

CHM-102**Exam 2 Review****Review Materials:**

Chapters covered: 11.3-11.8, 13.1-13.5, 14.1-14.4 (omit information on pages 589-590 dealing with second-order reactions).

Online practice test questions related to this exam: all

Other: Be sure to bring your calculator and two #2 pencils to the exam

Important Equations from Chapters 11, 13, and 14:

For sc: $2r = a$ For fcc: $4r = a\sqrt{2}$ For bcc: $4r = a\sqrt{3}$

$$M = \frac{\text{moles}_{\text{solute}}}{L_{\text{solution}}} \quad m = \frac{\text{moles}_{\text{solute}}}{\text{kg}_{\text{solvent}}} \quad \text{ppm} = \frac{\text{mg}_{\text{solute}}}{\text{kg}_{\text{solution}}} \quad \text{ppb} = \frac{\mu\text{g}_{\text{solute}}}{\text{kg}_{\text{solution}}}$$

$$C_g = kP_g \quad P_A = \chi_A P_A^0 \quad \Delta T_b = iK_b m \quad \Delta T_f = -iK_f m$$

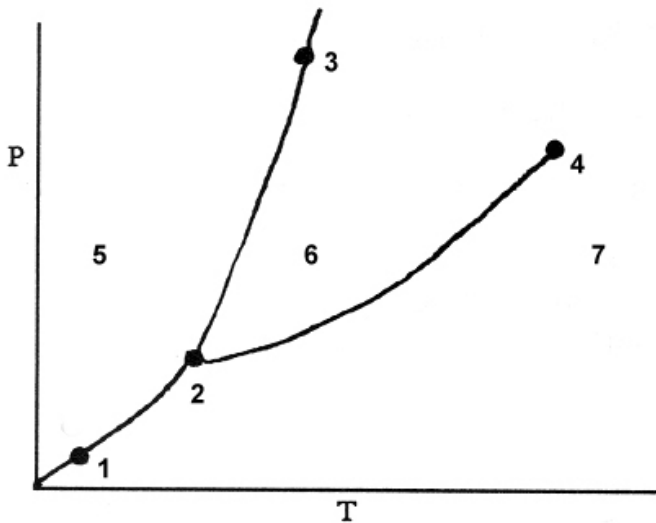
$$\text{Rate} = \frac{-\Delta[A]}{\Delta t} \quad \text{Rate} = k[A]^m[B]^n \quad \ln[A] = -kt + \ln[A]_0 \quad t_{1/2} = \frac{0.693}{k}$$

Practice Questions

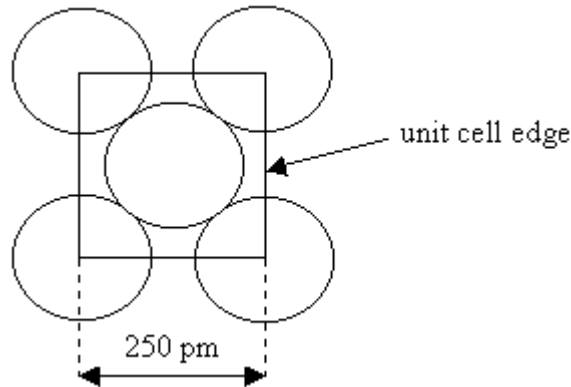
- Which of the following intermolecular attractive forces would have to be overcome in order to boil CH_3OH ?
 - London dispersion forces
 - dipole-dipole attractions
 - hydrogen bonds
 - all of these
- Which of the following properties of a liquid is (are) dependent on the intermolecular attractive forces in the liquid?
 - viscosity
 - surface tension
 - density
 - all of the above

3. On the phase diagram below, which line segment corresponds to the conditions of temperature and pressure under which the solid and gas of the substance are in equilibrium.

- a) between 1-2 b) between 2-4
 c) between 2-3 d) between 1-4 going through 2



4. Shown below is one face of a face-centered cubic unit cell. The radius of each atom is



- a) 88 pm b) 125 pm c) 354 pm d) 500 pm

5. An ionic compound is found to crystallize in such a way that the anions (Y) form a body-centered cubic structure and the cations (X) occupy positions at the center of each face of this structure. What is the formula for this compound?

