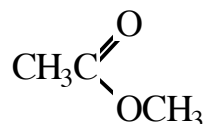
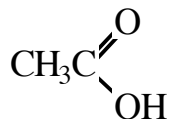
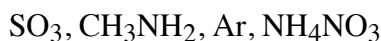


1. Identify the intermolecular attractive force(s) present in the following substances. If more than one intermolecular force, indicate which is the most important.
 - a) $\text{N}_2(\text{l})$
 - b) $\text{SO}_2(\text{l})$
 - c) $\text{CH}_3\text{NH}_2(\text{l})$
 - d) $\text{CH}_2\text{Cl}_2(\text{l})$
2. Identify the interparticle attractive force(s) present in the solids of the following substances. If more than one interparticle force, indicate which is the most important.
 - a) SCl_2
 - b) NH_4Cl
 - c) CH_3OH
 - d) $\text{C}_{\text{diamond}}$
3. In each of the following groups, pick the member which has the given property. Provide a brief explanation for our choice. Be sure explanation explains why the other two choices were ruled out.
 - a) highest boiling point; CH_4 , CCl_4 , CF_4
 - b) lowest vapor pressure at $25\text{ }^\circ\text{C}$; $\text{CH}_3\text{CH}_2\text{OH}$, $\text{CH}_3\text{CH}_2\text{CH}_3$, CH_3OCH_3
- (4. In each of the following groups, pick the member which has the given property. Explain your answer.
 - a) highest boiling point; CO_2 , CSe_2 , CS_2
 - b) lowest boiling point; HF , HCl , HBr
 - c) lowest vapor pressure at $25\text{ }^\circ\text{C}$; H_2SO_4 , NH_3 , $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
5. Identify the interparticle attractive forces present in the solids of the following substances. If more than one interparticle force, indicate which is the most important.
 - a) CHCl_3
 - b) BaSO_4
 - c) CH_3OH
 - d) $\text{C}_{\text{diamond}}$

- (8) 7. Which of the two compounds below would you expect to have the higher boiling point? Support your answer with a brief explanation.



11. Arrange the following in order of increasing boiling point.



- a) $\text{Ar} < \text{SO}_3 < \text{CH}_3\text{NH}_2 < \text{NH}_4\text{NO}_3$
 b) $\text{SO}_3 < \text{Ar} < \text{NH}_4\text{NO}_3 < \text{CH}_3\text{NH}_2$
 c) $\text{SO}_3 < \text{NH}_4\text{NO}_3 < \text{CH}_3\text{NH}_2 < \text{Ar}$
 d) $\text{NH}_4\text{NO}_3 < \text{Ar} < \text{SO}_3 < \text{CH}_3\text{NH}_2$
12. The boiling points of four liquids are

Compound	Boiling Point ($^{\circ}\text{C}$)
diethyl ether	35
acetone	56
ethanol	78
water	100

Which has the highest vapor pressure at 25°C ?

- a) diethyl ether b) acetone c) ethanol d) water
8. At a given temperature the vapor pressure of acetone, methanol and carbon tetrachloride increase in the order

carbon tetrachloride < methanol < acetone

Identify the substance with the

	Lowest boiling point	strongest intermolecular attractive forces	largest $\Delta H^{\circ}_{\text{vap}}$
A)	acetone	acetone	carbon tetrachloride
B)	methanol	acetone	acetone
C)	carbon	acetone	carbon tetrachloride

	tetrachloride		
D)	carbon tetrachloride	methanol	acetone
E)	acetone	carbon tetrachloride	carbon tetrachloride

8. Which of the following is the correct order from lowest to highest melting point

- (A) $\text{HCl} < \text{HBr} < \text{HF} < \text{NaCl}$
- (B) $\text{HF} < \text{HBr} < \text{NaCl} < \text{HCl}$
- (C) $\text{NaCl} < \text{HCl} < \text{HBr} < \text{HF}$
- (D) $\text{HBr} < \text{NaCl} < \text{HF} < \text{HCl}$
- (E) $\text{HF} < \text{HCl} < \text{NaCl} < \text{HBr}$

9. At a given temperature the vapor pressure of acetone, methanol and carbon tetrachloride increase in the order

carbon tetrachloride < methanol < acetone

Identify the substance with the

Highest boiling point
forces largest $\Delta H^\circ_{\text{vap}}$

weakest intermolecular attractive

- | | | | |
|-----|----------------------|----------------------|----------------------|
| (A) | acetone | acetone | carbon tetrachloride |
| (B) | methanol | acetone | carbon tetrachloride |
| (C) | carbon tetrachloride | acetone | carbon tetrachloride |
| (D) | carbon tetrachloride | methanol | acetone |
| (E) | acetone | carbon tetrachloride | methanol |

(6) 5. Indicate the type of attractive force(s) that occur in each of the following pure substances:

- a) SiH_4
 CH_3NH_2

b) $(\text{CH}_3)_2\text{CO}(l)$

b) $\text{CS}_2(l)$

c) $\text{MgO}(s)$

d) $\text{CH}_3\text{COOH}(l)$

a) $\text{CH}_3\text{CH}_2\text{OH}(l)$

b) $\text{SO}_2(s)$

c) $\text{CaF}_2(s)$

d) $\text{HNO}_3(l)$

e) $\text{Bi}(s)$

10. Rank the pure substances N_2 , CH_3OH , Ar and CaO in terms of increasing strength of attractive forces

A) $\text{N}_2 < \text{CH}_3\text{OH} < \text{Ar} < \text{CaO}$

B) $\text{N}_2 < \text{Ar} < \text{CH}_3\text{OH} < \text{CaO}$

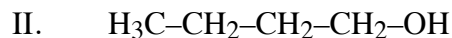
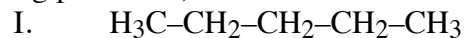
C) $\text{CaO} < \text{CH}_3\text{OH} < \text{Ar} < \text{N}_2$



11. Which of the following statements is true?

- A) For liquids with strong intermolecular attractive forces, e.g. hydrogen-bonding, the equilibrium vapor pressure can decrease with increasing temperature.
- B) As intermolecular attractive forces increase the vapor pressure decreases and the boiling point increases.
- C) In a closed system, the vapor pressure of a liquid depends on the volume of vapor above the liquid, whether liquid is present in the system or not.
- D) The vapor pressure of a liquid depends on the surface area of the liquid.

14. The molar masses of the three compounds diagrammed below are effectively the same (72). When the compounds are arranged in order of increasing boiling point (lowest boiling point first) what is the correct order?



- A) I, II, III
- B) II, I, III
- C) II, III, I
- D) III, I, II
- E) I, III, II

(8) 2. London dispersion forces are one example of an intermolecular attractive force.

- a) Give an example of a pure substance for which London dispersion forces are the only intermolecular force which produces the attraction in the liquid or solid phase.

- b) Briefly describe the nature of the London dispersion force, that is, how two or more such particles/molecules can attract one another.