2. In the laboratory, the hydrate $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}(s)$ can be heated in a crucible to completely drive off the water of hydration to form the anhydrous salt, $\text{CaSO}_4(s)$. A 2.49 g sample of pure $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}(s)$ is heated several times until the mass is constant. Calculate the mass, in grams, of the solid that remains after the dehydration reaction is complete.

\[
2.49 \text{g CaSO}_4 \cdot 2\text{H}_2\text{O} \quad \text{?g CaSO}_4
\]

% Composition

What % of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ is just $\text{CaSO}_4$?

$\text{hydrate} = 172.2 \text{g/mole}$
\[
\text{CaSO}_4 = 136.2 \text{g/mole}
\]
\[
\% \text{CaSO}_4 = \frac{176.2}{172.2} \times 100 = 101.8%
\]

\[
2.49 \text{g CaSO}_4 \cdot 2\text{H}_2\text{O} \times \frac{1 \text{mol}}{172.2 \text{g}} \times 0.0114 \text{mol CaSO}_4 = 79.1\% \text{ CaSO}_4
\]

79.1\% \times 2.49 \text{g} = 1.97 \text{g CaSO}_4

\[
0.014 \text{ g CaSO}_4 \times \frac{1 \text{ mol}}{136.2 \text{ g}} = 1.97 \text{ g CaSO}_4
\]
3. Solutions of silver(I) nitrate and sodium phosphate are combined, forming a precipitate.
   (i) Balanced equation:
   \[ 3\text{AgNO}_3(aq) + Na_3\text{PO}_4(aq) \rightarrow 3\text{NaNO}_3 + \text{Ag}_3\text{PO}_4 \]
   (ii) If 5 mol of silver(I) nitrate and 3 mol of sodium phosphate react as completely as possible, which reactant, if any, is present in excess? Justify your answer.

4. Answer the following questions in terms of principles of chemical bonding and intermolecular forces. In each explanation where a comparison is to be made, a complete answer must include a discussion of both substances. The following complete Lewis electron-dot diagrams may be useful in answering parts of this question:

   (a) At 1 atm and 298 K, pentane is a liquid whereas propane is a gas. Explain.
   (b) At 1 atm and 298 K, methanol is a liquid whereas propane is a gas. Explain.
   (c) Indicate the bond angle around the carbon atom in each of the following:
      (i) Methanol
      (ii) Methanoic (formic) acid
      (iii) Methanal (formaldehyde)
   (d) Draw the complete Lewis electron-dot diagram for a molecule of propanoic acid, H\(\text{C}_2\text{H}_3\text{O}_2\).
Organic Nomenclature - basics

Prefixes = number of carbon atoms in a chain
- meth (or form-) 1
- eth 2
- prop 3
- but 4
- pent 5
- hex 6
- hept 7
- oct 8
- non 9
- dec 10

Suffix = indicates type of bond or things attached to carbon
- ane = all single bonds
  - butane \( \text{CH}_3\text{CH}(_2\text{CH}_3)\text{CH}_2\text{CH}_3 \)
- ene = has a double bond (indicated with the number of the carbon that has the double bond)
  - 2-hexene \( \text{CH}_2\text{=CH}(_2\text{CH}_2\text{CH}_2\text{CH}_3)\text{CH}_3 \)
  - 3-octyne \( \text{CH}(_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3)\text{CH}_2\text{=CH}\text{CH}_2\text{=CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \)

Other suffixes:
- ol = this is an alcohol - has -O-H attached to a carbon
  - ethanol \( \text{CH}_3\text{CH}(_2\text{OH}) \)
- oic acid = has -O-H at the end
  - Carboxylic acid
  - Ethanoic acid
- aldehyde = has C=O at the end
  - or -al

There is a lot more to organic nomenclature and variations in naming convention, this is just a start. We will do more as needed and time allows (it's usually your 2nd year college chem course)
Particle Diagrams Practice

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