Token: 481 045

$a + b \longrightarrow C + d$ reazioni nucleari

$Q = m_a + m_b - m_C - m_d$

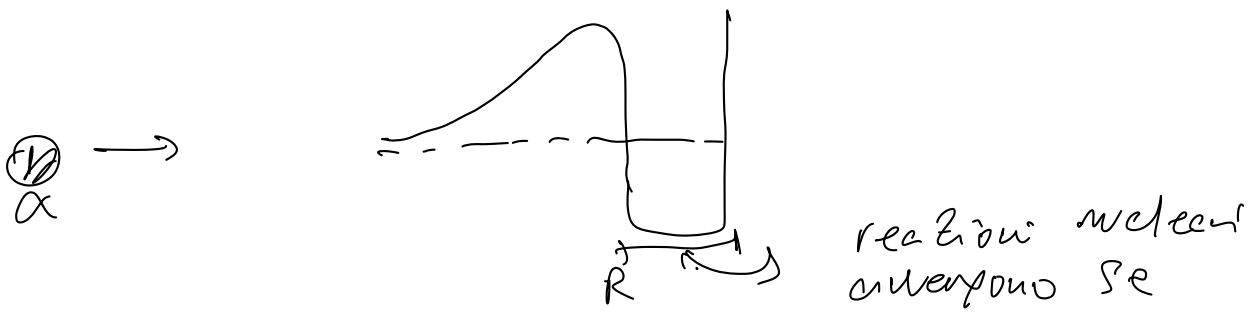
$Q > 0$: reazione esotermica

$Q < 0$: endotermica

Scoperta del protone

$\alpha + {}^{14}_{7}N \longrightarrow {}^{17}_{8}O + p$ $\quad Q = -1.19$ MeV

$K_\alpha \approx 5 - 8$ MeV $> Q \Rightarrow$ reazione attiva

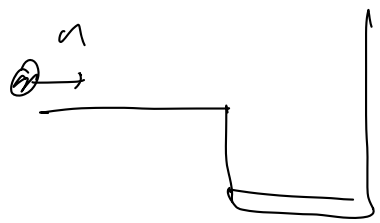


reazioni nucleari avvengono se $r \lesssim R$

particelle con carica $q > 0$

$\Rightarrow$ superare barriera di Coulomb

proiettili neutri neutrone



$p + {}^{7}_{3}Li \longrightarrow \alpha + \alpha$ $\quad$ 1931

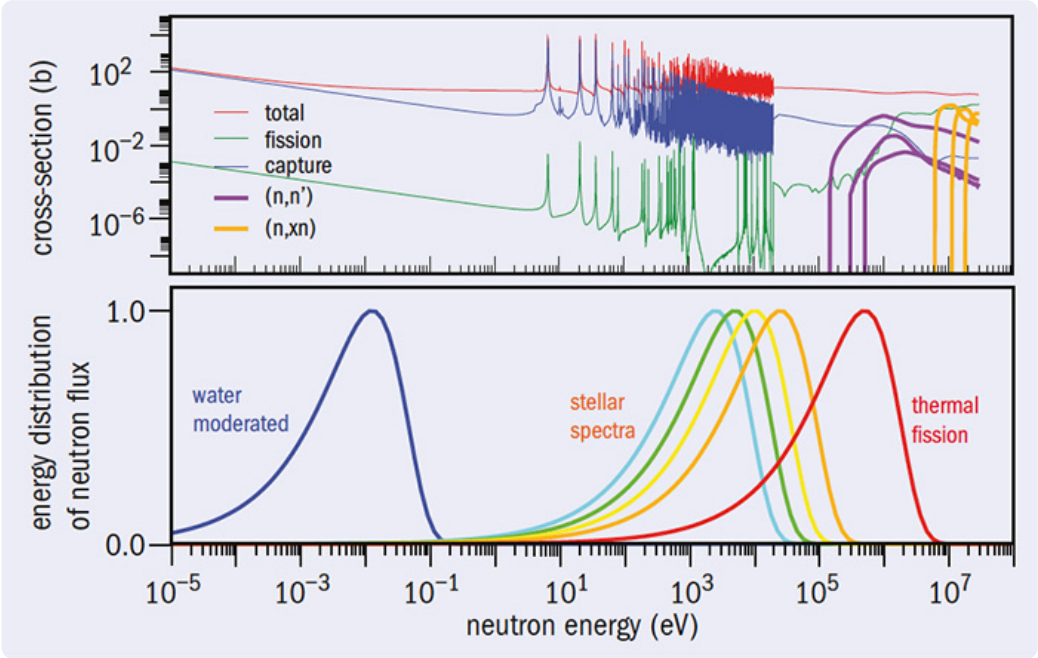
$Q = 17.35$ MeV

Converte K del protone in K di α

Chadwick

$$\alpha + {}^{9}_{4}Be \rightarrow {}^{12}_{6}C + n \qquad Q = 5.7\ MeV$$

$\Rightarrow$ accelerare neutroni



$n + {}^{A}_{Z}X$

- $n + X$ diffusione elastica.
- γ cattura del neutrone.
- fissione.

