Nuclear & Standard Model Review

1) Know all Nuclear ideas are based around Einstein's idea that energy can convert to matter or matter to energy by famous equ. $E=mc^2$ When using this formula it will be in kg of mass & Joules of energy.

2) You can also do matter energy conversion process using the conversion factor for universal mass units (1u = 931 Mev).

3) Inside the nucleus of the atom if you mass the individual parts and add them up you will get slightly more mass than the nucleus as a whole. This missing mass changes into energy that holds the nucleus together. (mass defect, & binding energy). Be aware of how fundamental forces in the universe compare (Gravitational, Electro-Magnetic, Strong & Weak Nuclear)

$^{6}_{3}Li$ mass = 0.95×10^{-26} Kg

proton mass = 1.67×10^{-27} Kg

Neutron mass = 1.67×10^{-27} Kg

4) Understand how to find energy produced in certain famous reactions -

Fission -

$$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{141}_{56}Ba + ^{92}_{36}Kr + 3(^{1}_{0}n) + Energy$$

Fusion -

$$^{2}_{1}H + ^{1}_{1}H \rightarrow ^{3}_{2}He + Energy$$

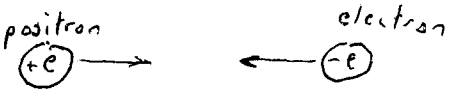
Alpha Decay -

$$^{238}_{92}U \rightarrow ^{4}_{2}He + ^{234}_{90}Th$$

Beta Decay -

$$^{234}_{90}Th \rightarrow ^{0}_{-1}e + ^{234}_{91}Pa$$

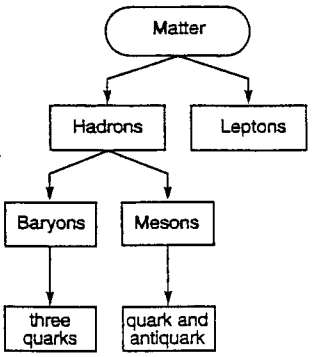
5) Matter - AntiMatter Reactions, How to do balance (or conservation) of Charge in a reaction. (-1e = charge on electron, +1e=charge on proton or antielectron)



particles annihilate + give total Energy

6) Undertand idea of Standard Model of matter. How do Quarks and Leptons tie into the model

Classification of Matter



Particles of the Standard Model

Quarks

Name	up	charm	top
Symbol	u	c	t
Charge	$+\frac{2}{3}e$	$+\frac{2}{3}e$	$+\frac{2}{3}e$
	down	strange	bottom
	d	s	b
	$-\frac{1}{3}e$	$-\frac{1}{3}e$	$-\frac{1}{3}e$

Leptons

	electron	muon	tau
	e^-	μ^-	τ^-
	$-1e$	$-1e$	$-1e$
	electron neutrino	muon neutrino	tau neutrino
	ν_e	ν_μ	ν_τ
	0	0	0

Note: For each particle, there is a corresponding antiparticle with a charge opposite that of its associated particle.