

Unit 2 - Atomic Structure and Nuclear Chemistry

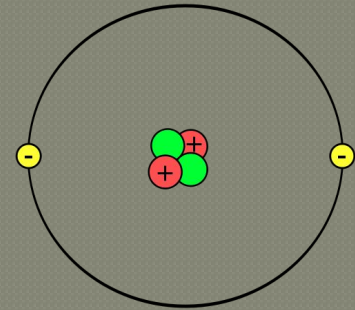


Section 3: “It’s da bomb!”
– Fission and Fusion
Reactions

Quick Review

● Nucleus

- Centermost part of an atom
- Composed of protons and neutrons
 - Protons – Positive Charge
 - Neutrons – Neutral Charge
- Surrounded by electrons
 - Electrons – Negative Charge



Atomic Structure (Review)

- In chemistry, a quick symbol may be used to describe an atom...

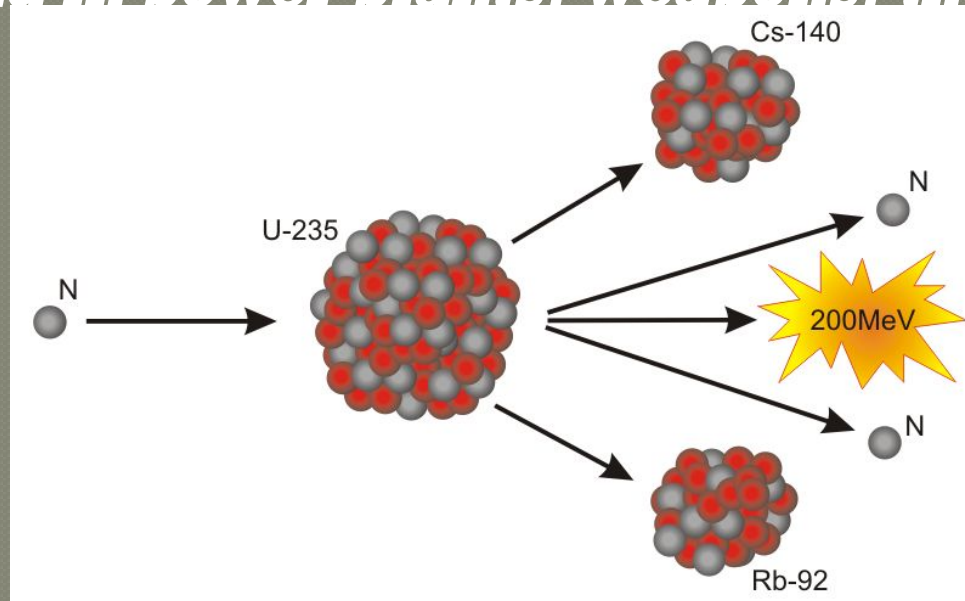
Mass Number
(p + n)



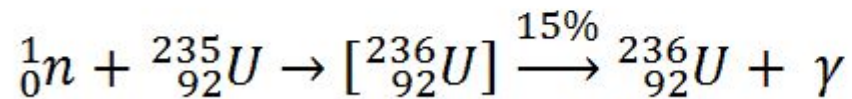
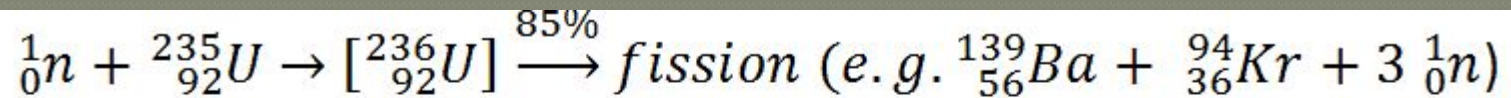
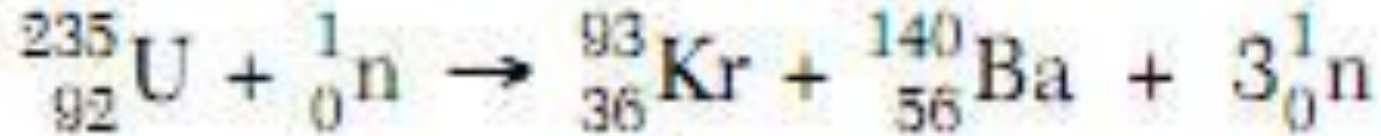
Atomic Number

Fission Reactions

- **Nuclear Fission** – atomic nucleus is struck with a neutron, causing it to become unstable and split.
 - Splitting of the nucleus creates *enormous amounts of energy - energy is converted from mass!*
($E=mc^2$)
 - *Found in power plants, weapons, the sun, etc.*




