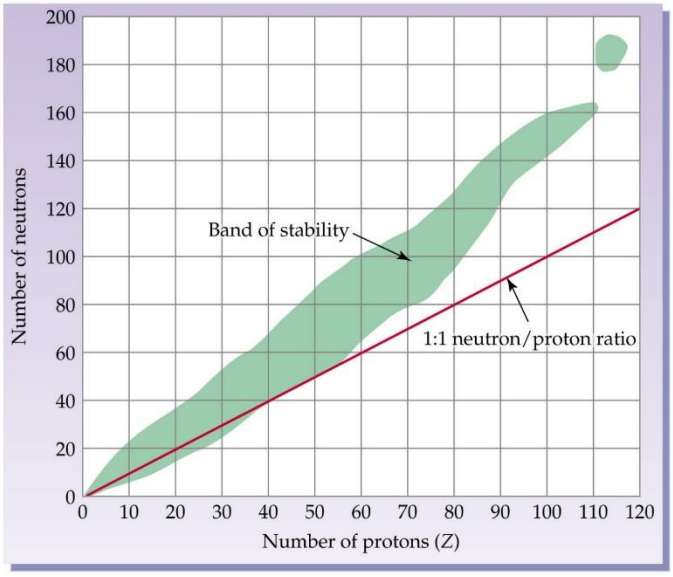
Chemical Reactions	Nuclear Reactions
Occur when bonds are broken	Occur when nuclei emit particles and/or rays
Atoms remain unchanged, although they may be rearranged	Atoms often converted into atoms of another element
Involve only valence electrons	May involve protons, neutrons, and electrons
Associated with small energy changes	Associated with large energy changes
Reaction rate influenced by temperature, particle size, concentration, etc.	Reaction rate is not influenced by temperature, particle size, concentration, etc.



Particle	Symbol	Composition	Charge	Mass
Alpha	$^{4}_{2}He$ α	Helium Nuclei	+2	4 amu
Shielding	**Approx. Energy**	**Penetrating Power**	**Change to Mass #**	**Change to Atomic #**
Paper Clothing	5MeV	Low 0.05mm body tissue	-4	-2
Particle	**Symbol**	**Composition**	**Charge**	**Mass**
Beta	e^{-} β	Like an electron	-1	1/1837th amu basically 0
Shielding	**Approx. Energy**	**Penetrating Power**	**Change to Mass #**	**Change to Atomic #**
Aluminum foil	0.05-1MeV	Moderate 4mm body tissue	0	+1
Particle	**Symbol**	**Composition**	**Charge**	**Mass**
Gamma	γ	High energy electromagnetic radiation	0	0
Shielding	**Approx. Energy**	**Penetrating Power**	**Change to Mass #**	**Change to Atomic #**
Lead Concrete	1MeV	High Penetrates easily	0	0
Proton		**Neutron**	**Positron**	
$^{1}_{1}p$		$^{1}_{0}n$	$^{0}_{+1}e$	

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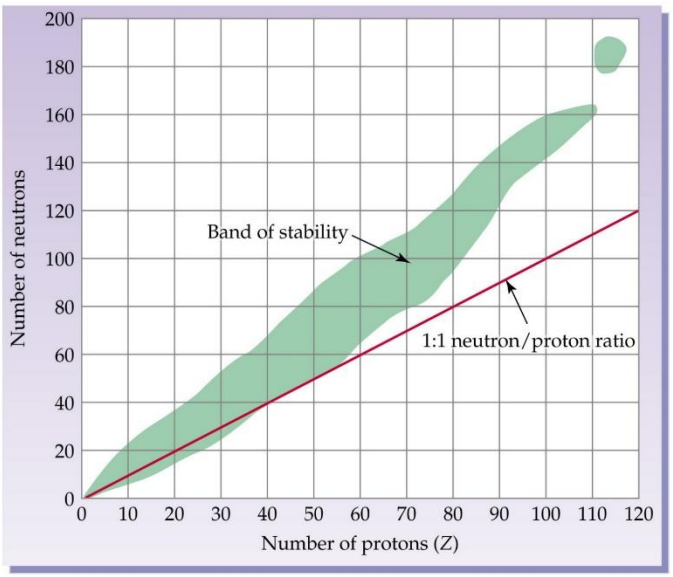

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