GCS Unit Plan Template

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Unit Overview

Unit Title Solids. Liquids and Gases Unit 5

In this unit students will learn about the chemical and physical properties of solids, liquids and gases. They will also use a variety of equations to complete calculations that involve both liquids and gases.

Subject Area

Chemistry

Grade Level

10 & 11

Approximate Time Needed

15 x 90 minutes

Unit Foundation

Targeted Content Standards and Benchmarks

2.1 Understand the relationship among pressure, temperature, volume, and phase.
2.1.1 Explain the energetic nature of phase changes.
-Explain physical equilibrium: liquid water,water vapor. Vapor pressure depends on temperature and concentration of particles in solution. (conceptual only calculations)
-Explain how the energy (kinetic and potential)of the particles of a substance changes when heated, cooled, or changing phase.
-Identify pressure as well as temperature as a determining factor for phase of matter.
-Contrast heat and temperature, including temperature as a measure of average kinetic energy, and appropriately use the units Joule, Celsius, and Kelvin

2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).
-Define and use the terms and/or symbols for: specific heat capacity, heat of fusion, heat of vaporization.
-Interpret the following: heating and cooling curves (noting both significance of plateaus and the physical states of each segment
-Phase diagrams for H2O and CO2,
-Complete calculations of: $q=mC_p\Delta T$, $q = mH_f$, and $q = mH_v$using heatling/cooling curve data.
-Explain phase change calculations in terms of heat absorbed or released
(endothermic vs. exothermic processes)

2.1.3 Interpret the data presented in phase diagrams.
-Draw phase diagrams of water and carbon dioxide (shows how sublimation occurs)
-Identify regions, phases and phase changes using a phase diagram.
-Use phase diagrams to determine information such as (1)

phase at a given temperature and pressure, (2) boiling point or melting point at a given pressure, (3) triple point of a material

2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat.
-Recognize that, for a closed system, energy is neither lost nor gained only transferred between components of the system.
-Complete calculations of: q=mCpΔT, q = mHf , q = mHv, and q lost=(-q gain)in water, including phase changes, using laboratory data

2.1.5 Explain the relationships among pressure, temperature, volume, and quantity of gas, both qualitative and quantitative
-Identifycharacteristics of ideal gases
Apply general gas solubility characteristics
Apply the following formulas and concepts of kinetic molecular theory.
1. 1 mole of any gas at STP=22.4 L
2.Ideal gas equation (PV=nRT), Combined gas law (P1V1/T1= P2V/T2 and applications holding one variable constant:
for PV=k, P1V1= P2V2; for V/T=k, V1/T1= V2/T2; for P/T=k, P1/T1= P2/T2
Note: Students should be able to derive and use these gas laws,
but are not necessarily expected to memorize their names.
3.Avogadro's law (n/V=k), n1/V1= n1/V2
4.Dalton's law (Pt=P1+P2+P3..)
5.Vapor pressure of water as afunction of temperature (conceptually)
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Student Objectives/Learning Outcomes

Students will be able to:
-define and use specific terminology that relates to phase changes and physical characteristics of liquids and gases
-read and construct a vapor pressure/temperature graph
-read and construct a phase diagram graph
-read and construct a change of state graph
-compute total variables of the following equations whether they be 1, 2, 3, 4, or 5 step problems (Q=mΔTCp, Q=mHf, Q=mHv)
-use a two sided equation showing heat absorbed = heat released to calculate variable
-explain the use of a calorimeter in chemical and physical changes.
-understand the effects of gas pressure and temperature on volume
-use the following equations to calculate gas variables $\frac{PV = P_2V_2}{T \quad T_2}$ $PV = nRT$ $P_T = P_1 + P_2 + \ldots$

Cross-Curricular Connections

Foods – affects of pressure on boiling point of water and cooking foods at higher elevations
English – students will write a lab paper

Curriculum-Framing Questions

Essential Question	How do race mechanics use gas pressure in competition? How do meteorologists use their understanding of the interaction of pressure, volume and temperature when launching weather balloons? Why is a gas a gas even though it is often found in liquid form?
Unit Questions	What are the terms associated with liquids? What information can be gleaned from a phase diagram, Vapor pressure graph, and heating curve graph?
Content Questions	What are the definitions for the following terms: Solid, liquid, gas, melting, freezing, boiling, condensation, sublimation, normal melting, normal boiling, heat of fusion, heat of vaporization, phase diagram, volatile, liquefaction, etc..

Assessment Summary

Unit Details

Prerequisite Skills

Students should have a basic understanding of phase change terminology and the equation $Q=m\Delta TCp$

Instructional Procedures

Day 1

Liquids terminology

Day 2

Reading, analyzing and drawing phase diagrams

http://sharepoint.mvla.net/teachers/DarrenD/Chemistry/Lists/Chem%20Calendar/Attachments/490/Phase%20Diagram%20Worksheet%20KEY.pdf

Days 3 & 4

Phase diagram Quiz

Heating Curves/Change of states of graphs

$Q=m\Delta TCp$. $Q=mHf$, $Q= mHv$

"Chemo" Quiz on terminology(like Bingo)

Day 5

Quiz on 1,3,5 step problems

Day 6

Liquids Quest

Intro to Lab

Day 7

Melting and Freezing Pt Determination using Napthalene

Day 8

Gases

-Temperature Conversions

-Boyle's and Charles' Law

http://video.mit.edu/watch/boyles-law-pressure-vs-volume-8456/

Day 9
Review Boyle' & Charles' Laws
Combined Gas Law
Dalton's Law
Graham's Law
Day 10
Review CGL, Dalton's, Graham's Laws
Ideal Gas Equation - PV=nRT and PV = mRT/M
Day 11
Review Ideal Gas Law
Quiz on Ideal Gas Law
Day 12
Review with Study Guide
One group completes either Molecular Mass of Butane Lab or Charles' Law Lab
Day 13
Other ½ of students will do the labs
Day 14
Complete Labs
Day 15
Unit Test

Accommodations for Differentiated Instruction	
Special Needs Students	Make labs accessible to students with special physical needs.
Gifted/Talented Students	Compare ideal and real gases

Materials and Resources Required For Unit

Technology – Hardware (Click boxes of all equipment needed)

X Interactive Technology	☐ Student Response System/Clickers	☐ Cell Phone
☐ Computer(s)/iPads, etc.	☐ Printer	☐ Video Camera
☐ Digital Camera	X Projection System	☐ Video Conferencing Equip.
X DVD Player	☐ Scanner	☐ Document Camera
X Internet	X Television	☐ Other

Technology – Software (Click boxes of all software needed.)

☐ Database/Spreadsheet	☐ Image Processing	☐ Web Page Development
☐ Desktop Publishing	☐ Internet Web Browser	☐ Word Processing
☐ E-mail	☐ Multimedia	☐ Other
X Web-Based Encyclopedia		

Printed Materials	Test book Merrill and Prentice Hall and worksheets associated with each Teacher made worksheets
Supplies	Naphthalene, test tubes, thermometers, beakers, lighters, graduated cylinders, Erlenmeyer flasks, burners,

Unit Plan Reflection

Describe any adaptations or "tweaks" to the resource or lesson plan that were needed:
What do you plan to do differently the next time you teach this unit?:

The unique circumstances of a class of 33 required additional time for labs (twice as many days as usual). The length of this unit will probably be about 2 days shorter when I have a class of 25 or less.

I will also include https://www.khanacademy.org/science/chemistry/ideal-gas-laws as a tutorial website for future semesters.