Today's Class

Attendance

Syllabus

What's Inorganic Chemistry and from Where Did this Stuff Come?

Next Class

Read Chap 1 and Chapter 2 sections 1 and 2

Early experiments to identify the atom

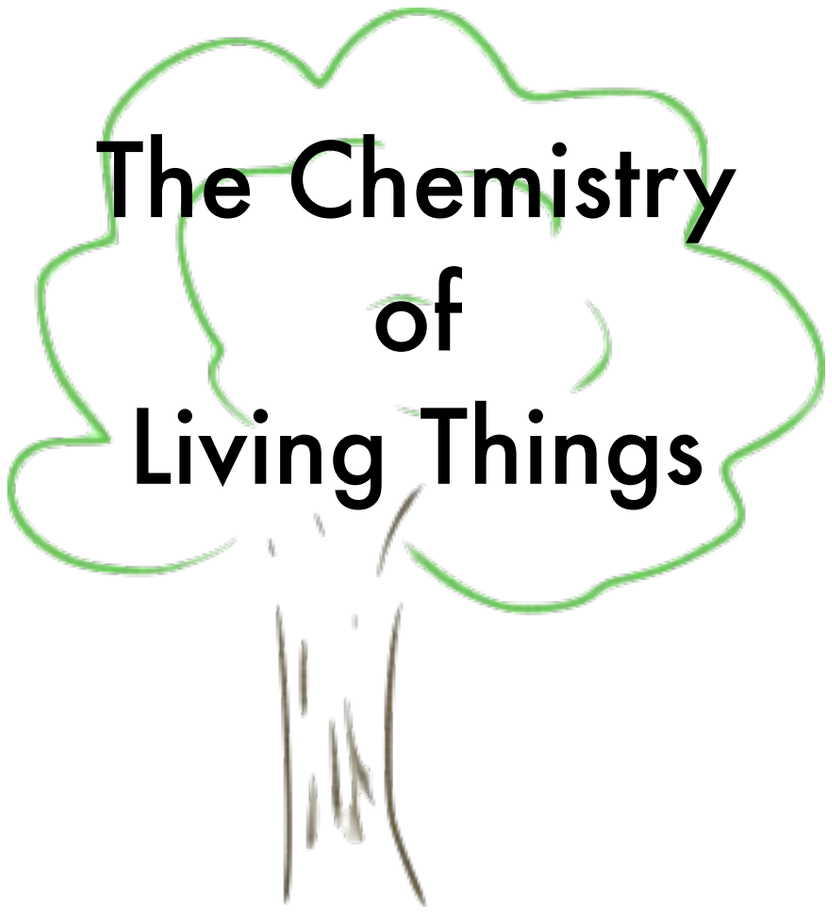
A simplified look at quantum mechanics , the results thereof, and shielding

