4-2-2009

What's the Matter...Do Things Keep Changing? [10th-12th grade]

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UNDERSTANDING BY DESIGN

Unit Cover Page

Unit Title: What's the matter…do things keep changing?

Grade Level: 10^{th}-12^{th} Grade

Subject/Topic Area(s): Chemistry and Science

Designed By: Dustin Demoin

Time Frame: 15 days (1 Catch-Up Day and Day 16 is just turning in the project) of 45 minute periods

School District: Northside ISD

School: John Marshall High School

School Address and Phone:
8000 Lobo Lane
San Antonio, TX 78240
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Brief Summary of Unit (Including curricular context and unit goals):
This unit attempts to provide students with a deeper understanding of the properties of matter and physical and chemical properties/changes. This unit could be used at the middle school or IPC level with the omission of the discussion of the kinetic molecular theory. You will also need access to a CRC manual for the project. You could just work with photocopies of the book for the triple points and critical points.

Unit: What's the matter… do things keep changing?
Grade: 10-12 (High School Chemistry)

Stage 1: Desired Results

Content Standards (TEKS)

4. The student knows the characteristics of matter.
   The student is expected to:
   A. Differentiate between physical and chemical properties of matter.
   B. Analyze examples of solids, liquids, and gases to determine their compressibility, structure, motion of particles, shape, and volume.
   C. Investigate and identify properties of mixtures and pure substances.
5. The student knows that energy transformations occur during physical or chemical changes in matter.
   The student is expected to:
   A. Identify changes in matter, determine the nature of the change, and examine the forms of energy involved.
   C. Measure the effects of the gain or loss of heat energy on the properties of solids, liquids, and gases.

Understandings

Students will understand that…

- All matter can be classified in a variety of manners.
- Changes to matter can be physical, chemical, or both.
- The kinetic (energy of motion) and potential (energy of position) energy of the particles that make up a substance determine the state and temperature of the matter.

Essential Questions

- How can I classify the matter in my world?
- What happens to a substance when it changes? (Dissolve/React/Formula Change/Decompose/etc.)
- How is it possible that all matter is in constant motion?

Knowledge

Students will know:

- The four indications of a chemical change are: energy is released, change in color, evolves gases/bubbles, and forms a precipitate…[Formula change]
- The Kinetic Molecular Theory
  - Matter is composed of small particles
  - The volume occupied is mostly empty space
  - Particles are in constant motion (different for each phase)
- Properties of solids (lowest KE; defined volume, shape, and structure; relatively incompressible; diffuse millions times slower; particles bend and vibrate)
- Properties of liquids (middle range of KE; defined volume, but undefined shape and structure; relatively incompressible; easily diffuses; surface tension; fluids; low to high viscosity; particles flow or glide over one another)
  - Water and Ice behave differently for density
- Properties of gases (highest KE; no defined shape, structure, or volume; easily compressed; easily diffuses; fluids; low viscosity; particles move in continuous straight-line motion)
- Use of the Kelvin Temperature Scale and the importance of absolute zero

Skills

Students will be able to:

- Classify matter as a mixture (homogenous or heterogeneous) or substance (compound or element)
- Use experimental data to determine if the changes occurring are physical or chemical
- Discuss the difference between solids, liquids, and gases in terms of the relative kinetic energy of the particles that make up the substance, volume, compressibility, structure, and shape
- Label the points on a phase diagram and discuss their relevance
- Define the terms used to describe matter and changes
- Label the points on a heating curve and discuss their relation to physical properties for the substance
- Use experimental data to determine if the process was exergonic, exothermic, endergonic, or endothermic

Stage 2: Assessment Evidence

Performance Task (Worksheets and Rubrics are after Day 11):

It's Just a Phase You're Going Through

Students will be assigned a compound in pairs. Together, they will create a cube that will have 6 sides, one for each of the pieces of knowledge they are to find and one side for the name, formula, and student information. Students will need to

- determine, summarize, and write about the usage, transportation, storage, and precautions for their respective compound
- identify the phase of matter at room temperature (25°C) and 1 atmosphere of pressure (760 torr) for the element or compound that they have been assigned
- research the triple-point, critical point, and critical pressure for their compound
- draw, label, and color a phase diagram for their compound or element from their research
- find other interesting physical and chemical properties (at least three of each type)
- create a heating curve for their chemical at a pressure of their choice (where the chemical has three phases), correctly labeling the boiling, condensation, fusion, crystallization, freezing, and melting points

Paper cubes will be provided, as well as, resources to supplement information that they may or may not be able to find online.

Other evidence:
(quizzes, tests, academic prompts, etc. note – these are usually included where appropriate in Stage 3 as well)

Matter Pre-Test: Ask students to answer questions about material that was covered in 8th grade and should be familiar to the students.

