

Understanding Radiochemistry

What Makes Radiochemistry
Data Unique

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Topics and Discussions

- What is radiochemistry?
- What are some of the features that make radiochemistry unique?
- Determining data is of known quality and usable.



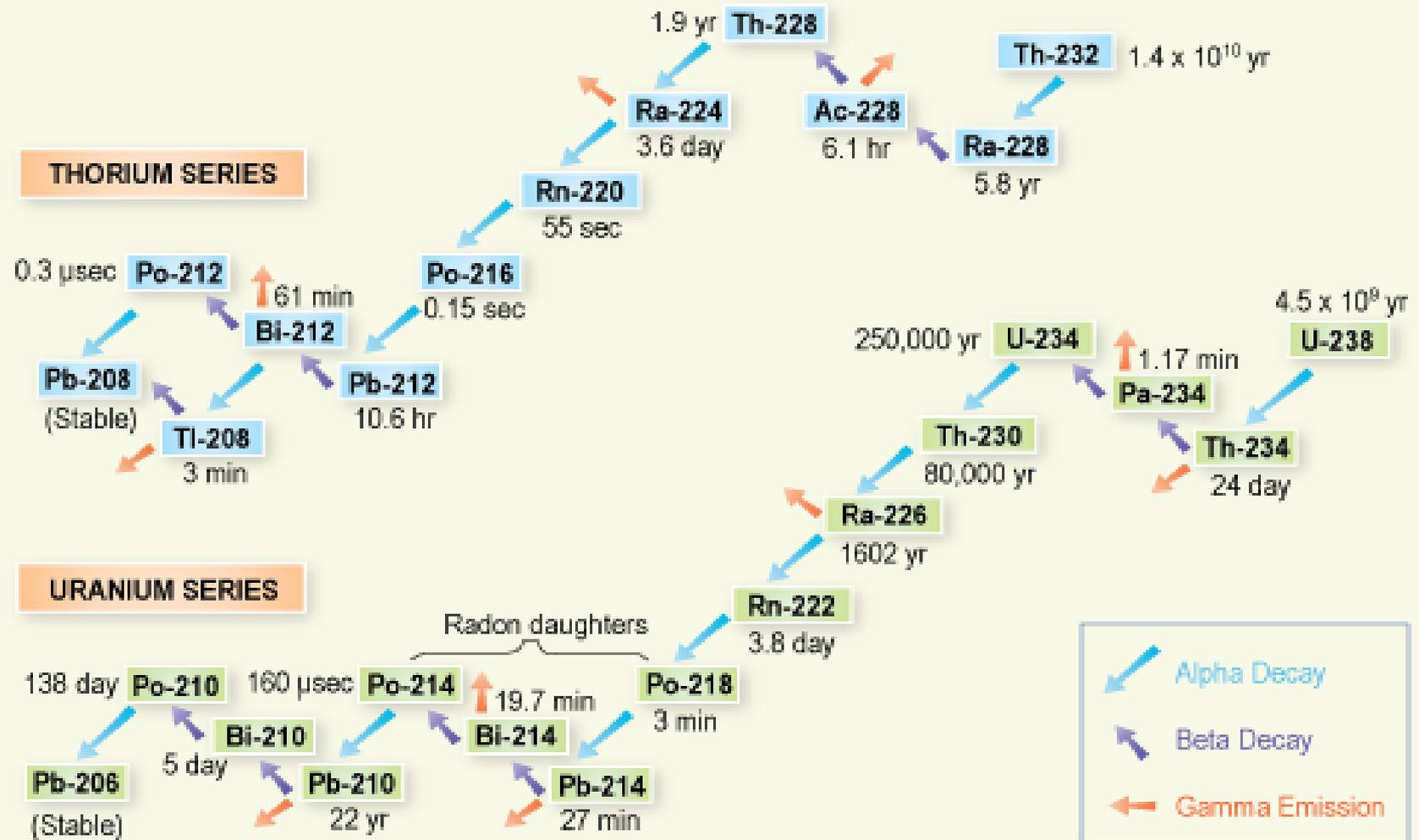
What is radiochemistry?

