

Organic Chemistry Warm-Up - ANSWERS

1 a) molecular formula H_2O

b) Lewis structure $H-\ddot{O}-H$

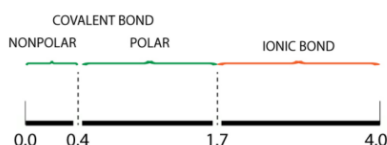
c) structural formula $H-O-H$

2 a) Electronegativity measures how strongly an atom is able to attract electrons from another atom in a chemical bond.

b) Electronegativity increases across a period (as the atomic radius decreases), and decreases down a group (as the atomic radius increases).

c) Electronegativity is used to classify the type of bonding, because if there is a very large difference in EN values of bonding atoms, the electrons are transferred, where as if there is a smaller difference, they electrons are shared.

d) Calculate the difference in electronegativity and classify bond based on the result according to the scale below:



3. Polar covalent bonds are ones where bonding electrons are shared, but not in an equal way – so one atom pulls the shared electrons closer to its side of the bond – this makes that side more negative.

4 a) LiF $\Delta EN = 3.98 - 0.98 = 3.0 \therefore \text{ionic}$

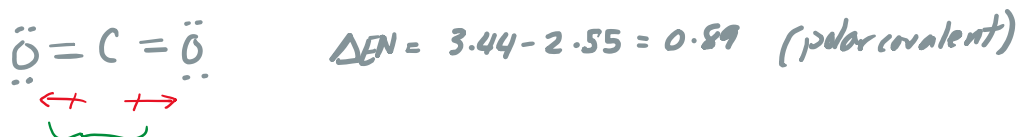
b) NH $\Delta EN = 3.04 - 2.2 = 0.84 \therefore \text{polar covalent}$

c) BO $\Delta EN = 3.44 - 2.04 = 1.4 \therefore \text{polar covalent}$

d) HH $\Delta EN = 2.2 - 2.2 = 0 \therefore \text{non-polar covalent}$

So based on the ΔEN values above, $HH \rightarrow NH \rightarrow BO \rightarrow LiF$

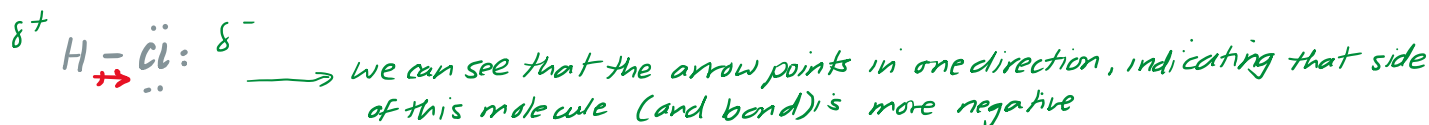
5a) Disagree. Some molecules contain polar bonds, but are non-polar MOLECULES, because of their shape. Carbon dioxide is an example:



these arrows point to the side of the bond that's more negative, but since the molecule is symmetrical, there's no side that's more negative

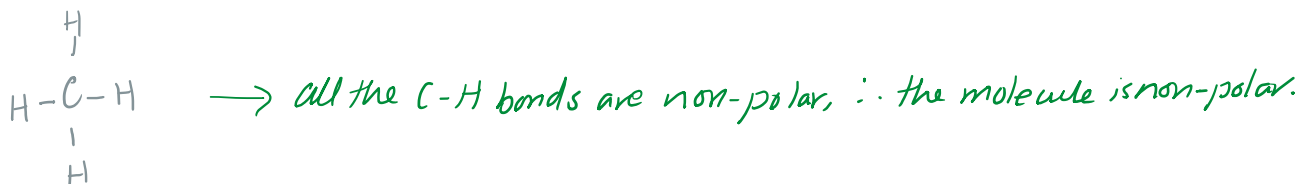
b) HCl is an example of a polar molecule.

$$\Delta EN = 3.16 - 2.2 = 0.96 \text{ (polar covalent)}$$



c) An example of a non-polar molecule is methane (CH₄)

$$\Delta EN = 2.55 - 2.2 = 0.35 \text{ (non-polar covalent)}$$



6a) a solution contains a solute (what dissolves) and a solvent (what the solute dissolves into). Salt water is a solution made of salt (solute) and water (solvent).

b) solubility is a measure of how much solvent can be dissolved in a solvent at a specific temperature. Sodium chloride's solubility is 36g/100g at 25°C.

c) Some example of solutes that aren't solids include: dissolved oxygen in water, ethanol (a type of alcohol) in water, food coloring in water.

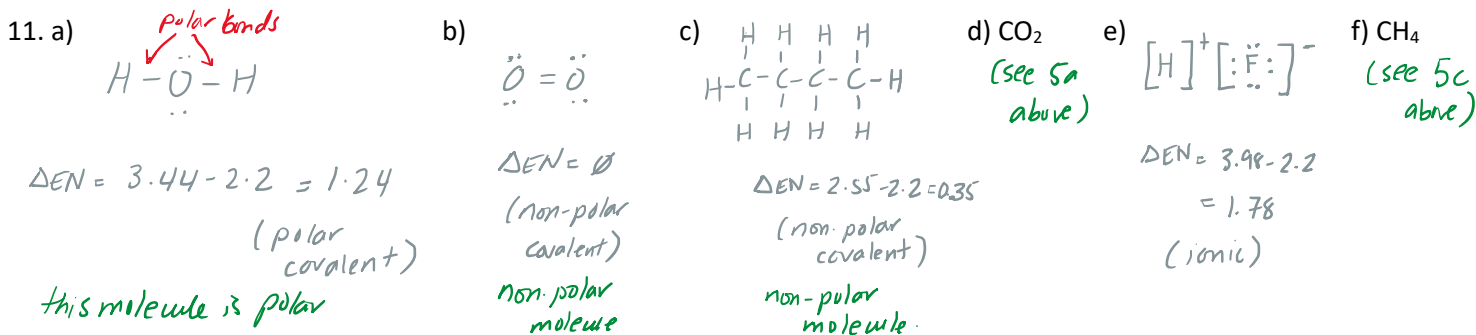
7a) Acid ionize to form H⁺ ions in solution, for example HCl_(aq). Bases dissociate into OH⁻ ions, for example NaOH_(aq).

b) The general formula of an acid (HA) is useful because we see that it contains hydrogen which can ionize.

8. Intermolecular forces are attractive forces that exist between certain molecules. They include London Dispersion Forces, dipole-dipole forces, H-bonds, and ion-dipole forces.

9. In order of decreasing strength: covalent → ionic → hydrogen → dipole-dipole → London dispersion

10. Hydrogen bonds form between molecules that contain H and one of either oxygen, fluorine, or nitrogen. So NH₃, H₂O, HF.



12a) carbon has 4 valence electrons, so it would typically need to form 4 bonds to get an octet.



b) carbon may bond to only three other atoms, but still fulfill the requirement of having 4 bonds by forming a double bond with one of the three atoms.