Advanced Inorganic

The Other Chemistry

Organic vs Inorganic

The Chemistry of Living Things

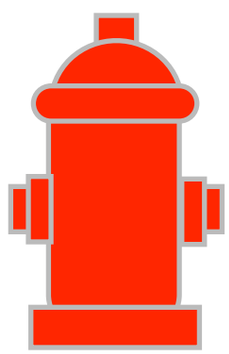


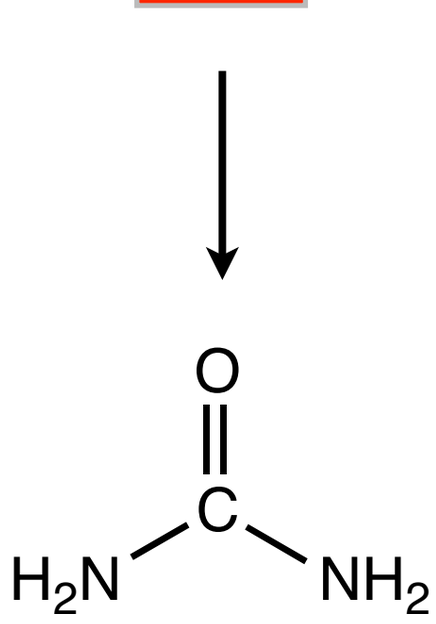
Organic

The Chemistry of Non-living Things

Inorganic

Organic vs Inorganic

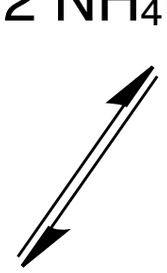


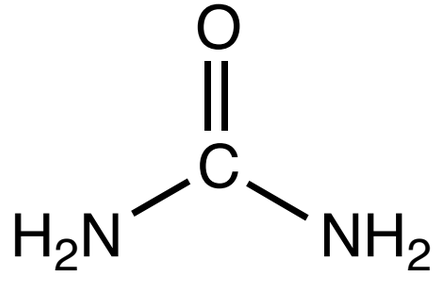


Organic ✓

$Pb(NCO)_2 + 2\ NH_3 + 2\ H_2O$

$Pb(OH)_2 + 2\ NH_4NCO$





Inorganic ?

Friedrich Wöhler

Organic vs Inorganic

Organic

Inorganic

Organic vs Inorganic

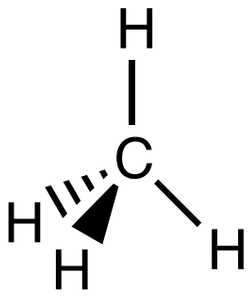
The Chemistry of Carbon and Hydrocarbons

Organic

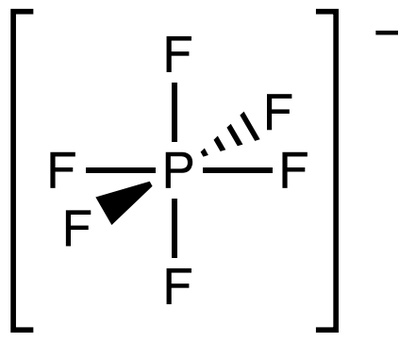
The Chemistry of Everything Else

Inorganic

"Cool" Differences



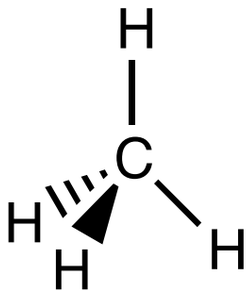
lame



awesome

Organic	Inorganic
four 2-e⁻ bonds, maximum	more than four 2-e⁻ bonds possible

"Cool" Differences



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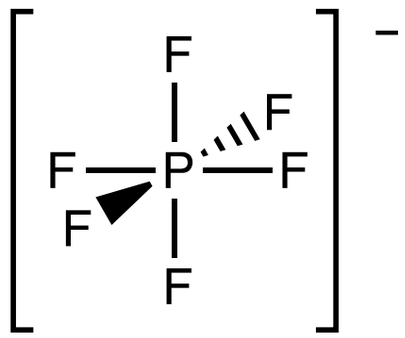

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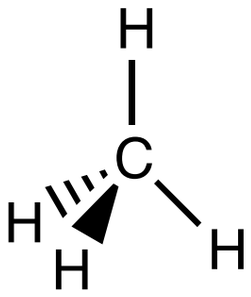

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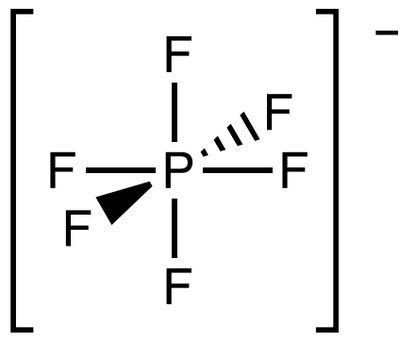

