What is the meaning of the blue square in the safety diamond?

A. reactivity  
B. health  
C. fire  
D. specific hazards
Question #: 2

After completing an experiment, all chemical wastes should be

A. left at your lab station for the next class.
B. disposed of according to your instructor's directions.
C. dumped in the sink.
D. taken home.

Question #: 3

Carbon disulfide is a liquid that can be used in the production of rayon and cellophane. It is manufactured from methane and elemental sulfur according to the following chemical reaction:

CH₄(g) + 4 S(s) → CS₂(l) + 2 H₂S(g)

How many moles of CS₂ can be formed by the complete reaction of 10.6 mol of S with excess CH₄?

A. 1 mol
B. 10.6 mol
C. 2.65 mol
D. 42.4 mol

Question #: 4

Balance the following chemical reaction by filling in the blank coefficients below with the smallest possible whole numbers. If the coefficient is 1, enter the number 1.

1 KO₂(s) + 2 CO₂(g) → 3 K₂CO₃(s) + 4 O₂(g)

1. __________
2. __________
3. __________
4. __________
**Question #**: 5

What is the net ionic equation for the reaction between the reagents shown below?

**magnesium nitrate + sodium chromate**

Complete the table shown below with your response. Give the cation first.

<table>
<thead>
<tr>
<th>Substance</th>
<th>State</th>
<th>Substance</th>
<th>State</th>
<th>Substance</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (2)</td>
<td>+</td>
<td>3 (4)</td>
<td>→</td>
<td>5 (6)</td>
<td></td>
</tr>
</tbody>
</table>

You do not need to balance the reaction. Enter ionic charges without superscripts; e.g., Ca2+.

1. 
2. 
3. 
4. 
5. 
6. 

---

**Question #**: 6

Which of the following aqueous solutions would you use in a qualitative chemical test to identify a solution of Ba(OH)₂?

A. BaCl₂  
B. HNO₃  
C. NH₃  
D. H₂SO₄

---

**Question #**: 7

The phosphorus atom in PBr₃ has __1__ lone pairs(s) and a __2__ molecular geometry.

1. 
2. 

---
Question #: 8

What are the appropriate hybridization schemes for the carbon atoms in molecular CH₃CO₂H?

A. \( sp^3 \) and \( sp \)
B. \( sp^3 \) and \( sp^2 \)
C. \( sp^2 \) and \( sp \)
D. \( sp^3 \) and \( sp^3 \)

Question #: 9

What mass of ethylene glycol (antifreeze, MW = 62.1 g/mol) must be added to 10.0 liters of water to produce a solution that freezes at \(-23.3 \, ^\circ C\)? The density of water is 1.00 g/mL and \( K_f = 1.86 \, ^\circ C/m \).

A. 7.78 kg
B. 26.9 kg
C. 0.406 kg
D. 12.5 kg

Question #: 10

A solution was prepared by dissolving 9.54 g of dry ice (CO₂) in 250.0 mL ethanol (C₂H₅OH). The freezing point depression constant (\( K_f \)) for ethanol is 1.99 \( ^\circ C/m \) and pure ethanol's freezing point is \(-114.6 \, ^\circ C\). The density of ethanol is 0.789 g/mL. How much did the dry ice depress ethanol's freezing point?

A. \(-114.6 \, ^\circ C\)
B. 0.197 \( ^\circ C\)
C. \(-116.8 \, ^\circ C\)
D. 2.19 \( ^\circ C\)

Question #: 11

Which aqueous solution will have the lowest freezing point?

A. 0.030 \( m \) glucose
B. 0.030 \( m \) AlBr₃
C. 0.030 \( m \) CaBr₂
D. 0.030 \( m \) NaBr
A student prepared a sugar solution containing 6.0046 g of sugar (C\textsubscript{12}H\textsubscript{22}O\textsubscript{11}) in 25.00 mL of water, and he/she produced the following freezing point data:

What is the $K_f$ of water based on the student's data?

A. 0.70 °C/m
B. 9.3 °C/m
C. 4.2 °C/m
D. 0.11 °C/m
**Question #: 13**

A catalyst speeds up a reaction principally by _____.

A. increasing $T$
B. increasing $K$
C. decreasing $E_a$
D. decreasing $k$

**Question #: 14**

A solution is said to contain 28% phosphoric acid by mass. What does that mean?

