2025 Ch H2 Q3

Section: Chemical Changes and Structure
Topic: Structure and Bonding

Question Summary:
This question asks you to explain how the bonding continuum from pure covalent to ionic bonding can be understood using electronegativity, and how a compound's position on the continuum predicts both bonding type and physical properties.

Worked Solution

Bonding exists on a continuum between pure covalent and ionic. In pure covalent bonding, electrons are shared equally between atoms of identical electronegativity. In ionic bonding, electrons are transferred completely from a metal to a non-metal due to a very large difference in electronegativity.

Electronegativity is key to determining where a compound sits on this continuum. As the electronegativity difference between two atoms increases, the bond becomes more polar. Moderate differences lead to polar covalent bonds. Very large differences normally produce ionic bonds.

A compound’s position on the bonding continuum predicts its physical properties:
- Pure covalent (non-polar) substances have weak London dispersion forces and therefore low melting and boiling points.
- Polar covalent molecules have stronger permanent dipole–permanent dipole interactions and higher boiling points.
- Ionic compounds form giant lattice structures with strong ionic attractions and therefore have high melting points, conduct electricity when molten or in solution, and are usually soluble in water.

Final Answer

The bonding continuum is explained through differences in electronegativity. Small or zero electronegativity differences give pure covalent bonding, larger differences give polar covalent bonding, and very large differences give ionic bonding. The position on the continuum determines key properties such as melting point, solubility and electrical conductivity.

Revision Tips

- Learn typical electronegativity differences that distinguish covalent, polar covalent and ionic bonding.

- Link bonding type directly to physical properties: melting point, conductivity, solubility.
- Remember that bonding type predicts structure: ionic lattice, simple covalent molecules, or covalent networks.