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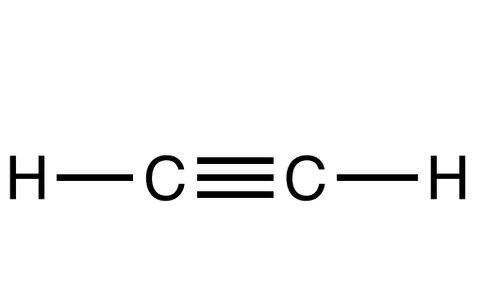
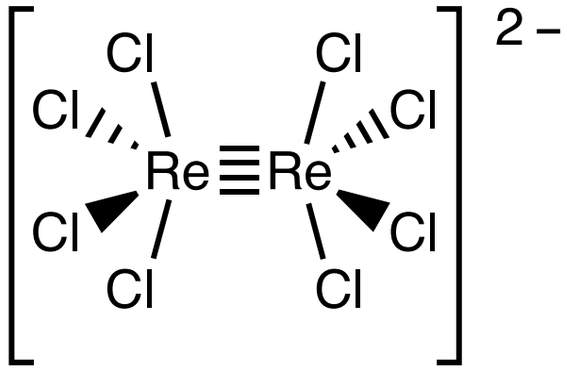
"Cool" Differences



quadruple



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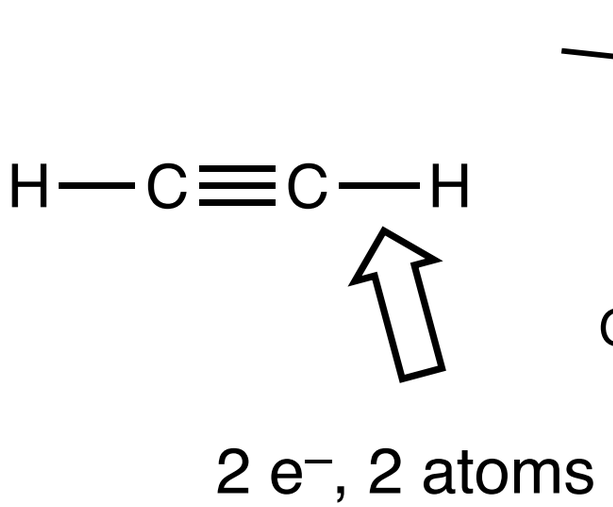
"Cool" Differences



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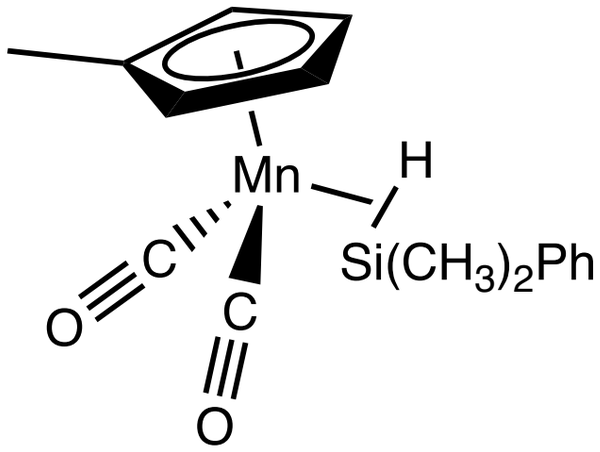

