Question number	Answer	Notes	Marks
2 (a)	any two from: MP1. different orbital radii; MP2. different orbital path lengths; MP3. different eccentricity; MP4. different speeds; MP5. different time periods;	allow specific statements involving a comparison e.g. Mercury orbits closer to the Sun Earth travels a greater distance in its orbit Mercury's orbit is more elliptical, Sun more centralised for Earth's orbit Mercury travels faster Earth takes longer to complete an orbit	2
(b)	any two from: MP1. variable orbital radii; MP2. variable orbital speed; MP3. different planes of orbit; MP4. different eccentricity; MP5. different orbital path lengths;	allow specific statements involving a comparison e.g. distance from Earth to Sun stays constant but comet's distance changes Earth orbits at constant speed but speed of comet changes comet's orbit is more elliptical, Sun more centralised for Earth's orbit comet travels a greater distance in its orbit	2

Total for question 2 = 4 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>4 (a)</td><td colspan="2"><table>
<tr><th>Statements</th><th>Tick</th></tr>
<tr><td>the light from the object passes through the image in a plane mirror</td><td></td></tr>
<tr><td>the light waves are longitudinal</td><td></td></tr>
<tr><td>the angle of incidence equals the angle of reflection</td><td>✓</td></tr>
<tr><td>the image in a plane mirror is virtual</td><td>✓</td></tr>
<tr><td>the incident ray is always at right angles to the reflected ray</td><td></td></tr>
</table>
1 mark for each correct tick;;
if more than two ticks, -1 for each additional tick to a minimum of zero</td><td>2</td></tr>
<tr><td>(b)</td><td>i = 45 (°);

r = 26 (°);</td><td>allow answers in range 43-47°
allow answers in range 24-28°</td><td>2</td></tr>
</table>

Question number	Answer	Notes	Marks
12 (a) (i)	neutron numbers correct; particle X numbers correct;  		2
(ii)	proton / p;	allow hydrogen, H, H^+ (ion)	1
(iii)	any two from: MP1. both have same number of protons (and electrons); MP2. C-12 has **fewer** {neutrons / nucleons} than C-14; MP3. C-12 is lighter than C-14;	both C atoms have 6 protons allow RA C-14 has 8 neutrons, C-12 has 6 neutrons allow RA	2
(iv)	mass number is constant; atomic number increases by one;	however expressed, including numerically	2
(b)	working seen / appropriate line(s) on graph seen; 5 500 (years)	e.g. line drawn across from 125 Bq allow 5000-6000 (years)	2
(c) (i)	(due to) background radiation;		1
(ii)	idea that activity depends on the mass;	allow 'fair test' idea ignore 'to have the same activity'	1