

Comparing Bond Types Key

The three compounds SeO_2 , CaH_2 , and Cs_3Sb are each comprised of two atoms whose difference in electronegativity is approximately the same. Yet only one of these compounds conducts electricity in the solid state, only one has a high melting point and dissolves in water to give a solution that conducts electricity, and only one has a relatively low melting point.

First, match the properties described above (e.g. conducts electricity in the solid state) to one of the following types of bonding: covalent, ionic, or metallic. Be sure to explain your reasoning.

covalent \rightarrow relatively low melting point

ionic \rightarrow relatively high melting point and dissolves to give a solution that is conducting

metallic \rightarrow conducts electricity in the solid state

Second, based solely on the relative position of the atoms in the periodic table, match the compounds to their expected type of bonding. Be sure to explain your reasoning.

$\text{SeO}_2 \rightarrow$ covalent; two main group elements

$\text{CaH}_2 \rightarrow$ ionic; metal and non-metal

$\text{Cs}_3\text{Sb} \rightarrow$ metallic; metal and metalloid

Next, using the bond triangle, verify that your assignments of compounds and bonding types are correct. Be sure to show all your work.

$\text{SeO}_2 \rightarrow \Delta\text{EN} = 1.19$ and $\overline{\text{EN}} = 3.015$

$\text{CaH}_2 \rightarrow \Delta\text{EN} = 1.27$ and $\overline{\text{EN}} = 1.665$

$\text{Cs}_3\text{Sb} \rightarrow \Delta\text{EN} = 1.32$ and $\overline{\text{EN}} = 1.32$

For a similar ΔEN a smaller $\overline{\text{EN}}$ means more metallic and a larger $\overline{\text{EN}}$ means more covalent.