic Salts



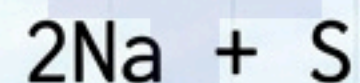
Lassaigne's test bridges organic and inorganic chemistry by fusing the compound with sodium metal, forcibly converting covalently bound elements into water-soluble ionic salts.

The Sodium Fusion Extract Formulation

Organic Compound
+ Sodium Metal (Na)



(Sodium Cyanide)



(Sodium Sulphide)



(where X = Cl, Br, I)



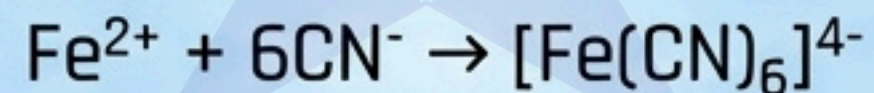
(Sodium Halide)

Process Note: The fused mass is boiled with distilled water and filtered. The resulting clear filtrate is the Sodium Fusion Extract used as the starting material for all diagnostic tests.

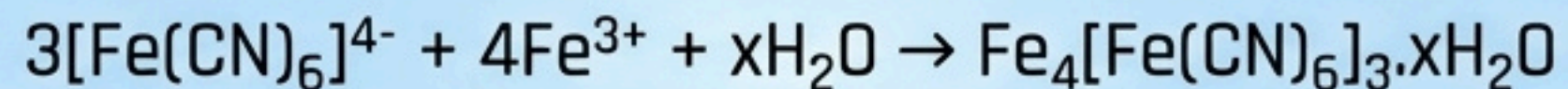
Nitrogen Detection Pathway

NaCN

Add FeSO₄ and boil



Acidify with conc. H₂SO₄



Reaction Insight:

Concentrated sulphuric acid oxidizes a portion of Iron(II) to Iron(III), which reacts with the hexacyanidoferrate(II) complex to form ferriferrocyanide.



Positive Indicator: Prussian Blue



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Let's Test Them Now.**

$$E=mc^2$$



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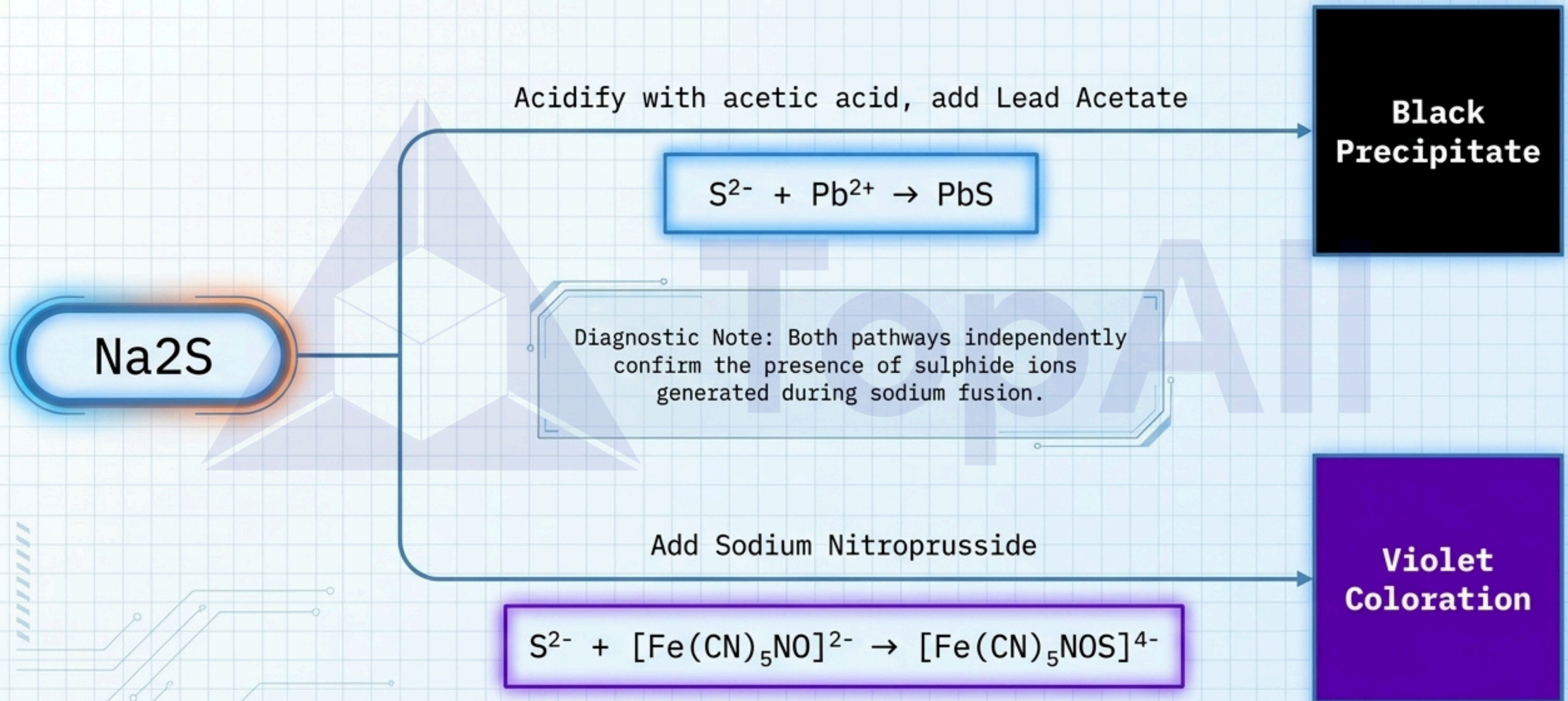
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Dual Pathways for Sulphur Detection



