

Name: _____ Date: _____

Nuclear Chemistry

Aim: Introduction to Radioactivity: Particles and Decay

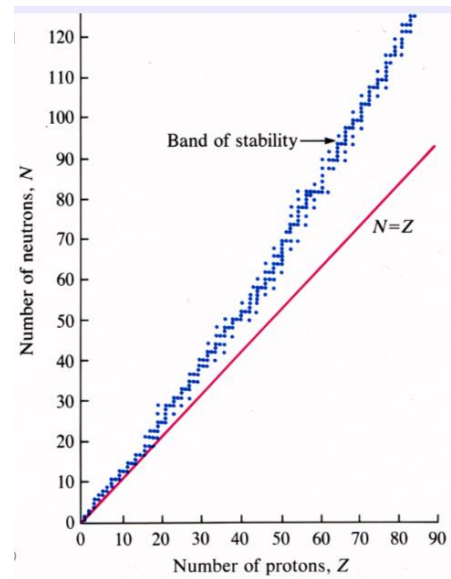
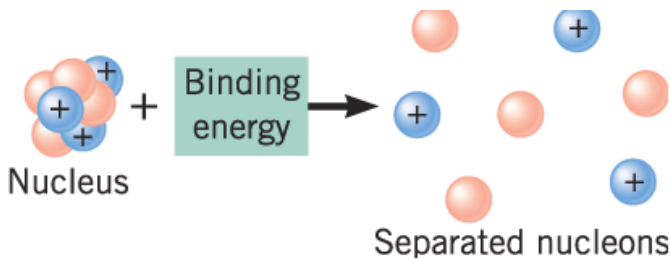
Element Stability

- _____

- Unstable nuclei of elements have a proton to neutron ratio larger than 1:1.

- _____

- Binding energy: _____



Periodic Table of the Elements

KEY																	
Atomic Mass → 12.011 Selected Oxidation States																	
Symbol → C Relative atomic masses are based on ¹² C = 12 (exact)																	
Atomic Number → 6 Note: Numbers in parentheses are mass numbers of the most stable or common isotopes.																	
Electron Configuration → 2-4																	
Group																	
1	2	Group										13	14	15	16	17	18
H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Uuq	Uup	Uuh	Uus	Uuo
Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu																	
Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr																	

Radioisotope: _____

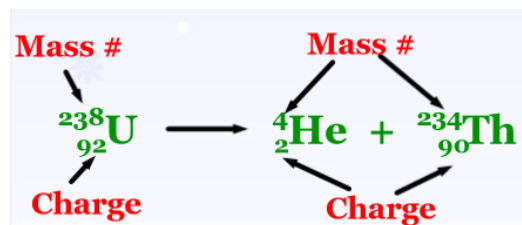
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What is Radioactivity?

- _____

- Natural Transmutation: _____



Uranium-238 nucleus is unstable and will decay by releasing an alpha particle (decay mode according to reference Table N) and naturally transmutes into Thorium-234.

- The radioactive particles can be found in reference Table O.
- Fill in the notation for each particle listed below using Table O.

Radioactive Decay Particles

<u>Name</u>	<u>Symbol</u>	<u>Strength</u> <u>(penetrating power)</u>
alpha		
beta		
gamma		

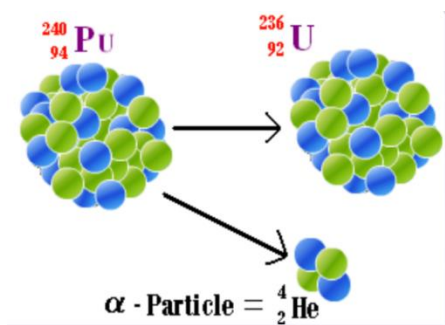
Table O
Symbols Used in Nuclear Chemistry

Name	Notation	Symbol
alpha particle	^4_2He or $^4_2\alpha$	α
beta particle	$^0_{-1}\text{e}$ or $^0_{-1}\beta$	β^-
gamma radiation	$^0_0\gamma$	γ
neutron	^1_0n	n
proton	^1_1H or ^1_1p	p
positron	$^0_{+1}\text{e}$ or $^0_{+1}\beta$	β^+

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Nuclear Chemistry

Types of Decay



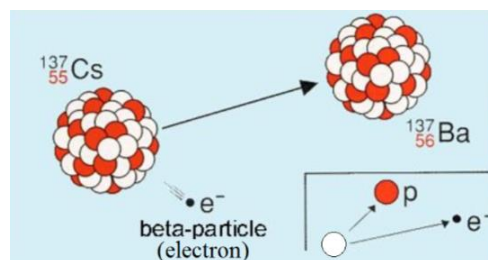
Alpha decay: the emission of an alpha particle by the nucleus. The mass decreases by 4 and the atomic number or nuclear charge decreases by 2.

Equation: _____

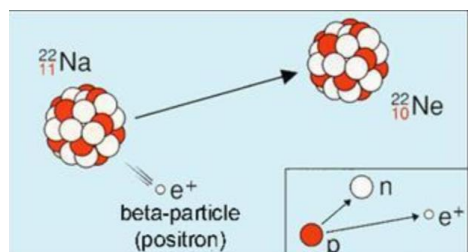
Isotopes that release an alpha particle according to Table N: _____

Beta decay: the emission of an electron by the nucleus. The atomic number or nuclear charge increases by 1 and the mass number remains the same.

Equation: _____



Isotopes that release a beta particle according to Table N: _____



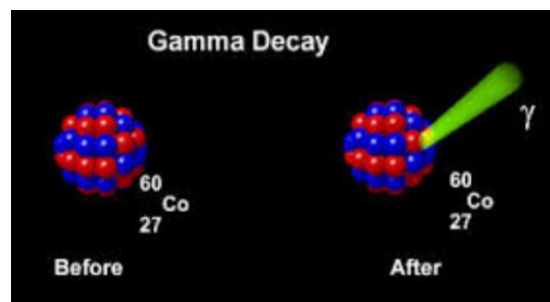
Positron decay: the nucleus gives off a positron. The atomic number decreases by 1 and the mass remains the same.

Equation: _____

Isotopes that release a beta particle according to Table N: _____

Gamma decay: emission of pure energy in the form of a gamma particle. The mass number and atomic number remain the same.

Equation: _____



These are all examples of NATURAL TRANSMUTATION because one nuclear reactant decays.