Bonding, structure and properties

AQA 8462 Separate Chemistry · Foundation and Higher

Show your working where needed.

Name _____ Date _____

1. A water molecule

Draw an outer-shell dot-and-cross diagram for one water molecule, H_2O. Use different symbols for hydrogen and oxygen electrons.

2. What holds a salt together?

Sodium chloride contains Na^+ and Cl^- ions in a giant lattice. What holds these ions together and why does melting the solid need much energy?

3. A change in conductivity

Solid magnesium chloride does not conduct electricity. Molten magnesium chloride does. Explain the difference.

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4. Boiling hexane

Hexane, C_6H_{14}, boils at a much lower temperature than sodium chloride. Use the structure and bonding of each substance to explain this difference.

5. Graphite and diamond

Graphite is used in electrodes. Diamond is used on the edge of a cutting tool. Explain both choices using the structures of the two forms of carbon.

6. Pure aluminium and an alloy

A pure aluminium strip bends more easily than a strip of aluminium alloy of the same size. Explain how adding a different element can change how easily the strip bends.

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7. Two forms of carbon

Graphene is a single sheet of carbon atoms. Diamond is a three-dimensional network. Explain why both structures are strong. Predict which conducts electricity and explain your choice.

8. Classify from measurements

P melts at 801 °C and conducts only when molten. Q melts at 1085 °C and conducts as a solid. R melts at 81 °C and does not conduct as a solid or a liquid. Match the samples to ionic, metallic and simple molecular structures. Explain one result for each.

9. Extra challenge · A heating element and its support

Material P conducts as a solid and can be bent. Material Q is hard, has a very high melting point and never conducts in these tests. Material R conducts only when molten. Choose P, Q or R for a solid heating element that must bend and for an electrical insulating support that will be heated. Give a structure-based reason for each choice and explain why molten R conducts.

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