The Nitrogen & Sulphur Combination Anomaly

The Mechanism

Sodium Thiocyanate Formation

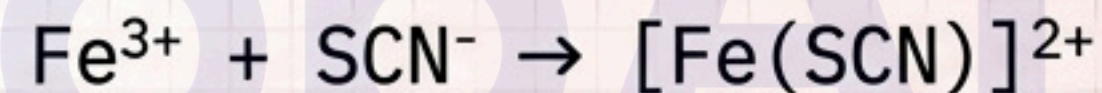


No free CN^- ions are formed.
The standard Prussian Blue test will fail.

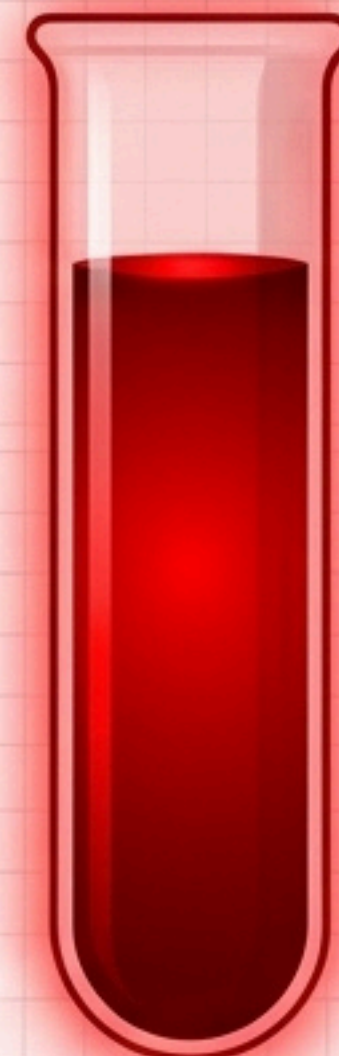
The Test

Adding Iron(III)

Add Fe^{3+} to extract



Blood Red Coloration



Crucial Caveat:

If an excess of Sodium metal is used during the initial fusion, the thiocyanate decomposes back into distinct cyanide and sulphide ions ($\text{NaSCN} + 2\text{Na} \rightarrow \text{NaCN} + \text{Na}_2\text{S}$), restoring the standard individual tests.

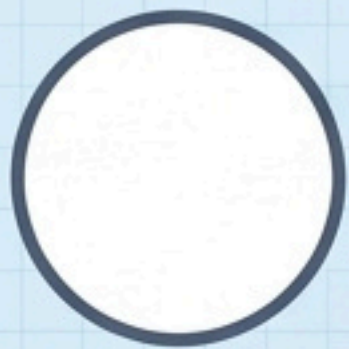
Halide Differentiation via Silver Nitrate



Procedural Prerequisite: The extract must first be boiled with concentrated HNO_3 to expel hydrogen cyanide or hydrogen sulphide gases, which would otherwise interfere with the halogen test.

