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| **Lesson Plan:** |

**Prior learning and thinking:** Students have completed the unit on chemical equilibrium, which are the basics for the acid/base section. They also know how to Keq to find the concentrations of reactants/products at equilibrium and work backwards to solve for Keq. They may or may not have learned how to use logs, which is needed for calculating pH and pOH. Students have experience with neutralization reactions and know the strong acid to strong base reaction only.

**Learning objectives**

- Define Arrhenius acids and bases

- Define Brönsted-Lowry acids and bases

- Identify Brönsted-Lowry acids and bases in an equation

- Define conjugate acid-base pairs

- Identify the conjugate of a given acid or base

- Show that in any Brönsted-Lowry acid-base equation there are two conjugate pairs present.

- Identify an H3O+ ion as a protonated H2O molecule rep. as H+

- Relate electrical conductivity in a solution to the total concentration of ions in the solution

- Define and give several examples for the following terms:

– Strong acid

– Strong base

– Weak acid

– Weak base

- Write equations to show what happens when strong and weak acids and bases are dissolved in water.

**Big Ideas**

1) Not all acids and bases dissociate completely in water, the more they dissociate in water, the stronger they are

2) The stronger the acid/base, the more they "don't want"/"want" their proton

**PLOs**

**D2** identify various models for representing acids and bases

**D3** analyse balanced equations representing the reaction of acids or bases with water

**D4** classify an acid or base in solution as either weak or strong, with reference to its electrical conductivity

**Material and equipment needed**

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| Hover Cam | Notes | Acid tables | Chemical props | Johnson's meme |
| Worksheet 4-2 | Laptop | Projector | White boards |  |

**Assessment Plan:**

**Formative -** Inquiry questions discussed in class and worksheet handed in this class or next class

**Hook and Introduction**

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| **Time** | **Activity** | **Teaching notes** | **Assessment** |
| 5 min | * Funny Friday | * Johnson's meme on transport proteins | * "What did we do last class" |

**Development**

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| **Time** | **Activity** | **Teaching notes** | **Assessment** |
| 10 min | * Debrief on last class and start next set of notes | * Are all Bronsted Lowry bases Arrhenius bases? | * Response to this question |
| 10-15 min | * Notes | * Teacher presents material on conjugate acid/base pairs * Students copy and asks questions * Have students realize how water is behaving * Students are passing white boards quietly |  |
| 10 min | * Question on White board | * Have students write on their white boards to find the conjugate acid/base pair and write a balanced chemical reactions * Teacher walks around to check for understanding | * Observations * "What did we get?" |
| 20 min | * Conjugate acid/conjugate base pair activity | * Instructions - part 1: * Each student gets colored paper faced down - do not open until instructed to do so * Stand up and make sure bags aren't obstructing the walking space * When teacher says, "go", flip to see your compound and find your conjugate pair. Raise hands when done. * Instructions - part 2 * When teacher says go, find another CA/CB pair * Line yourselves up so you read a chemical reaction - demonstrate this * When you're done, put your hands up * If teacher asks you to present, you must be able to describe from which person to which person does the electron transfer (reactants) and which compounds result (products). | * Check if students realize that there are a lot of possible combinations because of amphiprotic species -tricky! * They might choose to form a group of 4 with their amphiprotic species - have these groups stay at the front |
| 10-15 min | * Notes | * Amphiprotic + Strong/Weak acids/bases * Demonstrate how all species are part of a chain of species losing protons into water, therefore they don't necessary react with each other as acid and base - covered more later (this concept might be a bit more advanced for them now) |  |
| 2 - 15 min | * Role play with Strong/Weak acid/base | * If have time, students can create their own analogies with strong acids and bases and present it to the class * Otherwise, teacher demonstrates story with volunteer near the side of the room |  |
| 15 min | * Relate strength to ionization and conductivity | * Questions to ask: * Do stronger acids favor reactants or products? What do we expect high or low Ka values for strong acids? | * Questions prompted |

**Closure**

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| **Time** | **Activity** | **Teaching notes** | **Assessment** |
| 5 min | * Check in with the class | Make sure students hand in HW before they leave  1) Group lab  2) Worksheet 4-1  *Big question:*  *2 solutions:*  *1) Low concentration SA*  *2) High concentration WA*  *Which solution conducts more electricity? Explain.*  *- Guiding questions: what is the conflict here? How would you make solution 1 more conductive than solution 2? How would you make solution 2 more conductive than solution 1? (2 ways)*  Due next Tues:  1) Big questions + guiding questions  2) Suggested problems in book  3) Worksheet 4-2 (first 3 pages only) | **HWK**  Worksheet 4-1, group lab |