

(2141)  ${}^{40}_{19}\text{K} \rightarrow {}^{40}_{18}\text{Ar}$   $t_{1/2} = 1.27 \times 10^9 \text{ yr}$

original Ar = now + decomposed

START MASS Ar =  $4.2 \text{ g Ar} + \frac{1 \text{ g K}}{1} \left( \frac{40 \text{ g Ar}}{40 \text{ g K}} \right)$

Original MASS Ar =  $5.2 \text{ g Ar}$

now  $\frac{\text{Ar } 4.2 \text{ g}}{\text{K } 1 \text{ g}}$

$\frac{t_{1/2}}{t} = \frac{0.693}{t}$

$k = \frac{0.693}{1.27 \times 10^9 \text{ yr}}$

$\ln A_t = -kt + \ln A_0$

mass (mole) ratio

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now  $\Rightarrow 1 \text{ g U} + 0.257 \text{ g Pb}$

Original MASS  ${}^{238}\text{U} = 1 \text{ g} + 0.257 \text{ g Pb} \left( \frac{238 \text{ g U}}{206 \text{ g Pb}} \right)$

${}^{238}\text{U} \rightarrow \text{Pb} \rightarrow \text{U}$

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E3

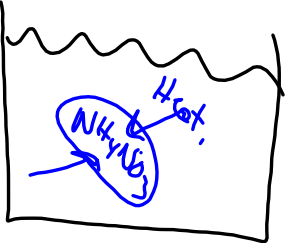
(6)  $\Delta G = \Delta H - T \Delta S$

↑

(8)  $\text{NH}_4\text{NO}_3 (s) \rightarrow \text{NH}_4\text{NO}_3 (g)$

More entropy  $\oplus \Delta S$

$\oplus \Delta H$



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Nuclear Binding Energy

Strong forces → holds nucleus together → STABLE

From missing mass

"Mass Defect"

$$E = mc^2$$

$E = \Delta m c^2$

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${}^4_2\text{He}$  4.00150 amu Given.

$2p = 2(1.00728)$   
 $2n = 2(1.00866)$

$4.03188 \text{ amu} \leftarrow \text{Mass He!}$   
 $- 4.00150 \text{ amu}$

$\Delta m = 0.03038 \text{ amu} \text{ g/mole}$

$E = mc^2$   
 $= \left( \frac{0.03038 \times 10^{-3} \text{ Kg}}{\text{mole}} \right) \left( 3 \times 10^8 \frac{\text{m}}{\text{sr}} \right)^2$   
 $= \frac{2.7342 \times 10^{12} \text{ J}}{\text{mole}} \times \frac{1 \text{ mole}}{6 \times 10^{23} \text{ particles}}$   
 $= 4.5 \times 10^{-12} \text{ J}$   
 $\frac{4.5 \times 10^{-12} \text{ J}}{4 \text{ Nuclei}} = 1.14 \times 10^{-12} \text{ J/Nucleus}$

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Fission - Large mass  $\rightarrow$  Small mass  
 $\hookrightarrow$  Nuclear Power plant.

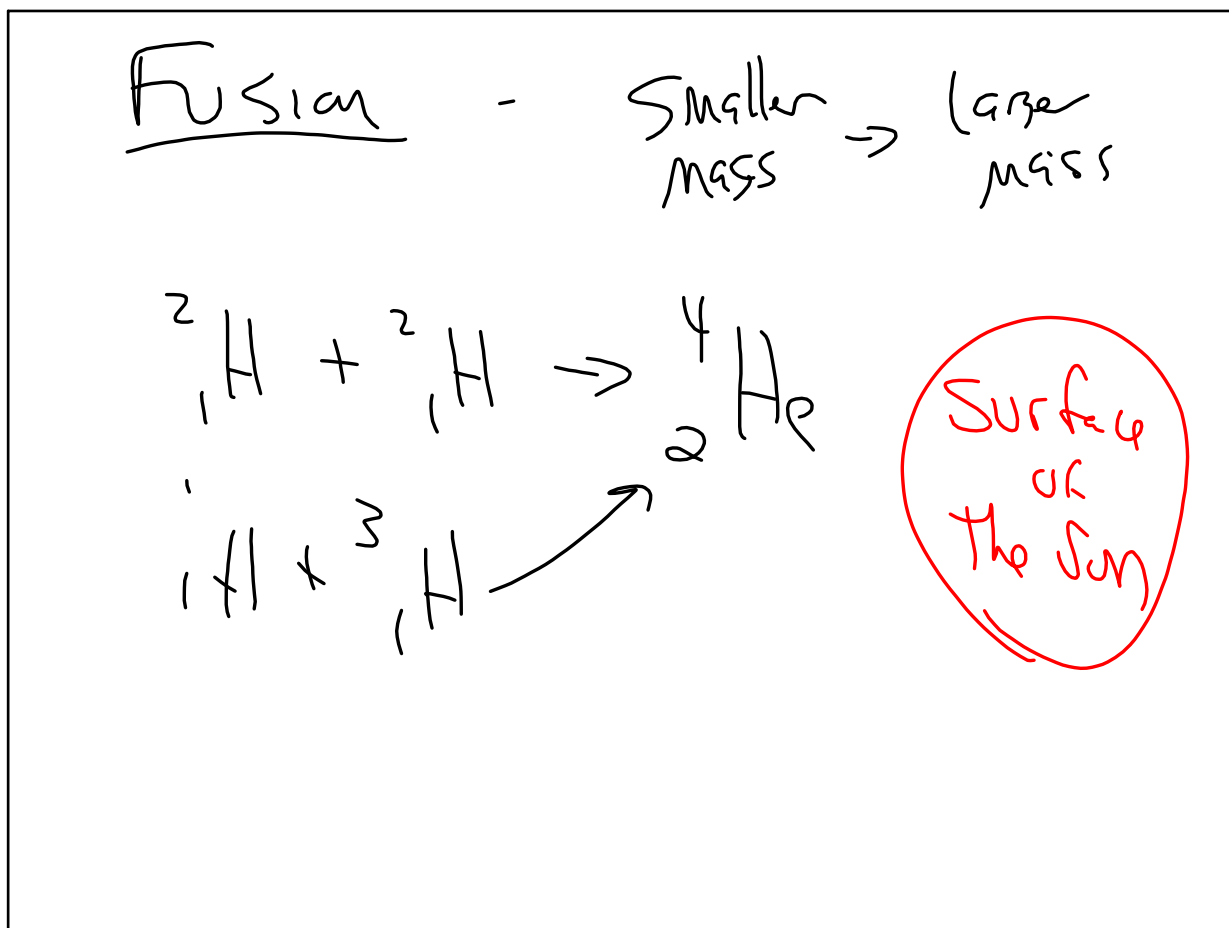
${}^{235}_{92}\text{U} + {}^1_0\text{n} \rightarrow {}^{142}_{56}\text{Ba} + {}^{91}_{36}\text{Kr} + 3 {}^1_0\text{n}$