freakish

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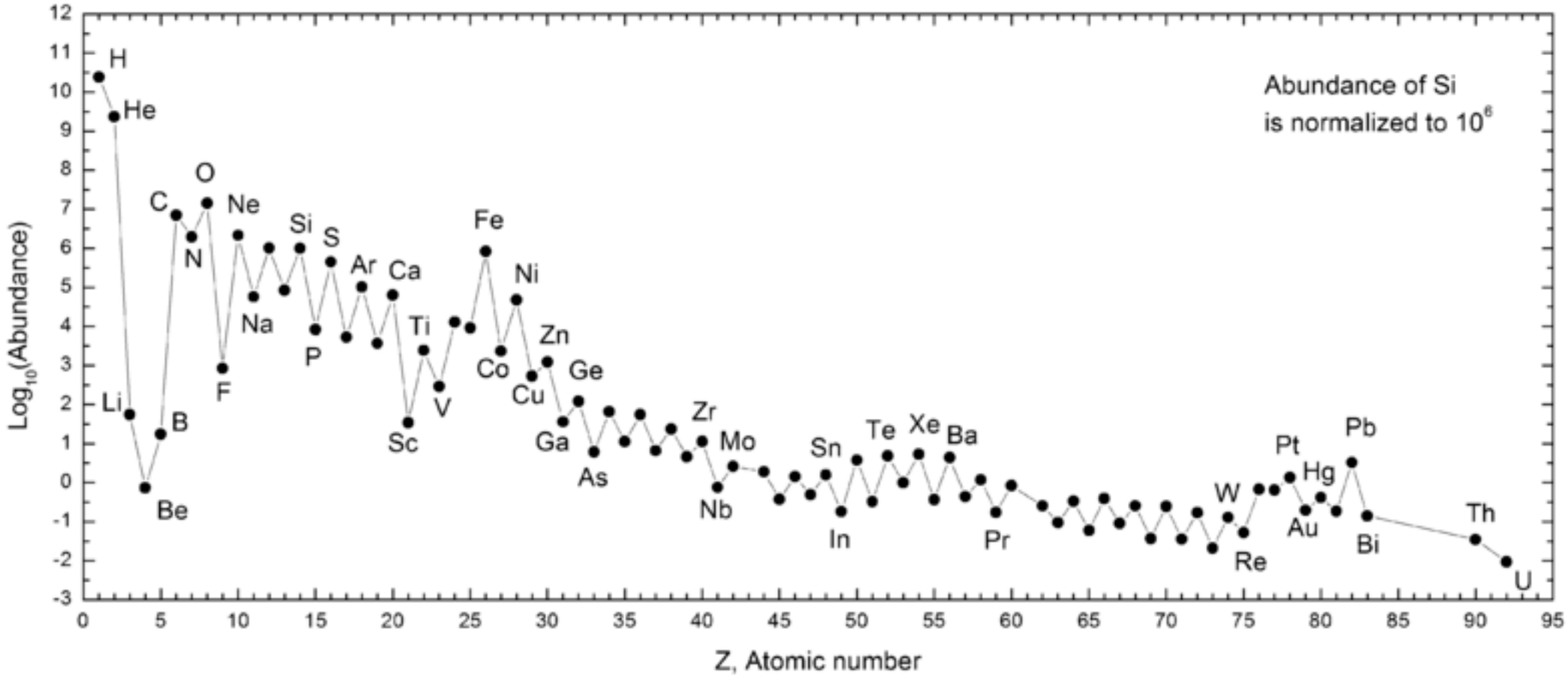
fairly strict adherence to octet rule	often exceed octet rule for elements $n \geq 3$
no greater than triple bond	higher order bonds possible
plain 2-e⁻, 2 center bonds	multi-center multi-e⁻ bonds

Abundance of Elements in Our Solar System



http://en.wikipedia.org/wiki/File:SolarSystemAbundances.png, data from Katharina Lodders (2003). "SOLAR SYSTEM ABUNDANCES AND CONDENSATION TEMPERATURES OF THE ELEMENTS". The Astrophysical Journal 591: 1220–1247.

Where Does All This Cool Stuff Come From?

Ask Prof. Rees....