Tested or Quizzed Vocabulary:

a. Vocabulary Foldable: Degrees Celsius, Kelvin, gases, liquids, solids, compressibility, volume, temperature, surface tension of liquids, viscosity, buoyancy, kinetic energy
b. Not on Vocabulary Foldable: mixture, pure substance, homogeneous, heterogeneous, element, compound, crystal structure, phase change, sublimation, deposition, melting, fusion, vaporization, condensation, boiling point, triple point, Kinetic Molecular Theory (KMT)

States of Matter Partner Quiz: Quiz over the states of matter and their properties.

Tests: Culminating test to ask some basic knowledge, but three prompts at the end:

Test Form A:

Explain how aluminum could undergo a physical change. A chemical change.
Construct a heating curve for a substance that is heated to 150°C. The substance is originally a solid at 35°C, melts at 75°C, and boils at 126°C.
Explain how a recycling plant works

Test Form B:

Explain how aluminum could undergo a physical change. A chemical change.
Construct a cooling curve (backwards heating curve) for a substance that is cooled to 43°C. The substance is originally a gas at 160°C, condenses at 132°C, and freezes at 67°C.
Explain what's wrong with a recycling plant that isn't working properly.

Benchmark Test Questions

Student Work: Worksheets, Homework Questions, and Labs.

Stage 3: Learning Activities

(Steps taken to get students to answer Stage 1 questions and complete performance task)

Calendar

Monday	Tuesday	Wednesday	Thursday	Friday
1 • Introduce Unit • States of Matter Vocabulary Foldable	2 •Define Matter •Discuss the classification of matter	3 •Classification/ Separation Rotation Lab	4 •mT Elements •Twizzler Lab •Notes Physical vs. Chemical Properties	5 •Catch-Up Day
How can I Classify the Matter in My World?				
6 • Notes Physical vs. Chemical Changes	7 •Observing a Chemical Reaction Lab	8 •Quiz Matter •KMT Notes/ Phase Changes	9 •mT Elements •Phase Diagrams •Heating Curves	10 •Freezing/ Melting of Water Lab
What Happens To A Substance When It Changes?				
		How is it possible that all matter is in constant motion?		
11 • Project-Intro/work	12 •Quiz States of Matter •Project-Work	13 •Project-Work •Go over Quiz •Pass out Review	14 •Project-Work •Go over Review Questions	15 •TEST
16 • Project and Self-Assessments Due				

Day 1

- Pre-Test Matter
- Introduce the Unit
  - EQ's
  - Discuss what we will be doing
- **EQ: How can I Classify the Matter in My World**
- States of Matter Vocabulary Foldable
- Start Defining Matter

Day 2

- Defining Matter Walk Around
- Defining Matter Worksheet
- Homework: Students work on Vocabulary Boxes to define homogeneous, heterogeneous, mixture, compound, element, and pure substance.

Day 3

- Grade Their Vocabulary Boxes (Completion grade) while the students are asked to fill-in a classification flow chart.
- Classifying/Separating Matter Rotation Lab
  - The students classify matter into the different categories based on appearance of model systems (similar to the Benchmark question from last year)
  - Once the students are done with the first few lab stations, they design their own experiment to separate a mixture using the substances' physical properties.

Day 4

- Mini-Test over the Elements (Runs throughout the class for students to familiarize themselves with the periodic table)
- Twizzler Lab (Identifying the Physical Properties of a Twizzler)
  - Students will take notes over Chemical and Physical Properties in the information section of the Twizzler lab
- Students will complete a worksheet over chemical and physical properties

Day 5

- Catch-Up Day

Day 6

- **EQ: What Happens To A Substance When It Changes?**
- Notes on Physical and Chemical Changes
- Homework: Worksheet to practice identifying Physical and Chemical Changes.

Day 7

- Observing a Chemical Reaction Lab

Day 8

- Quiz over Matter
- **EQ: How is it possible that all matter is in constant motion?**
- KMT Notes & Phase Change Notes

Day 9

- Mini-Test Elements (Runs throughout the class for students to familiarize themselves with the periodic table)
- Notes on Phase Diagram and Heating Curves
- Homework over phase diagrams and/or heating curves

Day 10

- Freezing/Melting Point of Water Lab

Day 11

- Introduce Project
- Start Project Work

Day 12

- Partner Quiz over States of Matter
- Project Work

Day 13

- Go over Quiz
- Hand out Review
- Project Work

Day 14

- Go over Questions from the Review
- Project Work

Day 15

- States of Matter Test

Day 16

- Projects and Self-Assessment Due

Day 1

- Matter Pre-Test
- Introduce the Unit
  - EQ's
  - Discuss what we will be doing
- **Introduce the Essential Question: How can I Classify the Matter in My World**
- States of Matter Vocabulary Foldable
- Start Defining Matter

