Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

(a) (i) mass and energy have equivalent values

B1

$E = mc^2$ mentioned

B1

MeV is energy unit (and kg that of mass)

B1

max2

(ii) clear attempt to substitute amu values into equation

C1

5.135×10^{-3} (u) or 4.78 (MeV) seen

C1

mass of 1 lithium nucleus = 9.98×10^{-27} (kg)

C1

total number of nuclei in 1 kg = 1.00×10^{26}

C1

total energy given out = 4.78×10^{26} MeV

A1

5

(iii) neutrons needed (for the lithium reaction) can come from the other (deuterium-tritium) reaction

B1

1

(b) (i) potential energy equation ($E = \frac{Qq}{4\pi\varepsilon_0 r}$) quoted or used

C1

correct substitutions

C1

$1.5(3) \times 10^{-13}$ (J)

A1

3

(ii) ke = 3/2 kT

C1

$0.75/0.765 \times 10^{-13}$ (J) **or** half of (b) (i)
or 4×10^{9} (K) used

C1

3.7×10^{9} (K) **or** total energy 1.6×10^{-13} (J)

A1

3

(iii) each nucleus carries a positive charge

B1

(electrostatically) repel each other

B1

strong nuclear force

B1

this has a range of nucleus diameters

B1

high temperature needed for high kinetic energy

B1

max4

[18]