- The analysis, identification, and quantification of radioactivity in samples
- Radioactivity is present as a naturally occurring event and a result of human introduction of radioactivity into the environment
- The radioactivity that we are looking for derives from the decay of parent nuclides





Radioactive Decay in Thorium and Uranium Series



Radiochemistry Methodology

Method	Nuclide of Interest	Methodology
EPA 904.0	Ra-228	Gas-flow Proportional Counter
EPA 903.1	Ra-226	Alpha Scintillation Counter
EPA 908.0	Uranium or Thorium	Alpha Spectroscopy
EPA 905.0	Strontium	Beta Counter (Liquid Scintillation)
EPA 906.0	Tritium	Beta Counter (Liquid Scintillation)
EPA 901.1	Various	Gamma Spectroscopy

Collection to Analysis – Half Lives



Radioactive Decay in Thorium and Uranium Series



Photo courtesy of World Nuclear Association

Interpreting a Result

- Radiochemistry results are calculated from directly measured quantities
- All results include a level of uncertainty
- Minimum Detectable Concentration (MDC)/Minimum Detectable Activity (MDA)

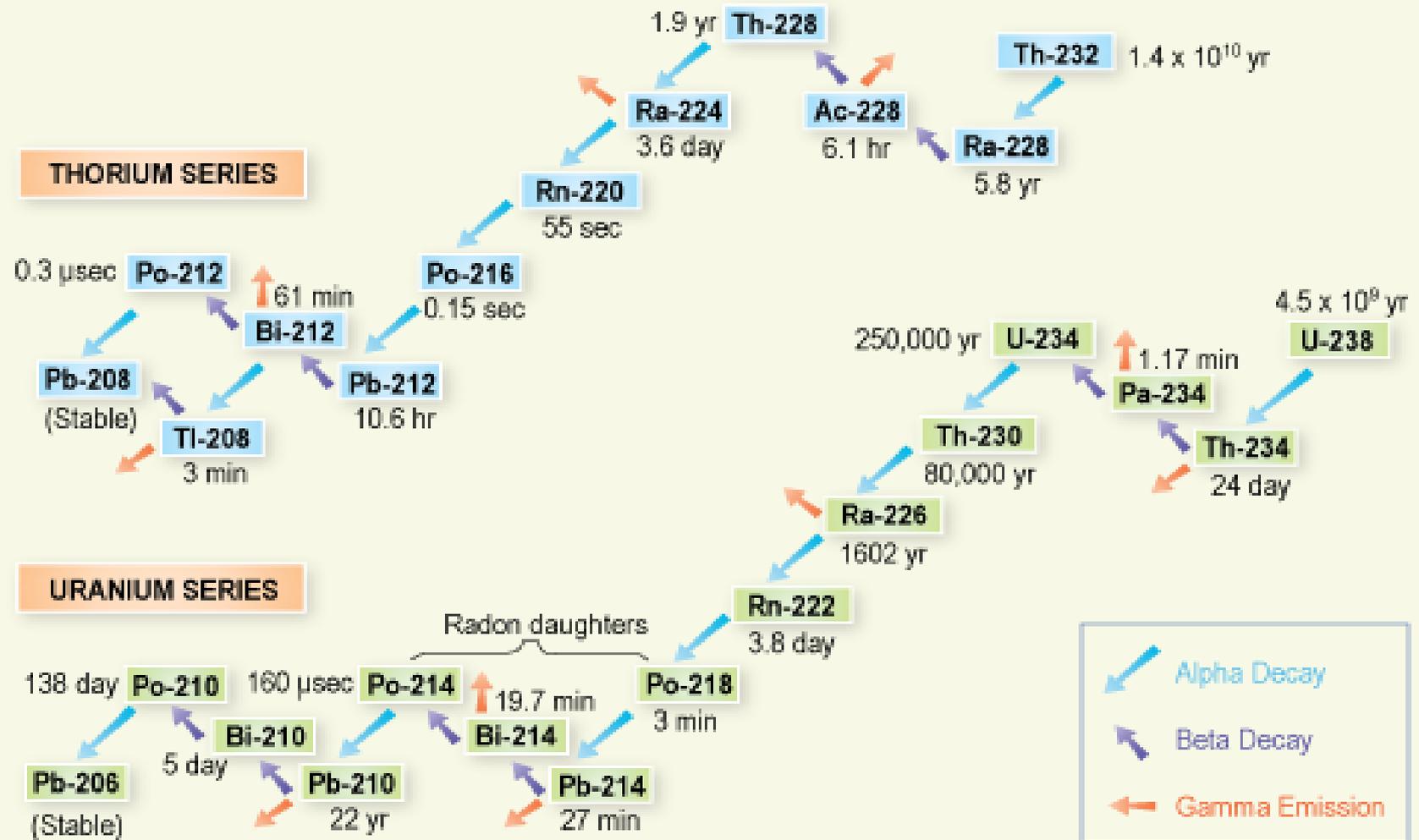


Various Factors of a Result

- Count
- Count Time
- Detector Efficiency
- Carrier/Tracer Yield
- Decay, Ingrowth, & Unit Correction Factors
- Volume of Sample



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Validation Certification & Guidance Documents

- Radiometric Data Validation Specialist Certification
- Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP)
- Department of Defense Quality Systems Manual (DoD QSM), Version 5.0



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