

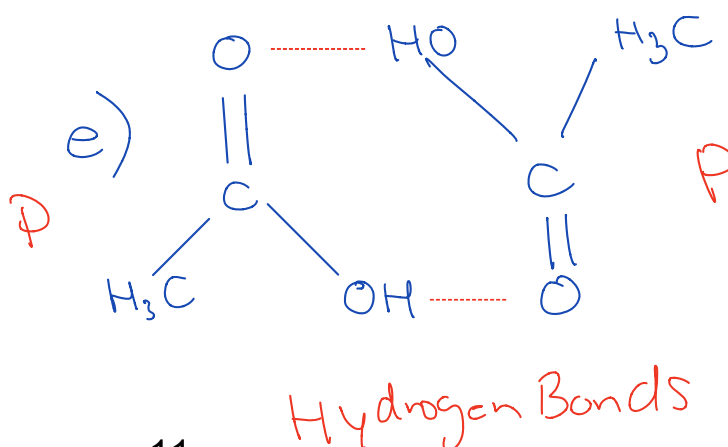
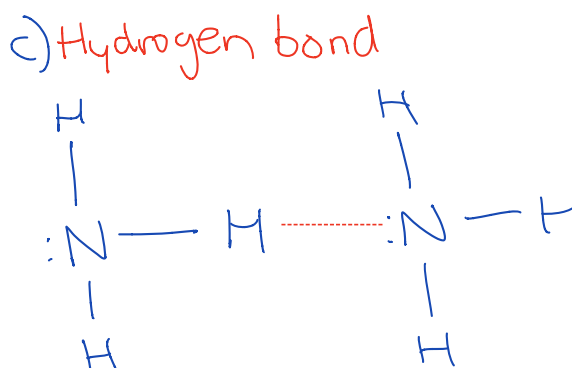
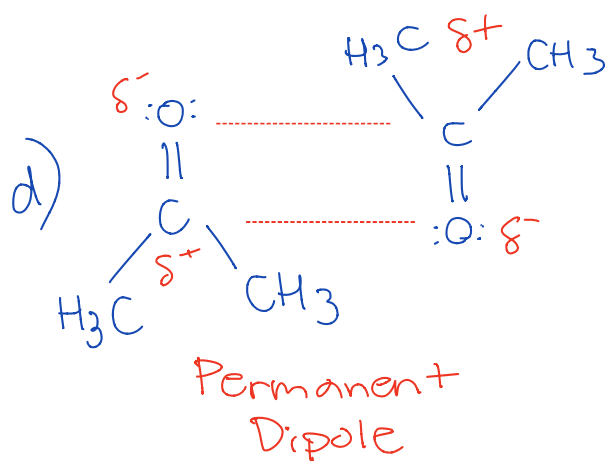
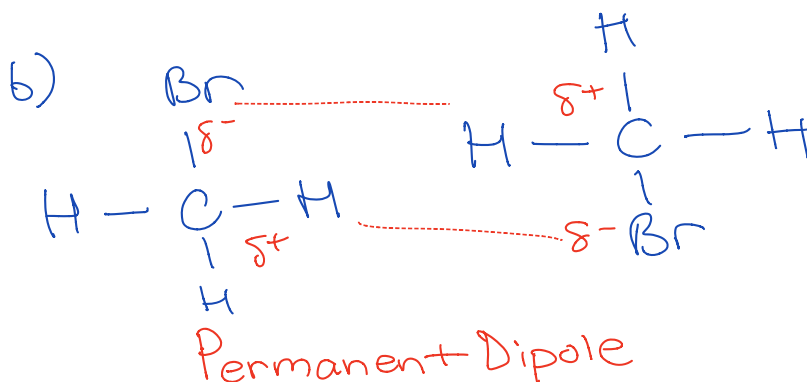
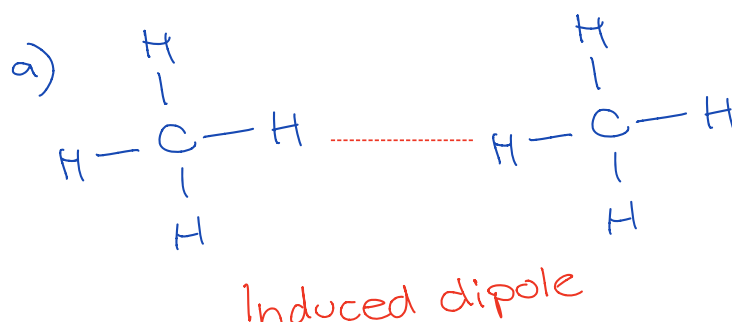
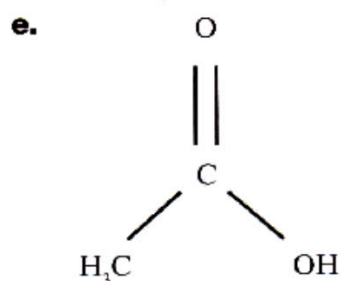
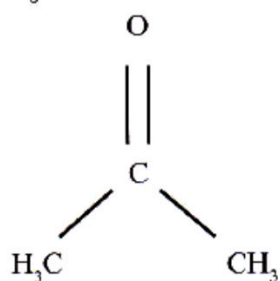
## Skill Problems