+ energy! :D

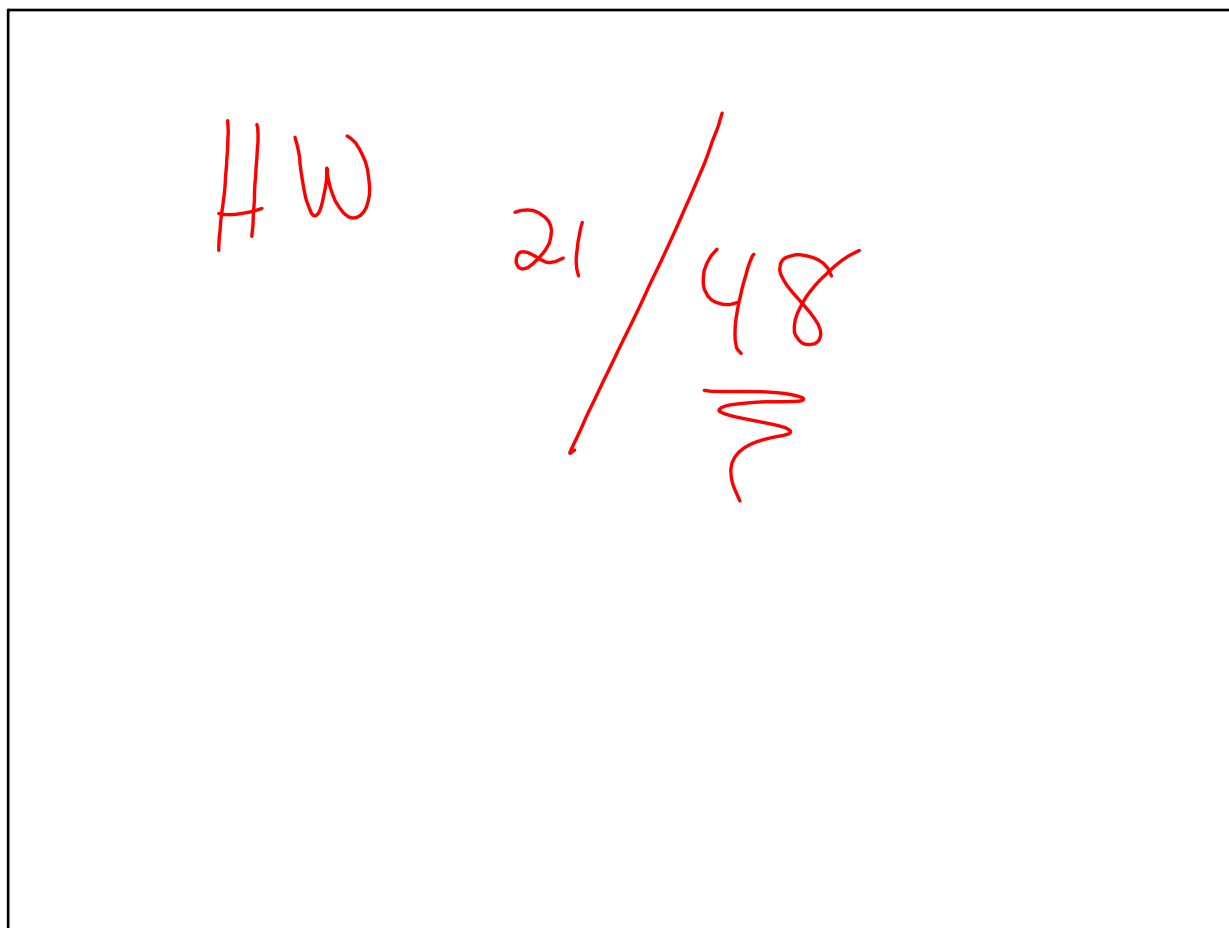
Control rods  $\rightarrow$  absorbs excess neutrons  
 B or Cd

↑  
 BAD

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