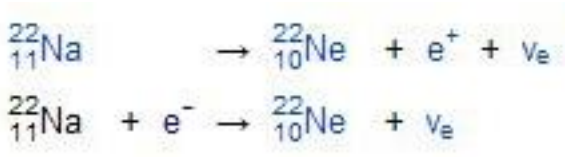
Extra Practice with Radioactivity

1. Given:



$$^{22}_{11}Na \rightarrow {}^{22}_{10}Ne + e^{+} + \nu_e$$

$$^{22}_{11}Na + e^{-} \rightarrow {}^{22}_{10}Ne + \nu_e$$

   a) What particle is being emitted by ^{22}Na in the first reaction? What transformation is taking place in the nucleus?

   A positron Is being emitted. A proton is being lost and converted into a neutron and a positron. Notice that the mass number does not change since a neutron takes the place of a proton:

$$^{1}_{1}p \rightarrow {}^{1}_{0}n + {}^{0}_{1}e$$

   b) What particle is being absorbed by the second equation?

   A beta particle.

   c) How do you know these are not chemical reactions?

   Elements are changing into different elements.

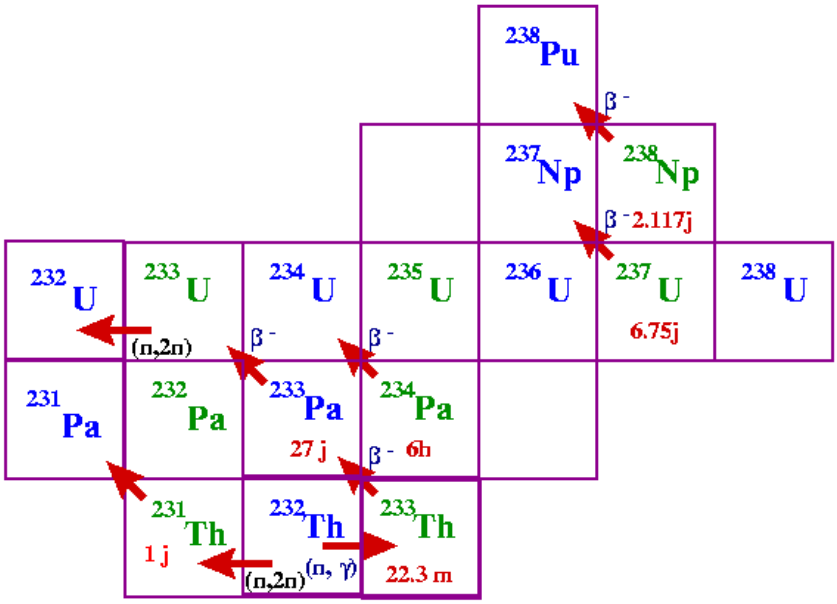
2. If a nuclear reaction destroys 2.8 $X10^{-7}$ moles of ^{2}H, how much energy is released?
   c = 3.0 X 10^{8} m/s

2.8 $X10^{-7}$ moles (2g/mole) = 5.6 $X10^{-7}$ g

5.6 $X10^{-7}$ g (1kg/1000 g) = 5.6 X 10^{-10} kg

$E = mc^2$ = 5.6 X 10^{-10} kg(3.0 X 10^{8} m/s)^2 = 5.04 X 10^{7} J, enough energy to power your computer for almost 70 hours---not bad from such a small amount of hydrogen.

3. Use the following diagram to write **three** balanced nuclear equations.



$$^{238}_{93}Np \rightarrow {}^{238}_{94}Pu + {}^{0}_{-1}e$$

$$^{233}_{92}U \rightarrow {}^{232}_{92}U + {}^{1}_{0}n$$

$$^{231}_{90}Th \rightarrow {}^{231}_{91}Pa + {}^{0}_{-1}e$$