

Ch 11-12 MC Review

- Helium atoms do not combine to form He₂ molecules, yet He atoms do attract one another weakly through
 - dipole-dipole forces.
 - ion-dipole forces.
 - dispersion forces.**
 - dipole-induced dipole forces.
 - hydrogen bonding.

All substances exhibit dispersion forces
- The molecular property related to the ease with which the electron density in a neutral atom or molecule can be distorted is called
 - a dipole moment.
 - polarizability.**
 - a dispersion force.
 - surface tension.
 - a van der Waals force.
- Which two properties are more typical of molecular compounds than of ionic compounds?
 - They are gases or liquids at room temperature.**
 - They have high melting points.
 - Solids do not conduct electricity, but liquids do.
 - Atoms share electrons.**

A. I and IV	B. I and III
C. II and III	D. II and IV
E. III and IV	
- Which of the following substances should have the highest boiling point?

A. CH ₄	B. Cl ₂	C. Kr
D. CH₃Cl	E. N ₂	

CH₃Cl is the only polar molecule in the choices
- Which of the following properties indicates the presence of *strong* intermolecular forces in a liquid?
 - a low heat of vaporization
 - a low critical temperature
 - a low vapor pressure**
 - a low boiling point
 - none of these
- For which of the following species are the intermolecular interactions entirely due to dispersion forces?

A. C₂H₆	B. CH ₃ OCH ₃	C. NO ₂
D. H ₂ S	E. CaNO ₃	

C₂H₆ is the only non-polar non-ionic substance here
- Each of the following substances is a liquid at -50°C. Place these liquids in order of *increasing* vapor pressure. dimethyl ether (CH₃OCH₃), propane (C₃H₈), ethanol (CH₃CH₂OH)
 - ethanol < propane < dimethyl ether
 - ethanol < dimethyl ether < propane**
 - propane < dimethyl ether < ethanol
 - dimethyl ether < ethanol < propane
 - propane < ethanol < dimethyl ether

Arranged from strongest → weakest IMFs
- Given the following liquids and their boiling points, which has the *highest* vapor pressure at its normal boiling point?
 - ethanol, bp = 78°C
 - methanol, bp = 65°C
 - water, bp = 100°C
 - benzene, bp = 80°C
 - The vapor pressure of each of the liquids at its normal boiling point would be the same.**

Normal BP is defined as T at which P_{vap} = 1 atm
- Krypton has a *higher* melting point than argon because of its
 - hydrogen bonding.
 - stronger dispersion forces.**
 - permanent dipole moment.
 - ionic bonds.
 - greater ionization energy.

Kr has more electrons, higher polarizability
- Which of the responses includes all of the following that can form hydrogen bonds with water molecules?

(1) Na ⁺	(2) CH₃COOH
(3) C ₂ H ₆	(4) CH₃NH₂

A. (1) and (2)	B. (1) and (3)
C. (2) and (3)	D. (2) and (4)
E. (3) and (4)	
- Which property of water allows a razor blade to float on it without sinking?

A. viscosity	B. surface tension
C. density	D. specific heat
E. triple point	
- The structural form of the element Ge closely resembles the structure of

A. C (diamond).	B. N (diatomic).
C. As (tetrahedral).	D. S (S ₈ ring).
E. Kr (monatomic).	

Both are network covalent solids
- Which of the following is *not* an endothermic process?
 - melting of a solid
 - vaporization
 - raising the temperature of a gas
 - condensation of water vapor**
 - sublimation of dry ice

Forming bonds is exothermic
- Solid iodine has a vapor pressure of 1.0 mmHg at 39°C. How many *moles* of iodine will sublime into a 500. mL flask at this temperature? If the volume of the flask is doubled at constant temperature, what will happen to the *equilibrium* vapor pressure of I₂? (Assume some solid I₂ is always present in the container.)