Fission Reactions



Nuclear Fission – Chain Reaction

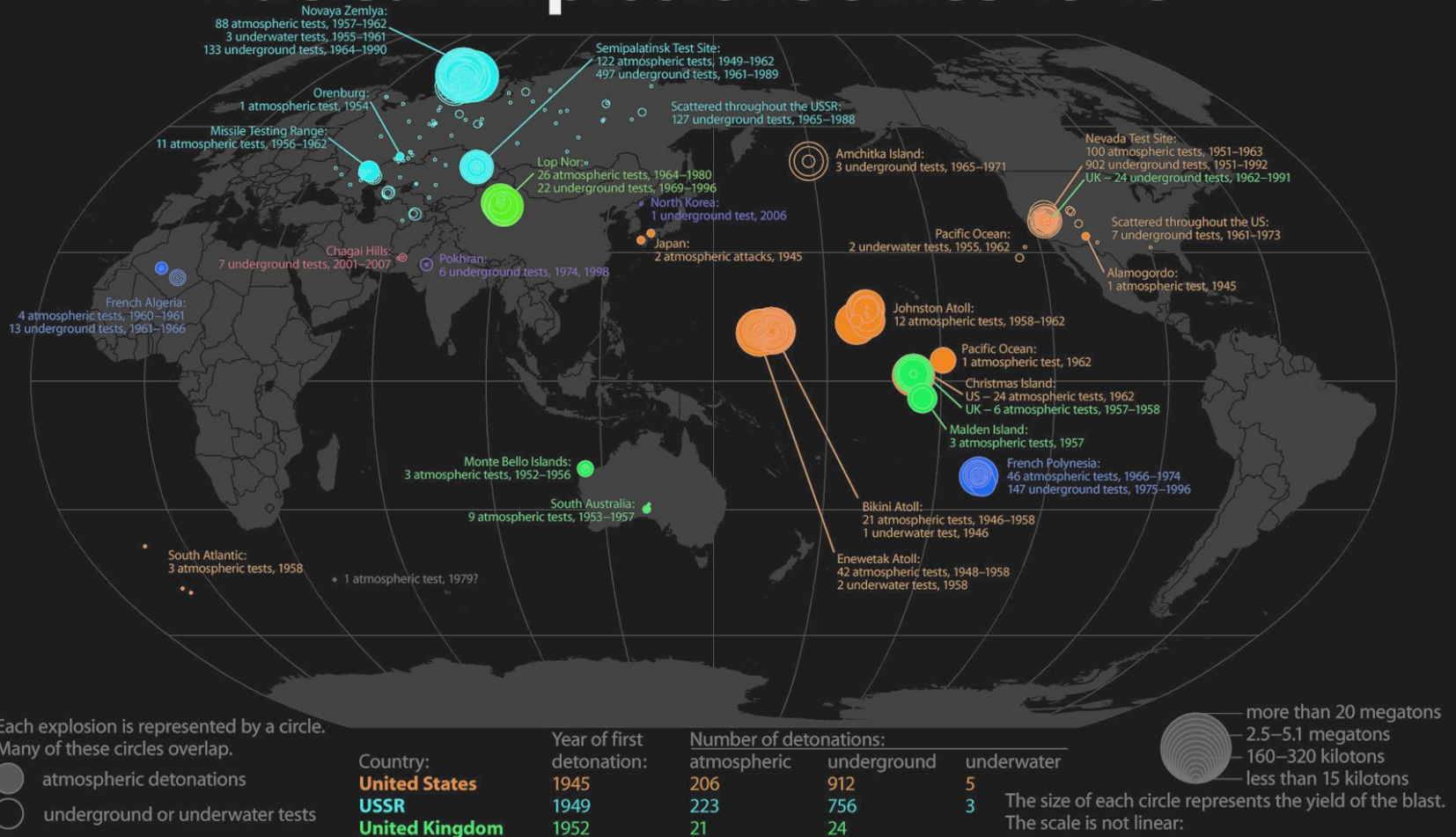
Nuclear Fission Chain Reaction

 — ^{235}U

 — Neutron

 — Fission Product

Nuclear Explosions since 1945



Novaya Zemlya:
88 atmospheric tests, 1957–1962
3 underwater tests, 1955–1961
133 underground tests, 1964–1990

Semipalatinsk Test Site:
122 atmospheric tests, 1949–1962
497 underground tests, 1961–1989

Orenburg:
1 atmospheric test, 1954

Scattered throughout the USSR:
127 underground tests, 1965–1988

Missile Testing Range:
11 atmospheric tests, 1956–1962

Lop Nor:
26 atmospheric tests, 1964–1980
22 underground tests, 1969–1996

North Korea:
1 underground test, 2006

Nevada Test Site:
100 atmospheric tests, 1951–1963
902 underground tests, 1951–1992
UK – 24 underground tests, 1962–1991

Amchitka Island:
3 underground tests, 1965–1971

Scattered throughout the US:
7 underground tests, 1961–1973

Chagai Hills:
7 underground tests, 2001–2007

Pokhran:
6 underground tests, 1974, 1998

Japan:
2 atmospheric attacks, 1945

Pacific Ocean:
2 underwater tests, 1955, 1962

Alamogordo:
1 atmospheric test, 1945

French Algeria:
4 atmospheric tests, 1960–1961
13 underground tests, 1961–1966

Johnston Atoll:
12 atmospheric tests, 1958–1962

Pacific Ocean:
1 atmospheric test, 1962

Christmas Island:
US – 24 atmospheric tests, 1962
UK – 6 atmospheric tests, 1957–1958

