/45

AP Chemistry – Up, Up and Away! – 60

Name _____Per ___

1. The decomposition of hydrogen peroxide is catalyzed by the iodide ion. The catalyzed reaction is thought to proceed by a two-step mechanism:
$H_2O_{2(aq)} + I^-_{(aq)} \rightarrow H_2O_{(l)} + IO^-_{(aq)}$ (slow)
$IO^-_{(aq)} + H_2O_{2(aq)} \rightarrow H_2O_{(l)} + O_{2(g)} + I^-_{(aq)}$ (fast)
(a) Assuming that the first step of the mechanism is rate-determining, predict the rate law for the overall process.

(b) Write the chemical reaction for the overall process.

(c) Identify the intermediate, if any, in the mechanism.

2. A biochemist needs 750.0 mL of an acetic acid-sodium acetate buffer with pH 4.50. Solid sodium acetate and glacial acetic acid are available. Glacial acetic acid, $HC_2H_3O_2$, is 99% acetic acid by mass and has a density of 1.05 g/mL. If the buffer is to be 0.20 M in $HC_2H_3O_2$, how many grams of sodium acetate and how many mL of glacial acetic acid must be used?

3. What is meant by the term reduction?

4. What is the reducing agent?

5. What is meant by the term oxidation?

6. What is the oxidizing agent?

7. On which side of a reduction half-reaction do the electrons appear?

8. The cooling system of a small car is filled with a 1.00 L solution formed by mixing equal volumes of water, density 1.00 g/mL, and ethylene glycol, $C_2H_6O_2$, density 1.12 g/mL. What would the freezing and boiling points of the mixture be?

9. Complete and balance the following equations, and identify the oxidizing and reducing agents:
(a) $HNO_2 + I^- \rightarrow NO + I_2$ (acidic solution)

(b) $CN^- + MnO_4^- \rightarrow CNO^- + MnO_2$ (basic solution)

10. A 0.144 mole sample of an element has a mass of 14.82 grams. What element is it?

11. A student would like to determine how many moles of water in the formula of the hydrate $MgCl_2 \cdot n\ H_2O$. Here is the data the student collected:

Mass of empty crucible	22.347 g
Initial mass of sample and crucible	25.825 g
Mass of sample and crucible after heating	23.982 g
Mass of sample and crucible after 2nd heating	23.976 g
Mass of sample and crucible after 3rd heating	23.977 g

(a) How do you know that the hydrate sample was heated sufficiently in the experiment?

(b) Determine the total number of moles of H_2O lost upon heating the hydrate sample.

(c) What is the formula of the hydrate?

12. A 3.85 g mixture contains anhydrous magnesium chloride and potassium nitrate. The mixture is treated with sufficient silver nitrate which precipitates 7.90 g of silver chloride. (a) Determine how many moles of magnesium chloride were in the original 3.85 g.

(b) What is the % by mass of the magnesium chloride in the original 3.85 g?