

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Mark Schemes

Q1.

- (a) *evidence of conclusion* 4×1.007825 **or** 4.0313
each gain 1 mark

*based on use of data that there is a (very small) loss of mass
or 0.0276 but a loss of mass of 0.0276 for every helium atom or 0.69%/0.7%
gains 3 marks*

3

- (b) *idea that loss of mass results in release of energy
gains 1 mark*

but small loss of mass results in huge energy release
gains 2 marks

2

[5]

Q2.

- (a) it use $E = mc^2$

mass in kg i.e. $0.001 \times \frac{0.7}{100}$

each gains 1 mark

but 000007
gains 2 marks

2.1×10^3
gains 3 marks

evidence of 0.000007

mass in kg (i.e. 0.0007 **or** 0.7/100000)
each gains 1 mark

squaring the speed of light
but 6.3×10^{11} (credit alternative ways of stating this)
gains 3 marks

units J/joule

for 1 further mark

(N.B credit kJ, MJ, GJ but check power of 10 for full credit)

4

- (b) (i) *idea that the bigger the mass the shorter the life*
gains 1 mark

but *idea that* decrease in life is much more than
proportional to increase in mass

or more than proportional to mass²

gains 2 marks

2

- (ii) *ideas that:*
greater mass means greater **core** temperature/pressure
greater core temperature/pressure means greater rate of fusion
increase in mass produces a proportionally much greater
increase in the rate of fusion
each for 1 mark

3

[9]

Q3.

ideas that: galaxies show a red-shift

gains 1 mark

but more distant galaxies show bigger red-shift

gains 2 marks

galaxies moving away/Universe expanding

gains 1 mark

but more distant galaxies moving away faster

gains 2 marks

so all Universe once in one place

for 1 further mark

(only if the previous 2 marks are also gained)

[5]