Base Reagent: Acidified Extract + AgNO_3

Chlorine (Cl)

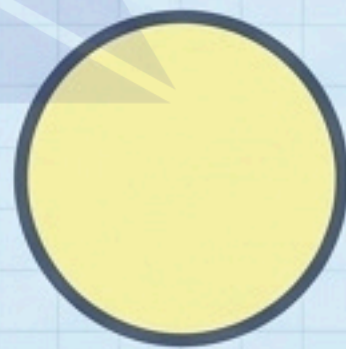


**White
Precipitate**

AgCl

Soluble in ammonium
hydroxide

Bromine (Br)

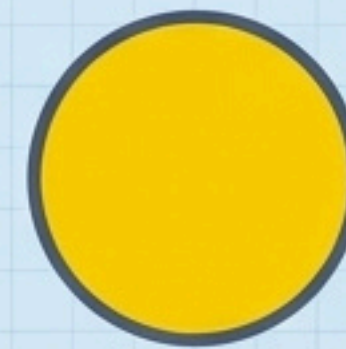


**Pale Yellow
Precipitate**

AgBr

Sparingly soluble in
ammonium hydroxide

Iodine (I)



**Yellow
Precipitate**

AgI

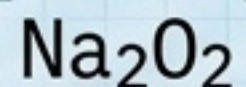
Insoluble in ammonium
hydroxide

Oxidative Detection of Phosphorus



1. Oxidation

Compound heated with Sodium Peroxide

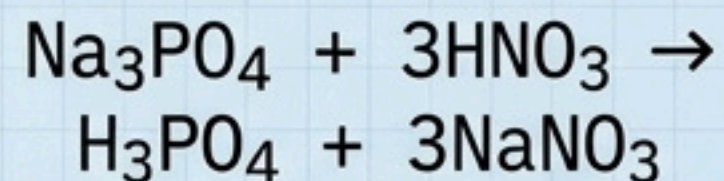


Phosphorus is converted to phosphate (Na_3PO_4).



2. Acidification

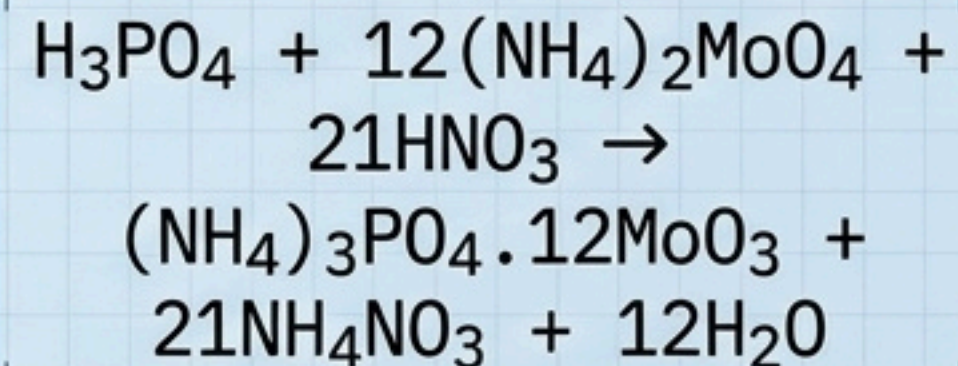
Boiled with Nitric Acid



Yellow Precipitate
(Ammonium Phosphomolybdate)

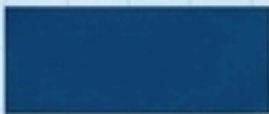
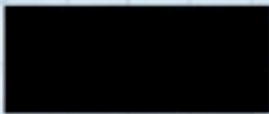
3. Detection

Add Ammonium Molybdate



Note: This test uses a distinct oxidative pathway, bypassing the standard Lassaigne's filtrate.

Qualitative Analysis Master Blueprint

Element	Core Reagent	Chemical Product	Visual Indicator (Color)
Nitrogen (N)	$\text{FeSO}_4 + \text{H}_2\text{SO}_4$	$\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 \cdot x\text{H}_2\text{O}$	 Prussian Blue
Sulphur (S) - Path A	Lead Acetate	PbS	 Black
Sulphur (S) - Path B	Sodium Nitroprusside	$[\text{Fe}(\text{CN})_5\text{NOS}]^{4-}$	 Violet
N + S Combined	Fe^{3+}	$[\text{Fe}(\text{SCN})]^{2+}$	 Blood Red
Chlorine (Cl)	AgNO_3	AgCl	 White (Soluble)
Bromine (Br)	AgNO_3	AgBr	 Pale Yellow (Sparingly Soluble)
Iodine (I)	AgNO_3	AgI	 Yellow (Insoluble)
Phosphorus (P)	Ammonium Molybdate	$(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3$	 Yellow Precipitate



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