| Question number | Expected Answer | Accept | Reject | Marks |
|---|---|---|---|---|
| 1 (a) | **M1** both protons = 6<br><br>**M2** C-13 has 7 **and** C-14 **has** 8 (neutrons) | | | 1<br><br>1 |
| (b) | same electronic configuration(s) / structure(s)<br>**OR**<br>same <u>number</u> of electrons<br>OR<br>have <u>four/same number of</u> electrons in <u>outer / valence</u> shell<br><br>IGNORE same number of electrons in inner shells<br>IGNORE references to atomic number / same number of protons / different number of neutrons | amount for number / six electrons | different number of protons | 1 |
| (c) (i) | M1 the average / mean mass of an <u>atom</u> (of the element)<br><br>M2 compared to / relative to (1/12$^{th}$) the mass (of an atom) of carbon-12<br><br>OR<br>M1 mass of one mole of <u>atoms</u><br><br>M2 compared to (mass of) 1/12$^{th}$ one mole **/** 1g of carbon-12 | average/mean of:<br>atomic masses /<br>mass numbers /<br>mass of isotope<u>s</u><br><br>on a scale where carbon-12 has a mass of 12<br>/ compared with the mass of carbon-12 which is 12 | mean mass of an element<br><br>mass of one mole of the element | 1<br><br>1 |

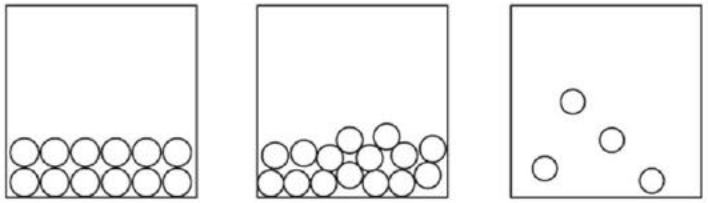
| Question number | Expected Answer | Accept | Reject | Marks |
|---|---|---|---|---|
| 1 c (ii) | M1 (12 x 98.9) + (13 x 1.1)<br><br>M2 ÷ 100<br><br>M3 12.01<br><br>IGNORE units | (12 x 0.989) + (13 x 0.011) for first 2 marks<br><br><br>12.011 on its own for 2 marks<br><br>12.01 on its own for 3 marks | | 1<br><br>1<br><br>1 |

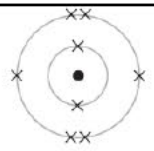
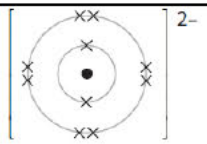
| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 2 (a) | electron(s) | | 1 |
| (b) | electron(s) | | 1 |
| (c) (i) | protons (and) electrons | Accept in either order both answers | 1 |
| (ii) | protons | | 1 |
| | neutrons | | 1 |
| (d) (i) | 12 | | 1 |
| (ii) | 24 | | 1 |
| (iii) | 2.8.2 | Accept any other punctuation marks, such as , / ) — and no punctuation marks | 1 |

**Total 8 marks**

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 3 (a) | 3 | | 1 |
| (b) | ammonia / $NH_3$<br>hydrogen chloride / HCl | Do not accept ammonium<br>Do not accept hydrochloric acid<br>Accept in either order.<br>If name and formula given, both must be correct.<br>Ignore state symbols, except HCl (aq) | 1<br>1 |
| (c) | ammonium chloride / $NH_4Cl$ | Do not accept ammonia chloride.<br>If name and formula given, both must be correct. | 1 |
| (d) | cross in box 2 (decomposition)<br>cross in box 4 (neutralisation) | | 1<br>1 |

**Total 6 marks**

| Question number | | | Answer | Notes | Marks |
|---|---|---|---|---|---|
| 4 | a | |  ☐ ☐ ☒ | | 1 |
| | | | | | |
| | b | i | A (an electron) | | 1 |
| | | | | | |
| | | ii | B (a neutron) | | 1 |
| | | | | | |
| | | iii | B (electrons and protons) | | 1 |
| | | | | | |
| | c | | isotopes | | 3 |
| | | | atomic numbers | | |
| | | | mass numbers | | |
| | | | | **Total 7 marks** | |

| Question number | Answer | Accept | Reject | Marks |
|---|---|---|---|---|
| 5 (a) | releases thermal energy | releases heat (energy)<br>produces an increase in temperature | just releases energy | 1 |
| (b) | <br>D | | | 1 |
| (c) | <br>A | | | 1 |
| (d) | **M1** (consists of) positive <u>AND</u> negative/oppositely charged ions/$Mg^{2+}$ <u>AND</u> $O^{2-}$ (ions)<br>**IGNORE** references to loss and gain of electrons<br><br>**M2** (strong) attraction between (positive <u>AND</u> negative/ oppositely charged) ions/$Mg^{2+}$ <u>AND</u> $O^{2-}$ (ions)<br><br>**M3** many ions (present in lattice)/giant structure/giant lattice<br><br>**M4** large amount of energy required (to separate the ions/overcome the attraction between the ions)<br><br>If mention of covalent bonds/metallic bonds/intermolecular forces only **M4** can be awarded | <br><br>(strong) ionic bonding/(strong) ionic bonds<br><br><br><br>break the ionic bonding/bonds | | 4 |
| 7 (e) | **M1** (name) magnesium chloride<br><br>**M2** (formula) $MgCl_2$<br><br>Penalise inappropriate use of upper or lower case letters or numbers in the wrong place | <br><br>accept a correct formula as a <u>product</u> in an equation whether the equation correct or not | | 1<br><br>1 |
| | | | **Total** | **9** |

| Question number | | | | Answer | Notes | Marks |
|---|---|---|---|---|---|---|
| 6 | a | | M1 | nucleus | | 1 |
| | | | M2 | protons | Accept in either order | 1 |
| | | | M3 | neutrons | | 1 |
| | | | M4 | electrons | | 1 |
| | | | M5 | shells | | 1 |
| | | | M6 | protons AND electrons | In either order | 1 |
| | | | M7 | electrons | | 1 |
| | b | i | | 3 | | 1 |
| | | ii | | 5 | | 1 |