

Question 1

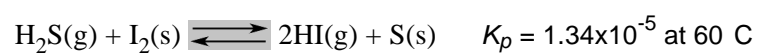
Question 2

Knowing that a human eye has an osmotic pressure of 7.97 atm at 37.0 C, an eye-drop solution with the same osmotic pressure and temperature is prepared by adding 0.242 g of NaCl in 25.0 mL water. Calculate the van't Hoff factor for NaCl in this solution. Assume the density of the solution to be 1.00 g/mL.

Question 4

Question 6

Consider the following reaction



| 2.00 g solid iodine (I_2)

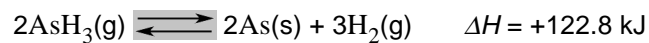
A 5.00 L reactor contains the following initial mixture at 60 C

Question 7

a. Indicate whether the following statements are true or false

- | | True | False |
|---|--------------------------|--------------------------|
| i. The solubility of a gas in water decreases with increasing temperature | <input type="checkbox"/> | <input type="checkbox"/> |
| ii. The presence of a non-volatile solute in a solvent lowers the vapor pressure of the solution | <input type="checkbox"/> | <input type="checkbox"/> |
| iii. Henry's law states that the amount of a gas dissolved in a solution is directly proportional to the pressure of the gas above the solution | <input type="checkbox"/> | <input type="checkbox"/> |
| iv. A liquid-liquid solution that obeys Raoult's law is called an "ideal solution" | <input type="checkbox"/> | <input type="checkbox"/> |
| v. Colligative properties are based on the number of particles in solution, whatever the "size" of the particle. | <input type="checkbox"/> | <input type="checkbox"/> |
| vi. The addition of an ionic compound to any solvent will cause a boiling point depression. | <input type="checkbox"/> | <input type="checkbox"/> |

b. The gas Arsine, AsH₃ decomposes as follows:



Question 9

a. Order the following from the strongest to the weakest base

- i. H_2O
- ii. CH_3NH_2
- iii. ClO_4^-

strongest base

weakest base

b. Arrange the following aqueous solutions in order from most acidic to most basic.

- i. 0.1M KF
- ii. 0.1M KNO_3
- iii. 0.1M NH_4Cl

most acidic

most basic

Question 10

Calculate the mass of KNO

Question 11

A 20.0 mL sample of 0.10 M formic acid (HCOOH) was titrated with 5.0×10^{-2} M Ba(OH)₂.
 K_a for HCOOH is 1.8×10^{-4} .

- a. Calculate the pH of the solution upon the addition of 15.0 mL of Ba(OH)₂ to the sample.

Question 11 (cont.)

b. What volume of $\text{Ba}(\text{OH})_2$ is needed to reach the equivalence point?

2 marks

c. Calculate the pH of the solution at the equivalence point.

3 marks

Answers

b. volume at equivalence point :

c. pH at equivalence point :

Question 12

Solid NaI is slowly added to a solution that contains both $\text{Pb}(\text{NO}_3)_2$

Question 13

a. Predict the sign of ΔS of the system for each of the following processes

	$\Delta S < 0$	$\Delta S > 0$
i. A liquid that boils	<input type="checkbox"/>	<input type="checkbox"/>
ii. Sugar that crystallized out from a supersaturated sugar solution	<input type="checkbox"/>	<input type="checkbox"/>
iii. Iron rusts (formation of Fe_2O_3 from pure Fe and O_2)	<input type="checkbox"/>	<input type="checkbox"/>
iv. $\text{A-B(g)} + \text{C-D(s)} \longrightarrow \text{A-B-C(g)} + \text{D(s)}$	<input type="checkbox"/>	<input type="checkbox"/>
v. $\text{N}_2\text{O}_4(\text{g}) \longrightarrow 2\text{NO}_2(\text{g})$	<input type="checkbox"/>	<input type="checkbox"/>
vi. $\text{NaCl(s)} \longrightarrow \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \quad !H_{\text{sol}} = +4.0 \text{ kJ/mol}$	<input type="checkbox"/>	<input type="checkbox"/>

b. For mercury (Hg), the enthalpy of vaporization is 58.51 kJ/mol and the entropy of vaporization is 92.92 J/K.mol. What is the normal boiling point of mercury?

Answer

b. T_b :

Question 14

Consider the following reaction



Will the reaction be spontaneous at each of the following temperatures? Show your work.
(assume that ΔH° and ΔS° do not change very much within the given temperature range)

- a. 25.0 C
- b. 60.0 C

Answers

Question 15

Complete the "experiment 2" laboratory data sheet and find the molar mass of the unknown no 3.

6 marks

The solid unknown added is a non-ionic compound, completely soluble in cyclohexane.

COLLIGATIVE PROPERTIES

DATA SHEET

cyclohexane = 20.2 C.kg.mol⁻¹

cyclohexane = 6.55 C

Data for the Unknown Solute/Cyclohexane Solution

Unknown Number: _____

Mass of empty test tube, stopper, beaker

g 1.223

Mass of test tube, stopper, beaker, & cyclohexane

g 204.3

Mass of test tube, stopper, beaker, & unknown solute/cyclohexane solution

g 204.4

Mass of cyclohexane

g _____

Mass of unknown solute

g _____

Freezing Temperature of unknown solute/cyclohexane solution

C 4.2

Molar mass of unknown solute

g.mol⁻¹ _____

Sample calculation.