

# Rest Mass Energy

Einstein!

$$E = mc^2$$

energy  
(J)

mass  
(kg)

$c = 3 \times 10^8$  m/s  
speed of  
light

- Put this formula and the value of 'c' on your formula sheet.

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Nuclear Power Plants  $\Rightarrow$  use this idea to generate electrical energy.

Einstein's formula states that Mass can be converted to energy. This is possible but not easy to do.

ie: 'The Big Bang'  $\Rightarrow$  lots of energy created the 1<sup>st</sup> elements (mass) of our universe.

When radioactive uranium reacts in a nuclear reactor, some mass "disappears".

The mass after < mass before!

This seems to go against the law of conservation of Mass

but it doesn't if you consider the missing mass (called "mass defect") changed into energy.

ie: If 1 gram of uranium "disappears" - ie: there is a mass defect of 1g of uranium, how much energy is produced?

$$m = 1g = 0.001 \text{ kg}$$

$$c = 3 \times 10^8 \text{ m/s}^2$$

$$E = mc^2$$

$$= (0.001)(3 \times 10^8)(3 \times 10^8)$$

$$= 9 \times 10^{13} \text{ J!}$$

$$= \underline{\underline{90000000000000000 \text{ Joules!}}}$$

Mass has energy just because it has mass "rest mass energy"