Lesson Plan

Jerel Ray Perez	Anderson High School	Pre-AP Chemistry	90 minutes
Objective **Students will identify oxidation-reduction reactions based on the types of reactions that they are already familiar with. They should be able to use half reactions in order to pinpoint the direction of the electron flow for any given reaction.**			
Warm up **This warm up will consist of a thirty minute exercise where students will evaluate their performance on the MOY Benchmark exam. Students will determine how well they answered questions based on performance objectives and determine where to focus on the upcoming TAKS test.**		Materials Needed Teacher Computer, projector, white board, dry erase markers, PowerPoint presentation on redox reactions, a solution of silver chloride, a beaker, copper wire	 Students Pencils or pens, calculator, Periodic Table with Polyatomic Ions Chart

Day1

ENGAGE/HOOK/INTRODUCTION				
Pacing	**Level of Thinking** (Bloom's Taxonomy)	**Description of Activity: Demonstration of a oxidation-reduction reaction** **Objective: Students will analyze the chemical properties associated with redox reactions**		**Probing Questions**
10-15 min.	Knowledge	Teacher Do: In front of the class place 100 mL of a 1Molar silver nitrate solution in a small beaker. Add a copper wire coil to the solution and have students observe the chemical change as the solution changes from clear to blue. Say: The reaction taking place is a redox reaction where electrons are moving from one chemical species to another. The solution is composed of silver nitrate diluted with water with the addition of a pure copper wire.	Students say/do: Do: Have students write and balance the chemical equation for the reaction. They should also predict why the silver nitrate should be dissolved in water for this reaction to take place	1. Is this a chemical or physical change? 2. Why does the water turn blue over time? 3. What are the crystals that form around the copper wire?
EVALUATE/ASSESS/CHECK FOR UNDERSTANDING:		Ask probing questions		

Explain/Input/Instruction				
Pacing	**Level of Thinking** (Bloom's Taxonomy)	**Description of Activity: Presentation of oxidation-reduction concept Objective: Students will conceptualize the process by which oxidation and reduction of chemical species take place as well as formulate rules for determining oxidation states**		**Probing Questions**
45 min.	Knowledge comprehension	Teacher Do: Refer to the presentation on Redox Reactions Say: Chemical species exchange valence electrons in most types of chemical reactions. Oxidation is the loss of electrons by a reducing agent, both of which are the reacting chemicals. Reduction is the gain of electrons by an oxidizing agent.	Students Do: Students follow along with the lesson by either formulating the material in their own words, following along with printed material or a hybrid of the both. Students will demonstrate understanding by working examples given via the presentation. Do: Complete the assigned worksheet	1. What is the charge on an atom, molecule or ion? 2. How does the charge change when electrons are added or gained?
§112.35. Chemistry (c) Knowledge and skills. (H) understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions				**Independent/Group Practice:** Practice questions on note sheet
EVALUATE/ASSESS/CHECK FOR UNDERSTANDING:		Ask for participation		

Day 2

Jerel Ray Perez	Anderson High School	Pre-AP Chemistry	90 minutes
Objective **Students will use their knowledge of solution chemistry to determine the temperature affects of solubility of both solids and gases in a liquid. Students will also work collaboratively to test their conceptual knowledge of solutions with a test review game.**			
Warm up **At the front of the class the instructor will drop two Alka-Seltzer tablets into clean beaker of room temperature water. Students will be asked to predict the gas formed and its purpose in the medicine.**		Materials Needed Teacher Alka-Seltzer tablets, beaker of water, review game, projector, white board and markers	Students Pencils or pens, stopwatch, small beakers, hot plates, lab safety gear, lab procedure

Extend/Elaborate (Lab)				
Pacing	**Level of Thinking** (Bloom's Taxonomy)	**Description of Activity: Lab activity concerning solubility rates** **Objective: Students will test their hypothesis that compares the solubility rates of solids and gases dissolved in water by varying temperatures of solutions**		**Probing Questions**
45 min.	Application Knowledge comprehension	Teacher says/does: Do: Prepare materials for Alka-Seltzer lab and have students equip their stations. Do: Put students into small groups. Have them perform the procedure and clean up the lab station. Allow them a few minutes to answer the questions at the bottom of the sheet. Pick up the papers to grade or go over in class.	Students say/do: Do: Students will test the dissolving rate of Alka-Seltzer tablets by adjusting the temperature of three types of water solutions. Students will use their knowledge of solubility to determine and diagram the dissolving rate of gases and solids in a liquid solution. Do: In the form of a lab report students will collaboratively conduct the lab and discuss their scientific method of formulating and testing a hypothesis.	1. Write the chemical reaction of citric acid, sodium bicarbonate and aspirin with the addition of water.

