**M1.**          (a)     **Y** and **Z**

**1**

          they have the same number of protons **or** same atomic number

*accept they have the same number of electrons* ***or*** *same number of protons* ***and*** *electrons  
allow only different in number of neutrons N.B. independent marks*

**1**

(b)     **Quality of written communication**

*for correct use of terms underlined in B* ***or*** *C*

*Q  Q *

**1**

          A – alpha particle passes straight through the empty space of the atom  
**or**   it is a long way from the nucleus

*describes 3 tracks correctly for* ***2*** *marks  
describes 2 or 1 track correctly for* ***1*** *mark*

          B – alpha particle deflected / repelled / repulsed by the (positive) nucleus

          C – alpha particle heading straight for the nucleus is deflected / repelled /  
       repulsed backwards

*do* ***not*** *accept hits the nucleus  
do* ***not*** *accept answers referring to refraction  
do* ***not*** *accept answers in terms of reflected backwards unless qualified in terms of repulsion*

*mention of difference in charge on nucleus negates that track*

**max 2**

**[5]**

**M2.**          (a)     (i)      electron  
neutron  
proton  
nucleus

*1 mark for each correct label*

**4**

(ii)     H-1 has no neutrons  
H-3 has 2 neutrons

*more neutrons gets 1 mark*

**2**

(iii)     nucleus unstable

**2**

(b)     lead/concrete  
lead/concrete needed to stop gamma rays

**2**

**[10]**

**M3.**          (a)     1, 0  
X, -l (X = negligible / very small / (1/1840) to (1/2000), but not nothing

*2 for 4 correct  
1 for 2/3 correct*

**2**

(b)     has a nucleus which is positive charge  
negative charges (electrons) orbit nucleus

*each for 1 mark*

**3**

**[5]**

**M4.**          (a)     nucleus positive charge / protons in nucleus electrons / negative charges  
orbit nucleus

*each for 1 mark*

**3**

(b)     (i)      positive dough repels positive alpha particles **or** 2 positive  
charges repel forces small

*each for 1 mark*

**2**

(ii)     large force needed + ves in plum pudding spread out – *may appear in (i)*

         positive charge must be concentrated / in nucleus  
*(ignore references to electrons)*

*for 1 mark each*

**3**

(c)     1, 0  
X,–l (X = negligible / very small/(1/1840) (1/2000),but not nothing)

*each row for 1 mark*

**2**

(d)     (i)      4

*for 1 mark*

**1**

(ii)     B and C have the same number of protons / atomic number  
but different number of neutrons / mass number

*each for 1 mark*

**3**

**[14]**

**M5.**          (a)     (i)      B

*for one mark*

**2**

(ii)     has a different number of electrons (protons)

*for one mark*

(b)     (i)      A and C

*for one mark*

**1**

(ii)     same number of protons / electrons, same nuclear charge  
different number of neutrons / nuclear masses different

*for 1 mark each*

**2**

**[5]**