

# Atomic Structure and Isotopes 1 Mark Schemes

## QUESTION 1

| QUESTION    | ANSWER                                  | EXTRA INFORMATION                                    | MARKS |
|-------------|---|--|-------|
| a)          | L<br>J<br>K                             | all 3 in correct order<br>allow 1 mark for 1 correct | 2     |
| b)          | number of electrons = number of protons | accept amount for number                             | 1     |
| c)          | neutrons                                | this answer only                                     | 1     |
| d)          | loses / gains electron(s)               |  | 1     |
| Total marks |   |  | 5     |

## QUESTION 2

| QUESTION | ANSWER  | EXTRA INFORMATION   | MARKS         |                 |        |   |  |         |  |   |  |            |
|----------|---|---|---------------|-----------------|--------|---|--|---------|--|---|--|------------|
| a)       | <table border="1"> <thead> <tr> <th>Particle</th> <th>Relative Mass</th> <th>Relative charge</th> </tr> </thead> <tbody> <tr> <td>Proton</td> <td>1</td> <td></td> </tr> <tr> <td>Neutron</td> <td></td> <td>0</td> </tr> </tbody> </table> | Particle  | Relative Mass | Relative charge | Proton | 1 |  | Neutron |  | 0 | accept one, accept +1<br>do not accept -1<br>accept zero<br>do not accept no charge/ nothing/<br>neutral unless given with 0 | 1<br><br>1 |
| Particle | Relative Mass   | Relative charge   |               |                 |        |   |  |         |  |   |  |            |
| Proton   | 1   |   |               |                 |        |   |  |         |  |   |  |            |
| Neutron  |   | 0   |               |                 |        |   |  |         |  |   |  |            |
| b)       | equal numbers/amounts of protons and electrons<br>protons and electrons have equal but opposite charge  | accept protons charge +1 and electron charge -1<br><br>accept (charge) on proton cancels/balances (charge) on electron<br>accept positive (charges) cancel out<br>the negative(charges)<br>neutrons have no charge is neutral<br>do not accept total charge of protons, electrons (and neutrons) is<br>0 unless qualified | 1<br><br>1    |                 |        |   |  |         |  |   |  |            |
| c)i)     | fewer neutrons  | accept lower/ smaller mass  | <b>1</b>      |                 |        |   |  |         |  |   |  |            |

|             |                   |   |   |
|-------------|-------------------|---|---|
|             |                   | number<br>do not accept different numbers of neutrons<br>any mention of fewer/more protons/<br>electrons negates mark<br>accept answers in terms of U-238<br>providing U-238 is specifically stated<br>i.e. U-238 has (3) more neutrons |   |
| c)ii)       | neutron           |   | 1 |
| c)iii)      | (nuclear) fission | accept fision<br>do not accept any spelling that may<br>be<br>taken as fusion   | 1 |
| Total marks |                   |   | 7 |

### QUESTION 3

| QUESTION | ANSWER                                  | EXTRA INFORMATION  | MARKS      |
|----------|---|--|------------|
| a)i)     | All correct                             | accept presented as a tally chart<br><br>allow 1 mark for 1 correct  | 2          |
| a)ii)    | 7<br><br>number of protons and neutrons | reason may score even if 7 not<br>chosen<br>accept number of particles in the<br>nucleus<br>accept number of nucleons<br>do not accept number of electrons | 1<br><br>1 |

|             |   |   |   |
|-------------|---|---|---|
|             |   | and neutrons                                  |   |
| b)          | an ion  |   | 1 |
| c)i)        | smaller than  |   | 1 |
| c)ii)       | radon loses an alpha (particle)<br>or<br>radon loses an (alpha) particle<br>or<br>(mass of) polonium plus an alpha<br>= (mass) radon<br>or<br>radon loses 2 protons and 2<br>neutrons<br>(to become polonium) | accept radon has less protons and<br>neutrons | 1 |
| Total marks |   |   | 7 |

#### QUESTION 4

| QUESTION | ANSWER  | EXTRA INFORMATION          | MARKS |
|----------|---|----------------------------|-------|
| a)       | electron(s)   |                            | 1     |
| b)       | 3rd box ticked<br><br>The model cannot explain the<br>results from a new experiment |                            | 1     |
| c)       | All correct   | allow 1 mark for 1 correct | 2     |

|                 |   |                 |        |          |         |  |  |
|-----------------|---|-----------------|--------|----------|---------|--|--|
|                 | <table border="1"> <tr> <td><b>Particle</b></td> </tr> <tr> <td>Proton</td> </tr> <tr> <td>Electron</td> </tr> <tr> <td>Neutron</td> </tr> </table> | <b>Particle</b> | Proton | Electron | Neutron |  |  |
| <b>Particle</b> |   |                 |        |          |         |  |  |
| Proton          |   |                 |        |          |         |  |  |
| Electron        |   |                 |        |          |         |  |  |
| Neutron         |   |                 |        |          |         |  |  |
| Total marks     |   |                 | 4      |          |         |  |  |

### QUESTION 5

| QUESTION    | ANSWER                        | EXTRA INFORMATION  | MARKS      |
|-------------|-------------------------------|--|------------|
| a)          | proton<br>electron<br>neutron | all 3 in correct order<br><br>allow 1 mark for 1 correct<br><br>do not accept letters p, e, n  | 2          |
| b)          | 4<br>number of protons        | reason only scores if 4 is chosen<br><br>accept number of electrons<br><br>accept there are 4 protons and<br>4 electrons<br><br>do not accept there are 4 protons<br>and electrons | 1<br><br>1 |
| c)          | The atom loses an electron.   |  | 1          |
| Total marks |                               |  | 5          |

**QUESTION 6**

| QUESTION    | ANSWER  | EXTRA INFORMATION   | MARKS      |
|-------------|---|---|------------|
| a)          | 78  |   | 1          |
| b)          | atomic  |   | 1          |
| c)i)        | 131<br>54   | correct order only  | 1<br>1     |
| c)ii)       | 32 (days)   | allow 1 mark for showing<br>4 half-lives provided no<br>subsequent step   | 2          |
| c)iii)      | limits amount of iodine-131 /<br>radioactive iodine that can be<br>absorbed<br><br>so reducing risk of cancer (of the<br>thyroid) | accept increases level of<br>non-radioactive iodine in thyroid<br>do not accept cancels out iodine-<br>131<br>accept stops risk of cancer (of the<br>thyroid) | 1<br><br>1 |
| Total marks |   |   | 8          |