A. the density of this solution is 2.8 g/mL
B. 100 g of this solution contains 28 g of phosphoric acid
C. 1 L of this solution has a mass of 28 g
D. 1 mL of this solution contains 28 g of phosphoric acid

**Question #: 15**

In order to determine the energy of activation for the decomposition of hydrogen peroxide, a student determined that the rate constant at 22.33 °C was 0.023 s$^{-1}$. At 33.96 °C, the rate constant increased to 0.061 s$^{-1}$. What is the activation energy?

A. 63 kJ/mol
B. –8.1 kJ/mol
C. $7.4 \times 10^2$ kJ/mol
D. $1.3 \times 10^{-3}$ kJ/mol
In order to determine the rate law for the decomposition of hydrogen peroxide, a student collected pressure versus time measurements as the hydrogen peroxide decomposed with the addition of KI. The following graph was produced at 22.33 °C. What is the rate of the reaction?

Question thrown out due to error.

A. \( \frac{1.515}{\text{mol L} \times \text{s}} \)

B. \( \frac{0.06248}{\text{mol L} \times \text{s}} \)

C. \( \frac{8.865}{\text{mol L} \times \text{s}} \)

D. \( \frac{0.02429}{\text{mol L} \times \text{s}} \)
Question #: 17

Which one of the following is necessary to form a saturated solution at equilibrium?

A. excess solute
B. an ionic solute
C. solute of low solubility
D. a $Q$ less than $K_{sp}$

Question #: 18

The absorbance of a standard solution of $2.032 \times 10^{-4}$ M FeSCN$^{2+}$ ($aq$) was determined to be 1.086. A student prepared a solution containing 4.98 mL of 0.00200 M Fe(NO$_3$)$_3$ and 3.97 mL of 0.00200 M KSCN in 1.00 mL water. What is the concentration of FeSCN$^{2+}$ if its absorbance at equilibrium was measured to be 0.792?

A. $6.75 \times 10^4$ M
B. $6.81 \times 10^{-2}$ M
C. $2.03 \times 10^{-4}$ M
D. $1.48 \times 10^{-4}$ M

Question #: 19

Hydroxyapatite, Ca$_5$(PO$_4$)$_3$OH, is present in our tooth enamel. It undergoes continuous reversible reactions with the minerals supplied from saliva as seen in the following reaction:

$$\text{Ca}_5(\text{PO}_4)_3(\text{OH}) \rightleftharpoons 5 \text{Ca}^{2+}(aq) + 3 \text{PO}_4^{3-}(aq) + \text{OH}^- (aq)$$

At equilibrium, the concentration of OH$^-$ ($aq$) is $2.00 \times 10^{-4}$ mol/L. What is the value of $K_{sp}$?

A. $2.00 \times 10^{-4}$
B. $1.20 \times 10^{-10}$
C. $2.16 \times 10^{-25}$
D. $4.32 \times 10^{-29}$
**Question #: 20**

Nitrosyl bromide decomposes according to the following equation.

\[ 2 \text{NOBr}(g) \rightleftharpoons 2 \text{NO}(g) + \text{Br}_2(g) \]

A 0.64 mol sample of NOBr was placed in a 1.00 L flask containing no NO or Br₂. At equilibrium, the flask contained 0.46 mol of NOBr. How many moles of NO and Br₂ are in the flask at equilibrium?

A. 0.18 moles NO and 0.18 moles Br₂  
B. 0.18 moles NO and 0.090 moles Br₂  
C. 0.46 moles NO and 0.46 moles Br₂  
D. 0.36 moles NO and 0.23 moles Br₂

**Question #: 21**

Consider the following reaction at equilibrium in a closed container

\[ 4 \text{NH}_3(g) + 3 \text{O}_2(g) \rightleftharpoons 2 \text{N}_2(g) + 6 \text{H}_2\text{O}(g) \quad \Delta H = -64.5 \text{ kJ/mol} \]

Increasing the O₂ partial pressure will ______ the NH₃ partial pressure.

