| Question number | Answer | Accept | Reject | Marks |
|---|---|---|---|---|
| 7 (a) | B | | | 1 |
| (b) | Any **two** of<br>Energy transfer from supply / electrical energy;<br>Energy transfer to thermal energy (heat) / particle vibration;<br>There is a current (in the heating element);<br>Heating effect of resistance /a resistor; | Electrical → thermal /heat for 2 marks<br><br>IGNORE: electricity | | 2 |
| (c) (i) | Power = current x voltage; | Or equivalent, e.g. Power = voltage x current Voltage = power ÷ current Current = power ÷ voltage<br>P= I x V<br><br>If (i) is blank, but correct equation written in (ii), then credit. | equation “triangles” | 1 |
| (ii) | Substitution 2000 / 230;<br>Calculation 8.7 (A); | ACCEPT: 8.69 (A) | | 2 |
| (iii) | 13 A;<br>Only one above working current; dop | OWTTE<br>ORA e.g the others would blow | | 2 |

**Total 8 marks**

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 13 (a) (i) | 77 | | 1 |
| (ii) | 115 | | 1 |
| (b) | (nuclei with) same number of protons / same atomic number / same element ;<br>different numbers of {neutrons / nucleons} / different mass number; | ACCEPT: atoms / elements for nuclei<br>REJECT: molecules / substances for nuclei<br>IGNORE: electrons | 2 |
| (c) | 192;<br>78; | | 2 |
| (d) | alpha not penetrating enough (of the tumour) / ionises before reaching whole tumour ;<br><br>gamma too penetrating / travels straight through /too weakly ionising / OWTTE ;<br><br>beta will penetrate the tumour but no further / stays in tumour and doesn't affect horse / ionises within tumour (but no further) / OWTTE ; | IGNORE: doesn't penetrate skin<br><br>IGNORE: bald 'weak' or 'strong'<br><br>IGNORE: general properties of alpha, beta and gamma | 3 |
| (e) (i) | C | | 1 |
| (ii) | activity decreases over time ;<br>relate activity to situation e.g. C remains sufficiently active (over the treatment) / A and B not effective over period of treatment / A and B would need source to be replaced / D continues to be radioactive / cause damage (after treatment) ; | ACCEPT: calculation of period of activity<br>IGNORE: bald 'weak' or 'strong' | 2 |

**Total 12 marks**