Class: 2 Date:
Unit: Solubility Teacher:

Lesson Plan Template

<table>
<tr><td colspan="2">Stage 1: Desired Results</td></tr>
<tr><td colspan="2">Previous knowledge (General)
Students should have been introduced to the definition of solution chemistry, and understand the terms solution, solvent, solute, soluble, saturated, unsaturated, and understand that solubility is dependent on: nature of solute, amount of solute, nature of solvent, amount of solvent, temperature of solution.</td></tr>
<tr><td>Big Ideas

Some solvents can dissociate into ions in solution which allows conductivity.

chemical bonding based on electronegativity</td><td>Essential Questions:

Why do certain solvents form ions in solution and others don’t? How do ionic solutions conduct electricity?</td></tr>
<tr><td>Content

solubility of molecular and ionic compounds</td><td>Curricular Competencies
Formulate multiple hypotheses and predict multiple outcomes
Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies
Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources
Communicate scientific ideas and information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations</td></tr>
<tr><td colspan="2">Core Competencies:
Collaboration: working collectively, supporting group interactions
Thinking: questioning and investigating, reflecting and assessing</td></tr>
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Stage 2: Assessment Evidence

- Lab worksheet,
- Exit slip for snowball,
- Exercises for hw

Materials and Equipment Needed for this Lesson

Circuit with lightbulb and open electrodes to dip into solutions.
Hook: salt, water, beakers, electrodes
Lab handout and worksheet to handout.
Slide show on ions in solutions
HW hangout

Stage 3: Lesson

	Lesson Stages	**Learning Activities**	**Time Allotted**
1.	**Warm-up** *Get students' attention, connect to previous knowledge and explain why the topic is important to learn.*	**Hook:** **Ask:** is water conductive? (pure water) Some students might say yes since it is a common misconception. Use electrical conductivity light circuit to dip into distilled water, lightbulb does not light up. Not conductive. (discrepancy event) **Ask:** if water is not conductive then can Timmy stay in the swimming pool during a thunderstorm? Why not? What's the	10min

		difference between pure water and swimming pool water? Add salt into same beaker of water and test electrode. Show that the light goes on. It now conducts. **Safety:** no harsh chemicals are used except water and table salt, so no PPE required. Electrodes with lightbulb might short so take care not to touch the two electrodes together.	
2.	**Presentation** *Teach the new content and language.*	Present how ions conduct electricity in solutions. Ionic compounds dissociate in solution to form positive and negative ions. When electrodes are placed in a solution containing ions, positively-charged ions flow toward one electrode and negatively-charged ions flow toward the other electrode. This flow of electrical charge completes the circuit and the light bulbs glow. Draw diagram (figure 1) on board while explaining the above concept. Reinforce teaching by playing the following video: https://www.youtube.com/watch?v=qyHwQEq0AIQ "Ionic Compounds: Conducting Electricity | GCSE Chemistry (9-1) | kayscience.com" Establish the following points: ● Conducting solutions contain ions, conductivity is positively correlated to concentration ● Metal + nonmetal substance will form ions ● Nonmetal+nonmetal will not form an ionic solution ● Acids and bases form conducting solutions ● Solids don't conduct ● Metals conduct	20 min

3.	**Practice and Production** *Practice, reinforcement, and extension of the new content and language.*	***Predict:*** *students take lab handout (Hebden pg 195) with list of substances that they will test, and predict which compounds will conduct electricity and which ones won't.* ***Observe:*** *students get into groups and test the conductivity of substances, both in their solid forms and their dissolved forms.* ***Explain:*** *student work independently to go over their predictions and observations. Write out findings and reflections on why they were the same/different.* *Go over the results as a class to avoid misconceptions and verify understanding. Reinforce the criteria for conductivity and which materials can dissociate into ions.* ● *Which compounds form conducting solutions?* ● *What can we conclude regarding which phase does not conduct electricity (solids except metals)?* ● *What additional requirement must be met, other than ions being present, before electrical conductivity can occur?*	5min 20min 5min 10min
4.	**Closure**	Depending on student energy can either do <u>snowball</u>: each student write down what they learned on a piece of paper, wad it up and throw it into the air away from them. Each student then picks up a piece of paper and read it aloud. (student then put it into a bin for teacher to check after on their own time) Or <u>Mock teacher</u>: have volunteers come up and explain the different points of how to decide	10min

		if a substance will be conducting and nonconducting. Give students exercises 6, 7, 8 on page 198 of Hebden as homework due next class.	

Technical Notes:

1. Important trick for students is to hold electrodes close together when doing the lab. Can explain that it makes it easier to test conductivity because the ions don't have as long of a path to travel between electrodes. (so students don't get a false negative)
2. Group lab may require supervision or guidance for using the electrodes properly.
3. Use lab textbook with answering key for the lab handout and answering key.

