Define Miscibility:

What’s the difference between solubility and miscibility?

Define Immiscibility:
Electronegativity (EN):

Dipole:

Origin of bond dipoles?
Molecular Dipoles = Shape + Bond Dipoles

- Draw the Lewis Structures for EtOH, H₂O, acetone, & hexane.
- Draw 3 D representations of the molecules & show partial negative & positive charges.

*electronegativity values: H 2.1 | C 2.5 | O 3.5*

- Show Molecular Dipoles by applying one arrow to each molecule drawn above. 

- Arrange in order of increasing polarity.
Dipole-Dipole Forces

- Definition:

- Energy compared to a covalent bond?

- Demonstrate the dipole-dipole force that exists between two molecules of acetone.
Hydrogen Bonding

- Definition:

- Energy compared to a covalent bond?

- Demonstrate the hydrogen bonding force that exists between two molecules of ethanol.
Also known as (aka):

- Definition (What happens?):
  - 
  - 

- Demonstrate the Dispersion force that exists between four molecules of hexane. (You’ll need 2 steps.)
When 2 chemicals have similar enough IM forces, they will form a homogeneous solution.

What IM force exists b/w molecules of the pure substances & b/w molecules in mixtures?

<table>
<thead>
<tr>
<th>Pure Substance or Mixture</th>
<th>H₂O</th>
<th>EtOH</th>
<th>H₂O &amp; EtOH</th>
<th>acetone</th>
<th>hexane</th>
<th>acetone &amp; hexane</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IM Forces</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Are the IM forces of the mixture stronger or weaker than the pure liquids by themselves?

What experimental observation will answer this question?
**Expt Summary – Part A**

*Find the density of 2 pure liquids & 7 solns.*

Create solns in E. flasks, fill 10 mL vol. flasks, mass. *(A/B: EtOH/H₂O or Hexane/Acetone)*

<table>
<thead>
<tr>
<th>ratio A:B</th>
<th>Vₐ (mL)</th>
<th>Vₐ (mL)</th>
<th>Vₐₐd =Vₐ+Vₐ</th>
<th>mₐₐ (g)</th>
<th>Dₐₐ =mₐₐ/10</th>
<th>mₐₐlₐₐ (g)</th>
<th>Vₐₐtₐₐlₐ (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A only</td>
<td>10</td>
<td>0</td>
<td>n/a</td>
<td>Dₐ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B only</td>
<td>0</td>
<td>10</td>
<td>n/a</td>
<td>Dₐ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:1</td>
<td>15</td>
<td>5</td>
<td>20</td>
<td>D₃:1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:1</td>
<td>10</td>
<td>5</td>
<td>15</td>
<td>D₂:1</td>
<td></td>
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<td>...</td>
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</tr>
</tbody>
</table>
Calculations & Results – Part A

- Comparison of additive & actual volumes...
  - \( V_{\text{additive}} = \)

- Too much uncertainty to measure \( V_{\text{actual}} \) directly...
  - \( V_{\text{actual}} = \)
  - In E. flask: *mass is conserved*: \( \text{mass total} = \text{mass } A + \text{mass } B \)
    - \( m_{\text{erlen}} = \)
  - In vol flask: *density dependent on interaction b/w A&B molecules*
    - \( D_{\text{mix}} = \)

- Is \( V_{\text{actual}} (\leq, \geq, =) V_{\text{additive}} \)? *How are IM forces involved?*
Do IM forces \( \uparrow \) or \( \downarrow \) going from pure A (or pure B) to a mixture of A & B?

\[
\begin{align*}
\uparrow \text{ forces}, & \quad V_{\text{actual}} < V_{\text{additive}} \\
\downarrow \text{ forces}, & \quad V_{\text{actual}} > V_{\text{additive}}
\end{align*}
\]

Do Spartan volume measurements correctly predict what happens between EtOH & \( H_2O \)?
Immiscibility

- **Definition:**

- **Relation of polarity & IM forces of the 2 liquids?**

- **How do you know which liquid is on top and which is on bottom?**
  - 
  - 
  -
Extraction

Describe the use of Separatory funnels...

Separation of chemicals b/w 2 immiscible liquids (typically H₂O & a nonpolar solvent).

Usually used....

Does Spartan correctly predict which layer the red dye goes to?