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| **1.** | (a) | Proton number/nuclear charge increases (M1); shielding stays the same (M2)  Attraction between nucleus and outer shell electrons increases (M3) |
|  | (b) | Number of shells increases so shielding increases (M4); Increase in shielding outweighs increase in nuclear charge (M5); Attraction between nucleus and outer shell electrons decreases (M6)  [max 5] |
| **2.** | (a) | Ability of an atom to attract bonding electrons (M1) |
|  | (b) | Sodium has low electronegativity so a weak attraction to bonding electrons (M2); it allows the electrons to delocalise (M3); chlorine has high electronegativity so a strong attraction to bonding electrons (M4)  it does not allow the electrons to delocalise/forms a covalent bond (M5)  [5] |
| **3.** | (a) | 4Li + O2 🡪 2Li2O (M1) |
|  | (b) | Sodium peroxide (M2); 2Na + O2 🡪 Na2O2 (M3); Correct reference to ion: peroxide contains O22-; oxide contains O2- (M4); Correct reference to oxidation number of O: -1 in peroxide; -2 in oxide (M5)  [5] |
| **4.** | (a) | Be2+ smaller than Mg2+ (ORA)/Be2+ has a higher charge density Mg2+ (ORA) (M1)  Be2+ has more polarising power than Mg2+ (ORA) (M2)  Be2+ can distort the charge cloud on Cl- to form a covalent bond but Mg2+ cannot (ORA) (M3) |
|  | (b) | MgCl2 🡪 Mg2+ + 2Cl- (M4); BeCl2 + 2H2O 🡪 Be(OH)2 + 2HCl (M5)  [5] |
| **5.** | (a) | Be2C and CaC2 (M1); Be2C: methanide or contains C4- (M2); CaC2: acetylide/ percarbide/ contains C22- (M3) |
|  | (b) | CaO does not dissolve in NaOH/no reaction (M4); BeO dissolves and BeO + 2NaOH 🡪 Na2BeO2 + H2O (M5)  [5] |
| **6.** | (a) | cations become larger (M1)  weaker attraction between cations and delocalised electrons/ weaker metallic bonding (M2) |
|  | (b) | More electrons per molecule/greater surface area per molecule (M3); More/stronger Van der Waal’s forces between molecules (M4); More energy needed to break bonds (in either (a) or (b)) (M5)  [5] |
| **7.** | (a) | Add nitric acid followed by aqueous silver nitrate (M1); KCl – white precipitate (M2)  Potassium iodide – yellow precipitate (M3) |
|  | (b) | Add aqueous NaOH (M4); MgCl2 – white precipitate (M5); BaCl2 – no precipitate (M6)  OR Add dilute H2SO4 (M4); MgCl2 – no precipitate (M5); BaCl2 – white precipitate (M6)  [max 5] |
| **8.** | (a) | Reducing power increase down the group (M1)  More shells/more shielding so outer electrons more easily lost (M2) |
|  | (b) | With NaCl: no redox reaction (M3)  With NaBr: SO2 and Br2 (M4)  With NaI: S/H2S and I2 (M5)  Because I- more strongly reducing than Br- which is more strongly reducing than Cl- (M6)  [max 5] |