| AEPHY2024  **Narrogin SHS Year 11 ATAR PHYSICS Name:** | |
| --- | --- |
| Task No: | 1b |
| Task Type: | Science Inquiry: Experiment Validation |
|  |  |
| Content: | Ionising Radiation and Nuclear Reactions |
|  |  |
| Task Description:  Time Allowed | Validation Test  Reading time: 5 minutes  Working time: 45 minutes |
|  |  |
| Weighting: | 6% (2% for Evaluation and Analysis, 4% for Validation) |
| Materials required | Physics Data Sheet, pens, pencils (including coloured), sharpener, correction fluid, eraser, ruler, highlighters, scientific calculator |
|  |  |

|  |  |  |
| --- | --- | --- |
| **Section** | **Mark** | **Percent** |
| Evaluation and Analysis | /10 | \_\_\_\_% |
| Validation test | / 15 | \_\_\_\_% |
|  | | **Total:**  \_\_\_\_% |

**Question 1:**

Within a nuclear reactor, Polonium-209 is bombarded by a neutron to split into two daughter products also emitting two neutrons. Part of the nuclear equation is shown below.

1. Write the element name for the missing daughter product labelled X. \_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)
2. What is the atomic and mass numbers of the daughter product X:
3. Mass number \_\_\_\_\_\_\_\_\_\_ (1 mark)
4. Atomic number \_\_\_\_\_\_\_\_\_\_\_ (1 mark)

**Question 2:**

Calculate the binding energy per nucleon (in MeV) of the Helium-3 atom given the mass of He-3 when using a mass spectrometer measures 4.99 x 10-27 kg . (5 marks)

**Question 3:**

When Pu-238 (atomic number 94) is bombarded with a neutron, fission occurs to form Sn-128 (atomic number 50), Ru-108 (atomic number 44) and some neutrons.

1. Complete the nuclear equation showing the number of neutrons released. (1 mark)
2. How much binding energy is released per reaction in Joules using the information on your data sheet and the information below? (6 marks)

* Pu-238 = 396.82 × 10-27 kg
* Sn-128 = 212.33 × 10-27 kg
* Ru-108 = 179.13 × 10-27 kg