A. increase  
B. decrease  
C. not change
Question #: 22

What is the equilibrium constant expression for the following reaction?

\[ \text{P}_4(\text{g}) + 6 \text{Cl}_2(\text{g}) \rightleftharpoons 4 \text{PCl}_3(\text{l}) \]

A. \[ K = \frac{[\text{PCl}_3]}{[\text{P}_4][\text{Cl}_2]} \]

B. \[ K = \frac{[\text{PCl}_3]^4}{[\text{P}_4][\text{Cl}_2]^6} \]

C. \[ K = \frac{1}{[\text{P}_4][\text{Cl}_2]^6} \]

D. \[ K = \frac{1}{[\text{PCl}_3]^4} \]

Question #: 23

What is "hard water" used to commonly describe?

A. water distilled from acid rain
B. groundwater found in arid areas
C. water with many dissolved ions
D. water from polluted water
Question #: 24

In order to produce a standard curve, you need to dilute a 12.0 M stock solution to produce 250.0 mL of a $6.41 \times 10^{-2}$ M solution. How much of the stock solution do you need to use for the dilution?

A. 0.0641 mL  
B. 150. mL  
C. 12.6 mL  
D. 1.34 mL

Question #: 25

For which of the following correlations would the data points be widely spread in a general straight line trend?

A. $r^2 = 0.10$  
B. $r^2 = 0.98$  
C. $r^2 = 0.76$  
D. $r^2 = 0.45$

Question #: 26

To determine the phosphate concentration in a water sample, the following standard curve was produced. If the absorbance of the water sample is 1.744, what is its phosphate concentration?

A. $2.59 \times 10^{-4}$ M  
B. $5.09 \times 10^{-4}$ M  
C. $3.16 \times 10^{-4}$ M  
D. $4.59 \times 10^{-4}$ M
Question #: 27

What is the pH of a 0.250 M solution of HNO₃(aq)?

A. 0.60  
B. 0.250  
C. 13.75  
D. 1.78

Question #: 28

What is the pH of a mixture of 0.100 M acetic acid and 0.200 M sodium acetate? The $K_a$ of acetic acid is $1.8 \times 10^{-5}$. Your answer should be reported to 2 decimal places.

1. ___________

Question #: 29

A buffer is prepared from succinic acid (H₂Suc, $K_a = 6.2 \times 10^{-5}$) and sodium succinate (HSuc⁻) such that [H₂Suc] = [HSuc⁻] = 0.34 M. What is the pH of this buffer solution?

A. 0.34  
B. 4.21  
C. 4.56  
D. 0.467

Question #: 30

Which of the following pairs could make a 0.1 M buffer solution?

A. HCl and NaOH  
B. KOH and NaCl  
C. NH₃ and NH₄Cl  
D. C₂H₅O₂H and NaCl
Question #: 31
Which of the following acids, when paired with its conjugate base, would be appropriate to use to prepare a buffer with a pH of 5.02?

A. HCOOH, $K_a = 1.77 \times 10^{-4}$
B. H$_3$PO$_4$, $K_a = 7.52 \times 10^{-3}$
C. NaH$_2$PO$_4$$\cdot$H$_2$O, $K_a = 6.23 \times 10^{-8}$
D. CH$_3$CH$_2$COOH, $K_a = 1.34 \times 10^{-5}$

Question #: 32
What is the molar solubility of calcium phosphate, whose $K_{sp}$ is $2.07 \times 10^{-33}$?

A. $2.07 \times 10^{-6}$ M
B. $2.03 \times 10^{-7}$ M
C. $3.45 \times 10^{-35}$ M
D. $1.14 \times 10^{-7}$ M

Question #: 33
In the standardization of hydrochloric acid with sodium carbonate, how many equivalence points should you see?

A. one
B. two
C. three
D. four

Question #: 34
For the determination of the solubility of calcium carbonate lab, the sodium carbonate used in the experiment was placed in the oven prior to using it to titrate the hydrochloric acid solution. Why was this necessary?

A. To ensure the sodium carbonate was not contaminated with hydrochloric acid.
B. To remove any water.
C. To heat the sample up.
D. To keep the sodium carbonate out of the light.
**Question #:** 35

How would the concentration of Fe$^{+2}(aq)$ ions in equilibrium with FeS be affected if the concentration of S$^{2-}(aq)$ ions were tripled?

A. increased by a factor of 6  
B. no change  
C. decreased by a factor 30  
D. decreased by a factor of 3

---

**Question #:** 36

Which of the following best represents the solubility product expression for the dissociation of strontium phosphate?

