

1) Fill in the missing information:

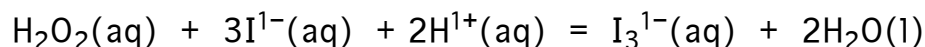
pH	pOH	[H <sup>+</sup> ]	[OH <sup>-</sup> ]
	2.3		
		$1.8 \times 10^{-5}$	
5.2			
			0.0033
		1.1	
	9.2		
			$7.0 \times 10^{-8}$

2) Calculate the pH of

a) 0.005 M HCl

b) 0.050 M HF

- 3) Iodide ion reacts with hydrogen peroxide in acidic solution according to the following equation:



From the rate data in the table below, deduce the rate expression, including the numerical value for the specific rate constant, for the reaction.

	[H <sub>2</sub> O <sub>2</sub> ]	[I <sup>-</sup> ]	[H <sup>+</sup> ]	initial rate M/sec
Exp 1	0.01	0.01	0.0005	1.15 x 10 <sup>-6</sup>
Exp 2	0.02	0.01	0.0005	2.30 x 10 <sup>-6</sup>
Exp 3	0.01	0.02	0.0005	2.30 x 10 <sup>-6</sup>
Exp 4	0.01	0.01	0.001	1.15 x 10 <sup>-6</sup>

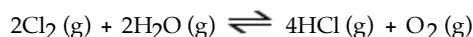
- 4) Compound W decomposes according to first order kinetics. If the half-life for the decomposition is 2.2 hours, how much W would remain after 30 minutes for an initial [W] = 0.75 M?

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

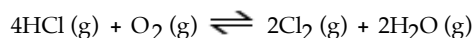
- 1) The dissolution of water in octane ( $C_8H_{18}$ ) is prevented by \_\_\_\_\_. 1) \_\_\_\_\_
- A) repulsion between like-charged water and octane molecules
  - B) hydrogen bonding between water molecules
  - C) London dispersion forces between octane molecules
  - D) dipole-dipole attraction between octane molecules
  - E) ion-dipole attraction between water and octane molecules
- 2) An unsaturated solution is one that \_\_\_\_\_. 2) \_\_\_\_\_
- A) contains no solute
  - B) has no double bonds
  - C) has a concentration lower than the solubility
  - D) contains more dissolved solute than the solubility allows
  - E) contains the maximum concentration of solute possible, and is in equilibrium with undissolved solute
- 3) Which of the following substances is more likely to dissolve in water? 3) \_\_\_\_\_
- A)  $CHCl_3$
  - B)  $HOCH_2CH_2OH$
  - C)  $CH_3(CH_2)_8CH_2OH$
  - D)  $CCl_4$
  - E) 
$$\begin{array}{c} O \\ || \\ CH_3(CH_2)_9CH \end{array}$$
- 4) Calculate the molality of a 25.4% (by mass) aqueous solution of phosphoric acid ( $H_3PO_4$ ). 4) \_\_\_\_\_
- A) 2.59 m
  - B) 25.4 m
  - C) 4.45 m
  - D) 3.47 m
  - E) The density of the solution is needed to solve the problem.
- 5) What types of intermolecular forces exist between HI and  $H_2S$ ? 5) \_\_\_\_\_
- A) dipole-dipole and ion-dipole
  - B) dispersion forces, dipole-dipole, and ion-dipole
  - C) dispersion forces, dipole-dipole, and ion-dipole
  - D) dispersion forces, hydrogen bonding, dipole-dipole, and ion-dipole
  - E) dispersion forces and dipole-dipole
- 6) In basic solution, \_\_\_\_\_. 6) \_\_\_\_\_
- A)  $[H_3O^+] < [OH^-]$
  - B)  $[H_3O^+] > [OH^-]$
  - C)  $[OH^-] > 7.00$
  - D)  $[H_3O^+] = [OH^-]$
  - E)  $[H_3O^+] = 0\text{ M}$

7) The  $K_{eq}$  for the equilibrium below is  $7.52 \times 10^{-2}$  at  $480.0^\circ\text{C}$ .

7) \_\_\_\_\_



What is the value of  $K_{eq}$  at this temperature for the following reaction?



- A)  $5.66 \times 10^{-3}$
- B) 13.3
- C) 0.150
- D) 0.0752
- E) -0.0752

8) The rate law for a reaction is

8) \_\_\_\_\_

$$\text{rate} = k[\text{A}][\text{B}]^2$$

Which one of the following statements is false?

- A) The reaction is second order in B.
- B)  $k$  is the reaction rate constant
- C) The reaction is first order in A.
- D) The reaction is second order overall.
- E) If  $[\text{B}]$  is doubled, the reaction rate will increase by a factor of 4.

9) Which solution below has the highest concentration of hydronium ions?

9) \_\_\_\_\_

- A)  $\text{pH} = 7.93$
- B)  $\text{pH} = 7.00$
- C)  $\text{pH} = 12.6$
- D)  $\text{pH} = 3.21$
- E)  $\text{pH} = 9.82$

10) Of the acids in the table below, \_\_\_\_\_ is the strongest acid.

10) \_\_\_\_\_

Acid	$K_a$
HOAc	$1.8 \times 10^{-5}$
HCHO <sub>2</sub>	$1.8 \times 10^{-4}$
HClO	$3.0 \times 10^{-8}$
HF	$6.8 \times 10^{-4}$

- A) HOAc and HCHO<sub>2</sub>
- B) HOAc
- C) HCHO<sub>2</sub>
- D) HClO
- E) HF