

- 12 (a) Explain what is meant by the *binding energy* of a nucleus.

.....  
.....  
.....

[2]

- (b) The following nuclear reaction takes place:



- (i) Determine the values of  $x$  and  $y$ .

$x = \dots$

$y = \dots$

[1]

- (ii) State the name of this type of nuclear reaction.

..... [1]

- (iii) Compare the binding energy per nucleon of uranium-235 with the binding energy per nucleon of caesium-144.

.....  
.....

[1]

- (c) Yttrium-90 decays into zirconium-90, a stable isotope.

A sample initially consists of pure yttrium-90.

Calculate the time, in days, when the ratio of the number of yttrium-90 nuclei to the number of zirconium-90 nuclei would be 2.0.

The half-life of yttrium-90 is 2.7 days.

time = ..... days [3]

[Total: 8]

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