

Exercises 4

- 1 Briefly describe the three different "solutions" nature has found for binding two atoms to form a chemical compound. Name an example for each.
- 2 Which of the following properties is (are) typical for compounds with ionic bonds?*

 - a) they all form solid and brittle crystals
 - b) they are all water soluble
 - c) if they are water soluble, the solutions are electrical conductors
 - d) all form well defined crystalline lattices
 - e) the structure of their lattice depends on the ionic radius
 - f) if they are heated above their melting points, the ionic bond is always destroyed

- 3 Which among the following statements correctly describe(s) the characteristics of an ideal metallic bond?*

 - a) all electrons are localized within a small volume around each nucleus
 - b) electrons are moving freely within the complete lattice volume
 - c) the electronic structure in metallic bonds completely inhibits plastic deformation of the lattice
 - d) all lattices with metallic bonds are good electrical conductors
 - e) metallic bonds are responsible for the characteristic shiny appearance of metals

- 4 Which among the following statements correctly describe(s) the characteristics of an ideal covalent bond between two atoms of a molecule?*

 - f) bond electrons are localized around the molecule
 - g) bond electrons can be easily exchanged between adjacent molecules
 - h) covalent bonds necessarily lead to a large atomic lattice
 - i) all lattices with covalent bonds are good electrical conductors
 - j) covalent bonds are generally found in metallic lattices
 - k) covalent bonds do not occur between elements of the same kind

- 5 Try to explain the similarities and the differences between the valence bond model and the molecular orbital model for covalent bonds.
- 6 Why does the valence bond model need a step called hybridization to describe the geometry of some molecules correctly? Name an example for a molecule where it is necessary and explain the result of hybridization.

* One or several answers may be correct. Please indicate appropriately by repeating the assignments a), b), c), ... followed by the statements "right" or "wrong" on your answer sheet.