2023 Ch H1 Q2

Section: Chemical Changes and Structure

Topic: Structure and Bonding

Question Summary

In which of the following compounds would hydrogen bonding not occur?
A: primary amine (–NH_2 group)
B: alcohol (–OH group)
C: nitrile (–C≡N group)
D: carboxylic acid (–COOH group)

Worked Solution

Hydrogen bonding occurs when a hydrogen atom is covalently bonded to a highly electronegative atom such as nitrogen, oxygen, or fluorine, and there is a lone pair of electrons available for intermolecular attraction.

• A primary amine (–NH_2) has N–H bonds, so hydrogen bonding is possible.
• An alcohol (–OH) has O–H bonds, so hydrogen bonding is possible.
• A carboxylic acid (–COOH) contains an

O–H group and can form strong hydrogen bonds.
• A nitrile (–C≡N) has a polar C≡N bond, but no hydrogen directly attached to nitrogen, so it cannot form hydrogen bonds.

Final Answer

C — Nitrile (–C≡N)

Revision Tips

• Hydrogen bonding requires H covalently bonded to N, O, or F.
• Lone pairs on N or O atoms act as hydrogen bond acceptors.
• Watch out for groups like –C≡N: polar, but no N–H bond, so no hydrogen bonding possible.