§112.35. Chemistry (c) Knowledge and skills. (b) Introduction. (1) Chemistry. In Chemistry, students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving.	(c) Knowledge and skills. (1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to: (A) demonstrate safe practices during laboratory and field investigations	(F) collect data and make measurements with accuracy and precision; (G) express and manipulate chemical quantities using scientific conventions and mathematical procedures, including dimensional analysis, scientific notation, and significant figures;
EVALUATE/ASSESS/CHECK FOR UNDERSTANDING:	Probe for understanding; Students will submit a lab report from each group	

REVIEW MATERIAL FOR TEST				
Pacing	**Level of Thinking** (Bloom's Taxonomy)	**Description of Activity: Preparation for the current lesson** **Objective: To review current material and have students identify topics or concepts that they should focus on while studying for next test.**		**Probing Questions**
35 min.	Knowledge	Teacher says/does: Do: With the use of a test generator the instructor will create a review game where students may earn points toward extra credit on the upcoming test. Questions will be presented in the form of a slideshow where students can work in teams to determine answers aloud to the class. Points can either be used toward extra credit on their individual tests or donated to the students of another group	Students say/do: Do: Students will use note cards to answer to multiple test review questions and earn points for their team.	1. From what subject does this TAKS question stem? 2. How does one determine the answer?

§112.35. Chemistry (c) Knowledge and skills.

(10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to:

(A) describe the unique role of water in chemical and biological systems;

(B) develop and use general rules regarding solubility through investigations with aqueous solutions;

(C) calculate the concentration of solutions in units of molarity;

(D) use molarity to calculate the dilutions of solutions;

(E) distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions;

(F) investigate factors that influence solubilities and rates of dissolution such as temperature, agitation, and surface area;

(G) define acids and bases and distinguish between Arrhenius and Bronsted-Lowry definitions and predict products in acid base reactions that form water;

(H) understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions

EVALUATE/ASSESS/CHECK FOR UNDERSTANDING:	Ask probing questions

OXIDATION-REDUCTION REACTIONS

REDOX

Introduction

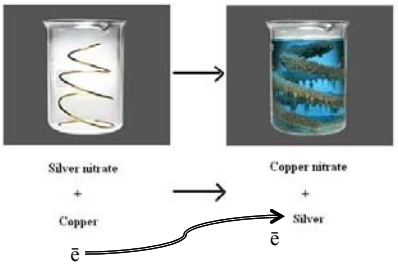
- Classifying reactions began with these:
  - Addition (synthesis)
  - Decomposition
  - Single displacement
  - Double displacement
  - Combustion
  - Acid-Base

Oxidation-Reduction Reactions

- Also appropriately named REDOX
- This classification method involves determining whether electrons have been transferred from one chemical to another.
- Several of the reactions that we have looked at and classified in another way are also REDOX reactions.

Oxidation-Reduction Reactions

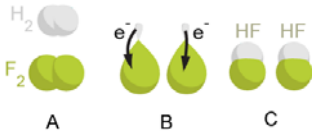
$AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + Ag$



The Oxidation-Reduction process overview

- Definition: chemical process in which elements undergo changes in oxidation state.

  If none of the atoms in a reaction change oxidation state, it's not a *redox reaction*.



The Oxidation-Reduction process overview

- Oxidation and Reduction occur simultaneously. You cannot have oxidation without reduction
- The number of electrons produced in oxidation = The number of electrons acquired in reduction
- The number of electrons lost = The number of electrons gained
- ALL ELECTRONS are accounted for

OXIDATION

- Oxidation occurs when an atom or ion loses one or more electrons.
- Atoms or ions increase in oxidation state
- Becomes more POSITIVE!
- Example: $2Na_{(s)} + Cl_{2(g)} \rightarrow 2NaCl_{(s)}$
- $Na^0 \rightarrow Na^+ + e^-$
- The Na atom is *oxidized* to a sodium ion.

