



-1

-2

-3

-4

-5

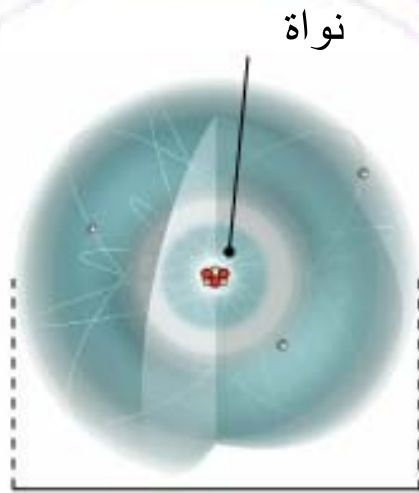
-6

-7

100 000

1911

$10^{-10}$  m       $10^{-15}$  m



سحابة الكترونية

2000      350

+ e

( )

. N

Z

:  ${}^A_Z X$

=

= Z

= A

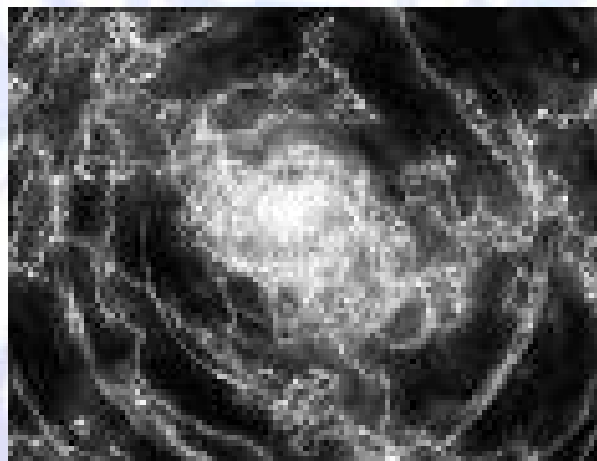
= N

${}^{16}_8 O$

:

.N = A - Z = 8 , Z = 8 ; A = 16 :

:



8

p<sup>+</sup>

8

. (K)<sup>2</sup>, (L)<sup>6</sup>

:

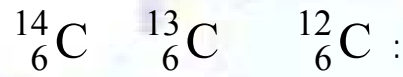
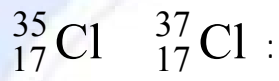
2.n<sup>2</sup>

n

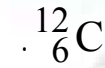
n	
1	$2 \times 1^2 = 2$
2	$2 \times 2^2 = 8$
3	$2 \times 3^2 = 18$

: -3

N Z



: -4



$\gamma$   $\beta$   $\alpha$



)

(

$\beta^-$

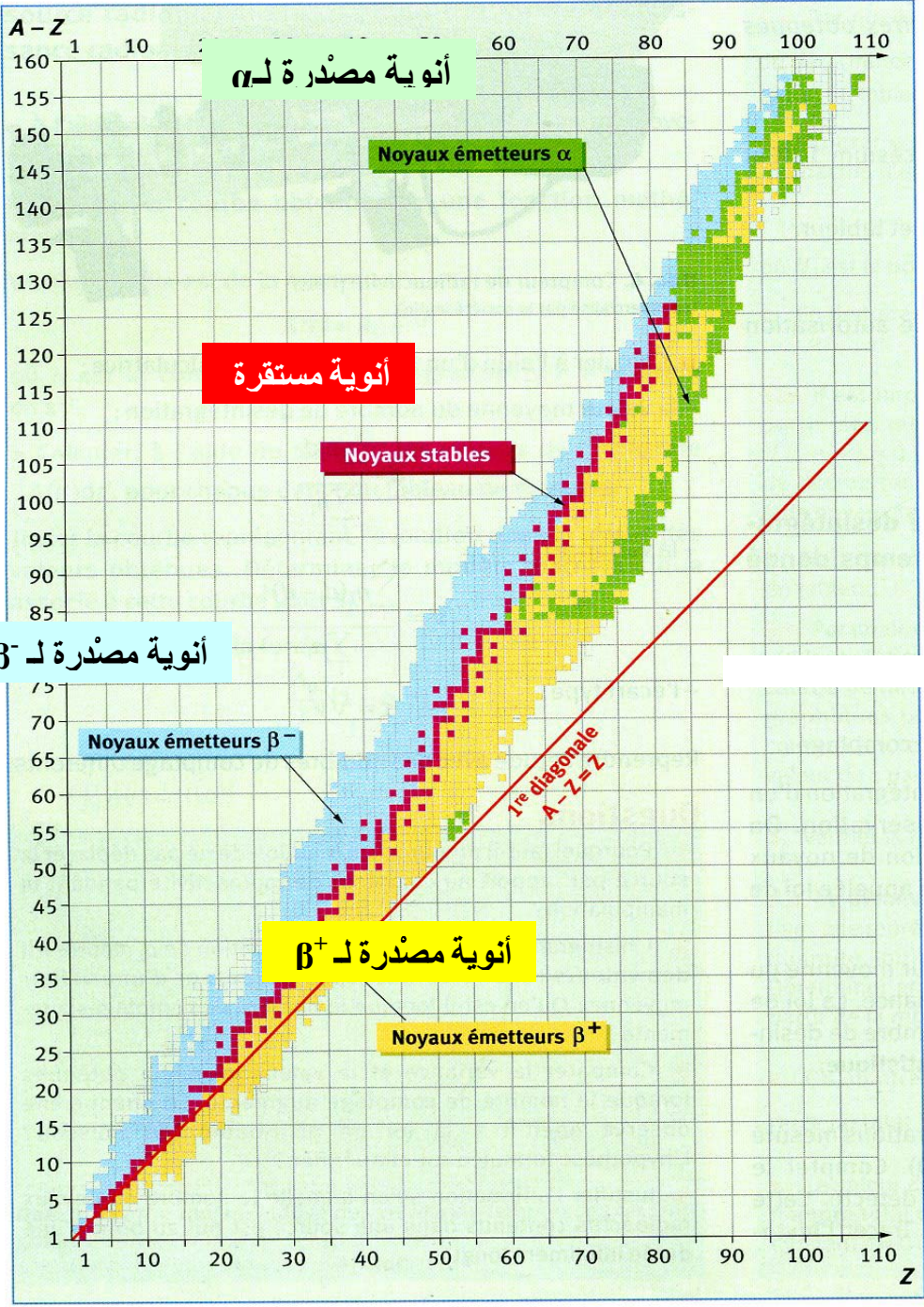


N Z (N Z)