A. $K_{sp} = [Sr^{+2}]^2[PO_4^{-3}]^3$  
B. 

\[
K_{sp} = \frac{[Sr^{+2}]^3[PO_4^{-3}]^2}{[Sr_3(PO_4)_2]} 
\]

C. $K_{sp} = [Sr^{+2}]^3[PO_4^{-3}]^2$  
D. $K_{sp} = [Sr^{+2}][PO_4^{-3}]$

---

**Question #:** 37

What result would you expect from a pH paper test of a solution of Ba(OH)$_2$?

A. pH paper will turn blue  
B. pH paper will turn red  
C. there will be no change in the color of the pH paper  
D. pH paper will turn green
**Question #: 38**

In lab, you conducted a vinegar test by adding 10 to 20 drops of vinegar directly to a solid sample. What were you testing for in this reaction?

A. The presence of acetic acid.  
B. The formation of an insoluble hydroxide.  
C. The presence of base.  
D. The formation of carbon dioxide.

---

**Question #: 39**

Which of the following substances would produce an orange flame in the flame test?

A. boric acid  
B. sodium chloride  
C. sucrose  
D. magnesium sulfate

---

**Question #: 40**

Various qualitative tests were performed on an unknown sample and the following results were obtained:

1. The unknown was soluble in water.  
2. Its aqueous solutions had a pH ranging from 10 to 12.  
3. It bubbled in vinegar.  

Based on this information, what is the identity of the unknown?

A. sucrose  
B. sodium hydroxide  
C. sodium carbonate  
D. magnesium sulfate
What is the meaning of the blue square in the safety diamond?

A. reactivity
✓ B. health
C. fire
D. specific hazards

Item Weight: 1.0
Question #: 2

After completing an experiment, all chemical wastes should be

A. left at your lab station for the next class.
✓ B. disposed of according to your instructor's directions.
C. dumped in the sink.
D. taken home.

Item Weight: 1.0

Question #: 3

Carbon disulfide is a liquid that can be used in the production of rayon and cellophane. It is manufactured from methane and elemental sulfur according to the following chemical reaction:

\[ \text{CH}_4(g) + 4 \text{S(s)} \rightarrow \text{CS}_2(l) + 2 \text{H}_2\text{S(g)} \]

How many moles of CS₂ can be formed by the complete reaction of 10.6 mol of S with excess CH₄?

A. 1 mol
B. 10.6 mol
✓ C. 2.65 mol
D. 42.4 mol

Item Weight: 1.0

Question #: 4

Balance the following chemical reaction by filling in the blank coefficients below with the smallest possible whole numbers. If the coefficient is 1, enter the number 1.

\[ 1 \text{KO}_2(s) + 2 \text{CO}_2(g) \rightarrow 3 \text{K}_2\text{CO}_3(s) + 4 \text{O}_2(g) \]

1. 4
2. 2
3. 2
4. 3

Item Weight: 1.0
**Question #**: 5

What is the net ionic equation for the reaction between the reagents shown below?

**magnesium nitrate + sodium chromate**

Complete the table shown below with your response. Give the cation first.

<table>
<thead>
<tr>
<th>Substance</th>
<th>State</th>
<th>Substance</th>
<th>State</th>
<th>Substance</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(     2    )</td>
<td>+</td>
<td>3</td>
<td>(     4    )</td>
<td>→</td>
</tr>
</tbody>
</table>

You do not need to balance the reaction. Enter ionic charges without superscripts; e.g., Ca2+.

1. Mg\(^{+2}\) Mg\(^{2+}\)
2. aq|aqueous|
3. CrO\(^{4-2}\) CrO\(^{2-}\) CrO\(^{4\cdot^-2}\) CrO\(^{4\cdot^2-}\)
4. aq|aqueous|
5. MgCrO\(_4\)
6. s|solid|

**Item Weight**: 1.0

---

**Question #**: 6

Which of the following aqueous solutions would you use in a qualitative chemical test to identify a solution of Ba(OH)\(_2\)?

A. BaCl\(_2\)
B. HNO\(_3\)
C. NH\(_3\)
D. H\(_2\)SO\(_4\)

**Item Weight**: 1.0

---

**Question #**: 7

The phosphorus atom in PBr\(_3\) has \_\_\_ lone pairs(s) and a \_\_\_ molecular geometry.

