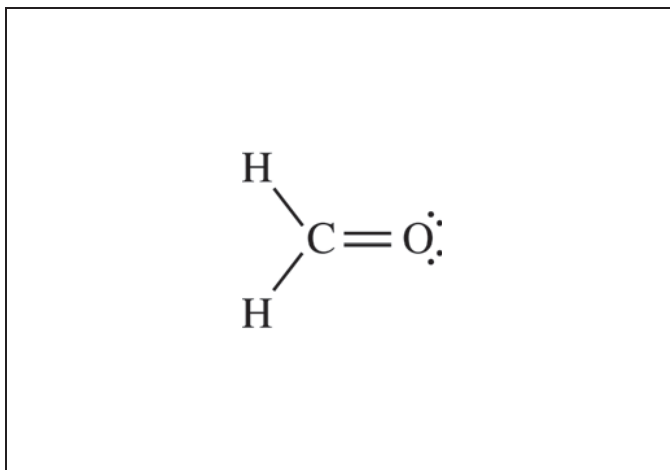


**2013 AP<sup>®</sup> CHEMISTRY FREE-RESPONSE QUESTIONS**

Use the information in the following table to answer parts (c) and (d).

Name	Lewis Electron-Dot Diagram	Boiling Point (°C)	Vapor Pressure at 20°C (mm Hg)
Dichloromethane	$\begin{array}{c} \text{H} \\   \\ :\ddot{\text{Cl}}:\ddot{\text{C}}:\text{H} \\   \\ :\ddot{\text{Cl}}: \end{array}$	39.6	353
Carbon tetrachloride	$\begin{array}{c} :\ddot{\text{Cl}}: \\   \\ :\ddot{\text{Cl}}:\ddot{\text{C}}:\ddot{\text{Cl}}: \\   \\ :\ddot{\text{Cl}}: \end{array}$	76.7	89

- (c) Dichloromethane has a greater solubility in water than carbon tetrachloride has. Account for this observation in terms of the intermolecular forces between each of the solutes and water.
- (d) In terms of intermolecular forces, explain why dichloromethane has a higher vapor pressure than carbon tetrachloride.
- (e) The complete Lewis electron-dot diagram of methanal (formaldehyde) is shown in the box below. Molecules of methanal can form hydrogen bonds with water. In the box below, draw a water molecule in a correct orientation to illustrate a hydrogen bond between a molecule of water and the molecule of methanal. Use a dashed line to represent the hydrogen bond.



**STOP**

**END OF EXAM**