(diagramme de Segré)

.Z (A-Z)





(Z ; N)

:

Segré

$Z = N$

$Z < 20$

. Segré

$Z = N$

$Z > 20$

A Z

1,5 )

(

:

83

:

-5

1896 (1850 – 1908) Becquerel



(spontanée)

Radiation

Radioactivité

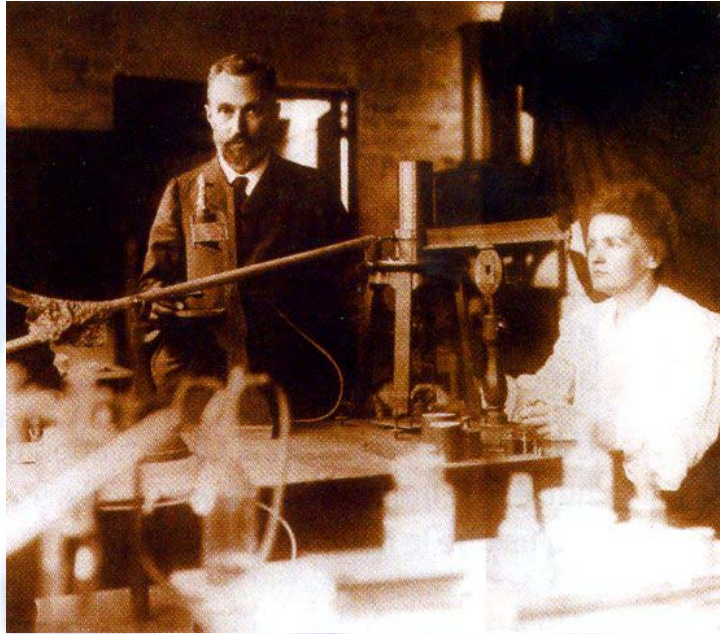
Radioactive

هنري بيكريل

1898

" "

:



بيير وماري كوري

:



: $\alpha^{++}$



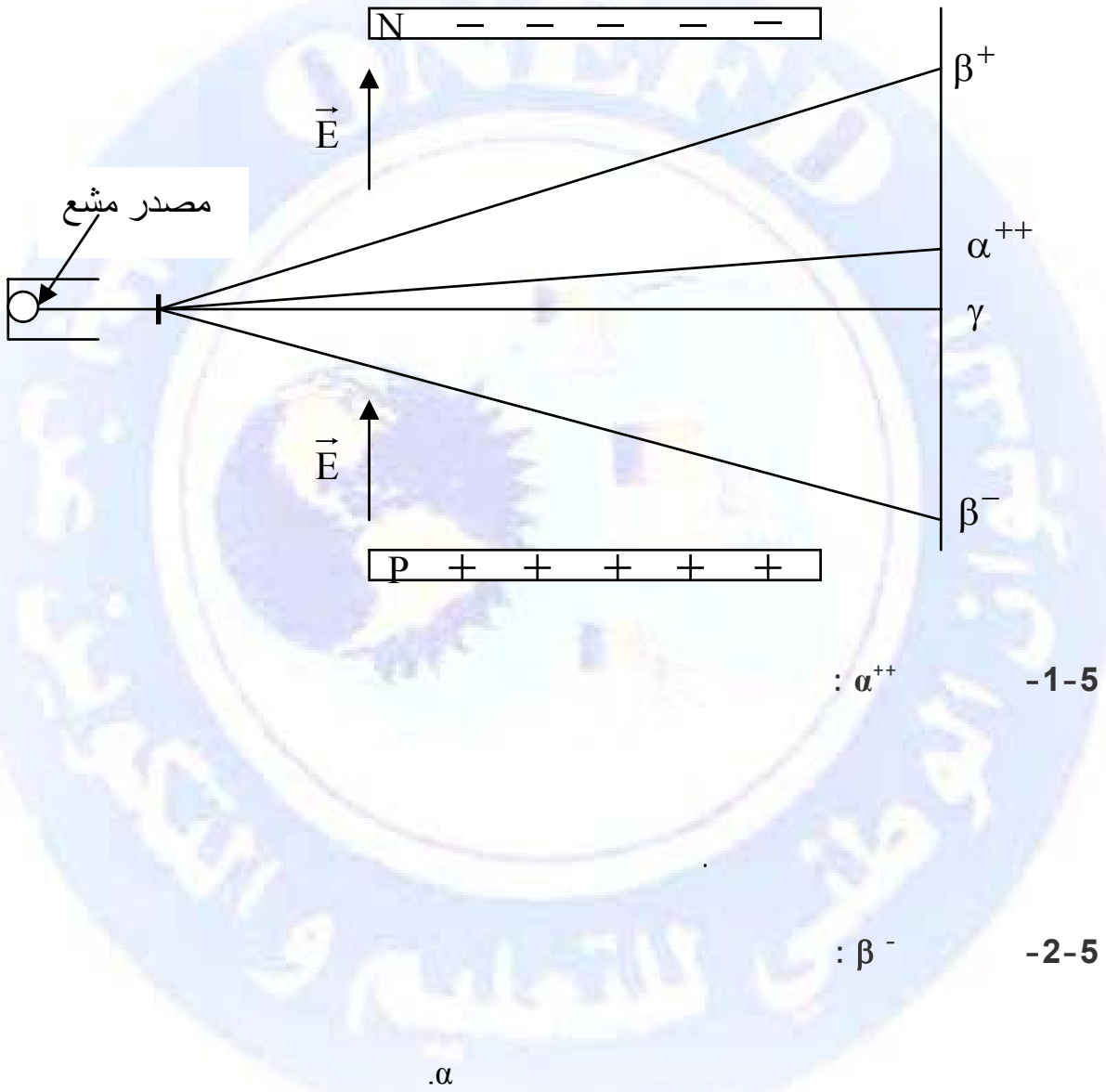
: $\beta^-$



: $\beta^+$



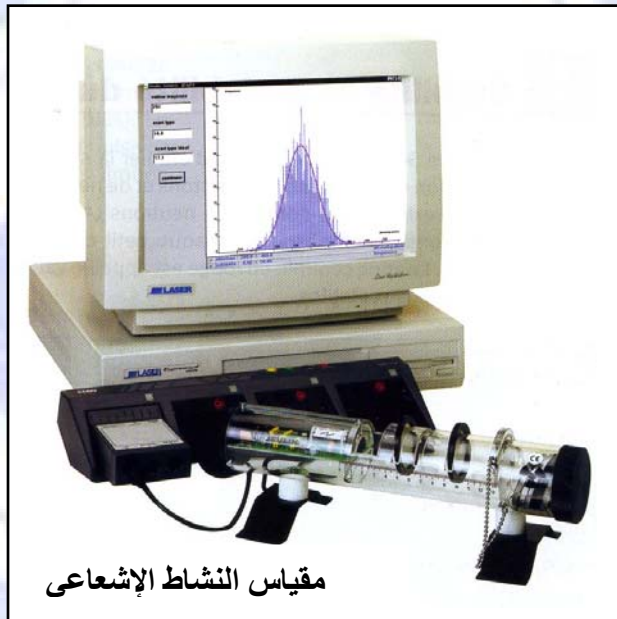
$\gamma$ :



-3-5 :  $\beta^+$

$\gamma$

$\beta^- \beta^+ \alpha$



مقياس النشاط الإشعاعي

-4-5 :  $\gamma$

30 cm

$$e = 1,600217733 \cdot 10^{-19} \text{ C}$$

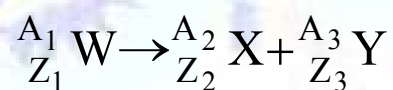
1 u = : ( )

$$1,6605402 \cdot 10^{-27} \text{ kg}$$

			u	
$\alpha^{++}$		${}^4_2\text{He}$	4,00150 u	+2 e
$\beta^-$		${}^0_{-1}\text{e}$	0,000549 u	-e
$\beta^+$		${}^0_1\text{e}$	0,000549 u	+e
$\gamma$		$\gamma$	0	0

:( ) : -5-5

:



:

W  
X  
Y

:

$$Z_1 = Z_2 + Z_3$$

$$A_1 = A_2 + A_3 .$$

:

:

.

-

( )

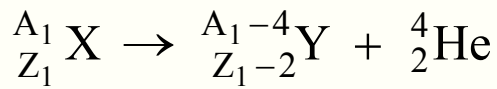
: $\alpha$

( $A > 180$ )

${}^4_2\text{He}$

.  $\alpha$

: $\alpha$



${}^{A_1-4}_{Z_1-2}\text{Y}$

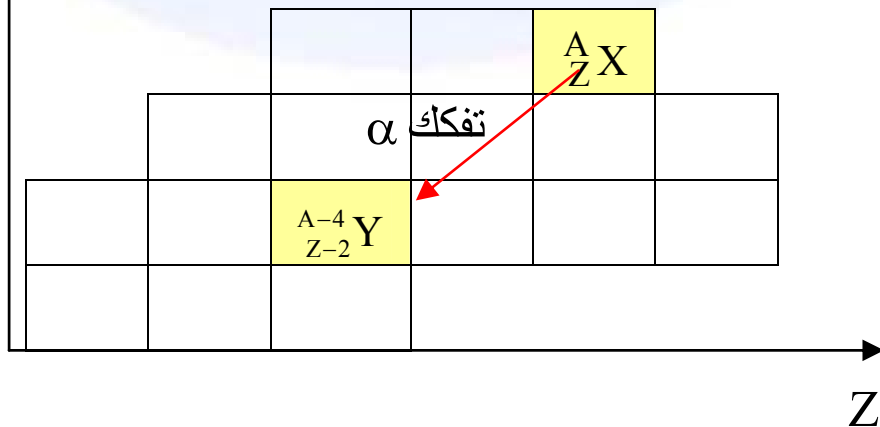
X

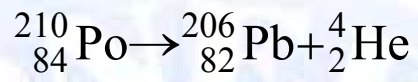
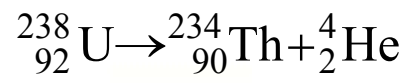
Y

Segré

( )

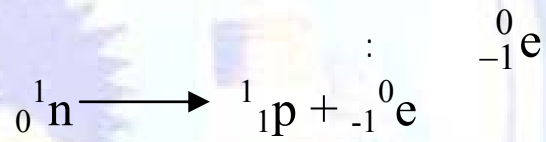
$A - Z$



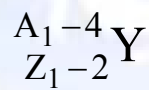
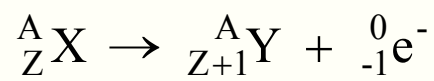


:β<sup>-</sup>

β<sup>-</sup>

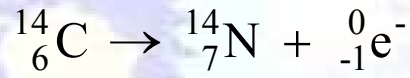
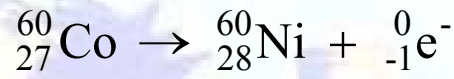
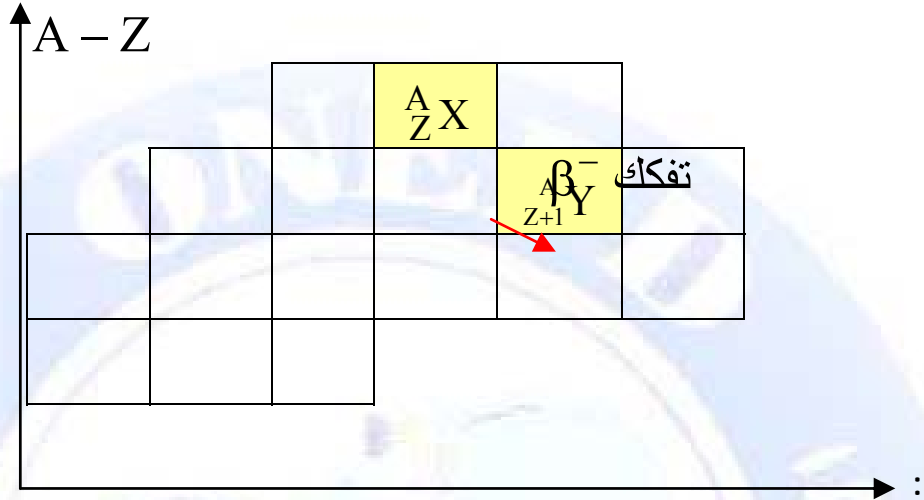