1. lone
2. trigonal pyramidal

**Item Weight**: 1.0
Question #: 8
What are the appropriate hybridization schemes for the carbon atoms in molecular CH₃CO₂H?
A. sp³ and sp
✓B. sp³ and sp²
C. sp² and sp
D. sp³ and sp³

Item Weight: 1.0

Question #: 9
What mass of ethylene glycol (antifreeze, MW = 62.1 g/mol) must be added to 10.0 liters of water to produce a solution that freezes at –23.3 ºC? The density of water is 1.00 g/mL and $K_f = 1.86$ ºC/m.

✓A. 7.78 kg
B. 26.9 kg
C. 0.406 kg
D. 12.5 kg

Item Weight: 1.0

Question #: 10
A solution was prepared by dissolving 9.54 g of dry ice (CO₂) in 250.0 mL ethanol (C₂H₅OH). The freezing point depression constant ($K_f$) for ethanol is 1.99 ºC/m and pure ethanol's freezing point is –114.6 ºC. The density of ethanol is 0.789 g/mL. How much did the dry ice depress ethanol's freezing point?
A. –114.6 ºC
B. 0.197 ºC
C. –116.8 ºC
✓D. 2.19 ºC

Item Weight: 1.0

Question #: 11
Which aqueous solution will have the lowest freezing point?
A. 0.030 m glucose
✓B. 0.030 m AlBr₃
C. 0.030 m CaBr₂
D. 0.030 m NaBr

Item Weight: 1.0
A student prepared a sugar solution containing 6.0046 g of sugar ($C_{12}H_{22}O_{11}$) in 25.00 mL of water, and he/she produced the following freezing point data:

What is the $K_f$ of water based on the student's data?

A. 0.70 °C/m  
B. 9.3 °C/m  
C. 4.2 °C/m  
D. 0.11 °C/m

Item Weight: 1.0
**Question # : 13**

A catalyst speeds up a reaction principally by _____.

- A. increasing $T$
- B. increasing $K$
- ✓ C. decreasing $E_a$
- D. decreasing $k$

**Item Weight: 1.0**

---

**Question # : 14**

A solution is said to contain 28% phosphoric acid by mass. What does that mean?

- A. the density of this solution is 2.8 g/mL
- B. 100 g of this solution contains 28 g of phosphoric acid
- ✓ C. 1 L of this solution has a mass of 28 g
- D. 1 mL of this solution contains 28 g of phosphoric acid

**Item Weight: 1.0**

---

**Question # : 15**

In order to determine the energy of activation for the decomposition of hydrogen peroxide, a student determined that the rate constant at 22.33 °C was 0.023 s$^{-1}$. At 33.96 °C, the rate constant increased to 0.061 s$^{-1}$. What is the activation energy?

- ✓ A. 63 kJ/mol
- B. −8.1 kJ/mol
- C. 7.4 ×10$^2$ kJ/mol
- D. 1.3 ×10$^{-3}$ kJ/mol

**Item Weight: 1.0**
In order to determine the rate law for the decomposition of hydrogen peroxide, a student collected pressure versus time measurements as the hydrogen peroxide decomposed with the addition of KI. The following graph was produced at 22.33 °C. What is the rate of the reaction?

Question thrown out due to error.
Question #: 17

Which one of the following is necessary to form a saturated solution at equilibrium?

✓ A. excess solute
B. an ionic solute
C. solute of low solubility
D. a $Q$ less than $K_{sp}$

Item Weight: 1.0

Question #: 18

The absorbance of a standard solution of $2.032 \times 10^{-4}$ M FeSCN$^{+2}$ ($aq$) was determined to be 1.086. A student prepared a solution containing 4.98 mL of 0.00200 M Fe(NO$_3$)$_3$ and 3.97 mL of 0.00200 M KSCN in 1.00 mL water. What is the concentration of FeSCN$^{+2}$ if its absorbance at equilibrium was measured to be 0.792?

A. $6.75 \times 10^{4}$ M
B. $6.81 \times 10^{-2}$ M
C. $2.03 \times 10^{-4}$ M
✓ D. $1.48 \times 10^{-4}$ M

Item Weight: 1.0

Question #: 19

Hydroxyapatite, Ca$_5$(PO$_4$)$_3$OH, is present in our tooth enamel. It undergoes continuous reversible reactions with the minerals supplied from saliva as seen in the following reaction:

$$\text{Ca}_5\text{(PO}_4\text{)}_3\text{OH}(s) \rightleftharpoons 5 \text{Ca}^{2+}(aq) + 3 \text{PO}_4^{3-}(aq) + \text{OH}^{-}(aq)$$

At equilibrium, the concentration of OH$^{-}(aq)$ is $2.00 \times 10^{-4}$ mol/L. What is the value of $K_{sp}$?

