GCSE and IGCSE Chemistry: Atomic Structure Worksheet - Mark Scheme

Year 10-11 · GCSE (AQA 4.1) and Cambridge IGCSE 0620 topics 2 and 9 · Exam-style questions

Section A: Sub-atomic particles [25 marks]

1	Proton: 1, +1, nucleus. Neutron: 1, 0, nucleus. Electron: very small (1/1840), ?1, shells / energy levels around the nucleus. Guidance: 1 mark for each correct box.	**9**
2	(a) Number of protons in the nucleus (1). (b) Total number of protons and neutrons (1). (c) Atoms of the same element with the same number of protons (1) but different numbers of neutrons (1).	**4**
3	Na: 11, 12, 11. Cl?: 17, 18, 18. Mg2+: 12, 12, 10. O2?: 8, 8, 10. Guidance: 1 mark for each correct box (12 boxes).	**12**

Section B: Electron configuration and the periodic table [20 marks]

4	Na: 2,8,1; Group 1; Period 3. Cl: 2,8,7; Group 7; Period 3. Ca: 2,8,8,2; Group 2; Period 4. Ar: 2,8,8; Group 0 (8); Period 3. Guidance: 1 mark for each correct box (12 boxes). Accept Group 8 for argon.	**12**
5	They have the same number of electrons in the outer shell (1) so they react in similar ways (1).	**2**
6	(35 × 75 + 37 × 25) ÷ 100 (2) = 35.5 (1) Guidance: Allow 2 marks for correct method with an arithmetical error.	**3**
7	(63 × 69 + 65 × 31) ÷ 100 (2) = 63.6 (1)	**3**

Section C: Group trends [11 marks]

8	Both have one electron in the outer shell (1). In potassium the outer electron is further from the nucleus and more shielded (1) so it is held less strongly and lost more easily (1).	**3**
9	chlorine + potassium bromide ⟶ potassium chloride + bromine (2). The solution turns orange / brown (1).	**3**
10	Bromine is less reactive than chlorine (1). A more reactive halogen displaces a less reactive one, so no reaction (1).	**2**
11	They have a full outer shell of electrons, so they do not need to gain, lose or share electrons.	**1**
12	Any two: higher melting points; higher density; harder / stronger; form coloured compounds; used as catalysts; less reactive.	**2**

Section D: Development of the atomic model [9 marks]

13	Dalton; Thomson; Rutherford; Bohr. Guidance: 1 mark each.	**4**
14	Most passed straight through: the atom is mostly empty space (1). A few deflected: the nucleus is positively charged (1). Very few bounced back: the nucleus is tiny and very dense and contains most of the mass (1).	**3**
15	Plum pudding could not explain the large-angle deflections (1). Alpha scattering evidence showed a small, dense, positive nucleus (1).	**2**

Total: 65 marks. Accept any scientifically correct alternative wording.