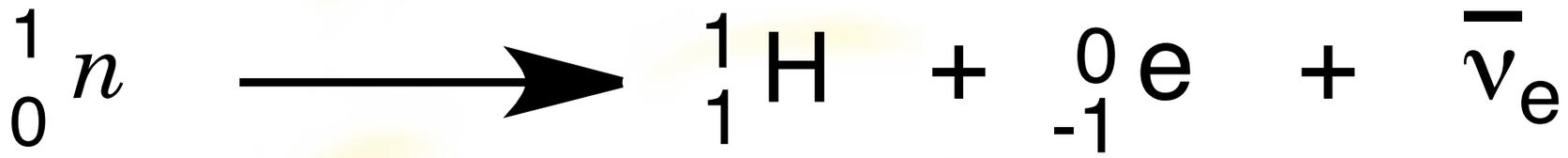
Big Bang Nucleosynthesis

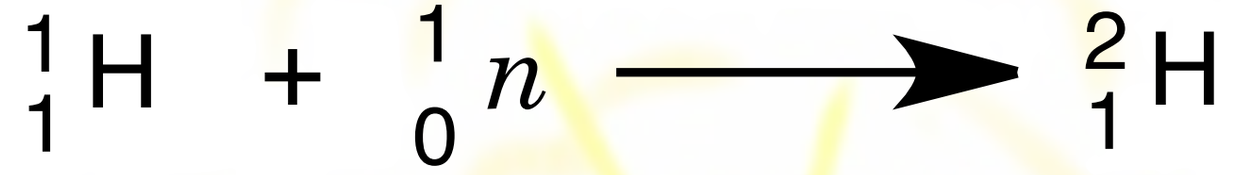
$$^{1}_{0}n$$

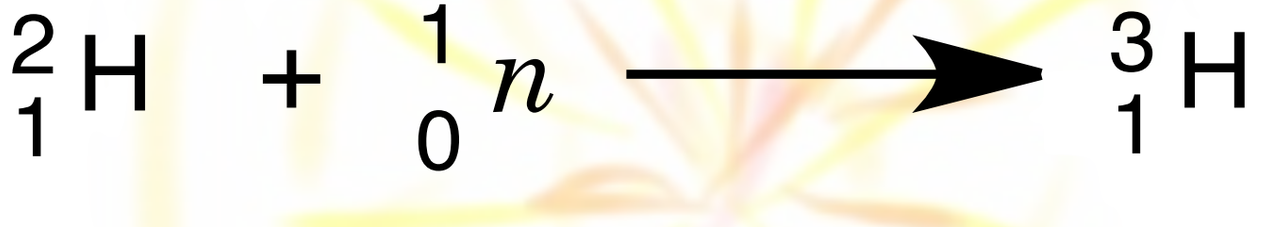
Big Bang Nucleosynthesis

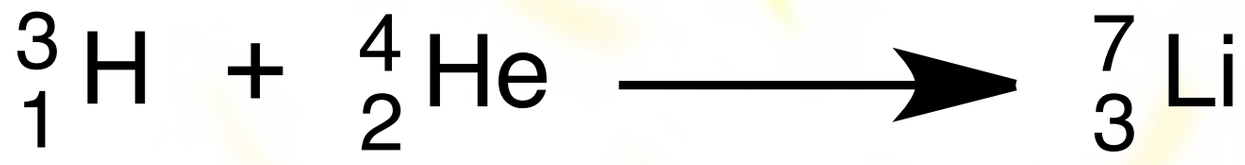
$$ {}^{1}_{0}n \longrightarrow {}^{1}_{1}\mathrm{H} + {}^{0}_{-1}\mathrm{e} + \bar{\nu}_{\mathrm{e}} $$

