Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

(a) Draws appropriate triangle on graph or other mark on graph at ~ 118

B1

Change of approx 1 Me V per nucleon is multiplied by 235

B1

Multiplies by 1.6×10^{-13}

B1

Quotes their answer of approx 3.8×10^{-11} to more than 2 sf

B1

4

(b) $(2 \times 2.0135) - 4.0026$ seen or 0.0244 (u)

C1

Multiplies u by 1.7×10^{-27}

C1

$E = mc^2$ seen or multiplies by $(3 \times 10^8)^2$

C1

3.67×10^{-12}J

A1

4

(c) Multiplies 3.8×10^{-11} or their (b) by 6×10^{23}

M1

attempts to convert to energy per kg by multiplying by 1000 / 4 or 1000 / 235

M1

Compares 5.5×10^{14} (J) (Hydrogen) with 9.6×10^{13} (J) (Uranium) in some way eg by stating that the fusion reaction gives more energy (per kg) than

the fission or very similar values – must be consequent on some correct analysis

A1

3

(d) Availability of fuel easier for fusion

B1

Doesn't produce radioactive fission products / no waste management problem

B1

2

[13]

Q2.

(a) any 2 from:

the sun, cosmic rays, radon (in atmosphere), nuclear fallout (from previous weapon testing), any radioactive leak (may be given by name of incident) nuclear waste, carbon-14 ✓

1

(b) (i) (ratio of area of detector to surface area of sphere)

ratio = $\frac{0.0015}{4\pi(0.18)^2}$ ✓

0.0037 ✓ (0.00368)

2

(ii) activity = 0.62/(0.00368 × 1/400) give first mark if either factor is used.

67000 ✓ Bq accept s^{-1} or decay/photons/disintegrations s^{-1} but not counts s^{-1} ✓ (67400 Bq)

3

(c) (use of the inverse square law)

$\frac{I_1}{I_2} = \left(\frac{r_2}{r_1}\right)^2$ or calculating k = 0.020 from $I = k/x^2$ ✓

$I_2 = 0.62 \times \left(\frac{0.18}{0.28}\right)^2$ ✓ 0.26 counts s^{-1} ✓(allow 0.24-0.26)

3

[9]