Acid Base Solutions: Strength and Concentration

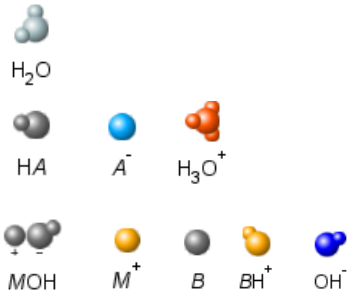
by Trish Loeblein July 2011

Learning goals: Students will be able to

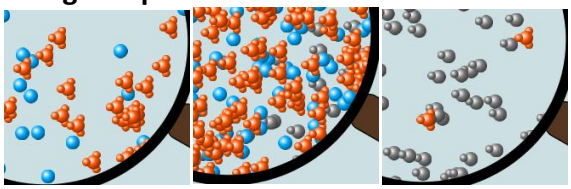
1. **Generate or interpret molecular representations (words and/or pictures) for acid or base solutions**
2. **Provide or use representations of the relative amounts of particles in acid or base solutions to estimate strength and/or concentration**
3. **Use common tools (pH meter, conductivity, pH paper) of acid or base solutions to estimate strength and/or concentration**

Some materials adapted from an activity by Lancaster /Langdon

Icons for Acid Base Solutions



1.Order the solutions from lowest to highest pH.

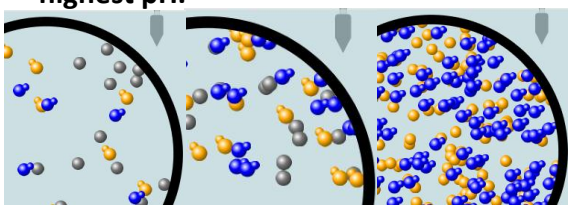


X Y Z

A. X<Y<Z B. Y<X<Z C. Z<Y<X

D. Z<X<Y E. Y<Z<X

2.Order the solutions from lowest to highest pH.

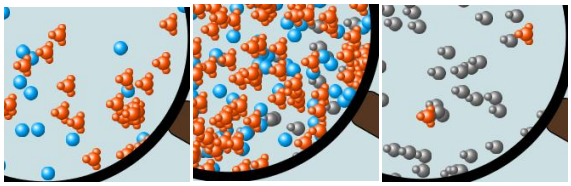


X Y Z

A. X<Y<Z B. Y<X<Z C. Z<Y<X

D. Z<X<Y E. Y<Z<X

3. Which image is from a strong acid?

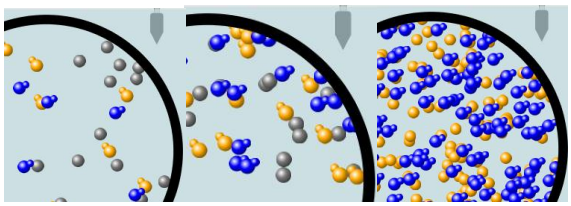


X Y Z

A. X B. Y C. Z

D. more than one E. none

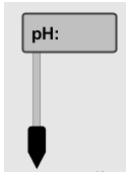
4. Which image is from a weak base?



A. X B. Y C. Z

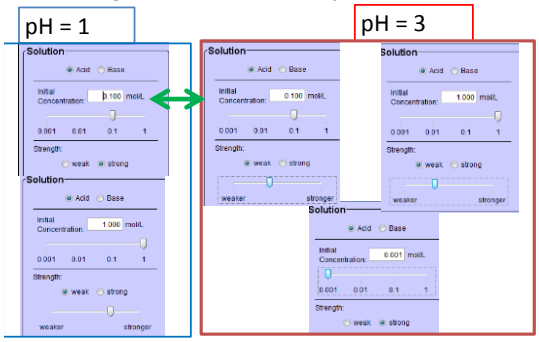
D. more than one E. none

5. Strong acids have lower pH than weak acids.



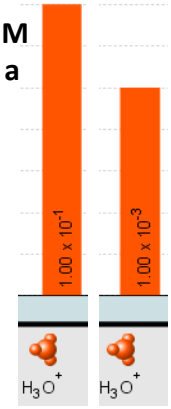
A. Always True
B. Always False
C. Sometimes True

5. Strong acids have lower pH than weak acids?



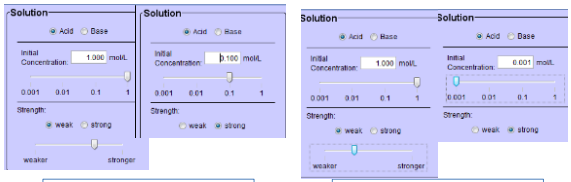
Use pH meter to see that if the acids are the same concentration, then the statement is true, but there are other possibilities

7. A solution with $[H_3O^+]$ = .1 M contains a stronger acid than a solution $[H_3O^+]$ = .001 M.



A. Always True
B. Always False
C. Sometimes True

8. A solution with $[H_3O^+]$ = .1 M contains a stronger acid than a solution $[H_3O^+]$ = .001 M?



.1 M Hydronium

.001 M Hydronium

Use the Equilibrium concentration View to see that if the acid is weak, then the statement is true, but if the acid is strong, concentration matters.

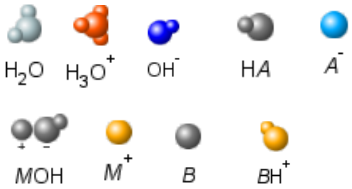
9. **What ALWAYS distinguishes a weak acid from a strong acid?**

A. A weak acid doesn't react much in water; strong acids completely react.
B. A weak acid is more dilute than a strong acid.
C. A weak acid has a higher pH than a strong acid.
D. Statements a and c are both characteristics that distinguish weak acids from strong acids.
E. Statements a, b, and c are all characteristics that distinguish weak acids from strong acids.

10. **What ALWAYS distinguishes a weak base from a strong base?**

A. A weak base doesn't react much in water; strong bases completely react.
B. A weak base is more dilute than a strong base.
C. A weak base has higher pH than a strong base.
D. Statements a and c are both characteristics that distinguish weak bases from strong bases.
E. Statements a, b, and c are all characteristics tha distinguish weak bases from strong bases.

Icons for Acid Base Solutions



Use these icons to write reactions for strong and weak acids and then for strong and weak bases.