REDUCTION

- Reduction occurs when an atom gains one or more electrons.
- Oxidation state is decreased.
- Becomes more NEGATIVE!
- Example: $2Na_{(s)} + Cl_{2(g)} \rightarrow 2NaCl_{(s)}$
- $Cl_2^0 + e^- \rightarrow Cl^{-1}$
- The chlorine atom is *reduced* to the chlorine ion.

OIL RIG - Mnemonics

- Oxidation Is Losing (electrons), Oxidized
- Reduction Is Gaining (electrons), Reduced
- It might not sound logical that when you reduce something you gain electrons, but remember that electrons have a negative charge. So when you gain a negative particle, the oxidation state goes down, or is reduced.

Oxidizing and Reducing Agents

- Reducing agent: substance that gets oxidized, loses electrons in a redox reaction
- Oxidizing agent: substance that gets reduced, gains electrons in a redox reaction

Oxidation States

- • Oxidation states are based on the electronegativity of the elements in an ionic or polar covalent bond.
- • The more electronegative element will have a stronger pull on the shared or transferred electrons causing it to have the more negative oxidation state.

Rules for Determining Oxidation State	
1.	Free elements are assigned an oxidation state of zero.
2.	The sum of the oxidation states of all the atoms in a species must be equal to the net charge on the species.
3.	The alkali metals (Li, Na, K, Rb, and Cs) in compounds are always assigned an oxidation state of +1.
4.	Fluorine in compounds is always assigned an oxidation state of -1.
5.	The alkaline earth metals (Be, Mg, Ca, Sr, Ba, and Ra) and also Zn and Cd in compounds are always assigned an oxidation state of +2.
6.	Hydrogen in compounds is assigned an oxidation state of +1.
7.	Oxygen in compounds is assigned an oxidation state of -2.
8.	Halogen in compounds is assigned an oxidation state of -1 EXCEPT when bound to oxygen (or other more electronegative atoms)

Examples

$2\ Cu_{(s)} + O_{2(g)} \longrightarrow 2CuO_{(S)}$

- In the reaction above, what are the oxidation states of: Cu, O, Cu (in CuO), O (in CuO)

$Cu_{(s)} + 2Ag^{+}_{(aq)} \longrightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$

- In the reaction above, what are the oxidation states of: Cu, Ag^{+}, Cu^{2+}, Ag

Half Reactions

- A way to show JUST the oxidation part of a reaction or JUST the reduction part of a reaction.
- Example:
- $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
- $Fe(s) \rightarrow Fe^{+2}(aq) + 2e^{-}$
- $Cu^{+2}(aq) + 2e^{-} \rightarrow Cu(s)$
- Which half reaction is showing reduction?_____Oxidation?_____

Practice

- Now try the 3 practice problems on your own.

Oxidation and Reduction Practice

In each of the following equations write half reactions, indicate the element that has been oxidized and the one that has been reduced. You should also label the oxidation state of each before and after the process:

1) $2\ Na + FeCl_2 \rightarrow 2\ NaCl + Fe$

2) $2\ C_2H_2 + 5\ O_2 \rightarrow 4\ CO_2 + 2\ H_2O$

3) $2\ PbS + 3\ O_2 \rightarrow 2\ SO_2 + 2\ PbO$

4) $2\ H_2 + O_2 \rightarrow 2\ H_2O$

5) $Cu + HNO_3 \rightarrow CuNO_3 + H_2$

6) $AgNO_3 + Cu \rightarrow CuNO_3 + Ag$

Oxidation and Reduction Practice - Solutions

In each of the following equations write the half reactions, indicate the element that has been oxidized and the one that has been reduced. You should also label the oxidation state of each before and after the process:

1) $2\ Na + FeCl_2 \rightarrow 2\ NaCl + Fe$

- **Sodium is oxidized, going from a 0 to +1 oxidation state.**
- **Iron is reduced, going from a +2 to 0 oxidation state.**

2) $2\ C_2H_2 + 5\ O_2 \rightarrow 4\ CO_2 + 2\ H_2O$

- **Carbon is oxidized, going from a –1 to +4 oxidation state.**
- **Oxygen is reduced, going from a 0 to –2 oxidation state.**

3) $2\ PbS + 3\ O_2 \rightarrow 2\ SO_2 + 2\ PbO$

- **Sulfur is oxidized, going from a –2 to +4 oxidation state.**
- **Oxygen is reduced, going from a 0 to –2 oxidation state.**

4) $2\ H_2 + O_2 \rightarrow 2\ H_2O$

- **Hydrogen is oxidized, going from a 0 to +1 oxidation state.**
- **Oxygen is reduced, going from a 0 to –2 oxidation state.**