A. 2.1 × 10 ⁻⁴ mol; vapor pressure increases
B. 2.0 × 10 ⁻² mol; vapor pressure increases
C. 2.6 × 10⁻⁵ mol; no change in vapor pressure
D. 2.1 × 10 ⁻⁴ mol; no change in vapor pressure
E. 2.6 × 10 ⁻⁵ mol; vapor pressure decreases

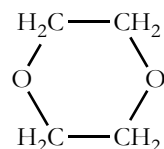
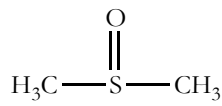
$$n = \frac{PV}{RT} = \frac{(1.00 \text{ mm Hg})(0.500 \text{ L})}{(62.4 \frac{\text{L}\cdot\text{mmHg}}{\text{mol}\cdot\text{K}})(39 + 273 \text{ K})} = 2.57 \times 10^{-5} \text{ mol}$$

15. The molar heats of sublimation and fusion of iodine are 62.3 kJ/mol and 15.3 kJ/mol, respectively. Calculate the molar heat of vaporization of liquid iodine.

- A. 77.6 kJ/mol
 B. **47.0 kJ/mol**
 C. -47.0 kJ/mol
 D. -77.6 kJ/mol
 E. 4.07 kJ/mol

$$\Delta H_{\text{vap}} = \Delta H_{\text{sub}} - \Delta H_{\text{fus}} = 62.3 \text{ kJ/mol} - 15.3 \text{ kJ/mol} = 47.0 \text{ kJ/mol}$$

16. Which one of the following would be immiscible with water?

- A.  B. $\text{C}_2\text{H}_5\text{—OH}$
 C.  D. **$\text{S}=\text{C}=\text{S}$**
 E. NH_3

CS₂ is nonpolar

17. The solubility of nitrogen gas at 25°C and a nitrogen pressure of 522 mmHg is 4.7×10^{-4} mol/L. What is the value of the Henry's Law constant in mol/L·atm?

- A. **6.8×10^{-4} mol/L·atm**
 B. 4.7×10^{-4} mol/L·atm
 C. 3.2×10^{-4} mol/L·atm
 D. 9.0×10^{-7} mol/L·atm
 E. 1.5×10^3 mol/L·atm

$$k = \frac{4.7 \times 10^{-4} \text{ mol/L}}{\left(522 \text{ mm Hg} \times \frac{1 \text{ atm}}{760 \text{ mm Hg}}\right)} = 6.84 \times 10^{-4} \text{ mol/L} \cdot \text{atm}$$

18. The solubility of oxygen in lakes high in the Rocky Mountains is affected by the altitude. If the solubility of O₂ from the air is 2.67×10^{-4} M at sea level and 25°C, what is the solubility of O₂ at an elevation of 12,000 ft where the atmospheric pressure is 0.657 atm? Assume the temperature is 25°C, and that the mole fraction of O₂ in air is 0.209 at both 12,000 ft and at sea level.

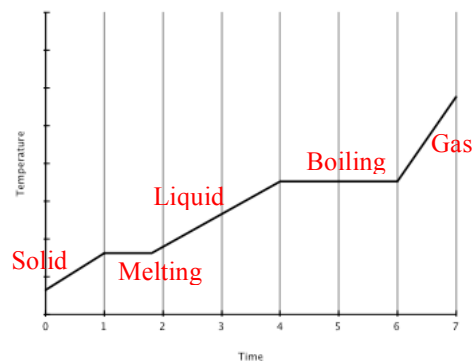
- A. **1.75×10^{-4} M**
 B. 2.67×10^{-4} M
 C. 3.66×10^{-5} M
 D. 4.06×10^{-4} M
 E. none of these

$$\frac{2.67 \times 10^{-4} \text{ M}}{0.609 \times 1 \text{ atm}} = \frac{s_2}{0.609 \times 0.657 \text{ atm}}; s_2 = 1.75 \times 10^{-5} \text{ M}$$

19. Which of the following correctly describes the conductivity observed by doping Si with the indicated element?

- A. Ge; n-type
 B. Ge; p-type
 C. P; p-type
 D. **As; n-type**
 E. Ga; n-type

As has 5 valence electrons



20. The heating curve above gives the relationship between time and temperature as a sample of an unknown substance goes through phase changes. The sample begins as a solid and is heated at a constant rate. At which point is the sample half liquid and half gas?

- A. Time 3
 B. Time 4
 C. **Time 5**
 D. Time 6
 E. Time 7