

Ranking by intermolecular forces

If you are asked to rank molecules in order of melting point, boiling point, viscosity, surface tension or vapour pressure ... what they are actually asking is for you to rank them by strength of intermolecular forces (either increasing or decreasing).

Here is a good strategy for this:

1. Look for molecules with hydrogen bonding capability will have the strongest intermolecular forces.
2. Look for molecules with dipoles. These will have the next strongest intermolecular forces.
3. Larger molecules will have stronger London dispersion forces. These are the weakest intermolecular forces but will often be the deciding factor in multiple choice questions

- List the following molecules in order of increasing surface tension:
 C_3H_8 , CH_4 , CH_3COOH , C_2H_6

Answer

Higher surface tension corresponds to stronger intermolecular forces. Go through the list above.

1. One of these (CH_3COOH) has the ability to hydrogen-bond. It will probably have the strongest intermolecular forces.
2. CH_3COOH is the only one of these molecules to have a dipole, and we already decided it has the strongest intermolecular forces.
3. Of the molecules that are left, the largest one (C_3H_8) likely has the strongest London dispersion forces. The smallest (CH_4) likely has the weakest intermolecular forces. The answer is: CH_4 , C_2H_6 , C_3H_8 , CH_3COOH

- List the following molecules in order of increasing boiling point: Br_2 , F_2 , I_2 , Cl_2 ,

Answer

Higher boiling points will correspond to stronger intermolecular forces. Go through the list above.

1. None of these have hydrogen bonding.
2. None of these have dipoles.
3. Bigger molecules will have stronger London dispersion forces. So I_2 has the strongest forces, and F_2 will have the weakest. Correspondingly, I_2 will have the highest boiling point and F_2 will have the lowest boiling point.

Answer: F_2 , Cl_2 , Br_2 , I_2