:β<sup>-</sup>



X

Y



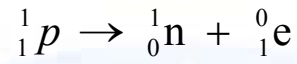
:  $\beta^+$  -

1934

.(Irène et Frédéric Joliot)

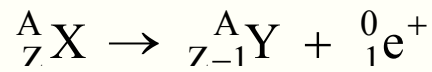


إيرين و فريديريك جوليو



A

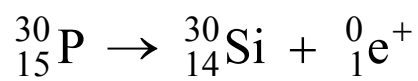
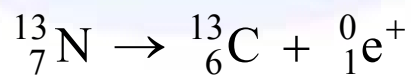
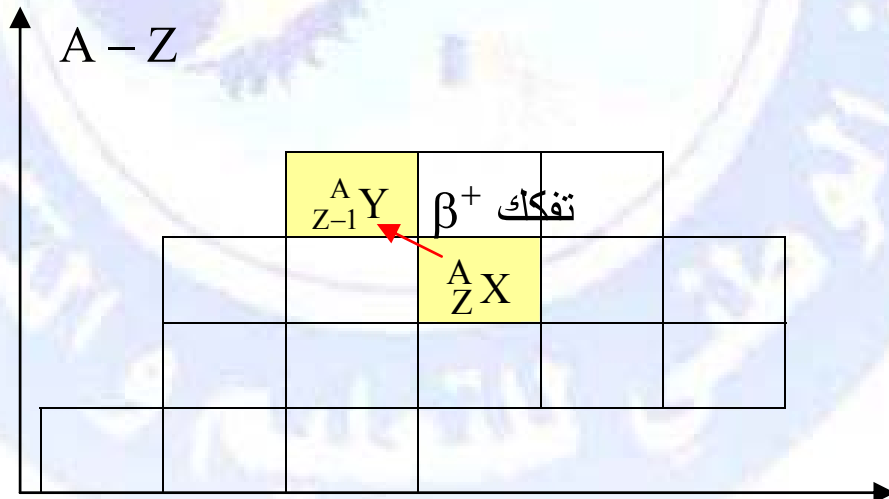
:  $\beta^+$



X

Y

.( )



: $\gamma$  -

300 000 km / s

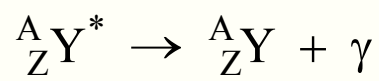
. Z A  
 $\beta$   $\alpha$

. $\gamma$

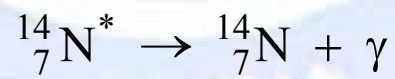
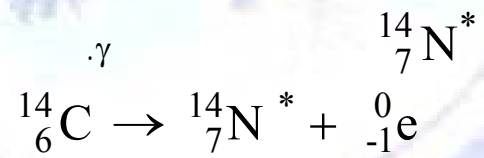
${}^A_Z Y^*$

:

:  $\gamma$



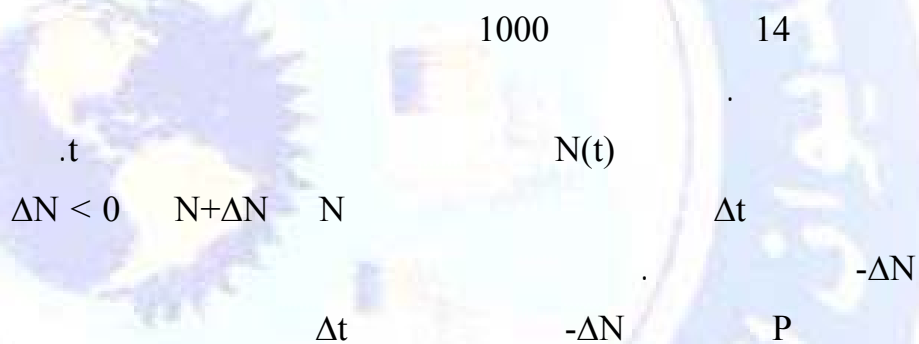
:





: :

(aléatoire )



$$P = -\frac{\Delta N}{N} = \frac{|\Delta N|}{N}$$

$$P = -\frac{\Delta N}{N} = \lambda \cdot \Delta t$$

(s<sup>-1</sup>)

