1. Assume 12,500 J of energy is added to 2.0 moles (36 grams) of H_2O as an ice sample at 0°C. The molar heat of fusion is 6.02 kJ/mol. The specific heat of liquid water is 4.18 J/g °C. The molar heat of vaporization is 40.6 kJ/mol. The resulting sample contains which of the following?
   A. water and water vapor
   B. ice and water
   C. only water
   D. only water vapor
   E. only ice

2. In a certain mountain range, water boils at 94°C. What is the atmospheric pressure under these conditions? The enthalpy of vaporization of water at 100°C is 40.7 kJ/mol. The normal boiling of water is 100 °C.
   A. 1750 mmHg
   B. 324 mmHg
   C. 613 mmHg
   D. 941 mmHg
   E. 329 mmHg

3. Which is the best reason for why water in a glass capillary has a concave meniscus, while mercury in a glass capillary has a convex meniscus?

   A. Mercury has a greater dispersion force than water.
   B. The water is attracted more strongly to the glass than the mercury is attracted to the glass.
   C. The mercury is attracted more strongly to the glass than the water is attracted to the glass.
   D. Water is a molecular compound while mercury is a metallic element.
   E. Water has a greater dispersion force than mercury.

4. Which compound has the lowest standard enthalpy of vaporization at 25°C?
   A. C_6H_{14}
   B. C_8H_{16}
   C. C_5H_{12}
   D. C_8H_{18}
   E. C_7H_{16}

$\frac{C_1}{C_2} = \frac{P_1}{P_2}$ $C_2 = \frac{C_1 P_2}{P_1}$

3 $P_2 = \frac{C_2 P_1}{C_1}$

5. Which of the following concerning intermolecular forces is/are correct?

i. Intermolecular forces depend in part on the shape of a molecule.
ii. London forces contribute to the net forces of attraction found in all molecular solids and liquids.
iii. Hydrogen bonding is a special category of dipole-dipole attractions.

A.i only B.ii only C.iii only D.i and ii (E.i, ii, and iii

6. If the solubility of O_2 at 0.160 bar and 25°C is 6.65 g/100 g H_2O, what is the solubility of O_2 at a pressure of 1.84 bar and 25°C?

(A) 77 g/100 g H_2O
B. 22.5 g/100 g H_2O
C. 1.7 g/100 g H_2O
D. 0.0 g/100 g H_2O
E. 0.6 g/100 g H_2O

$39.2 = \frac{g}{L}$ $9.98 = \frac{mole}{\frac{g}{1330}}$ $9.98 = \frac{mole}{L}$ $1000 = \frac{g}{L}$

7. What is the mass percent of an aqueous sodium hydroxide solution in which the molarity of NaOH is 9.98 *M*? The density of the solution is 1.33 g/mL. Molar mass of NaOH = 40.0 g/mol)

A. 0.1%
B. 30.0%
C. 13.2%
D. 1.7%
E. 68.9%

8. Substance A has a greater molar mass than substance B. If 50 g of substance A are dissolved in 250 g of water in one beaker, and 50 g of substance B are dissolved in 250 g of water in another beaker, then

A. the vapor pressure of solution A will be lower than the vapor pressure of solution B.
B. the solution of A will freeze at a lower temperature than the solution of B.
C. the two solutions will have the same vapor pressure.
D. the boiling point of solution A will be lower than the boiling point of solution B.
E. the solution of A will have a higher osmotic pressure than the solution of B.

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9. When a 33.8-g sample of an unknown compound is dissolved in 500. g of benzene, the freezing point of the resulting solution is 3.77°C. The freezing point of pure benzene is 5.48°C, and K_f for benzene is 5.12°C/*m*. Calculate the molar mass of the unknown compound.
   A. 173 g/mol
   B. 202. g/mol
   C. 101.2 g/mol
   D. 405 g/mol
   E. 19.8 g/mol

10. At 36°C, what is the osmotic pressure of a 0.82% NaCl by weight aqueous solution? Assume the density of the solution is 1.0 g/mL. molar mass of NaCl = 58.0 g/mol.

   A. 0.35 atm
   B. 3.5 atm
   C. 4.1×10^2atm
   D. 7.1 atm
   E. 0.82 atm

11. For the hypothetical reaction A + 2B → 2C + D, the initial rate of disappearance of A is 2.0×10^{-2}mol/(L · s). What is the initial rate of disappearance of B?
   A. 8.0×10^{-2}mol/(L · s)
   B. 4×10^{-2}mol/(L · s)
   C. 1.4×10^{-1}mol/(L · s)
   D. 4.0×10^{-4}mol/(L · s)
   E. 1.4×10^{-2}mol/(L · s)

12. If the rate law for a reaction is
Rate = $k[ClO_3^-][I^-][H^+]^2$
what are the units of k?

A. (L · s)/mol
B. $mol^2/(L^2 \cdot s)$
C. mol/(L · s)
D. $L^2/(mol^2 \cdot s)$
E. $L^3/(mol^3 \cdot s)$

$t_{1/2} = \frac{\ln 2}{CA^0}$

13. A first-order reaction is 45% complete at the end of 35 minutes. What is the length of the first half-life of this reaction?

A. 41 min
B. 39 min
C. 30. min
D. 27 min
E. none of these

14.For a reaction: aA→ Products, $[A]_0$ = 6.0 M, and the first two half-lives are 56 and 28 minutes, respectively.

$t_{1/2} =$

Calculate k (without units)

A. 1.2×10^{-2}
B. 3.0×10^{-3}
C. 5.4×10^{-2}
D. 1.0×10^{-2}
E. none of these

15.The following data were obtained for the hypothetical reaction 2A + B → products.

1	2	
$[A]_0$ (*M*)	$[B]_0$ (*M*)	Initial Rate (*M*/s)
0.2	0.1	5
0.2	0.2	20
0.6	0.1	15

What is the overall order of this reaction?

A. 4
B. ½
C. 0
D. 3
E. 1