A. $2.00 \times 10^{-4}$
B. $1.20 \times 10^{-10}$
C. $2.16 \times 10^{-25}$
✓ D. $4.32 \times 10^{-29}$

Item Weight: 1.0
**Question #**: 20

Nitrosyl bromide decomposes according to the following equation.

\[ 2 \text{NOBr}(g) \rightleftharpoons 2 \text{NO}(g) + \text{Br}_2(g) \]

A 0.64 mol sample of NOBr was placed in a 1.00 L flask containing no NO or Br₂. At equilibrium, the flask contained 0.46 mol of NOBr. How many moles of NO and Br₂ are in the flask at equilibrium?

- A. 0.18 moles NO and 0.18 moles Br₂
- B. 0.18 moles NO and 0.090 moles Br₂
- C. 0.46 moles NO and 0.46 moles Br₂
- D. 0.36 moles NO and 0.23 moles Br₂

**Item Weight**: 1.0

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**Question #**: 21

Consider the following reaction at equilibrium in a closed container

\[ 4 \text{NH}_3(g) + 3 \text{O}_2(g) \rightleftharpoons 2 \text{N}_2(g) + 6 \text{H}_2\text{O}(g) \quad \Delta H = -64.5 \text{ kJ/mol} \]

Increasing the O₂ partial pressure will ______ the NH₃ partial pressure.

- A. increase
- B. decrease
- C. not change

**Item Weight**: 1.0
Question #: 22

What is the equilibrium constant expression for the following reaction?

\[ \ce{P_4(g) + 6 Cl_2(g) \rightleftharpoons 4 PCl_3(l)} \]

A. \[ K = \frac{[\text{PCl}_3]}{[\text{P}_4][\text{Cl}_2]^6} \]

B. \[ K = \frac{[\text{PCl}_3]^4}{[\text{P}_4][\text{Cl}_2]^6} \]

✓ C. \[ K = \frac{1}{[\text{P}_4][\text{Cl}_2]^6} \]

D. \[ K = \frac{1}{[\text{PCl}_3]^4} \]

Item Weight: 1.0

Question #: 23

What is "hard water" used to commonly describe?

A. water distilled from acid rain
B. groundwater found in arid areas
✓ C. water with many dissolved ions
D. water from polluted water

Item Weight: 1.0
**Question #**: 24
In order to produce a standard curve, you need to dilute a 12.0 M stock solution to produce 250.0 mL of a $6.41 \times 10^{-2}$ M solution. How much of the stock solution do you need to use for the dilution?

- A. 0.0641 mL
- B. 150. mL
- C. 12.6 mL
- ✓D. 1.34 mL

**Item Weight**: 1.0

---

**Question #**: 25
For which of the following correlations would the data points be widely spread in a general straight line trend?

- ✓A. $r^2 = 0.10$
- B. $r^2 = 0.98$
- C. $r^2 = 0.76$
- D. $r^2 = 0.45$

**Item Weight**: 1.0

---

**Question #**: 26
To determine the phosphate concentration in a water sample, the following standard curve was produced. If the absorbance of the water sample is 1.744, what is its phosphate concentration?

![Standard Curve of Known Phosphate Concentrations (M)](image)

- A. $2.59 \times 10^{-4}$ M
- B. $5.09 \times 10^{-4}$ M
- C. $3.16 \times 10^{-4}$ M
- ✓D. $4.59 \times 10^{-4}$ M

**Item Weight**: 1.0
Question #: 27

What is the pH of a 0.250 M solution of HNO₃(aq)?

A. 0.60  
B. 0.250  
C. 13.75  
D. 1.78

Item Weight: 1.0

Question #: 28

What is the pH of a mixture of 0.100 M acetic acid and 0.200 M sodium acetate? The $K_a$ of acetic acid is $1.8 \times 10^{-5}$. Your answer should be reported to 2 decimal places.

