Matthew McKernan 2018 Radioactive decay.pynb

The formula used is:

$$N = N_0 e^{kt}$$

The programme first receives an input for the initial number of radiactive nuclui and the number after a stated elapsed time. The programme calculates the decay constant and half-life using the formulae:

$$k = \frac{1}{t}(ln(\frac{N}{N_0}))$$

$$T_{1/2} = \frac{ln2}{k}$$

- Input values for initial number of nuclei, number at a later time and the time elapsed
- Calculate the decay constant and half-life using the above formulae
- Output the calculated values

In [7]:

```
#Import NumPy for natural log
import numpy as np

#Input number of radiactive nuclei, the later number and elapsed time
init_num = eval(input("Enter the initial number of nucei: "))
final_num = eval(input("Enter the number after elapsed time: "))
time_elapsed = eval(input("Enter the elapsed time in seconds: "))

#Calculate decay constant
k = (1/time_elapsed)*(np.log(init_num/final_num))

#Calculate half-life
T_half = (np.log(2)) * (k**-1)

#Output decay constant and half-life
print("The decay constant is {0:10.2e} and the half-life is {1:10.2e} seconds".format(k
, T_half))
```

```
Enter the initial number of nucei: 3e8
Enter the number after elapsed time: 1.27e7
Enter the elapsed time in seconds: 100
The decay constant is   3.16e-02 and the half-life is   2.19e+01 seconds
```