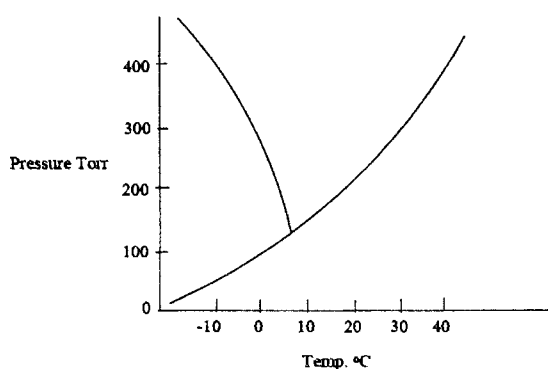


※ 考生請注意：本試題不可使用計算機

- In the following compounds indicate the type of bonds either covalent non-polar, covalent polar, ionic, or a mixture of two or more types that are present. (a) CH_4 , (b) NaCl , (c) H_2O , (d) $\text{CH}_3\text{CH}_2\text{OH}$, (e) CCl_4 . (10%)
- For the following compounds indicate which have a permanent dipole. (a) C_2H_6 , (b) CBr_4 , (c) CH_3Cl , (d) $\text{CH}_3\text{CH}_2\text{NH}_2$, (e) HCl . (10%)
- (a) Explain what a catalyst is and how it functions? (b) Explain what an inhibitor is and how it functions? (10%)
- 4.963g of an unknown substance is dissolved in water to produce 100 mL of solution. (The solution density is $1.00\text{g}\cdot\text{mL}^{-1}$). If the resultant solution freezes at -0.51°C calculate the molecular weight of the compound. Given k_f for water is $1.86^\circ\text{C}\cdot\text{m}^{-1}$. (10%)
- Explain (a) If the molecules in two compounds have the same average kinetic energy, what can we say about their temperature? (b) At atmosphere pressure a compound boils at 120°C . At 0.5 atmosphere pressure, will it boil at a higher or lower temperature? (10%)
- Explain the origin of the following: (a) London Dispersion Forces. (b) Hydrogen Bonding. (10%)
- For the following reaction using the Brønsted – Lowry acid/base definition what is:

$$\text{HCl} + \text{CH}_3\text{COOH} \leftrightarrow \text{CH}_3\text{COOH}_2^+ + \text{Cl}^-$$
 (a) the acid, (b) the base, (c) the conjugate acid, (d) the conjugate base (10%)
- Compound:** C_3H_8 , CH_4 , C_4H_{10} , C_2H_6 , (a) Arrange the compounds in order of increasing boiling point. (b) Explain your order in (a) above. (10%)
- The following is a phase diagram for a compound:



- What pressure at 20°C does the compound exist in a liquid-gas equilibrium?
- At what temperature does the compound boil at 300 Torr pressure?
- If the compound existed on another planet in the atmosphere as a gas at 100 Torr pressure at what temperature would it begin to 'snow' this compound?
- What is the triple point temperature and pressure for this compound and what occurs at this point? (20%)