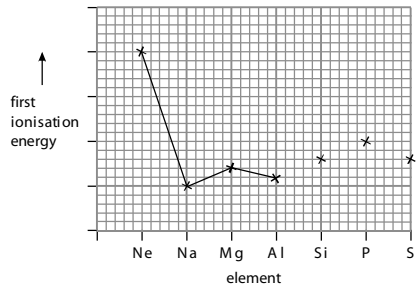
# Answers to examination-style questions

| Answers | Marks | Examiner's tips |
|---|---|---|
| **1 (a)** elements in the p-block have their outer electrons in p-orbitals | **1** | |
| example of any p-block element | **1** | |
| with the correct electronic configuration | **1** | |
| **(b)** pattern in the change in the properties of a row of elements | **1** | |
| repeated in the next row or element underneath (or in same group) has similar properties | **1** | |
| atomic radius decreases across the row | **1** | If the trend you give is wrong you will lose the explanation marks as well – so learn and understand the trends. |
| number of protons (or nuclear charge) increases | **1** | Remember that the nuclear charge increases across the period; then try and work out the rest. |
| more attraction for electrons in the same shell | **1** | |
| conductivity decreases along the row | **1** | |
| Na–Al metals | **1** | |
| and Si–Ar non-metals | **1** | |
| *either* electrons free to move (delocalised) in metals | | |
| *or* electrons unable to move in non-metals | **1** | |
| **2** increased nuclear charge | **1** | If you say the effective nuclear charge increases you get both the last two marks |
| same shielding/electrons added to same level | **1** | |
| therefore outer electrons attracted more strongly | **1** | |
| **3 (a)**   | **3** | |
| **(b)** $Ne(g) \rightarrow Ne^{+}(g) + e^{-}$ | **1** | |
| **(c)** *explanation for neon*: neon's electron is in a lower energy level | **1** | |
| attracted more strongly to the nucleus | **1** | |
| *explanation for magnesium*: more protons | **1** | |
| electrons in same shell or similar shielding | **1** | |
| **(d)** Al outer electron is in a 3p sub-level | **1** | |
| which is higher in energy than 3s in magnesium | **1** | |
| **(e)** *element with lowest melting point*: neon | **1** | |
| *explanation*: free atoms | **1** | |
| weak van der Waals forces between atoms | **1** | |
| **(f)** *element with highest melting point*: silicon | **1** | Silicon has a giant structure with many covalent bonds which need to be broken. Hence the high melting point. |
| *explanation*: macromolecular | **1** | |
| covalent bonds must be broken | **1** | |

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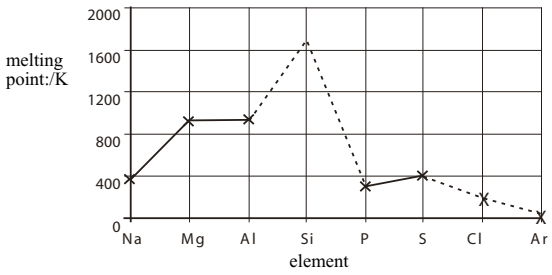
| **4 (a)** $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$ | **1** | |
| **(b) (i)** increases | **1** | |
| **(ii)** lower than expected / lower than Mg / less energy needed to remove an electron from a (3)p sub-level | **1** | |
| which is further away from nucleus or shielded by completed 3s orbital | **1** | |
| **(c)** $Al^+(g) \rightarrow Al^{2+}(g) + e^-$ | **1** | When you are asked for the second ionisation energy you must start with an ion. This is the removal of the second electron. Don't forget it takes much more energy since an electron is being taken from a + charge. |
| **(d)** trend: increases | **1** | |
| more protons / smaller atomic radius | **1** | |
| stronger attraction between cations and delocalised $e^-$ / stronger metallic bonding | **1** | |
| **5 (a) (i)**   | | |
| Si: cross≥ 1200 | **1** | |
| Cl: cross below S | **1** | |
| Ar: cross below Cl | **1** | |
| **(ii)** Si is macromolecular | **1** | You must say broken bonds not just weakened bonds. Silicon has a giant structure with many covalent bonds that need to be broken. |
| covalent bonds need to be broken | **1** | |
| a covalent bond is strong and requires much energy to break | **1** | If van der Waals or other forces are mentioned you lose the marks! You also lose them if you mention ions because they are not there! |
| **(iii)** intermolecular force = van der Waals/ induced | | |
| this is greater with greater $M_r$ | **1** | |
| sulfur has greater $M_r$ | **1** | |
| **(b)** *trend*: decreases | **1** | If the trend is wrong you lose the explanation marks too. |
| increase in size of atom | **1** | |
| weaker attraction for delocalised electrons/ weaker metallic bonding | **1** | |

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| **6** macromolecular | **1** | If you say giant covalent structure |
| held together by covalent bonds | **1** | you get both the marks. |
| lot of energy needed to <u>break</u> covalent bonds | **1** | |
| van der Waals forces between molecules of sulfur and between molecules of phosphorus | **1** | |
| forces increase with size or with number of electrons or with surface area etc | **1** | Your description must refer to the molecules. |
| $P_4$ or $M_r = 124$ | **1** | |
| $S_8$ or $M_r = 256$ | **1** | |
| **7 (a)** energy change when an electron is removed | **1** | |
| from a <u>gaseous</u> atom | **1** | |
| to form a uni-positive ion | | |
| **(b)** $1s^2 2s^2 2p^6$ | **1** | Remember the order of filling up the orbitals. |
| **(c)** 's'-block | **1** | Don't give a specific 's' orbital, e.g. |
| **(d)** $Mg^+(g) \rightarrow Mg^{2+}(g) + e^-$ | **1** | 1s. |
| **(e)** $Mg^{2+}$ ion smaller than Ne atom | **1** | |
| $Mg^{2+}$ has more protons than Ne *or* $e^-$ is removed from a charged $Mg^{2+}$ ion | | |
| whereas the neon atom is neutral | **1** | |
| **(f) (i)** *trend*: increases | **1** | If the trend is wrong you will lose |
| *explanation*: more protons or increased nuclear charge | **1** | this mark and the next 2 marks, so get it right! |
| same level or same shielding | **1** | |
| **(ii)** reference to the $e^-$ pair in the 3p sub-level | **1** | You must refer to the 3p level only. |
| repulsion between the electrons in this $e^-$ pair | **1** | |