1. 5.05

Item Weight: 1.0

Question #: 29

A buffer is prepared from succinic acid (H₂Suc, $K_a = 6.2 \times 10^{-5}$) and sodium succinate (HSuc⁻) such that [H₂Suc] = [HSuc⁻] = 0.34 M. What is the pH of this buffer solution?

A. 0.34  
B. 4.21  
C. 4.56  
D. 0.467

Item Weight: 1.0

Question #: 30

Which of the following pairs could make a 0.1 M buffer solution?

A. HCl and NaOH  
B. KOH and NaCl  
C. NH₃ and NH₄Cl  
D. C₂H₃O₂H and NaCl

Item Weight: 1.0
Question #: 31
Which of the following acids, when paired with its conjugate base, would be appropriate to use to prepare a buffer with a pH of 5.02?

A. HCOOH, $K_a = 1.77 \times 10^{-4}$
B. $\text{H}_3\text{PO}_4$, $K_a = 7.52 \times 10^{-3}$
C. $\text{NaH}_2\text{PO}_4\cdot\text{H}_2\text{O}$, $K_a = 6.23 \times 10^{-8}$
D. CH$_3$CH$_2$COOH, $K_a = 1.34 \times 10^{-5}$

$
\checkmark
$  

Item Weight: 1.0

Question #: 32
What is the molar solubility of calcium phosphate, whose $K_{sp}$ is $2.07 \times 10^{-33}$?

A. $2.07 \times 10^{-6}$ M
B. $2.03 \times 10^{-7}$ M
C. $3.45 \times 10^{-35}$ M
D. $1.14 \times 10^{-7}$ M

$
\checkmark
$  

Item Weight: 1.0

Question #: 33
In the standardization of hydrochloric acid with sodium carbonate, how many equivalence points should you see?

A. one
B. two
C. three
D. four

$
\checkmark
$  

Item Weight: 1.0

Question #: 34
For the determination of the solubility of calcium carbonate lab, the sodium carbonate used in the experiment was placed in the oven prior to using it to titrate the hydrochloric acid solution. Why was this necessary?

A. To ensure the sodium carbonate was not contaminated with hydrochloric acid.
B. To remove any water.
C. To heat the sample up.
D. To keep the sodium carbonate out of the light.

$
\checkmark
$  

Item Weight: 1.0
Question #: 35

How would the concentration of Fe\(^{+2}(aq)\) ions in equilibrium with FeS be affected if the concentration of S\(^{2-}(aq)\) ions were tripled?

A. increased by a factor of 6  
B. no change  
C. decreased by a factor 30  
✓D. decreased by a factor of 3

Item Weight: 1.0

Question #: 36

Which of the following best represents the solubility product expression for the dissociation of strontium phosphate?

A. \(K_{sp} = [Sr^{+2}]^2[PO_4^{-3}]^3\)  
B. 
\[
K_{sp} = \frac{[Sr^{+2}]^3[PO_4^{-3}]^2}{[Sr_3(PO_4)^2]} 
\]
✓C. \(K_{sp} = [Sr^{+2}]^3[PO_4^{-3}]^2\)  
D. \(K_{sp} = [Sr^{+2}][PO_4^{-3}]\)

Item Weight: 1.0

Question #: 37

What result would you expect from a pH paper test of a solution of Ba(OH)\(_2\)?

✓A. pH paper will turn blue  
B. pH paper will turn red  
C. there will be no change in the color of the pH paper  
D. pH paper will turn green

Item Weight: 1.0
Question #: 38

In lab, you conducted a vinegar test by adding 10 to 20 drops of vinegar directly to a solid sample. What were you testing for in this reaction?

A. The presence of acetic acid.
B. The formation of an insoluble hydroxide.
C. The presence of base.
✓D. The formation of carbon dioxide.

Item Weight: 1.0

Question #: 39

Which of the following substances would produce an orange flame in the flame test?

A. boric acid
✓B. sodium chloride
C. sucrose
D. magnesium sulfate

Item Weight: 1.0

Question #: 40

Various qualitative tests were performed on an unknown sample and the following results were obtained:
1. The unknown was soluble in water.
2. Its aqueous solutions had a pH ranging from 10 to 12.
3. It bubbled in vinegar.

Based on this information, what is the identity of the unknown?

A. sucrose
B. sodium hydroxide
✓C. sodium carbonate
D. magnesium sulfate

Item Weight: 1.0