

Question 4: Short Answer

4 points

A For the correct answer:

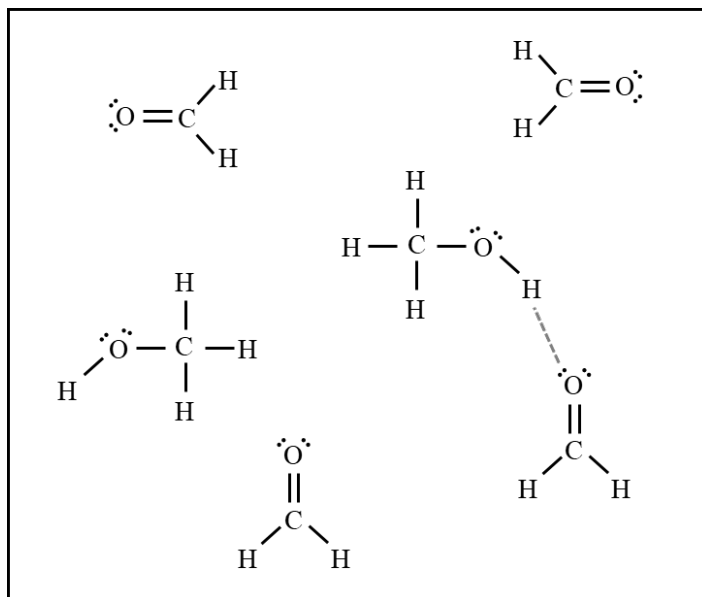
Point 01

 sp^2

B For a correct diagram:

Point 02

The diagram should show a dashed line between the O atom in one H_2CO molecule and the H atom in the $-\text{OH}$ group of one CH_3OH molecule. See example response below.



C (i) For a correct proposal:

Point 03

The proposed temperature should be in the range 181 K – 254 K .

(ii) For the correct calculated value:

Point 04

$$8.59 \text{ g CH}_3\text{OH} \times \frac{1 \text{ mol CH}_3\text{OH}}{32.04 \text{ g CH}_3\text{OH}} \times \frac{-37.6 \text{ kJ}}{1 \text{ mol CH}_3\text{OH}} = -10.1 \text{ kJ}, \text{ so } 10.1 \text{ kJ are removed.}$$

Question 5: Short Answer

4 points

A For the correct answer: **Point 01**
Tetrahedral

B For the correct answer and a valid justification: **Point 02**

Agree. Compound Y has a larger, more polarizable electron cloud because the Si atom has more occupied electron shells than the C atom, giving compound Y stronger London dispersion forces and a higher boiling point than compound X.

C For the correct answer and a valid justification. **Point 03**

Examples of acceptable responses may include the following:

- *Compound X. Compound X has weaker intermolecular forces than compound Y, so molecules of X are more likely to be in the gas phase at 82°C and would therefore have a higher vapor pressure.*
- *Compound X. At 82°C, compound X has reached its boiling point, but compound Y has not. Therefore, the proportion of X molecules in the vapor phase would be much greater than that of compound Y, giving compound X the higher vapor pressure.*

D For the correct calculated value: **Point 04**

$$PV = nRT$$

$$n = \frac{PV}{RT} = \frac{(2.30 \text{ atm})(12.5 \text{ L})}{(0.08206 \frac{\text{L} \cdot \text{atm}}{\text{K} \cdot \text{mol}})(471 \text{ K})} = 0.744 \text{ mol}$$
