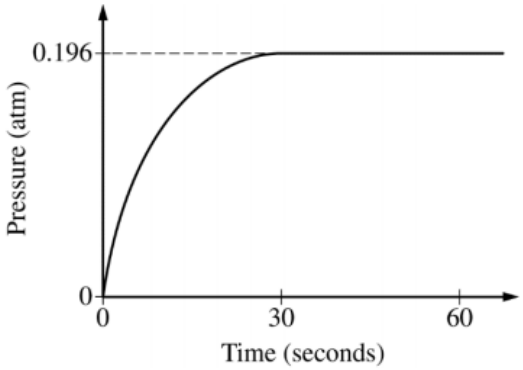
Making Sense of Prompts: States of Matter

The scenario refers to the following information.

Sulfur atom = ○ Carbon atom = ● Oxygen atom = ○

Compound	Molecular Structure	Boiling Point at 1 atm (K)
CS_2		319
COS		223

Equimolar samples of CS_2(l) and COS(l) are placed in separate, previously evacuated, rigid 3.0 L vessels. Each vessel is attached to a pressure gauge, and the temperatures are kept at 200. K. In both vessels, liquid is observed to remain present at the bottom of the container at all times. The change in pressure inside the vessel containing COS(l) is shown below.

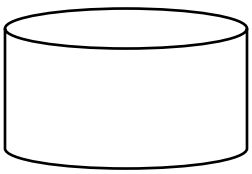


After reading the scenario above, we have so much information to make sense of. Here we go…

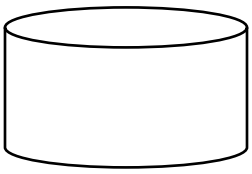
1. Vocabulary clarification

Prompt says…	**It really means…**
Equimolar	
Evacuated	
Rigid	

2. The liquids are placed into separate containers, temperature is constant at 200. K, liquid remains in both containers.



CS_2(l)
V = 3 L
T = 200 K



COS(l)
V = 3 L
T = 200 K

3. Has either liquid reached its boiling point?

4. Which liquid has the higher boiling point?

5. Based on the boiling points, _____ must have stronger _____ than _____.

6. What is causing the pressure inside the vessel containing COS(l)? Why does the pressure eventually reach a constant value?

7. Is CS_2 polar or nonpolar? What type of IMF's does CS_2 have?

8. Is COS polar or nonpolar? What type of IMF's does COS have?

Now that we've sorted out the information, let's try some sample questions.

(a) In terms of the types and relative strengths of all the intermolecular forces in each compound, explain why the boiling point of CS_2(l) is higher than that of COS(l).

(b) Is the equilibrium vapor pressure of CS_2 greater than, less than, or equal to 0.196 atm? Explain your reasoning.

Claim: Your answer.

_____ _____ 0.196 atm.

Evidence: How do you know? What information is given to you?

_____ has a higher boiling point than _____.

Reasoning: Explain how you used the evidence to arrive at your answer.

A higher boiling indicates _____ energy is needed to overcome the _____ between the particles. The stronger _____ of _____ keep more _____ particles in the liquid state than those of _____. Thus, producing _____ gaseous CS_2 than gaseous COS causing _____ vapor pressure than COS.