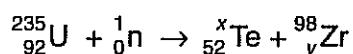


- 7 (a) Describe the experimental evidence for a small charged nucleus in the atom. You may include a diagram if you wish.

. [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.

$$x = \dots$$

$$y = \dots [2]$$

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

$$\text{energy released} = \dots \text{J} [4]$$

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

$$\dots [1]$$

(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<sup>-1</sup> [3]

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

1. ....

.....

2. ....

.....

[2]