5) $Cu + HNO_3 \rightarrow CuNO_3 + H_2$

- **Copper is oxidized, going from a 0 to +1 oxidation state.**
- **Hydrogen is reduced, going from a +1 to 0 oxidation state.**

6) $AgNO_3 + Cu \rightarrow CuNO_3 + Ag$

- **Copper is oxidized, going from a 0 to +1 oxidation state.**
- **Silver is reduced, going from a +1 to 0 oxidation state.**

Name: _____ Period: _____

Temperature and Alka-Seltzer Lab

Scientific Question:
What is the effect of temperature on the time it takes Alka-Seltzer to react (fizz) with the water?

If/Then Question: If the temperature of the water increases, then will the time it takes Alka-Seltzer to react (reaction time) increase or decrease?

Hypothesis:

_____

Independent or Manipulated Variable: _____
Dependent or Responding Variable: _____

What variables (things that could change) need to be held constant in order to make this a Controlled Experiment?

_____

Operational Definitions:
When should I start and stop timing the Alka-Seltzer fizzing?
Start time: When the Alka-Seltzer is dropped into the water.
End time: When the Alka-Seltzer does not make any more fizzing noise and the tablet is gone.

Methods:

1. Obtain a hot plate and set the temperature to 273 Kelvin.
2. Heat 100 mL of water in a beaker.
3. Measure the temperature and record it in the data table below.
4. Drop in one tablet of Alka-Seltzer and use a clock's second hand or a stopwatch to time the reaction until most of the fizzing ceases and the tablet is dissolved.
5. Record time in data table below.
6. Repeat steps 2 and 3 with 100mL of **room temperature (from the faucet)** and then **cold water**. Make sure that you are ending the timer at the same point in the fizzing each time.

Quantitative Data:

Water	Water Temp (C)	Reaction Time (min:sec)
Hot		
Room Temp		
Cold		

Qualitative Data:

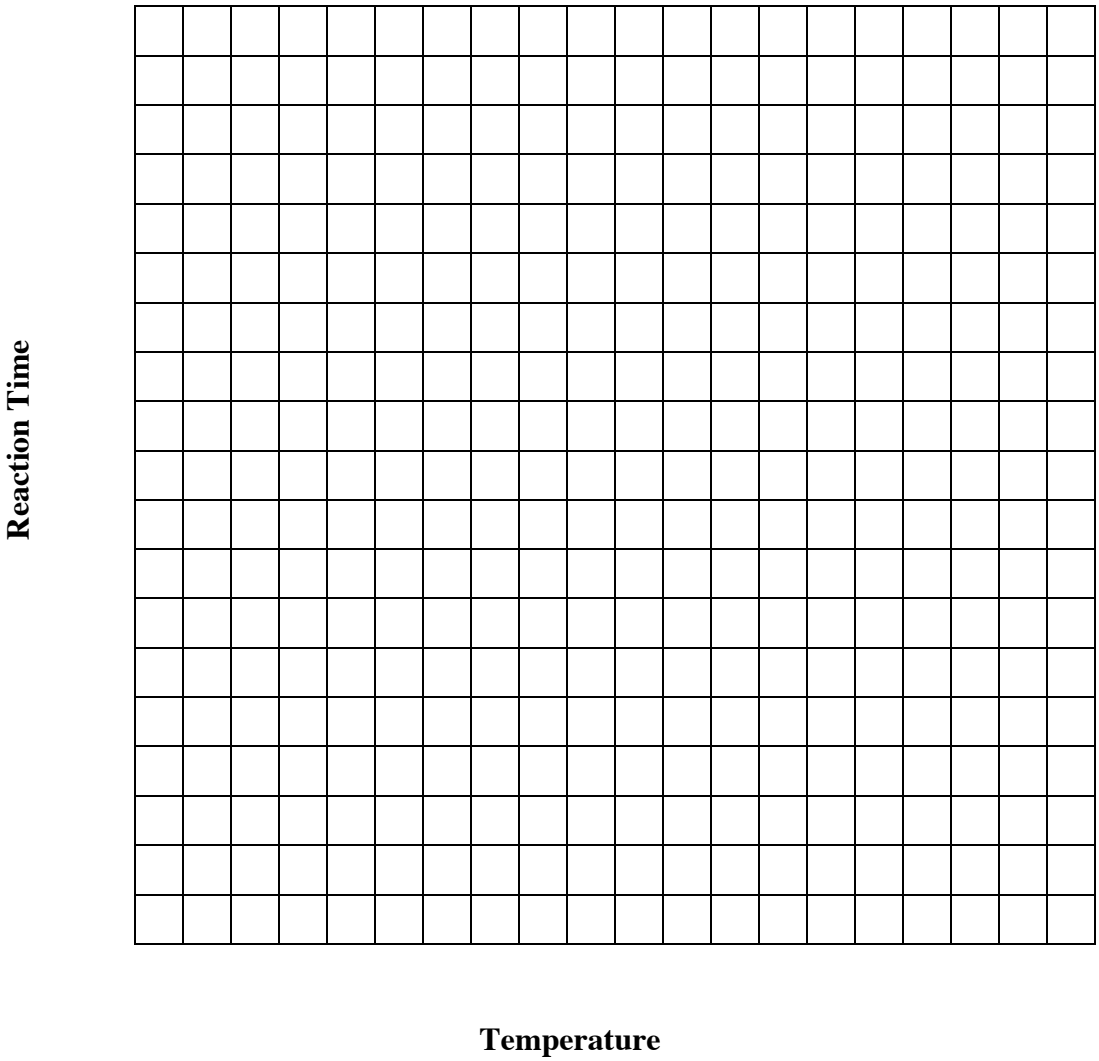
Written observations about what happened: _____