$\Downarrow$

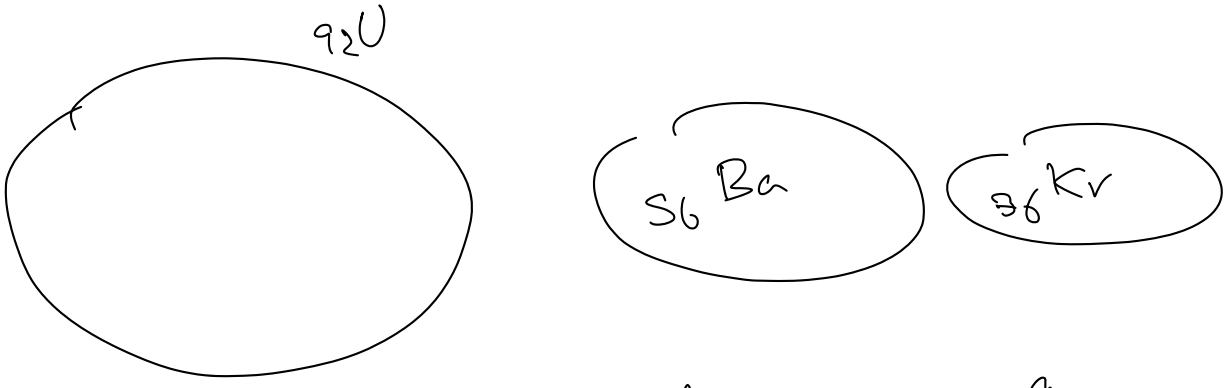
sistema cascata di decadimenti α, β, γ a secondi di A, Z

$$n + {}^{A}_{Z}X \rightarrow {}^{A+1}_{Z}X \rightarrow {}^{A+1-4}_{Z-2}Y + \alpha$$

1938 Hahn - Strassmann

$$n + {}^{238}_{92}U \rightarrow {}^{}_{56}Ba + {}^{}_{36}Kr + \#n$$

Fissione indotta.



$$ {}^{A}_{Z}X \longrightarrow {}^{A-a}_{Z-b}Y + {}^{a}_{b}W + Q \qquad Q \gtrsim 0 $$

fissione spontanea

1939 Meitner - Frisch

$$ {}^{238}_{92}U \longrightarrow {}^{137}_{56}Ba + {}^{84}_{36}Kr $$

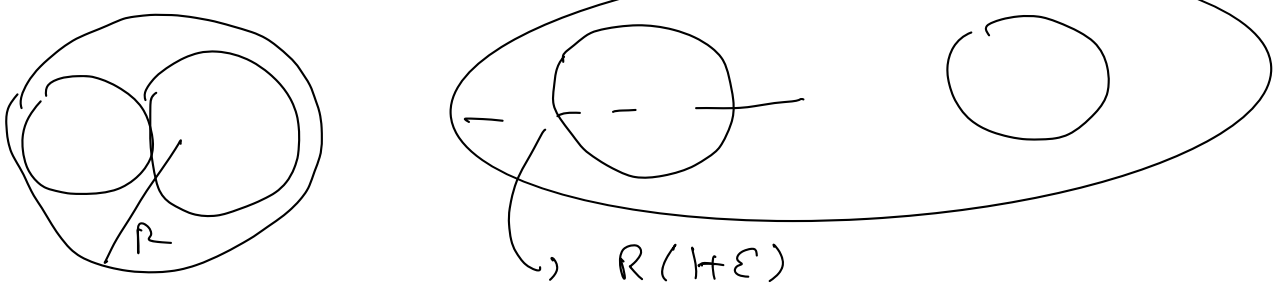
$\bar{B}(A=240) = 7.6$ MeV

$\bar{B}(A=120) = 8.5$ MeV

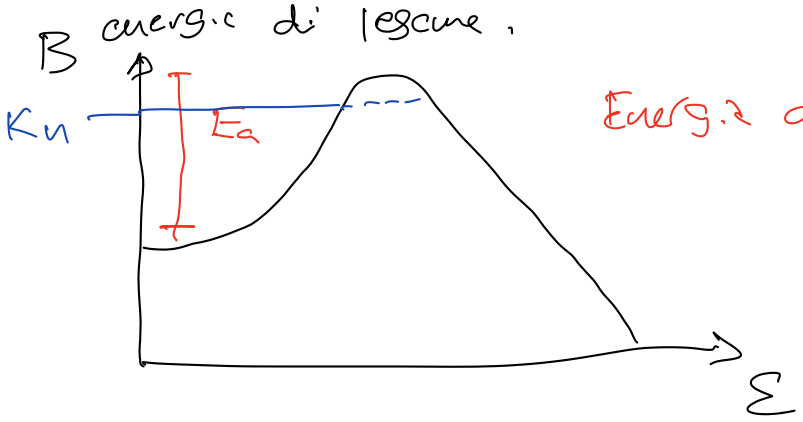
$\bar{B}(A=84) = 8.7$ MeV

$$ B_U - B_{Ba} - B_{Kr} = 137(-0.9) + 84(-1.1) $$
$$ \simeq -216 \text{ MeV} $$

Q valve $\simeq$ 210 MeV



ΔB dovute a ΔB_{sup} + $\Delta B_{Coul.}$



Energia di attivazione.

$E_a - Q$

Fissione spontanea.

$A \gtrsim 300$ $\quad Q - E_a > 0$

$A \gtrsim 240$ $\quad E_a - Q \simeq 6\ MeV$

$A \simeq 100$ $\quad E_a - Q \simeq 60\ MeV$

Sulla carta Fissione possibile per $A > 60$ $\quad \frac{\partial B}{\partial A} < 0$

$n + X \longrightarrow \gamma + W + \#n$

Kn serve a portare $\quad Q - E_a \gtrsim 0$

^{238}U	nature 99.3 %	$Q = 4.8\ MeV$	$E_a = 6.6\ MeV$
^{235}U	0.7 %	$Q = 6.5\ MeV$	$E_a = 6.2\ MeV$ $\gtrsim 0$

$n \longrightarrow {}^{A}U \longrightarrow {}^{A+1}U$