InkChemistry

QUESTION WORKBOOK

Shapes of molecules and ions

Bonding and structure · Unit C03

AQA 3.1.3.5 · OCR A 2.2.2

20 questions · 61 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 SM-Q1 State the principle of electron-pair repulsion theory. [2]

A2 SM-Q4 Give the shape of the oxonium ion, H_3O^+, and its bond angle. [2]

A3 SM-Q13 Suggest the shape of a molecule of sulfur dichloride, SCl_2, and estimate its bond angle. [2]

A4 SM-Q21 Suggest the shape of the nitrate ion, NO_3^-, and its bond angle, given that it is isoelectronic with BF_3. [2]

A5 SM-Q2 State the order of strength of the three kinds of repulsion between electron pairs. [1]

SECTION B · Standard, 3 to 5 marks

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B1 SM-Q5 Explain the shape of an ammonia molecule and why its bond angle is 107°. [4]

B2 SM-Q7 Explain the shape of a PCl_5 molecule, giving its bond angles. [4]

B3 SM-Q14 Compare the shapes of CO_2 and SO_2, explaining the difference. [4]

B4 SM-Q17 Outline how the number of electron pairs round the iodine atom in the ion IF_4^+ is found, and use it to deduce the shape of the ion. [4]

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B5 SM-Q6 Explain why the H–N–H bond angle in NH_4^+ is larger than in NH_3. [3]

B6 SM-Q8 Explain why XeF_4 is square planar. [3]

B7 SM-Q9 Explain why the ClF_3 molecule is T-shaped, with F–Cl–F angles a little under 90°. [3]

B8 SM-Q10 Describe how a methane molecule is drawn to show its three-dimensional shape. [3]

B9 SM-Q11 Suggest the shape of a BrF_5 molecule and estimate its bond angle. [3]

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B10 SM-Q12 Suggest the shape of the triiodide ion, I_3^-, and give its bond angle. [3]

B11 SM-Q15 Evaluate a student's prediction that XeF_2 is bent, like water, because both have two bonded atoms and lone pairs on the central atom. [3]

B12 SM-Q18 Suggest the shape of the amide ion, NH_2^-, and estimate its bond angle. [3]

B13 SM-Q19 Explain how the shape round the boron atom changes when ammonia and boron trifluoride join to form $H_3N{\rightarrow}BF_3$. [3]

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B14 SM-Q20 Explain why benzene, C_6H_6, is a planar molecule with bond angles of 120°. [3]

SECTION C · Long, 6 marks or more

C1 SM-Q16 Explain how electron-pair repulsion theory accounts for the bond angles in CH_4, NH_3 and H_2O. [6]

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