InkChemistry

QUESTION WORKBOOK

Periodicity: trends across Period 3 and the blocks of the table

Periodicity and Period 3 · Unit C12

AQA 3.2.1.1, 3.2.1.2 · OCR A 3.1.1

17 questions · 52 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 PTA-Q12

Calculate the energy, in kJ, needed to turn 0.540 g of gaseous aluminium atoms into $Al^{+}(g)$ ions. The first ionisation energy of aluminium is 578 kJ mol^{-1} and its relative atomic mass is 27.0. [2]

A2 PTA-Q14

Suggest why tables of atomic radius for Period 3 often give no value for argon that can be compared with the others. [2]

A3 PTA-Q20

Suggest which of K^{+} and Cl^{-} is the smaller ion, and why. Both have the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6$. [2]

A4 PTA-Q1

State what is meant by the term periodicity. [1]

SECTION B · Standard, 3 to 5 marks

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B1 PTA-Q2 Identify the block of the periodic table to which calcium, $[Ar]4s^2$, and bromine, $[Ar]3d^{10}4s^24p^5$, belong, giving a reason for each. Then give the full electron configuration of silicon and identify its block. [4]

B2 PTA-Q6 Explain why, although the first ionisation energy rises across Period 3, it falls from magnesium to aluminium and from phosphorus to sulfur. [4]

B3 PTA-Q15 Compare the trend in melting point across Period 2 with the trend across Period 3. [4]

B4 PTA-Q4 Explain why the atomic radius of the elements decreases across Period 3 from sodium to chlorine. [3]

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B5 PTA-Q5 Explain the general increase in first ionisation energy across Period 3. [3]

B6 PTA-Q7 Explain why magnesium has a higher melting point than sodium. [3]

B7 PTA-Q8 Explain why silicon has the highest melting point of the Period 3 elements. [3]

B8 PTA-Q13 Suggest the structure of germanium, which is directly below silicon in group 4, and suggest why germanium melts at 1211 K, lower than silicon's 1687 K. [3]

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B9 PTA-Q17 Outline how the electrical conductivity of the elements changes across Period 3, with a reason for each part of the pattern. [3]

B10 PTA-Q18 Explain why the ionic radius falls from Na^{+}, 0.102 nm, to Mg^{2+}, 0.072 nm, to Al^{3+}, 0.054 nm. [3]

B11 PTA-Q19 Explain why the sulfide ion, S^{2-}, radius 0.184 nm, is larger than the sulfur atom, radius 0.104 nm. [3]

B12 PTA-Q21 Justify the statement that argon has the lowest melting point of the Period 3 elements, although solid chlorine and solid argon are held together by the same kind of force. [3]

SECTION C · Long, 6 marks or more

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C1 PTA-Q10 Describe and explain the trend in the melting points of the elements across Period 3 from sodium to argon. [6]

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