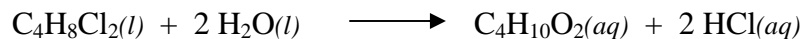
- a) X_3Y_2 b) XY c) X_2Y_3 d) XY_2

6. An unknown solid substance is found to have a high melting point and to conduct electricity in the liquid state but not the solid state. This solid is most likely classified as a
- a) metallic solid b) network solid
c) ionic solid d) molecular solid
7. What is the nature of the intermolecular forces that exist between molecules of CF_4 and C_6H_6 when they dissolve in each other?
- a) dipole-dipole
b) hydrogen bonding
c) London or induced dipole
d) dipole-induced dipole
8. Which one of the following steps in the dissolution of sodium chloride is exothermic?
- a) Separation of the ions in the solid salt.
b) Separation of the water molecules.
c) Hydration (solvation) of the ions from the salt by water molecules.
d) They are all exothermic processes.
9. Which one of the following would be the most soluble in CH_3OH ?
- a) CCl_4 b) H_2CO c) Kr d) NCl_3
10. N_2 gas is relatively _____ in water. Increasing the N_2 pressure over the water will _____ its solubility.
- a) insoluble, decrease
b) soluble, decrease
c) insoluble, no effect
d) insoluble, increase
11. Water has a freezing point constant (K_f) of $1.86\text{ }^\circ\text{C/molal}$. What is the freezing point of a 0.100 molal solution of NaCl ?
- a) -0.372 b) 0.186 c) -1.86 d) 0.372

12. Which one of the following solutions would have the lowest freezing point?

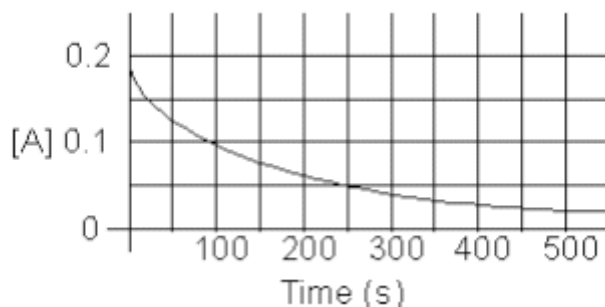
- a) 0.30 m NaCl b) 0.20 m Ca(NO₃)₂
c) 0.25 m Na₂SO₄ d) 0.15 m (NH₄)₃PO₄

13. The reaction of butyl chloride with water proceeds according to the equation below. Which statement is correct?



- a) C₄H₈Cl₂ and C₄H₁₀O₂ both disappear at the same rate.
b) C₄H₈Cl₂ disappears at the same rate that HCl appears.
c) HCl appears at twice the rate that C₄H₁₀O₂ appears.
d) C₄H₈Cl₂ disappears at twice the rate that C₄H₁₀O₂ appears.

14. Use the data in the following graph to determine the average rate of the reaction over the first 250 seconds.

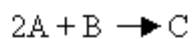


- a) 37.5 M/s b) 0.15 M/s c) 6.0×10^{-4} M/s d) 1.7×10^3 M/s

15. For the reaction $\text{A} + \text{B} \longrightarrow \text{C}$, the rate equation is found to be $R = k[\text{A}]^2$. Which of the following will not increase the rate of this reaction?

- a) increasing [A]
b) increasing [B]
c) increasing the temperature
d) adding a suitable catalyst

16. Select the rate law that corresponds to the data shown for the following reaction.



Exp.	Initial [A]	Initial [B]	Initial Rate
1	0.015	0.022	0.125
2	0.030	0.044	0.500
3	0.060	0.044	1.000
4	0.060	0.088	2.000

- a) $R = k[A]^2[B]^2$
- b) $R = k[A][B]$
- c) $R = k[A][B]^2$
- d) $R = k[A]^2[B]$

17. The reaction $A \rightarrow B$ is first order in A. Given the following data, determine the rate constant for this reaction.

Time (s)	[A] (M)
0	1.60
5	0.80
10.0	0.40
15.0	0.20
20.0	0.10

- a) 0.013 s^{-1}
- b) 0.030 s^{-1}
- c) 0.14 s^{-1}
- d) 5.0 s^{-1}