Reflection:

Can't have too much content within one class. Need to break it down into bite chunk sized info so students can digest.
Not sure if the lab will work well given so many substances that requires dissolving, might be confusing for students.
Is 20 min enough time for the lab?
Many steps throughout the lesson for checking understanding. Perhaps not all necessary? Can take out kahoot.
Changed the exit slip to be more conceptual, since they already have hw questions from Hebden that assesses their technical knowledge.

Resource list:

Provincial Resource Centre for the Visually Impaired. (2021). *Hebden: Chemistry 11, a workbook for students*.

The Hebden textbook is the main source of structure and content for this lesson. The content teach can be taken directly from the textbook and the lab is also in the textbook on page 195. The structure of the lab is flexible but the way it's structured (POE) is a good way to structure inquiry.

The hook and the closure activities are made by me, no references available.

https://www.youtube.com/watch?v=qyHwQEq0AIQ

"Ionic Compounds: Conducting Electricity | GCSE Chemistry (9-1) | kayscience.com"

Use this video to supplement content teach as an additional source of teaching event so students can review while having some images and animations.

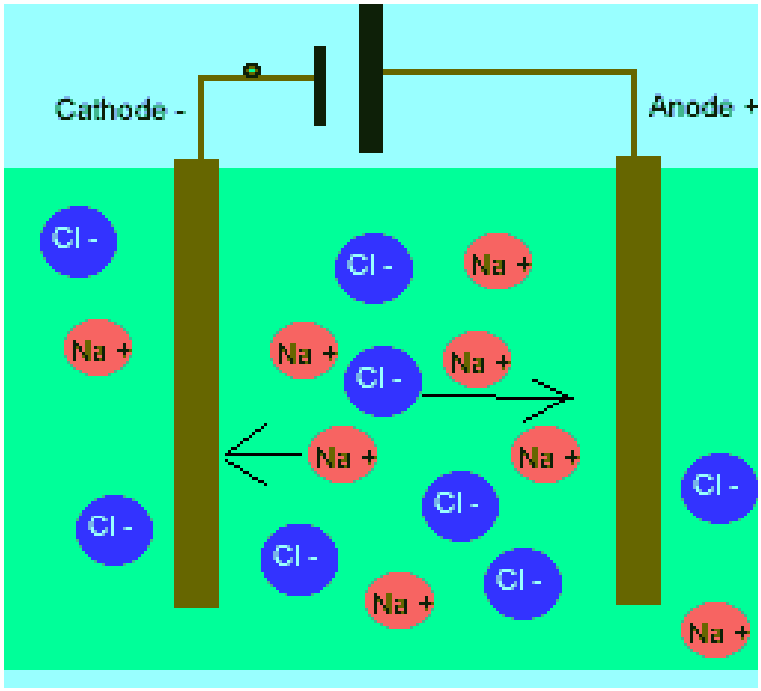

figure1

The Conductivity of Aqueous Solutions Lab: Name:_____

Purpose of lab:_____

Recall that atoms of molecules having an electric charge are called IONS. This section examines the evidence for the existence of ions and the effects which ions have on solutions.

Part A:

Electrical conduction in a solution requires the transferring of electrically-charged ions through the solution. Dip the two electrodes into each dissolved solution and observe if it conducts electricity by looking at the brightness of the bulb glow.

#	Substance tested	Result
1	Distilled water	No glow
2	Pure alcohol (C_2H_5OH)	no glow
3	1 M NaSCN	Glows brightly

4	1M HCl	Glows brightly
5	1M NaOH	Glows brightly
6	1M sugar ($C_{12}H_{22}O_{11}$)	Glows slightly
7	1M H_2SO_4	Glows brightly
8	1M Na_3PO_4	Glows brightly
9	Pure glycerine	No glow
10	1M KOH	Glows brightly
11	Pure acetone	No glow

Questions:

1. How do the observations show about the purity of water?

   There are no ions in solutions because it does not conduct.

2. Which of the compounds produce SUBSTANTIAL amounts of ions in solution?

3, 4, 5, 7, 8, 10

3. Does 1 M sugar appear to contain more ions than pure water? Does it appear that sugar produces ions when in water?

   Sugar has slightly more ions than pure water, and since the lightbulb glows slightly, it must conduct electricity slightly and thus contains ions.

Name: _____ Date: _____

Chapter 9: Solutions
Ionic Conductivity exit slip:

4. *What is one thing you thought you knew about conductivity of solutions?*

5. What is one thing you learned from today's class?

6. What is one thing you are still curious about?