

- 7 (a) Describe the experimental evidence for a small charged nucleus in the atom. You may include a diagram if you wish.

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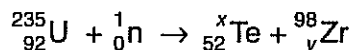
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.....[4]

- (b) A stationary Uranium-235 nucleus absorbs a slow neutron and undergoes fission. Occasionally, a fission can take place in which no neutrons are emitted. One such fission is shown by the following nuclear equation.



The masses of these particles are

uranium	${}_{92}^{235}\text{U}$	235.0439 u
tellurium	${}_{52}^x\text{Te}$	137.9603 u
zirconium	${}_y^{98}\text{Zr}$	97.9197 u
neutron	${}_0^1\text{n}$	1.0087 u.

- (i) State the values of x and y in the equation.

$x = \dots\dots\dots$

$y = \dots\dots\dots$ [2]

- (ii) Deduce the energy released in the fission reaction.

energy released = $\dots\dots\dots$ J [4]

- (iii) Of the energy released, 2.3×10^{-11} J becomes kinetic energy of the tellurium and zirconium nuclei. State one way in which the remaining energy may be released.

$\dots\dots\dots$ [1]

(iv) Calculate

1. the ratio $\frac{\text{speed of zirconium nucleus}}{\text{speed of tellurium nucleus}}$,

ratio of speeds = [2]

2. the ratio $\frac{\text{kinetic energy of zirconium nucleus}}{\text{kinetic energy of tellurium nucleus}}$.

ratio of kinetic energies = [2]

(v) Deduce the speed of the zirconium nucleus.

speed of zirconium nucleus = m s⁻¹ [3]

(vi) State two assumptions that you made in your calculation in (iv) part 1.

1.
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2.
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[2]