**3.3** What kind of bond is formed in each of the following compounds? Explain why.

- a.  $\text{Na}_2\text{S}$  Ionic as  $EN_{\text{S}} = 2.58$ ,  $EN_{\text{Na}} = 0.930$  and  $\Delta EN = 1.65$   
 b.  $\text{CH}_4$  Covalent as  $EN_{\text{C}} = 2.55$ ,  $EN_{\text{H}} = 2.20$  and  $\Delta EN = 0.35$   
 c.  $\text{AlMg}$  Covalent as  $EN_{\text{Al}} = 1.61$ ,  $EN_{\text{Mg}} = 1.31$  and  $\Delta EN = 0.30$   
 d.  $\text{GaAs}$  Covalent as  $EN_{\text{Ga}} = 1.81$ ,  $EN_{\text{As}} = 2.18$  and  $\Delta EN = 0.37$   
 e.  $\text{CS}_2$  Covalent as  $EN_{\text{C}} = 2.55$ ,  $EN_{\text{S}} = 2.58$  and  $\Delta EN = 0.03$

**3.4** What kind of nonbonding interaction occurs in liquids of the following molecules? Draw a picture illustrating the interaction.

- a.  $\text{CH}_4$   
 b.  $\text{CH}_3\text{Br}$   
 c.  $\text{NH}_3$   
 d.



## Conceptual Problems

- 3.6** CdLi and SiC have approximately the same  $\Delta EN$ , but one is a good conductor of electricity and one is not. Identify which compound is a good conductor of electricity, and explain why  $\Delta EN$  is not sufficient to distinguish between them.
- 3.10** The electrical conductivity of copper is approximately  $10^{22}$  times greater than that of diamond. Explain this difference on the basis of the type of bonding present in the two materials.
- 3.12** Is it possible for a pure element to exhibit ionic bonding? Explain why or why not.

3.6 : CdLi has average EN of 1.4 and lies in the metallic region on the bond type triangle.  
SiC has average EN of 2.2 and lies in the covalent region.

CdLi is the better conductor of electricity as it lies in the metallic region.

Jensen (1995) explored the metallic region of the van Arkel-Ketelaar triangle using a "probe, battery, buzzer" conductivity test, found materials within this area are conducting, while materials outside are insulating.

3.10 : Copper has EN of 2.5 and lies in semi-metallic region.  
Carbon has EN of 1.9 (diamond is pure carbon) and lies in covalent region.

Copper has good electrical conductivity as semi metallic. Covalent bonding doesn't allow electrons to move, but in semi-metallic bonding, electrons are free to move. This causes the increase of electrical conductivity in copper rather than diamond.

3.12 : No, it is not possible for a pure element to exhibit ionic bonding. This is because ionic bonds are formed between a low electronegativity atom and a high electronegativity atom. Pure elements do not have this difference in electronegativity, and therefore will not be able to form the bond.