

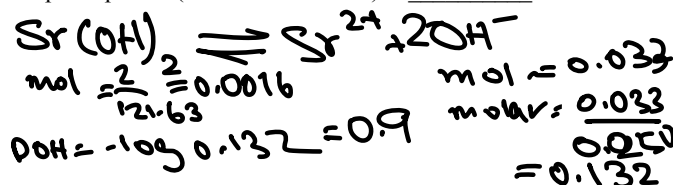
Scholars Of Calgary Northwest

Chemistry 30, Unit 4: Chemical Equilibrium Focusing on Acid-Base Systems, 10 Questions

Please wait until the exam has fully loaded in your web browser before starting. **Do not** press "Submit" at the end of the exam until you are sure of your responses, as your test will be graded immediately. Good luck!

1. A solution containing 2.00 g of $\text{Sr}(\text{OH})_{2(s)}$ in 250 mL of water was prepared. The pH expected (to the nearest tenth) is _____.

14 - 0.9 = 13.1



2.

Indicator Colour in Unidentified Solution	
indigo carmine	blue
bromothymol blue	blue
methyl red	yellow
phenolphthalein	colourless

table

The pH of the unidentified solution is approximately:

- ☐ A) 13.0
☐ B) 4.8
☐ C) 6.0
☐ D) 7.8

3. Use this list of acidic or basic solutions mixed to 1.00 mol/L to answer the following question.

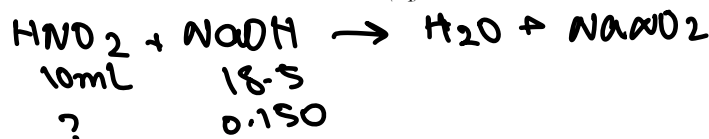
1 $\text{H}_2\text{SO}_{3(aq)}$	5 $\text{KHCO}_{3(aq)}$
2 $\text{HF}_{(aq)}$	6 $\text{LiF}_{(aq)}$
3 $\text{CH}_3\text{COOH}_{(aq)}$	7 $\text{NaOH}_{(aq)}$
4 $\text{H}_3\text{PO}_{4(aq)}$	8 $\text{NH}_3_{(aq)}$

When arranging the acidic solutions from **most acidic** to **least acidic**, the order is 1, 4, 2, 3.
(Separate each number by commas).

1423

4. A 10.0 mL sample of $\text{HNO}_{2(aq)}$ is titrated to the equivalence point with 18.5 mL of 0.150 mol/L $\text{NaOH}_{(aq)}$. The concentration of $\text{HNO}_{2(aq)}$ is

- ☐ A) 2.78 mol/L
☒ B) 0.278 mol/L
☐ C) 0.139 mol/L
☐ D) 1.39 mol/L

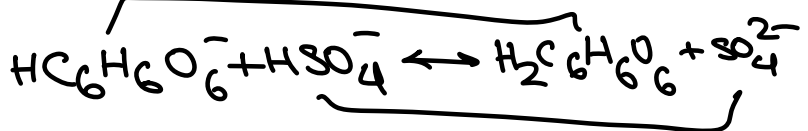


$$18.5 \div 1000 = 0.0185 \times 0.150 = 0.003 \text{ mol}$$

$$\frac{0.003 \times 1000}{10} = 0.278$$

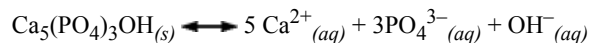
5. In the acid-base reaction





- ☐ A) reactants are favoured
☐ B) $\text{HC}_6\text{H}_6\text{O}_6^-$ is acting as an acid
☒ C) SO_4^{2-} is a proton acceptor
☐ D) HSO_4^- and $\text{HC}_6\text{H}_6\text{O}_6^-$ are a conjugate acid-base pair

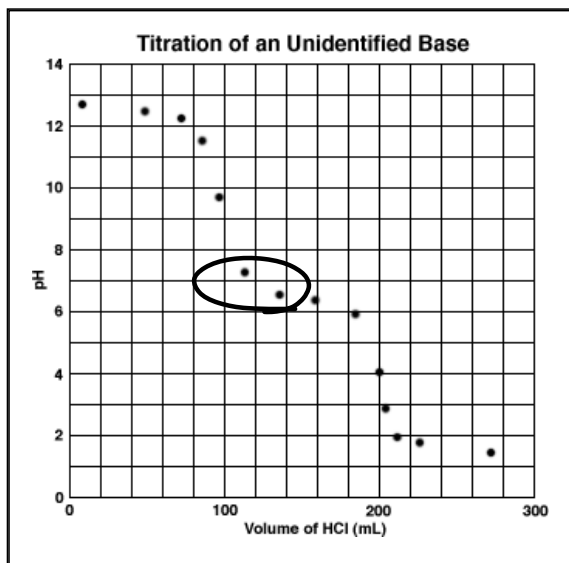
Tooth decay results from the dissolving of tooth enamel, or hydroxyapatite, $\text{Ca}_5(\text{PO}_4)_3\text{OH}_{(s)}$. Bacteria in the presence of sugars in the mouth change the pH of the mouth which causes the following equilibrium:



