**Assignment 12 – Radioactivity Name: ………….…………………**

1. The half-life of a particular radioactive material is 10 minutes. Without using a calculator, determine what fraction of a sample of the material will decay in 30 minutes. (2)
2. The activity of a particular radioactive nuclide falls from 1.0 × 1011 Bq to 2.5 × 1010 Bq in 10 hours. Calculate the half-life of the nuclide. (2)
3. Complete the table below:

|  |  |  |
| --- | --- | --- |
| **Isotope** | **Protons** | **Neutrons** |
| Hydrogen-1 |  |  |
| Hydrogen-2 |  |  |
| Helium-4 |  |  |
| Lithium-7 |  |  |
| Carbon-12 |  |  |
| Carbon-14 |  |  |
| Uranium-235 |  |  |
| Uranium-238 |  |  |
| Technicium-99 |  |  |
| Potassium-39 |  |  |

1. Label the three types of radiation based on their penetrating power. (1)

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1. The diagram below shows the paths of an alpha particle and a beta particle in a B-field.

Explain the difference in their paths. Hint: consider both Newton’s Laws and Fleming’s Left Hand Rule. (2)



1. The following decay chain shows how U-235 decays over a series of steps to a stable isotope. Fill in the empty boxes, moving the daughter product to the left side of the next equation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parent** |  |  |  |  | **Daughter** |
| $$$$ | $$\rightarrow $$ | $$$$ | + | $$$$ | Thorium |
| $$$$ | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |
|  | $$\rightarrow $$ |  | + | $$$$ |  |

1. A certain radioactive isotope has an activity of 800 Bq with a half-life of 60 years.
2. What does all this mean? (2)
3. How long will it take to decrease to an activity of 100 Bq? (2)
4. The half-life of strontium-90 is 29 years. If you started with 1000 atoms of strontium-90, how many would you expect there to be after 87 years? (2)
5. The activity of a radioactive sample is 1440 Bq. Five hours later it has fallen to 45 Bq. What is the half-life? (2)
6. A student records the following count rate data from a radioactive isotope.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time(mins) | 0 | 10 | 20 | 30 | 40 | 80 | 160 |
| Count rate(per min) | 740 | 553 | 420 | 326 | 260 | 140 | 103 |

1. Plot the graph of the data in EXCEL/SHEETS and attach. (remember labels and trendline) (2)
2. The count rate will never fall below 100 cpm. Suggest a reason for this. (1)
3. Determine the half-life of the sample. (2)