

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

(i) $\frac{1}{4}$

accept 0.25 or 25%

1

(ii) 2600

if answer to (c)(i) is $\frac{1}{2}$ then accept 1300

1

[2]

Q2.

- (a) (i) both lose 2 protons and (2) neutrons
accept changes by 2 protons and 2 neutrons

1

- (ii) different number of protons (in the nucleus)
accept different atomic number
do **not** accept different number of protons and neutrons or different mass number
ignore electrons

1

- (iii) gamma involves no change in the number of protons (in the nucleus)
or gamma is a wave (not a particle)
do **not** accept number of neutrons
and / or protons
ignore electrons

1

- (b) (i) water because
both material **and** reason required

for all energy values the thickness
of water needed to absorb (90% of)
the radiation is more than the other materials
accept thickness of water required is always more
than the other materials

1

- (ii) 6
allow **1** mark for obtaining both correct values 72
and 12 from graph

(c) any **three** from:

may be scored on annotated diagram provided
not negated elsewhere

- most (alpha) particles passed
undeflected / straight through the gold
- suggesting most of the atom is empty (space)
- a few (alpha) particles scattered / deflected through (very) large angles
accept repelled
do **not** accept reflected / rebound /
bounce back
- suggesting a concentrated / small nucleus
- nucleus is positive because it repels the positive (alpha) particles
no reference to experiment, maximum **1** mark

3

[9]

Q3.

(a) (i) element with equal number of protons, different number neutrons
or
same atomic/proton number different mass/nuclear number

1

(ii) time taken for activity **or** count rate **or** number of nuclei to decrease to half
accept parents atoms **or** radioactive isotope
do not accept time taken for radioactivity/substance/ material to halve

1

(iii) 12 (s)

1

(b) (i) 22800 (years)
allow 1 mark for iterative steps 80-40-20-10-5 **or** statement of 4
half-lives

2

(ii) decay (of carbon 14) over 150 years is insignificant
accept very little decay
accept change is too small

1

(c) either argument gains full credit
accept any 3 valid points from for and/or against arguments

FOR

- massive dilution of waste
- reduces concentration (within a given volume) to insignificant levels
- distant from habitation

AGAINST

- *pollution (of the sea/beach)*
- *mutation **or** harm caused to living things (animals/plants)*
- *effect on food chain*
- *long period of time necessary*