Momentum continued

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Example Q's

Q mass of an Oxygen atom

= 16 (relative atomic mass)

Actual mass of an Oxygen atom

16 u

where u is called unified atomic mass and

$1u = 1.66 \times 10^{-27}$ kg. (given in data booklet).

Mass of Oxygen atom in kg.

$16 \times (1.66 \times 10^{-27})$

$= 2.7 \times 10^{-26}$ kg.

Q. mass of an Helium atom

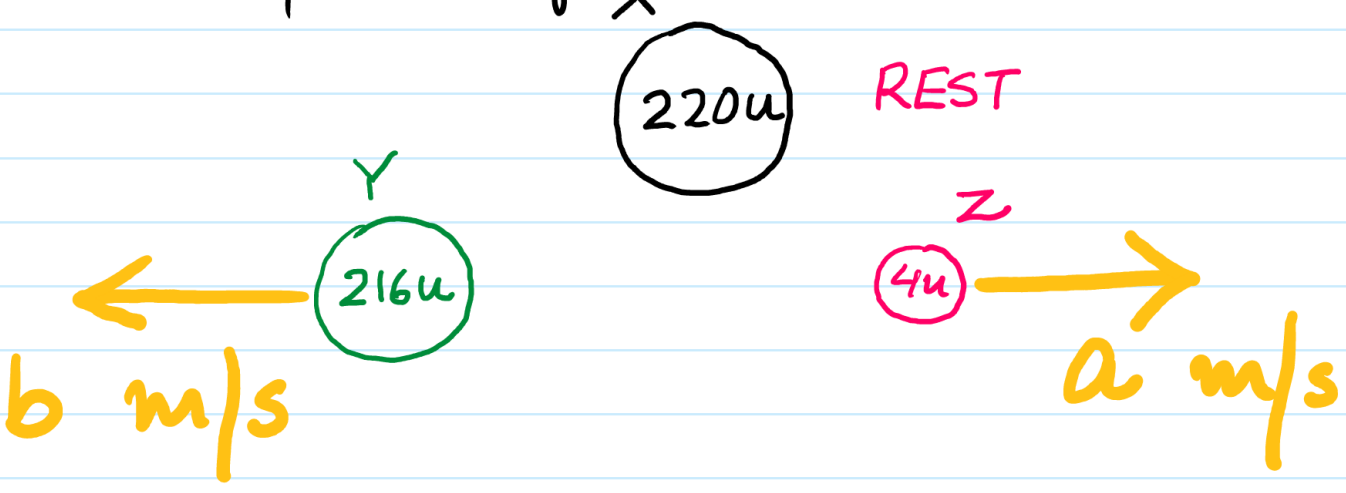
Relative = 4

Actual = 4u

Calculate $= 4 \times (1.66 \times 10^{-27})$

$= 6.6 \times 10^{-27}$ kg.

Q :. A nucleus X (220u) is initially at REST. It splits into 2 fragments Y and Z of masses (216u) and (4u) respectively as shown.



(i) Given that K.E of Z is 1.0×10^{-13} J

(a) Cal Speed of Z ?

K.E = 1.0×10^{-13} J

$\frac{1}{2} \times (4u) \times a^2 = 1.0 \times 10^{-13}$

$\frac{1}{2} \times (4 \times 1.66 \times 10^{-27}) \times a^2 = 1.0 \times 10^{-13}$

$a = 5.5 \times 10^6$ m/s.

(b) Hence Calculate Speed of Y ?

M.1 $\xrightarrow{+}$ $0 = (4u)(5.5 \times 10^6) + (216u)(-b)$

$(216u)(b) = (4u)(5.5 \times 10^6)$

$b = 1.0 \times 10^5$ m/s

M.2 General formula $MV = mv$

$(216u)(b) = (4u)(5.5 \times 10^6)$

$b = 1.0 \times 10^5$ m/s

M.3 Compare mass of Y : Z

$\frac{m_Y}{m_Z} = \frac{216u}{4u} = \frac{54}{1}$

$\frac{V_Y}{V_Z} = \frac{1}{54}$ hence $V_Y = \frac{1}{54} \times 5.5 \times 10^6$

$b = V_Y = 1.0 \times 10^5$ m/s.