_____

Graph Your Quantitative Data

Plot the combinations of temperature and time.

Draw a smooth "line of best fit" through your data points.



Conclusion (must support or disprove your hypothesis):

_____

HW #5:
Final Draft of Lab Research Paper

Your task is to write up all the information given to you and gathered by you in this packet. You are writing a real research paper to tell people what you thought would happen, what you did, and what you found out! You need to transform the information here into a written document using the structure stated below and with solid paragraphs, an intro and summary, and proper sentence structure and grammar. Use the rubric to make sure you have everything expected.

→ **Wednesday 19th of September**: The paper is due. You must turn in:

- ☐ This **packet**
- ☐ Your **final paper**
- ☐ **Filled out RUBRIC (on back)**

Paper Structure: your paper needs to be split into these sections with each section title before each new section.

I. **Introduction**: includes the Scientific Question, If/Then Question, Hypothesis, and Manipulated and Responding Variables.

II. **Methods**: includes Operational Definitions, a description of how you made it a controlled experiment, and a description of what is in the Methods part of this lab. (DO NOT just copy the numbered steps; put it in paragraph form!!!)

III. **Findings**: includes a written summary of your data, your data table, and your graph. When re-writing your table and graph for the final draft, please keep them clean and neat.

IV. **Conclusion**: includes your conclusions about your hypothesis based on your data and a brief summary of the entire lab.

RUBRIC: Self evaluation _____

Paper Structure and Form:

Paper is divided into the four sections with section headings before each one ___/2
Paragraphs are well-structured and include topic and concluding sentences ___/3
Introduction section includes all info required (see list in "Paper Structure") ___/5
Methods section includes all information required (see list in "Paper Structure") ___/5
Findings section includes all information required (see list in "Paper Structure") ___/5
Conclusion section includes all information required (see list in "Paper Structure") ___/5
Overall neatness, quality of written descriptions, and ability in communicate well. ___/5

Lab Related:

Data makes sense and is recorded and summarized properly ___/5
Data table and graph reflect each other correctly and have all required information and are labeled with units, title, and labeling of axes, rows and columns. ___/5

Total Points: ____/40 = Percentage: _____ = Grade: _____

RUBRIC: Instructor evaluation

Paper Structure and Form:

Paper is divided into the four sections with section headings before each one ___/2
Paragraphs are well-structured and include topic and concluding sentences ___/3
Introduction section includes all info required (see list in "Paper Structure") ___/5
Methods section includes all information required (see list in "Paper Structure") ___/5
Findings section includes all information required (see list in "Paper Structure") ___/5
Conclusion section includes all information required (see list in "Paper Structure") ___/5
Overall neatness, quality of written descriptions, and ability in communicate well. ___/5

Lab Related:

Data makes sense and is recorded and summarized properly ___/5
Data table and graph reflect each other correctly and have all required information and are labeled with units, title, and labeling of axes, rows and columns. ___/5

Total Points: ____/40 = Percentage: _____ = Grade: _____