λ > 0

Δt

λ

$$-\frac{\Delta N}{\Delta t} = \lambda \cdot \Delta N$$

$$(1) \dots \frac{dN}{dt} = -\lambda \cdot N$$

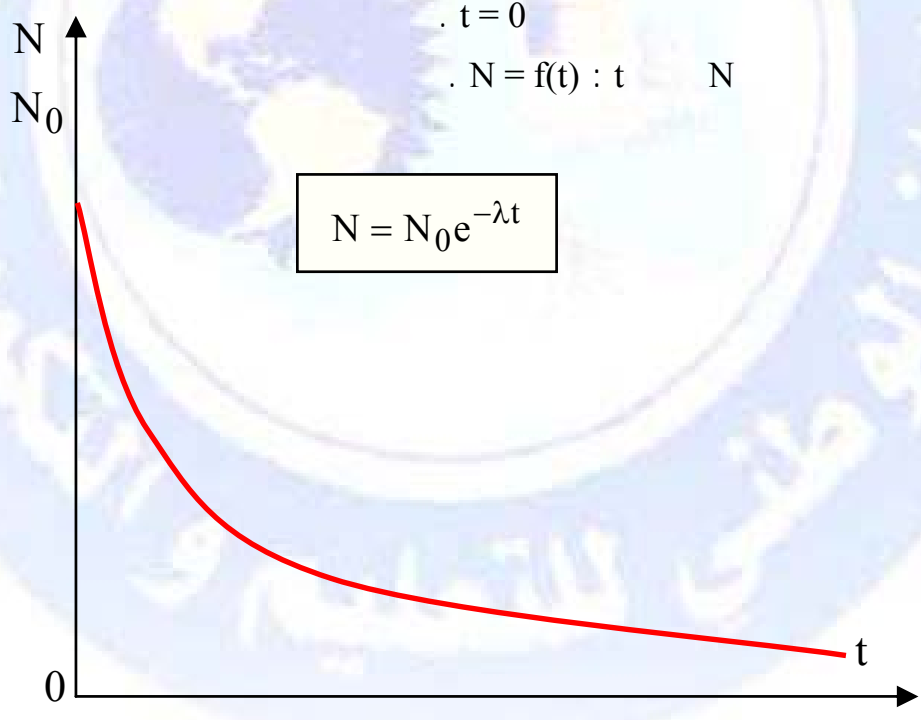
$$N = \frac{dN}{dt} \quad (1)$$

$$N(t) = N_0 \cdot e^{-\lambda t}$$

$t = 0 \quad N = N_0$

$N = f(t) : t \quad N$

$$N = N_0 e^{-\lambda t}$$



$$A_{\text{moy}} = -\frac{\Delta N}{\Delta t}$$

(s)  $\Delta t$

(Bq) Becquerel

A

t

$\Delta t$

A(t)

$$A(t) = -\frac{dN}{dt}(t)$$

:(1)

$$A(t) = \lambda N(t)$$

$$A(t) = \lambda N_0 \cdot e^{-\lambda t} = \lambda N(t)$$

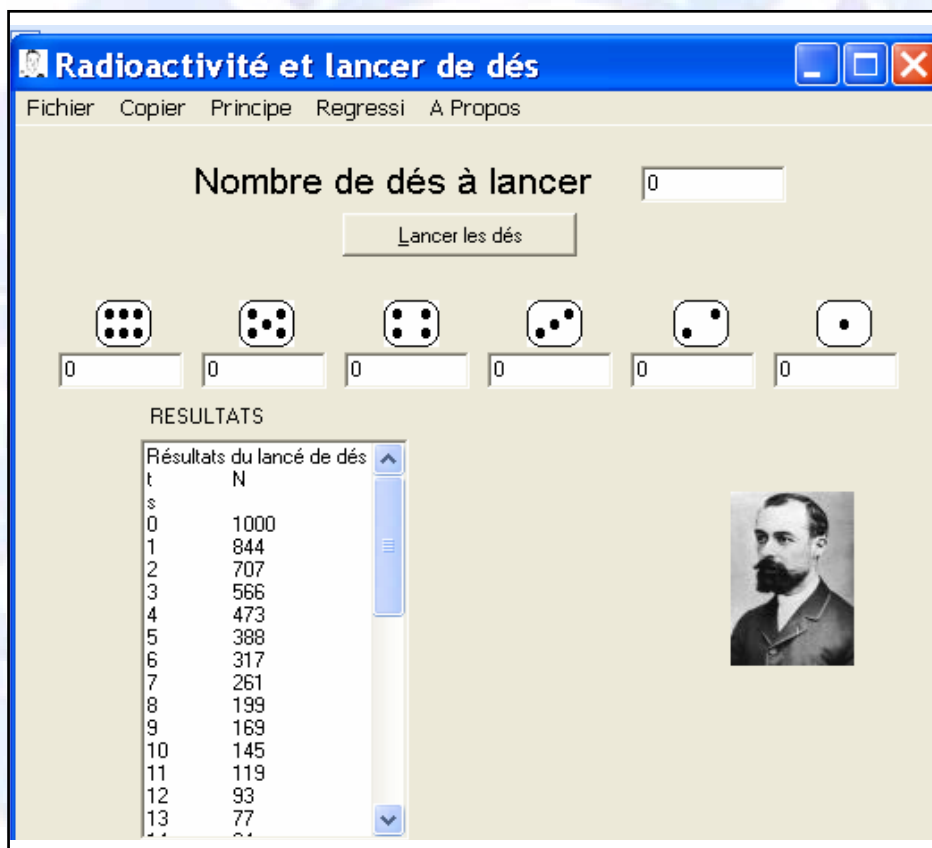
$$A(t) = A_0 \cdot e^{-\lambda t}$$

.t = 0

$$= A_0 = \lambda \cdot N_0 :$$

RadioDeV2

(dés)



( 6 )

)

.(1s

( 6 )

...

N

:

1000

Microsoft Excel - Classeur1

E18

L	K	J	I	H	G	F	E	D	C	B	A	
										t	N	4
										0	1000	5
										1	844	6
										2	707	7
										3	566	8
										4	473	9
										5	388	10
										6	317	11
										7	261	12
										8	199	13
										9	169	14
										10	145	15
										11	119	16
										12	93	17
										13	77	18
										14	64	19
										15	54	20
										16	44	21
										17	40	22
										18	35	23
										19	28	24
										20	25	25
										21	19	26
										22	16	27
										23	11	28
										24	8	29
										25	6	30
										26	4	31
										27	4	32
										28	2	33
										29	2	34
										30	1	35
										31	1	36
										32	1	37

