<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;

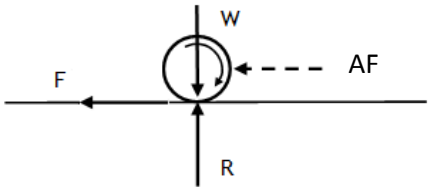
<table><tr><td rowspan="2">Property</td><td colspan="3">Type of radiation</td></tr><tr><td>Alpha particles</td><td>Beta particles</td><td>Gamma rays</td></tr><tr><td>most ionising</td><td>(✓)</td><td></td><td></td></tr><tr><td>largest mass</td><td>✓</td><td></td><td></td></tr><tr><td>most penetrating</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
12 (a)	Terminal (velocity / speed);	allow bald 'terminal'	1
(b)	Any four of - MP1. weight acts downwards; MP2. drag/friction acts upwards; MP3. Idea that forces are balanced; MP4. reference to $f_{(R)} = ma$; MP5. Idea that when forces are balanced then acceleration is zero; MP6. constant velocity = no acceleration;	ignore • motion before terminal velocity • gravity allow • force of gravity • air resistance • acts to oppose motion • drag = weight • force up = force down • no resultant force Allow answers in terms of N I forces may be shown on diagram	4

Total 5 marks

Question number	Answer	Notes	Marks
13 (a) (i)	Any two of - MP1. arrow downwards, labelled weight; MP2. arrow upwards, labelled reaction/contact force; MP3. arrow to the left, labelled air friction / air resistance / drag; MP4. arrow along the surface, labelled friction; e.g.  	In MP1, 2 & 3, position of arrows unimportant, but direction must match label Allow initial letters as shown in example ignore • gravity allow • mg • force of gravity • arrow drawn on left or right Accept arrow in either direction for MP4 N = normal contact force	2
(ii)	Any three of - MP1. friction/resistance /drag (acts); MP2. (there is an) unbalanced force; MP3. (hence) ball decelerates; MP4. reference to $f_{(R)} = ma$; MP5. (kinetic) energy dissipates / fate of energy discussed;	ignore stem allow • resistive forces > {forward/driving} force • there is a resultant force • its momentum changes • accelerates	3
(b) (i)	idea that friction is (much) less in the air;	allow • RA • no contact / ground friction • less energy lost	1

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