

| Question number | Answer | Notes | Marks |
|-----------------|---|---|-------|
| 7 (a) | <p>top line correct e.g. 228; bottom line correct e.g. 88 and 2; e.g.</p> $\begin{array}{ccc} \boxed{232} & & \boxed{228} \\ \text{Th} & \rightarrow & \text{Ra} \\ \boxed{90} & & \boxed{88} \end{array} + \begin{array}{c} \boxed{4} \\ \alpha \\ \boxed{2} \end{array}$ | | 2 |
| (b) (i) | idea that {alpha/beta} is {absorbed by / unable to penetrate} {aluminium / glass}; | <p>allow stops / blocks for absorbs</p> <p>ignore references to paper, air, lead</p> <p>ignore references to gamma, unqualified 'radiation'</p> | 1 |
| (ii) | <p>any 2 of:</p> <p>MP1. idea of radiation being ionising;</p> <p>MP2. (radiation) causes cancer / cell mutation / kills cells / blindness;</p> <p>MP3. {alpha / beta} will travel this short distance (between lens and eye);</p> <p>MP4. idea that astronomer is likely to suffer prolonged exposure;</p> | <p>ignore references to gamma</p> <p>allow (eye) within penetrating range of {alpha / beta}</p> | 2 |

Total 5 marks