Feuil3 Feuil2 Feuil1

Prêt

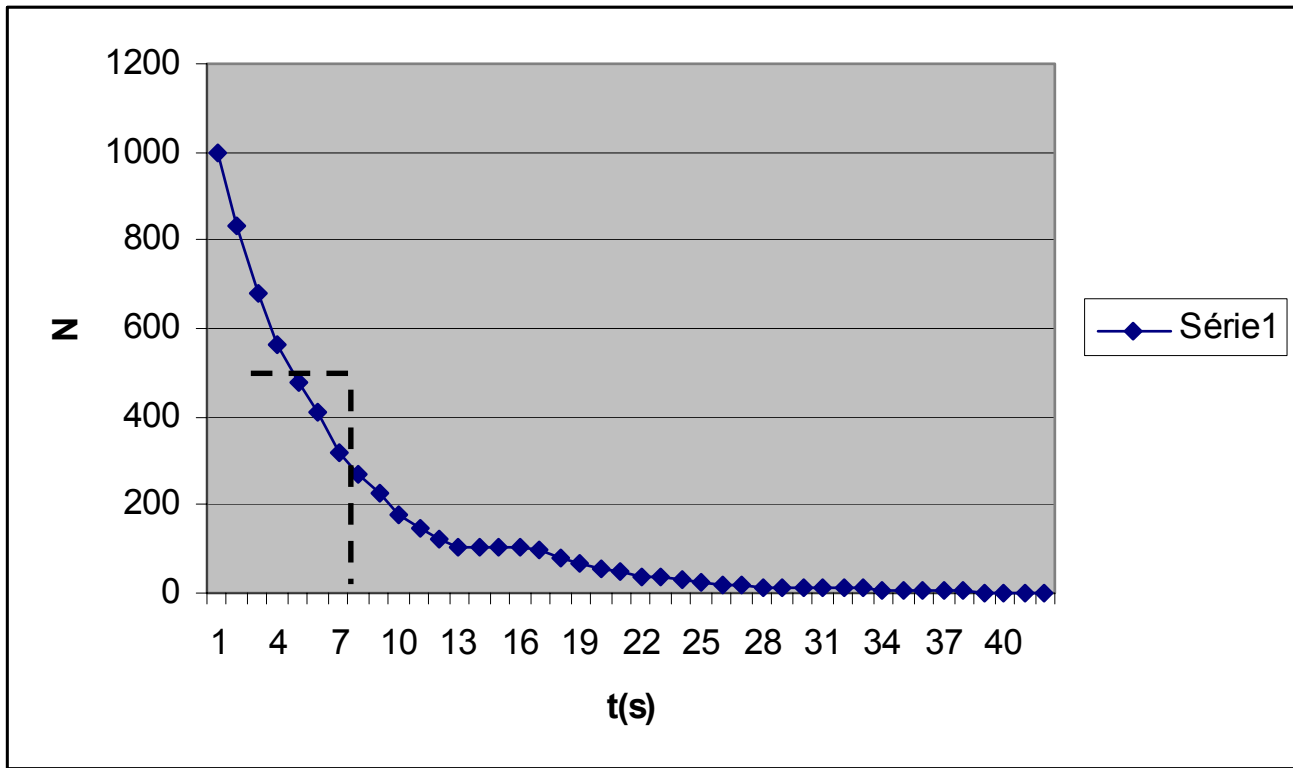
démarrer 2 وحدة ... simul-ra... Radiodev2 Microsof... Sans titr... FR 9:13 PM

Excel

$$N = f(t)$$

$$N = f(t)$$

Excel



$$N_{\text{متبقية}} = \frac{N_0}{2}$$

$N_0$

$$N_{\text{متبقية}} = \frac{N_0}{2}$$

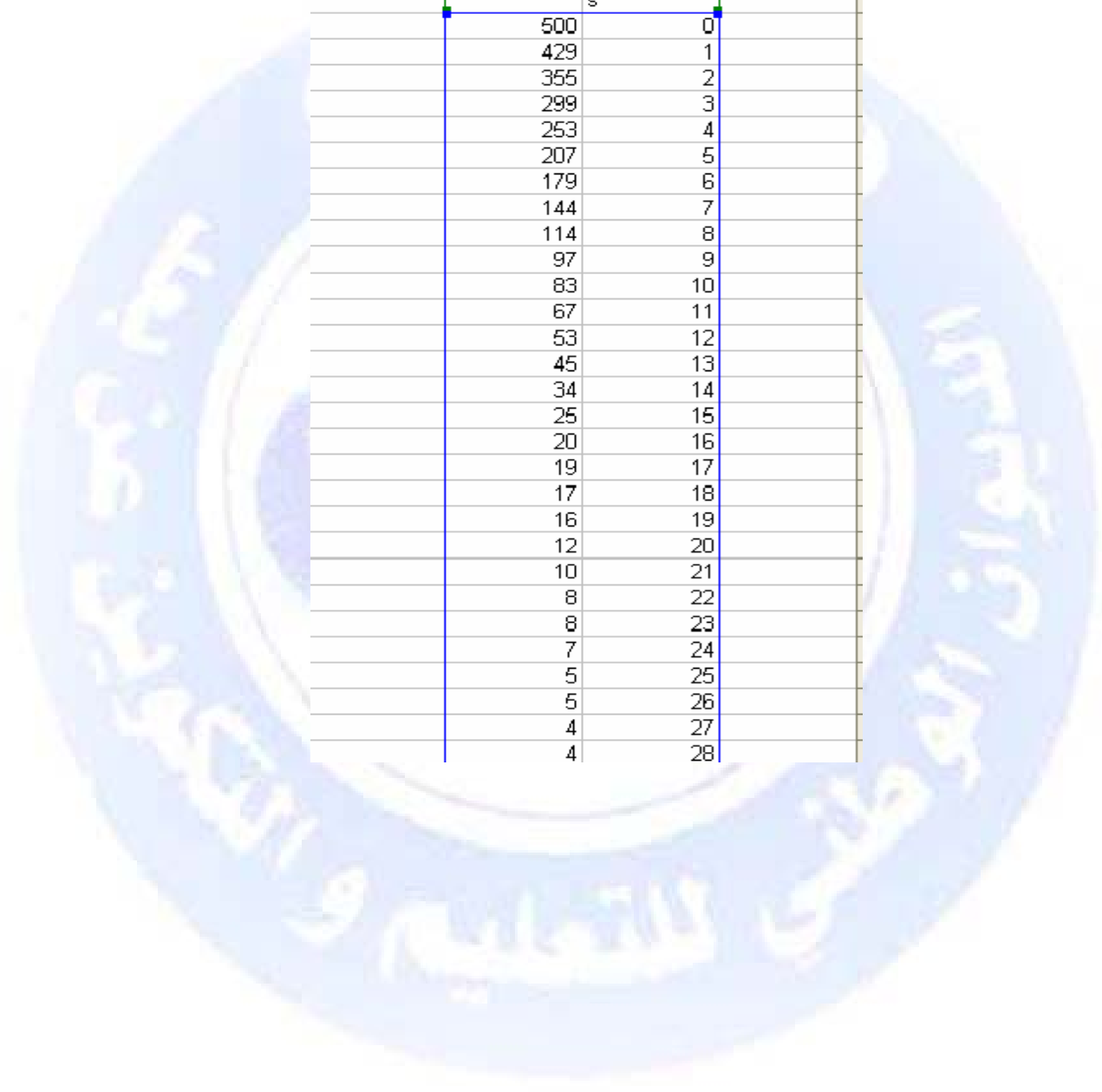
$$N_{\text{متبقية}} = \frac{1000}{2} = 500$$

