<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>2 (a)</td><td>3 or 4 ticks correct;;
OR
2 ticks correct;

<table><tr><td rowspan="2">Property</td><td colspan="3">Type of radiation</td></tr><tr><td>Alpha particles</td><td>Beta particles</td><td>Gamma rays</td></tr><tr><td>most ionising</td><td>(✓)</td><td></td><td></td></tr><tr><td>largest mass</td><td>✓</td><td></td><td></td></tr><tr><td>most penetrating</td><td></td><td></td><td>✓</td></tr><tr><td>highest speed</td><td></td><td></td><td>✓</td></tr><tr><td>negatively charged</td><td></td><td>✓</td><td></td></tr></table></td><td>ignore top line as this is given</td><td>2</td></tr>
<tr><td>(b) (i)</td><td>Number of neutrons = 2;
Number of protons 2;</td><td>Allow same ideas expressed in words</td><td>2</td></tr>
<tr><td>(ii)</td><td>Any one of-
MP1. Charge is larger (than other radiations);
MP2. Mass is larger (than other radiations);</td><td>comparative statement needed
ignore
• incorrect terminology e.g. more powerful
• references to protons and neutrons
no RA unless particles/radiation specified
condone
‘alpha particles have more momentum’</td><td>1</td></tr>
<tr><td>(c) (i)</td><td>Idea of background radiation;</td><td>Allow
Idea that some alpha particles (from source) will get through smoke
air is all around = insufficient</td><td>1</td></tr>
<tr><td>(ii)</td><td>Idea that radioactivity is random;</td><td>allow
• fluctuates
• source emits different numbers of alphas
• background radiation varies
ignore
• random movement of particles</td><td>1</td></tr>
<tr><td>(iii)</td><td>Idea that α particles are absorbed / deflected /stopped / scattered;

Idea that α particles are affected by <u>smoke</u>;</td><td>allow for both marks
smoke blocks the (alpha) particles</td><td>2</td></tr>
</table>

Total 9 marks

Question number	Answer	Notes	Marks
4 (a) (i)	6.1 (m);		1
(ii)	any two from:- MP1. (on distance-time graph,) flat line means zero speed / eq MP2. (so) count when slope is zero; MP3. 7 (times);	allow flat or horizontal for zero slope	2
(b) (i)	(average) speed = <u>(total) distance moved</u> / (total) time taken	allow defined symbols ignore 'triangles'	1
(ii)	Substitution; Calculation; Matching unit; e.g. Average speed = <u>6.1</u> / (7x 60) = 0.0145 = 0.015 m/s	allow both substitution and calculation marks for a correct value without working allow 6.1, or ecf for distance 7 for time allow alternatives with compatible unit, e.g. 1.45 cm/s OR 1.5 cm/s 14.5 mm/s OR 15 mm/s 0.87 m/minutes 87 cm/minute 870 mm/minute Allow for 1 mark 6 / 7 or 0.9	3

Total 7 marks

Question number	Answer	Notes	Marks
6 (c)	Any four of - MP1. idea of a displacement method; MP2. instrument to measure volume (of liquid displaced); MP3. a relevant experimental detail; MP4. second relevant experimental detail; MP5. use of **known liquid density** to find volume from mass (if appropriate);	 Allow overspill or rise in level Allow balance if mass method used (see MP5) Including • idea of repetition or averaging at any stage • **full** immersion of object • check liquid level in displacement can, • subtracting before and after volume measurements , • care with meniscus (e.g. in the measuring cylinder), • check zero or tare of balance • avoid parallax when reading scale as above	4

Total 13 marks

Question number	Answer	Notes	Marks
14 (a) (i)	any two ideas from:- MP1. voltage / current is <u>induced</u>; MP2. (because) field in coil is changing / field (lines) cut; MP3. current/voltage changes direction when magnet does; MP4. magnet slows down causing decrease in amplitude;	allow voltage for amplitude	2
(ii)	Either of - (voltage/current) changes direction; Positive <u>and</u> negative (voltage/current);	Ignore "wave"	1
(iii)	any two of - MP1. direction of magnet changes; MP2. amount of field (lines) cut changes / rate of flux cutting; MP3. direction of flux cutting changes; MP4. speed of magnet changes / slows down; MP5. as movement diminishes, so does voltage;		2
(b)	Any three of - MP1. Alternating trace that diminishes; MP2. Amplitude is larger; MP3. Frequency is lower;		3

Total 8 marks