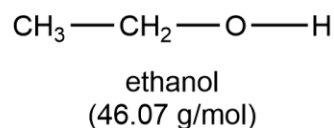
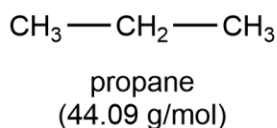
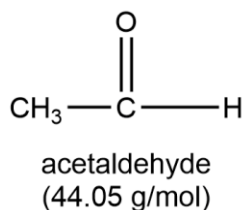

1. Select the **best** statement concerning the two containers described below.

Container A: Contains a substance with molar volume of 45 mL and a density of 0.70 g/mL.

Container B: Contains a substance with molar volume of 31 L and a density of 5.9×10^{-4} g/mL.

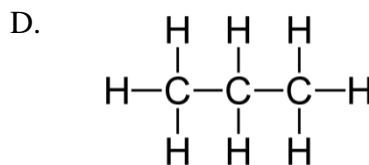
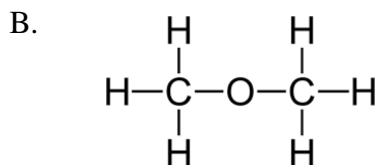
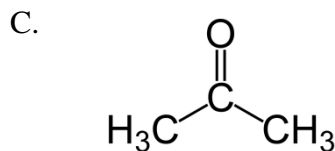
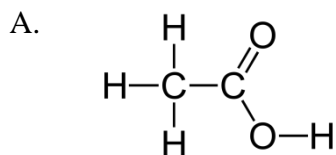
- A. A contains a gas; B contains a liquid. C. A and B both contain a gas.
B. A contains a liquid; B contains a gas. D. A and B both contain a liquid.

2. Arrange the following molecules in order of **increasing** boiling point:



- A. acetaldehyde < ethanol < propane C. ethanol < propane < acetaldehyde
B. propane < ethanol < acetaldehyde D. propane < acetaldehyde < ethanol

3. Which of the following can participate in hydrogen bonding?



4. Which liquid will demonstrate the **highest** viscosity?

- A. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$, 95 °C C. H_2O , 95 °C
B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$, 20 °C D. H_2O , 20 °C

-
5. The vapor pressure of a liquid in a closed container
- A. is greater for liquids with stronger intermolecular forces.
 - B. is the point when the rate of vaporization becomes zero.
 - C. is the same for all liquids at the same temperature.
 - D. is reached when the rate of vaporization equals the rate of condensation.

-
6. The vapor pressure (P_{vap}) is _____. For a liquid sample with a fixed mass and surface area, _____.
- A. temperature independent; more molecules vaporize at higher temperature
 - B. temperature independent; more molecules vaporize at lower temperature
 - C. temperature dependent; more molecules vaporize at lower temperature
 - D. temperature dependent; more molecules vaporize at higher temperature

-
7. Determine the vapor pressure of water at 42 °C. The heat of vaporization (ΔH_{vap}) of water is 40.7 kJ/mol. The normal boiling point of water is 100. °C.
- A. 0.089 torr
 - B. 68 torr
 - C. 692 torr
 - D. 760 torr

-
8. Which of the following statements is **false**?
- A. The critical point is the temperature and pressure above which a supercritical fluid exists.
 - B. The critical pressure is the pressure required to bring about a transition to a supercritical fluid at the critical temperature
 - C. The critical temperature is the temperature below which a liquid cannot exist, regardless of pressure.
 - D. Supercritical fluids are neither liquids nor gases, but have the properties of both.

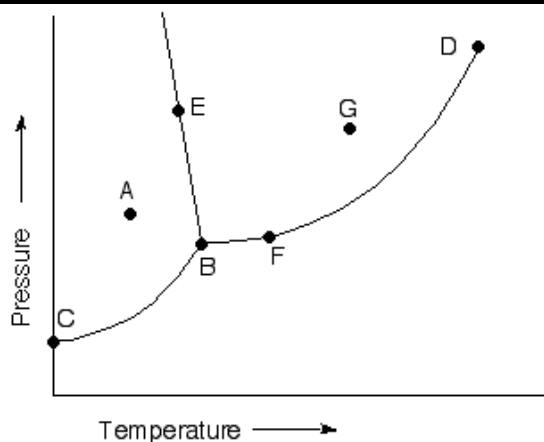
-
9. Select the **false** statement.
- A. The heat of vaporization (ΔH_{vap}) is less than the heat of fusion (ΔH_{fus}) for a substance.
 - B. Fusion is an endothermic process.
 - C. Sublimation is the phase change from solid to gas.
 - D. Fusion and melting are the same process.