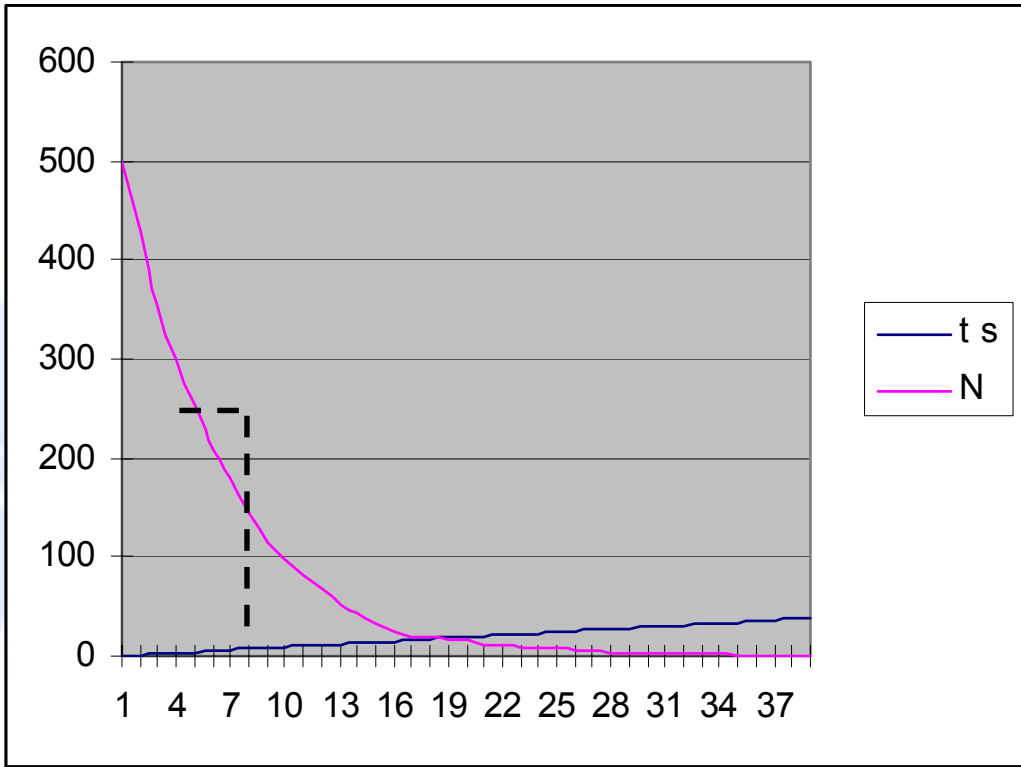
500

$$t_1 \approx 4,5 \text{ s}$$

500

D	C	B	A
		Résultats du lancé de dés	
	N	t	
		s	
	500	0	
	429	1	
	355	2	
	299	3	
	253	4	
	207	5	
	179	6	
	144	7	
	114	8	
	97	9	
	83	10	
	67	11	
	53	12	
	45	13	
	34	14	
	25	15	
	20	16	
	19	17	
	17	18	
	16	19	
	12	20	
	10	21	
	8	22	
	8	23	
	7	24	
	5	25	
	5	26	
	4	27	
	4	28	





$t_2 = 5 \text{ s}$

$t_1 \neq t_2$



.238      235      :



ACTIVIT



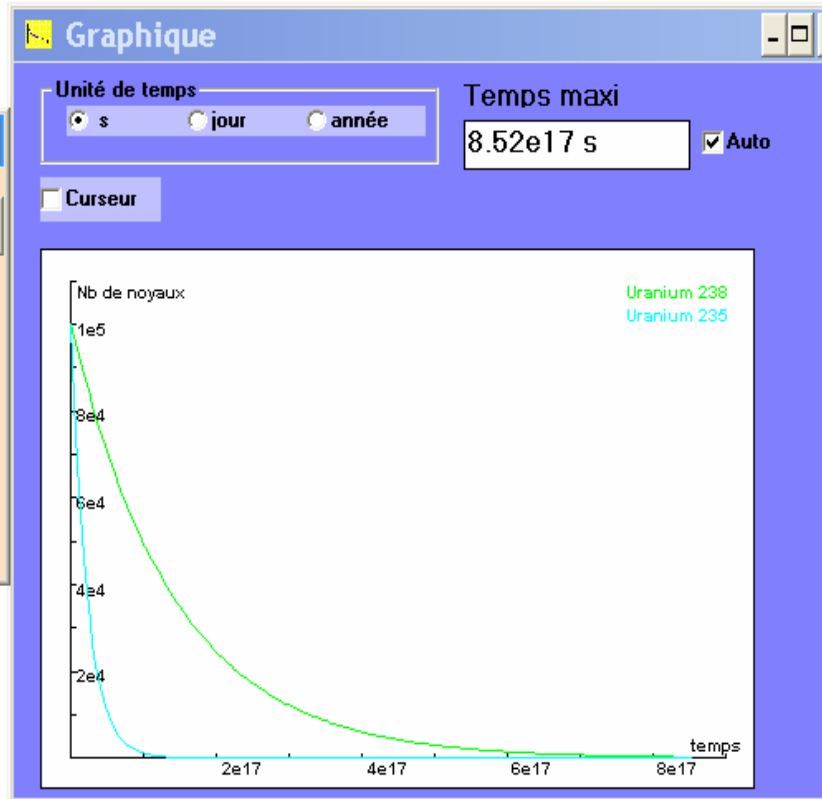
DEC\_ELT



desinteg

**Noyaux à étudier** ✕

- Polonium 212 A propos
- Iode131
- Cesium 137
- Carbone 14
- Uranium 235**
- Uranium 238 Fin



.  $t = 1,33 \cdot 10^{17}$  s : 235

.  $t = 8,52 \cdot 10^{17}$  s : 238

:

1 L	10 Bq
1 kg	$10^2$ Bq
1 kg	$10^3$ Bq
1	$10^4$ Bq
1kg	$25 \cdot 10^6$ Bq
	$70 \cdot 10^6$ Bq
1kg	$10^{13}$ Bq
	$10^{14}$ Bq

