| AEPHY2024  **Narrogin SHS Year 11 ATAR PHYSICS Name: SOLUTIONS** |
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| Task No: | 4 |
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| Task Type: | Test |
| Content: | Ionising radiation and nuclear reactions |
| Task Description: | Complete the attached questions in the spaces provided.  Marks will be awarded for presentation and working.  **Test conditions (50 minutes).**  *Formulae and data booklet provided.*  *Non-programmable calculator permitted.* |
| Total Marks: | 37 |
| Weighting: | 6% |
| Materials required | pens, pencils (including coloured), sharpener, correction fluid, eraser, ruler, highlighters, scientific calculator |
| Due Date: |  |

1. How is mass number different to atomic number? Use an example to assist with your answer

(2 marks)

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1. Explain how differences between an alpha particle and a beta particle result in their different penetrating ability.
2. marks)

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1. Americium -241 undergoes transmutation to Neptunium -237 as a result of radioactive decay.
2. Write a nuclear equation showing the type of particle emitted.

(2 marks)

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1. Which property of the Am-241 nuclide makes it likely to undergo this type of decay? (1 mark)

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1. A film badge worn by a nuclear medicine technician indicated the following monthly exposure:

gamma radiation: 0.2 Sv

beta radiation: 0.4 Sv

1. What is the technician’s absorbed dose for each radiation type?

A table of equations

Description automatically generated(2 marks)

1. If the technician’s body mass is 70 kg, how much energy did her body absorb from the radiation? (2 marks)

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5. Calculate the binding energy of a Th-228 atom (including electrons)

in MeV

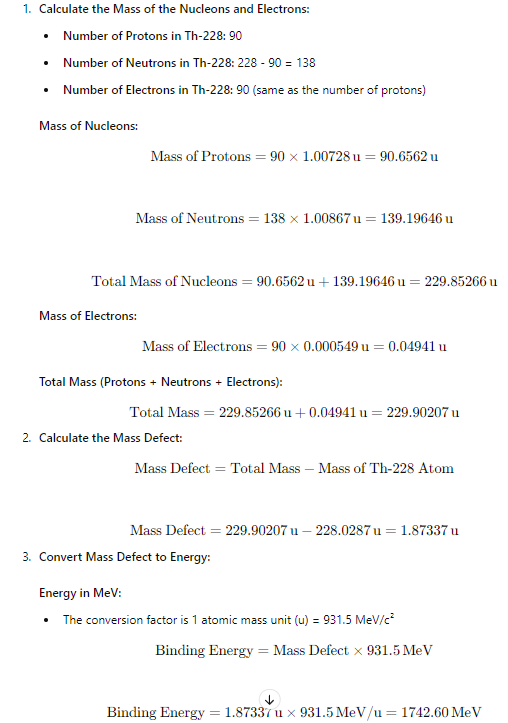
(mass of proton – 1.00728 u)

(mass of neutron – 1.00867 u)

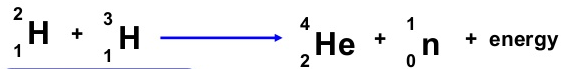
(mass of electron – 0.000549 u)

(mass of Th-228 atom – 228.0287 u)

(4 marks)



1. Calculate the energy released (in Joules) in the fusion reaction:

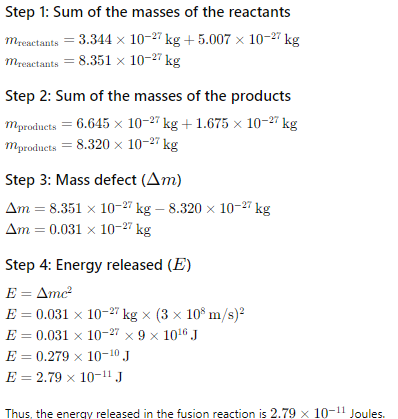


The masses are: H-2 = 3.344 x 10-27 kg

H-3 = 5.007 x 10-27 kg

He-4 = 6.645 x 10-27 kg

Neutron = 1.675 x 10-27 kg (4 marks)



1. An original 100 g sample of uranium 232 decays to a mass of 6.25 g in 288 years. Calculate the half-life of U-232

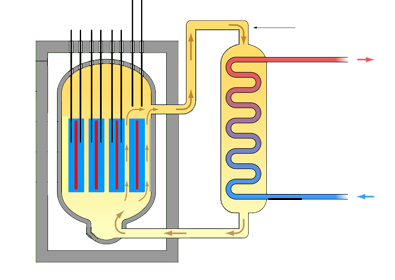
A screenshot of a math problem

Description automatically generated(2 marks)

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1. Examine the following picture of a nuclear reactor. Label the following parts
   1. shield
   2. control rods
   3. heat exchanger
   4. fuel rods
   5. moderator (5 marks)



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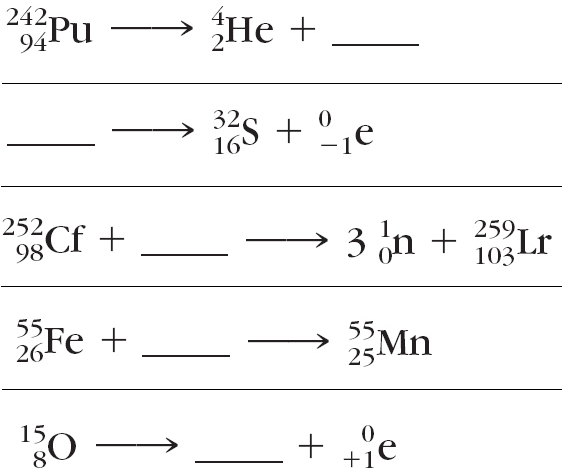
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1. A sample of plutonium has been recovered by a NATO inspector. What features will be used to determine whether the sample is weapons grade or fuel grade? (2 marks)

A screenshot of a cell phone

Description automatically generated

1. Complete the following nuclear reactions.



(5 marks)











End of Test