-
10. How much heat is **required** to melt 25.0 mg of isopropyl alcohol, $\text{C}_3\text{H}_8\text{O}(s)$, at its melting point of $-89.5\text{ }^\circ\text{C}$? $\Delta H_{\text{fus}} = 5.37\text{ kJ/mol}$; molar mass = 60.1 g/mol
- A. $2.23 \times 10^{-3}\text{ kJ}$
 - B. $8.62 \times 10^{-3}\text{ kJ}$
 - C. 0.134 kJ
 - D. 4.35 kJ
-

-
11. How much energy is required to warm 18.02 g of solid ice from $-17.0\text{ }^{\circ}\text{C}$ to liquid water at $100.0\text{ }^{\circ}\text{C}$?
The specific heat (C_s) of ice is $2.09\text{ J/g}\cdot^{\circ}\text{C}$.
The specific heat (C_s) of liquid water is $4.18\text{ J/g}\cdot^{\circ}\text{C}$.
The specific heat (C_s) of steam is $2.01\text{ J/g}\cdot^{\circ}\text{C}$.
 ΔH_{fus} of water is 6.02 kJ/mol .
 ΔH_{vap} of water is 40.7 kJ/mol .

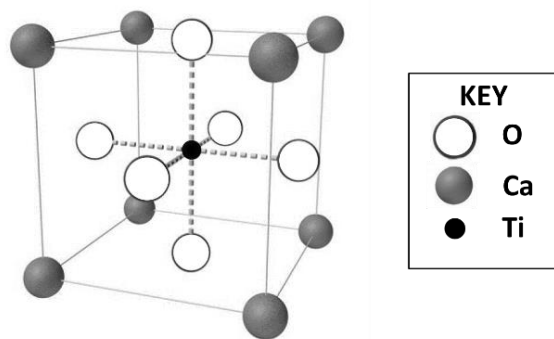
- A. 14.2 kJ
B. 37.2 kJ
C. 9.62 kJ
D. 8.01 kJ

-
12. Point F is located



- A. at the triple point.
B. on the fusion curve.
C. on the sublimation curve.
D. on the vaporization curve.
-
13. A simple cubic unit cell of a metal has
- A. eight atoms per unit cell.
B. lattice points on each corner and face.
C. one atom per unit cell.
D. bond angles greater than 90° .
-

14. Determine the ionic formula for calcium titanate, using the unit cell depicted on the right. The oxide ions (white circles) are on each face, the calcium ions (gray circles) are on each cell corner, and the titanium ion (smallest, black circle) is in the center.



- A. CaTiO C. Ca_4TiO_3
B. CaTiO_3 D. Ca_8TiO_6
-
15. Europium (151.96 g/mol) crystallizes in a body-centered cubic unit cell with an edge length of 458.1 pm. What is the density of europium?
- A. 9.31 g/cm^3 C. 20.55 g/cm^3
B. 5.25 g/cm^3 D. 1.97 g/cm^3
-
16. White phosphorus is a crystalline solid composed of P_4 units, has a low density (1.82 g/cm^3) and a low melting point (44.1°C). What type of crystalline solid is white phosphorus?

- A. molecular solid C. ionic solid
B. nonbonding atomic solid D. network covalent solid

17. Select the **false** statement.

- A. Solutions form when both solvent and solute have similar intermolecular forces.
- B. An aqueous solution has water as the solvent.
- C. Air is an example of a gaseous solution.
- D. A liquid solution can only be formed between two liquids.

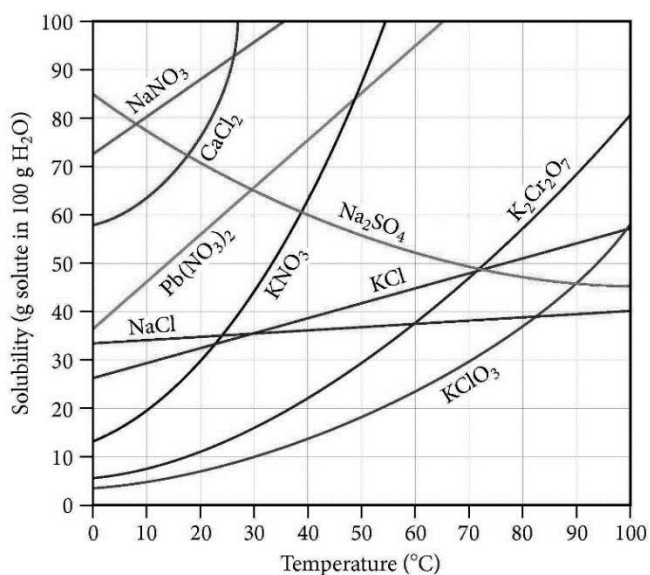
18. Which of the following is **not miscible** with carbon tetrachloride (CCl_4)?