Malden Island:
3 atmospheric tests, 1957

French Polynesia:
46 atmospheric tests, 1966–1974
147 underground tests, 1975–1996

Monte Bello Islands:
3 atmospheric tests, 1952–1956

South Australia:
9 atmospheric tests, 1953–1957

Bikini Atoll:
21 atmospheric tests, 1946–1958
1 underwater test, 1946

Enewetak Atoll:
42 atmospheric tests, 1948–1958
2 underwater tests, 1958

South Atlantic:
3 atmospheric tests, 1958

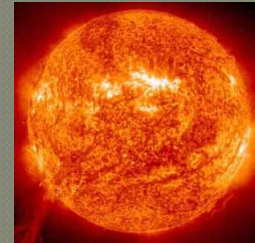
1 atmospheric test, 1979?

Fusion Reactions

- Nuclear Fusion – the ***combination of two nuclei*** to create a nucleus with a greater mass.

- Often occurs when Hydrogen nuclei fuse at high temperatures but can occur with fusion of other elements!

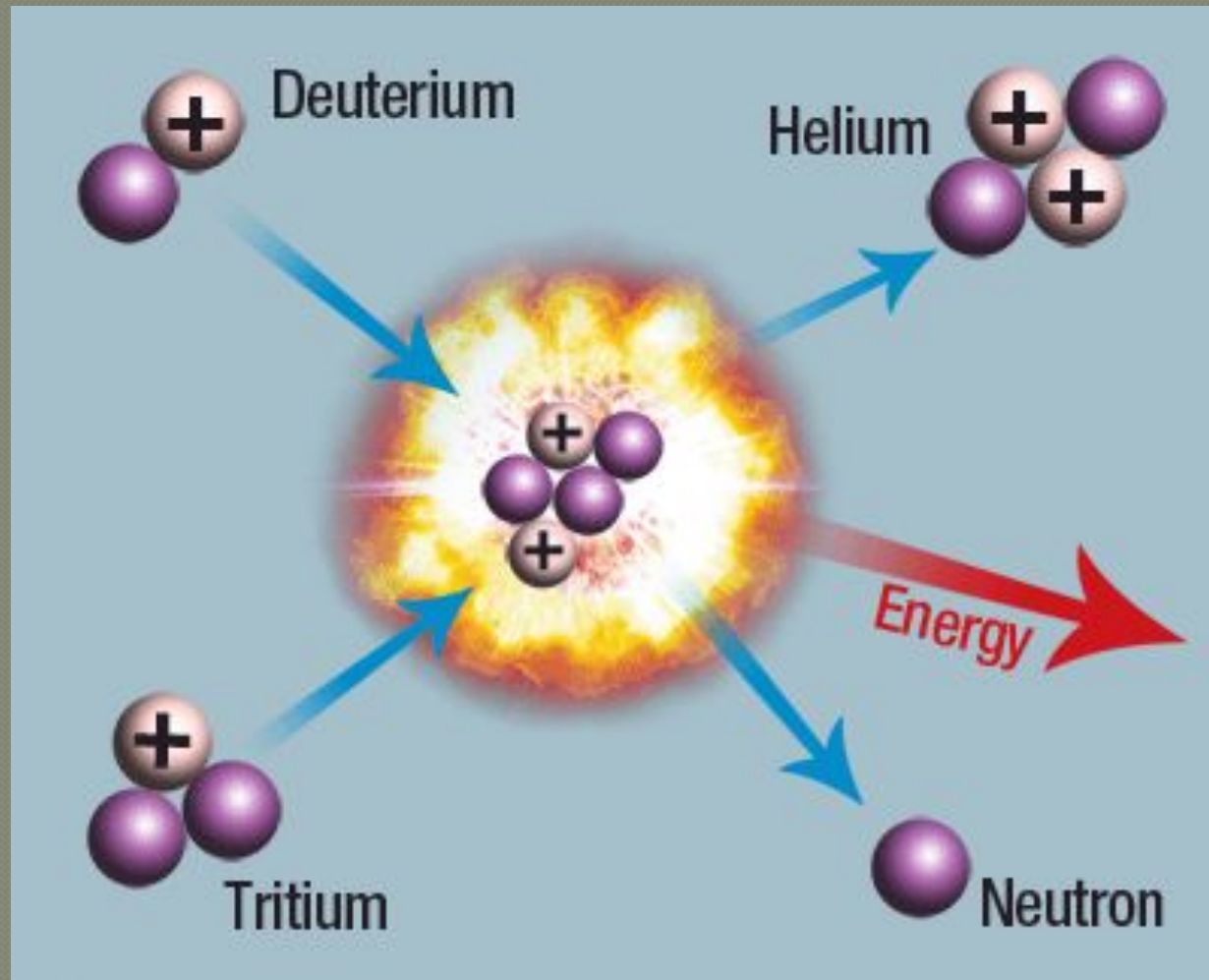
- **Found in Hydrogen bombs and the sun**



Nuclear Fusion



Energy



Fission vs. Fusion Reactions

