

| Question | Answer | Marks | AO Element | Notes | Guidance |
|----------|---|----------|------------|-------|----------|
| 1(a) | Mg ²⁺ / magnesium | 1 | | | |
| 1(b) | potassium chloride | 1 | | | |
| 1(c) | 0.032 (g) | 1 | | | |
| 1(d) | sodium chloride | 1 | | | |
| 2(a) | C | 1 | | | |
| 2(b) | E | 1 | | | |
| 2(c) | B | 1 | | | |
| 2(d) | A | 1 | | | |
| 2(e) | A | 1 | | | |
| 3 | electrons in K ⁺ : 18 (1) neutrons in ¹⁴ C: 8 (1) protons in ¹⁴ C and K ⁺ : 6 AND 19 (1) | 3 | | | |
| 4 | electrons in Cu ⁺ : 28 (1) neutrons in Ne: 12 (1) protons Ne 10 AND Cu ⁺ : 29 (1) | 3 | | | |

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|----------|---|-------|------------|-------|----------|
| 5 | E | 1 | | | |
| 6 | C | 1 | | | |
| 7 | A | 1 | | | |
| 8 | 2 : 8 : 8 : 2 | 1 | | | |
| 9(a) | same number of (or 2) outer electrons | 1 | | | |
| 9(b) | (Sr has) outer electrons in the 5th shell | 1 | | | |
| 10(a) | M1 11 M2 18 M3 2.8.8 M4 -1 | 4 | | | |
| 10(b) | A AND B | 1 | | | |
| 10(c) | Li/Lithium | 1 | | | |
| 10(d) | it has, a complete / full / 8 electrons, in the outer shell | 1 | | | |

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|----------|---|-------|------------|-------|--|
| 11 | <u>atoms</u> (of an element) with the same number of protons but different number of neutrons | 2 | | | IF 2 marks not scored: 1 mark for idea of same number of protons but different number of neutrons |
| 12 | One mark each for any 5 of: <ul style="list-style-type: none"> • protons in the nucleus / centre (of the atom) • neutrons in the nucleus / centre (of the atom) • electrons outside the nucleus / electrons surrounding the nucleus / electrons orbiting the nucleus • 9 protons • 9 electrons • 10 neutrons | 5 | | | |
| 13 | neon/Ne | 1 | | | |
| 14 | element | 1 | | | |
| | atomic | 1 | | | |
| | nucleons | 1 | | | |
| 15 | nitrogen/N ₂ | 1 | | | |

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| 16 | One mark each for any 5 of: <ul style="list-style-type: none"> • protons in the nucleus / centre (of the atom) • neutrons in the nucleus / centre of the atom • electrons outside the nucleus / electrons surrounding the nucleus / electrons orbiting the nucleus • 8 protons • 8 electrons • 9 neutrons | 5 | | | |
| 17 | bonding pair of electrons (1) 6 non-bonded electrons in each Cl atom (1) | 2 | | | |

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| 18 | <p>One mark each for any 5 of:</p> <ul style="list-style-type: none"> • protons in the nucleus / centre (of the atom) / middle • neutrons in the nucleus / centre (of the atom) / middle • electrons outside the nucleus / electrons surrounding the nucleus / electrons orbiting the nucleus • 7 protons • 7 electrons • 8 neutrons | 5 | | | |
| 19 | Isotopes of the same element have different numbers of neutrons | 1 | | | |
| | The isotope ${}_{92}^{235}\text{U}$ is a source of energy | 1 | | | |

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| 20 | 2.8.1 | 1 | | | |
| 21 | a substance made from two (or more) elements (1) chemically combined (1) | 2 | | | |
| 22(a) | radioisotopes | 1 | | | |
| 22(b) | ^{286}Fl 114p 172n 114e (1) ^{289}Fl 114p 175n 114e (1) | 2 | | | |
| 23(a) | calcium / Ca | 1 | | | |
| 23(b) | 7 | 1 | | | |
| 23(c) | 4 | 1 | | | |
| 24 | Row 1: 12 (1) Row 2: 17 (1) 18 (1) 37 (1) Row 3: Fe (1) 2+ (1) | 6 | | | |
| 25 | similar: number of protons AND electrons (1) different: number of neutrons (1) | 2 | | | |
| 26 | 3+ | 1 | | | |

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| 27 | protons: 8 neutrons: 9 electrons: 8 | 3 | | | |
| 28(a) | 25 (mg) | 1 | | | |
| 28(b) | potassium / K ⁺ | 1 | | | |
| 28(c) | magnesium sulfate | 1 | | | |
| 28(d) | add nitric acid (1) add (aqueous) silver nitrate (1) white precipitate / ppt (1) | 3 | | | |
| 29(a) | E / oxygen / O ₂ | 1 | | | |
| 29(b) | A / sodium bromide / NaBr | 1 | | | |
| 29(c) | E / oxygen / O ₂ | 1 | | | |
| 30 | <u>atoms</u> of the same element with the same <u>number</u> of protons but a different <u>number</u> of neutrons | 1 | | | |
| 31(a) | <i>graphite</i> : conducts (1) <i>potassium</i> : conducts (1) | 2 | | | |

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|-----------|---|-------|------------|--|----------|
| 31(b) | low boiling point | 1 | | | |
| 31(c) | does not conduct when solid but conducts when molten | 2 | | If full credit is not awarded, allow 1 mark for conducts when molten | |
| 32 | number of protons: 15 (1) number of neutrons: 16 (1) | 2 | | | |
| 33 | <i>number of protons</i> : 1 (1) <i>number of neutrons</i> : 2 (1) | 2 | | | |
| 34 | labels 'N' and 'H' in the correct circles (1) one pair of electrons in each overlap area and no non-bonding electrons or extra bonding electrons added (1) | 2 | | | |
| 35 | <i>Si</i> : 2 : 8 : 4 (1) <i>Ca²⁺</i> : 2 : 8 : 8 (1) <i>N³⁻</i> : 2 : 8 (1) | 3 | | | |
| 36(a)(i) | B | 1 | | | |
| 36(a)(ii) | A | 1 | | | |

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| 36(a)(iii) | C | 1 | | | |
| 36(a)(iv) | E | 1 | | | |
| 36(b) | O^{2-} M1 O M2 $^{2-}$ | 2 | | | |
| 37 | Na 11 11 (1) S^{2-} 16 18 (1) Cl_2 34 34 (1) | 3 | | | |
| 38(a) | 10 | 1 | | | |
| 38(b) | 22 | 1 | | | |
| 38(c) | A AND B | 1 | | | |
| 38(d) | A AND B | 1 | | | |
| 38(e) | C AND D | 1 | | | |
| 39(a) | A | 1 | | | |
| 39(b) | E | 1 | | | |
| 39(c) | C | 1 | | | |

- Mark Scheme

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| 39(d) | B | 1 | | | |
| 39(e) | C | 1 | | | |
| 40 | number of electrons in $\text{Br}^- = 36$ (1) number of neutrons in $\text{Cl} = 18$ (1) number of protons in $\text{Cl} = 17$ AND number of protons in $\text{Br}^- = 35$ (1) | 3 | | | |
| | | | | | [Total: 121] |