Most toothpastes contain stannous fluoride compounds that re-mineralize the tooth enamel forming $\text{Ca}_5(\text{PO}_4)_3\text{F}_{(s)}$, or fluorapatite. The fluorapatite is more resistant to breaking down in an acidic medium than hydroxyapatite because fluoride is

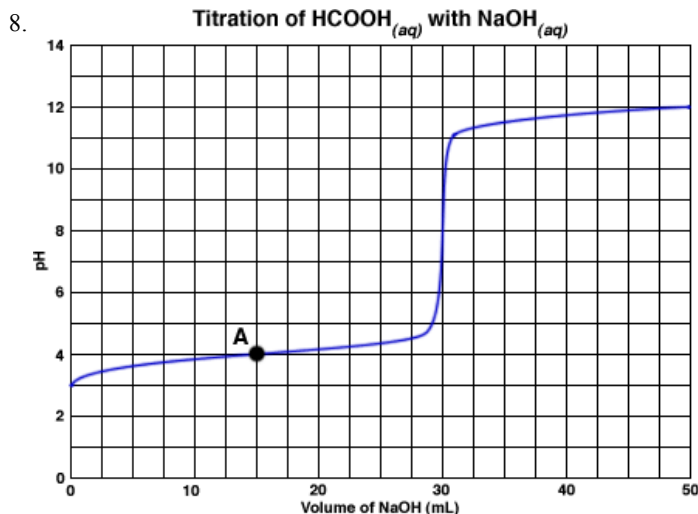
- ☐ A) a stronger base than hydroxide ion and is more likely to react
☐ B) a stronger base than hydroxide ion and is less likely to react
☒ C) a weaker base than hydroxide ion and is less likely to react
☐ D) a weaker base than hydroxide ion and is more likely to react

7.



The graph shows the number of buffer regions to be

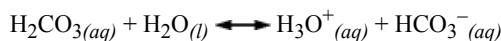
- ☐ A) one
☒ B) two
☐ C) three
☐ D) none



At point A during any titration, the solution is resistant to a change in pH if either a strong base or a strong acid is added to it. The reason for this is, at A, the solution contains equal amounts of

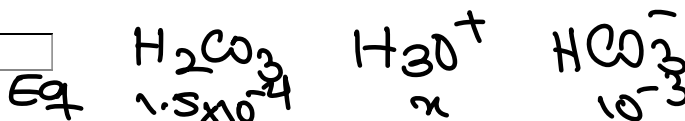
- ☐ A) $\text{HCOO}^-_{(aq)}$ and $\text{H}_3\text{O}^+_{(aq)}$
☐ B) $\text{HCOO}^-_{(aq)}$ and $\text{OH}^-_{(aq)}$
☐ C) $\text{HCOOH}_{(aq)}$ and $\text{OH}^-_{(aq)}$
☒ D) $\text{HCOOH}_{(aq)}$ and $\text{HCOO}^-_{(aq)}$

9. The primary buffer in the blood is the $\text{H}_2\text{CO}_{3(aq)} / \text{HCO}_3^-_{(aq)}$ buffer system. The equilibrium expression for this buffer is:



If this buffer at equilibrium contains $1.0 \times 10^{-3} \text{ mol/L HCO}_3^-_{(aq)}$ and $1.5 \times 10^{-4} \text{ mol/L H}_2\text{CO}_{3(aq)}$, then the pH of the sample (to the nearest hundredth) is _____.

7.17



10. Which of the following solutions has the highest pH?

- ☐ A) 300 mL of $1.00 \times 10^{-2} \text{ mol/L HClO}_{4(aq)}$
☐ B) 100 mL of $1.00 \times 10^{-2} \text{ mol/L HCl}_{(aq)}$
☒ C) 150 mL of $1.00 \times 10^{-5} \text{ mol/L H}_2\text{SO}_{4(aq)}$ pH = 5
☐ D) 10.0 mL of $1.00 \times 10^{-3} \text{ mol/L H}_3\text{O}^+_{(aq)}$

$$\text{pH} = -\log(6.75 \times 10^{-8})$$

$$= +7.17$$

Submit

$$K_a = 4.5 \times 10^{-7}$$

$$4.5 \times 10^{-7} = \frac{x \cdot 10^{-3}}{\sqrt{5 \times 10^{-4}}}$$

$$4.5 \times 10^{-7} = \frac{20}{3} x$$

$$6.75 \times 10^{-8} = x$$

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