-2-6

:  $\tau$

$\lambda$

$$\tau = \frac{1}{\lambda}$$

:( ) 1

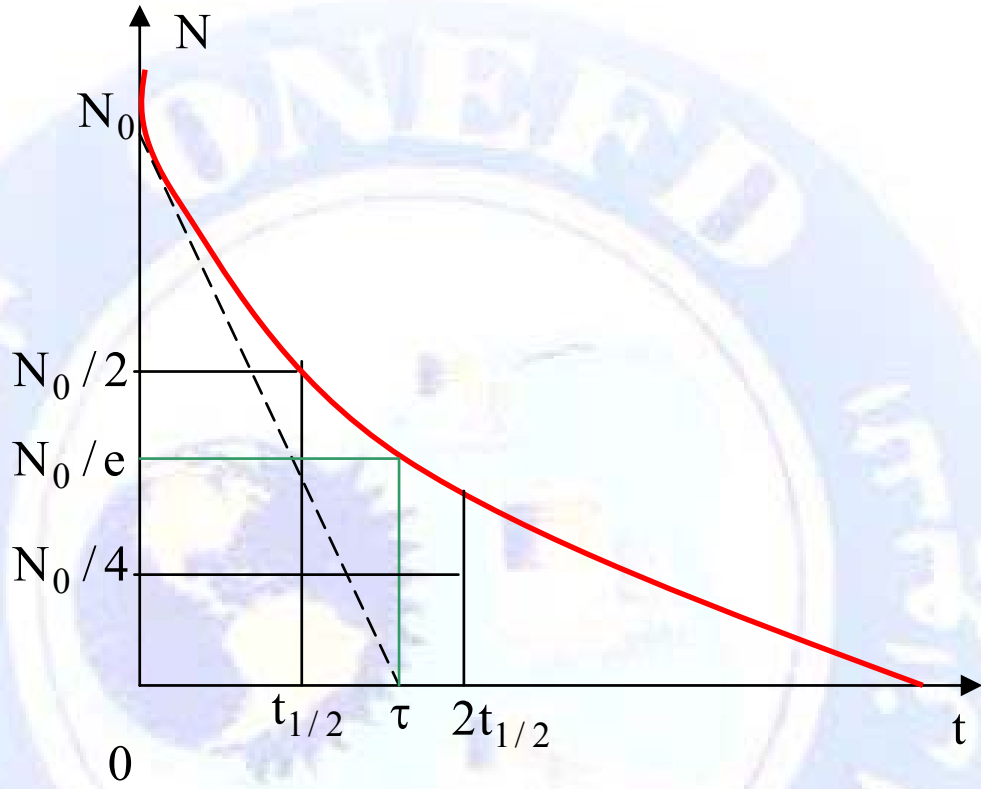
t =  $\tau$

$$N_0 \cdot e^{-1} = 0,37N_0$$

:( ) 2

.t =  $\tau$

t = 0



: $t_{1/2}$

-3-6

.(s)

$t_{1/2}$  :

$$N(t_{1/2}) = \frac{N_0}{2} = N_0 \cdot e^{-\lambda t_{1/2}}$$

$$\frac{1}{2} = e^{-\lambda t_{1/2}}$$

$$\ln \frac{1}{2} = \ln(e^{-\lambda t_{1/2}})$$

$$\ln \frac{1}{2} = -\lambda t_{1/2}$$

$$t_{1/2} = \frac{\ln 2}{\lambda} = \tau \ln 2$$

$$N = \frac{N_0}{4} \quad t = t_0 + 2 t_{1/2}$$

$$N = \frac{N_0}{8} \quad t = t_0 + 3 t_{1/2}$$

2

$$t_{1/2} = 3 \cdot 10^6 \text{ s} :$$

$$t_{1/2} = 1,4 \cdot 10^{10} \text{ s} :$$

:

	$^{14}_6\text{C}$	5730 ans
	$^{15}_8\text{O}$	2,04 mn
	$^{40}_{19}\text{K}$	$1,3 \cdot 10^9$ ans
	$^{60}_{27}\text{Co}$	5,27 ans
	$^{123}_{53}\text{I}$	13,2 heures
	$^{137}_{55}\text{Cs}$	30,2 ans
	$^{220}_{86}\text{Rn}$	58 s
	$^{226}_{88}\text{Ra}$	1600 ans
	$^{235}_{92}\text{U}$	$7,04 \cdot 10^8$ ans
	$^{238}_{92}\text{U}$	$4,46 \cdot 10^9$ ans
	$^{239}_{94}\text{Pu}$	$2,4 \cdot 10^4$ ans

:

$$A_0 =$$

$$N_0 = 2,66 \cdot 10^{18}$$

$t_0$

90

$$\cdot 1,14 \cdot 10^{12} \text{ Bq}$$

.90

/1

.

/2

. 1000                      100                      /3

:

:90                      /1

$$\lambda = \frac{A_0}{N_0} = \frac{1,14 \cdot 10^{12}}{2,66 \cdot 10^{18}} = 4,29 \cdot 10^{-7} \text{ s}^{-1}$$

:                      /2

$$\tau = \frac{1}{\lambda} = \frac{1}{4,29 \cdot 10^{-7}} = 2,33 \cdot 10^6 \text{ s}$$

$$t_{1/2} = \frac{\ln 2}{\lambda} = \frac{0,693}{4,29 \cdot 10^{-7}} = 1,62 \cdot 10^6 \text{ s} = 450 \text{ h} = 18,8 \text{ jours}$$

/3

$$N_{100} = 2,66 \cdot 10^6 \cdot e^{-4,29 \cdot 10^{-7} \cdot 8,64 \cdot 10^6} = 6,53 \cdot 10^{16}$$

:

$$t = 100 \times 24 \times 3600 = 8,64 \cdot 10^6 \text{ s} :$$

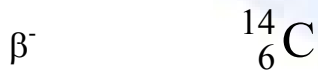
$$N_{100} = N_0 \cdot e^{-\lambda \cdot t} :$$

:

$$N_{1000} = 213 :$$

:

-7



14

. 5568 ± 30



$10^{-12}$

14

)

(



14

1g

50 000

.232

40