Big Bang Nucleosynthesis Ends at Be



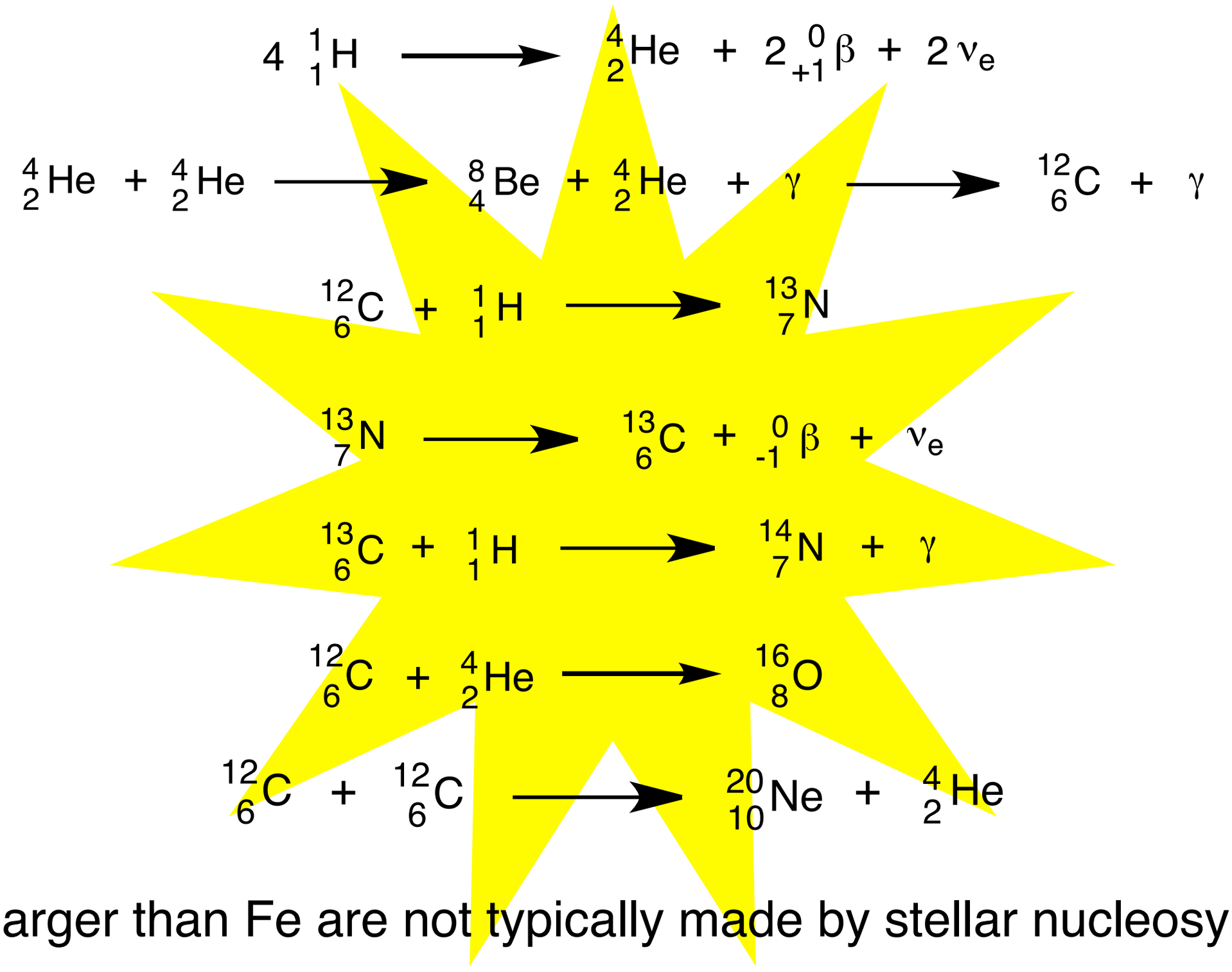






Stellar Nucleosynthesis

Example Reactions



Nuclei larger than Fe are not typically made by stellar nucleosynthesis

Atoms Heavier than Fe?

Can be made
by neutron capture

$$ {}^{m}_{z}X + {}^{1}_{0}n \longrightarrow {}^{m+1}_{z}X $$

$$ {}^{m+1}_{z}X \longrightarrow {}^{m+1}_{z+1}Y + {}^{0}_{-1}\beta + \bar{\nu}_e $$

Composite X-Ray and optical image of the Crab Nebula

Credits for X-ray Image: NASA/CXC/ASU/J. Hester et al.
Credits for Optical Image: NASA/HST/ASU/J. Hester et al.

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s-process

r-process

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Distribution of Elements on Earth

siderophiles	combine with iron and accumulate in the core
lithophiles	combine with oxygen and halogens and accumulate in the crust
chalcophiles	combine with sulfur, selenium, and arsenic and accumulate in the crust

Moved Around

Water and Magma

for example