- A. hexane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$)
- B. diethyl ether ($\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$)
- C. water (H_2O)
- D. carbon disulfide (CS_2)

19. Dynamic equilibrium occurs when the rate of dissolution is _____ the rate of recrystallization.

- A. equal to
- B. greater than
- C. less than
- D. the result of

20. If 15.0 g of $\text{K}_2\text{Cr}_2\text{O}_7$ is dissolved in 25.0 g H_2O at 90°C , what type of solution will result?



- A. unsaturated solution
- B. saturated solution
- C. supersaturated solution
- D. dynamic solution

-
21. The solubility of a certain gas in water is 0.10 M at pressure = P . What is the solubility of the gas if the pressure is increased to $5P$?
- A. 0.02 M
B. 0.50 M
C. 1.5 M
D. 5.1 M

-
22. A solution is prepared by mixing 15.0 g KOH (56.1 g/mol) with 600. g of water at 25.0°C. What is the **molality** of KOH?
- A. 10.7 *m*
B. 2.25 *m*
C. 0.446 *m*
D. 0.250 *m*

-
23. How many **grams** of ethylene glycol (C₂H₆O₂, 62.07 g/mol) are in 500. g of a 1.7 ppm aqueous solution?
- A. 8.5×10^2 g
B. 5.3×10^2 g
C. 8.5×10^{-4} g
D. 1.4×10^{-5} g

24. Calculate the **molality** of a 4.55% by mass aqueous glucose ($\text{C}_6\text{H}_{12}\text{O}_6$, 180.16 g/mol) solution.

- A. 1.19 *m* C. 0.265 *m*
B. 0.350 *m* D. 0.120 *m*

25. A sodium hydroxide solution is prepared by mixing 12.0 g of NaOH (40.00 g/mol) with 88.0 g H_2O (18.02 g/mol). The density of the solution is 1.13 g/mL. What is the **molarity** of NaOH?

- A. 0.143 M C. 6.65 M
B. 3.39 M D. 10.2 M

26. The experimentally determined Van't Hoff factor for potassium sulfate (K_2SO_4) in water is 2.6 at 0.05 *m*. Which statement is **true**?

- A. The experimental Van't Hoff factor is smaller than the predicted value because the dissociation of potassium and sulfate ions in solution is not complete.
B. The experimental Van't Hoff factor is smaller than the predicted value because there are more potassium ions than sulfate ions in solution.
C. The experimental Van't Hoff factor is larger than the predicted value because the salt dissociates into potassium ions and sulfate ions in water.
D. The Van't Hoff factor approaches 3.0 as the solution is made more concentrated.
-

-
27. A water sample at 25 °C contains 7.84 mol of water and 2.16 mol of sucrose, a nonvolatile solute. Pure water has a vapor pressure of 23.8 torr. What is the **vapor pressure** of the solution?
- A. 187 torr
B. 18.7 torr
C. 5.14 torr
D. 3.04 torr

-
28. What is the **freezing point** of a solution of 10.0 g CaCl₂ (110.98 g/mol) in 75.0 g H₂O? $K_f(\text{H}_2\text{O}) = 1.86 \text{ }^\circ\text{C}/m$.
- A. -11.2 °C
B. -6.70 °C
C. -2.78 °C
D. 1.64 °C

-
29. The osmotic pressure of a sodium hydroxide (NaOH) solution at 25 °C is 0.0225 atm. What is the **molarity**?
- A. $5.22 \times 10^{-3} \text{ M}$
B. $1.11 \times 10^{-3} \text{ M}$
C. $8.08 \times 10^{-4} \text{ M}$
D. $4.60 \times 10^{-4} \text{ M}$

-
30. Rank the aqueous solutions in order of **decreasing** freezing points (highest to lowest).
- A. 2.0 *m* CaCl₂ > 1.0 *m* CaCl₂ > 1.0 *m* glucose
B. 2.0 *m* CaCl₂ > 1.0 *m* glucose > 1.0 *m* CaCl₂
C. 1.0 *m* glucose > 1.0 *m* CaCl₂ > 2.0 *m* CaCl₂
D. 1.0 *m* glucose > 2.0 *m* CaCl₂ > 1.0 *m* CaCl₂
-

CHE 107 Exam 1 Form A Spring 2015 Key

1. B
2. D
3. A
4. D
5. D
6. D
7. B
8. C
9. A
10. A
11. A
12. D
13. C
14. B
15. B
16. A
17. D
18. C
19. A
20. A
21. B
22. C
23. C
24. C
25. B
26. A
27. B
28. B
29. D
30. C