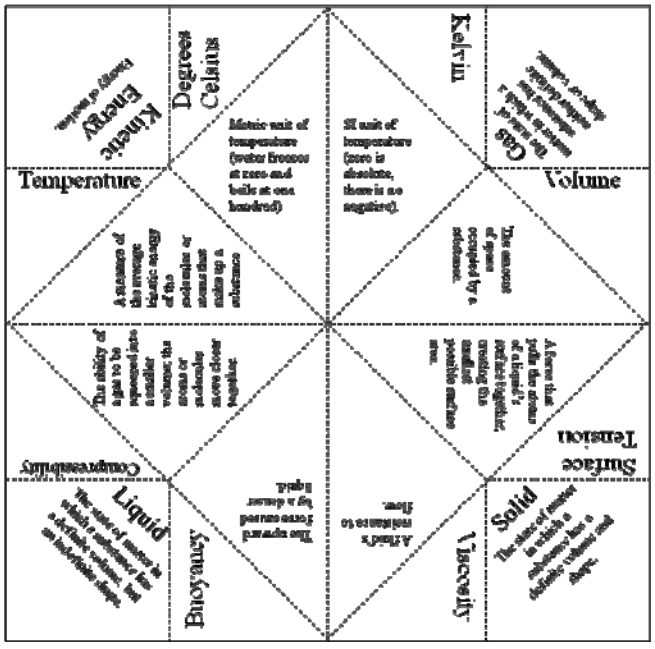
Matter Pre-Test

_____	1.	Says that all matter is in constant motion	A. Solids
_____	2.	Has a definite volume, but indefinite shape	B. Liquids
_____	3.	Has an indefinite volume and shape	C. Gases
_____	4.	Has a definite volume and shape	D. Both solids and liquids
_____	5.	Is not fluid	E. Both solids and gases
_____	6.	Is compressible	F. Both gases and liquids
_____	7.	Particles are in constant motion	G. Solids, liquids, and gases
			H. Kinetic Molecular Theory

Compound Element Heterogeneous Homogeneous Mixture Viscosity

The _____ carbon combines chemically with oxygen and hydrogen to form a _____known as sugar. When making syrup, the sugar is dissolved in water to make a _____. Before the sugar and water are mixed, the _____ mixture is not the same sweetness throughout. After mixing, the solution is _____ because when sugar is evenly disbursed throughout the water. Finally, the water is slowly boiled off and the solution slowly becomes sticky and gooey because the _____ has increased and the solution now resists flowing.

States of Matter Vocabulary Foldable



Day 2

- Defining Matter Walk-Around
  - Three prompts on the walls with “Matter,” “Not Matter,” “Unsure”
  - Students will each get one word to categorize on the board.
    - The words will be on cardstock, laminated, and magnets glued to the reverse.
    - The words will then be able to stick to the whiteboard.
  - Any leftover words will be decided by the class (Do these first as examples)
  - Use the “Price’s Right” method to have the class figure out which ones are correctly placed.
    - Have students justify their answer if any remain after a couple times (or ask them some of the harder ones).
- Defining Matter Worksheet
  - Fill-in the Worksheet once we have the correct answers so that there are less scratch outs
- Homework: Students work on Vocabulary Boxes to define homogeneous, heterogeneous, mixture, compound, element, and pure substance.
  - They will be checked for completion the following day

Defining Matter Walk-Around Words

Toothpaste	**Clouds**
Electricity	**Batteries**
A Star	**Saliva**
Juice	**Helium**
Sound	**Democracy**
The ocean	**Car Exhaust**
Fear	**Gasoline**
DNA	**Paper**
Peanut Butter	**Bacteria**

A Cell	**Exhaustion**
Wisdom	**Salt**
Heat	**Water**
A Dog	**The Sun**
Movement	**Time**
Atoms	**Heat**
Soil	**Jell-O**

Name: _____
Period: _____ Date: _____

WHAT'S THE MATTER?

Purpose: In order to study matter, it is important to understand what matter is and what qualities all matter possesses. In this lesson, you will work to come up with a definition for matter.

Answer the following questions

1. Which things in the following list are matter? Divide the items into three categories as shown below:

Toothpaste	Fear	Helium	A Cell	Soil
Electricity	DNA	Democracy	Wisdom	Exhaustion
A Star	Peanut Butter	Car Exhaust	Heat	Salt
Juice	Clouds	Gasoline	A Dog	Water
Sound	Batteries	Paper	Movement	The Sun
The ocean	Saliva	Bacteria	Atoms	Time

Matter	Unsure	Not Matter

2. What do all of the things that are matter have in common?

3. Give a definition for matter?

4. Pick one item that is not matter. State why it is not matter. How does it not fit your definition?

5. Could we experience heat without matter? What do you think is the relationship between heat and matter?

6. What are the two things you have to prove about something to prove that it's matter?

7. How would you **prove** that air **is matter**?

Homework

Use the Vocabulary Boxes provided and YOUR BOOK to define:

Mixture	Pure Substance
Homogeneous Mixture	Compound
Heterogeneous Mixture	Element

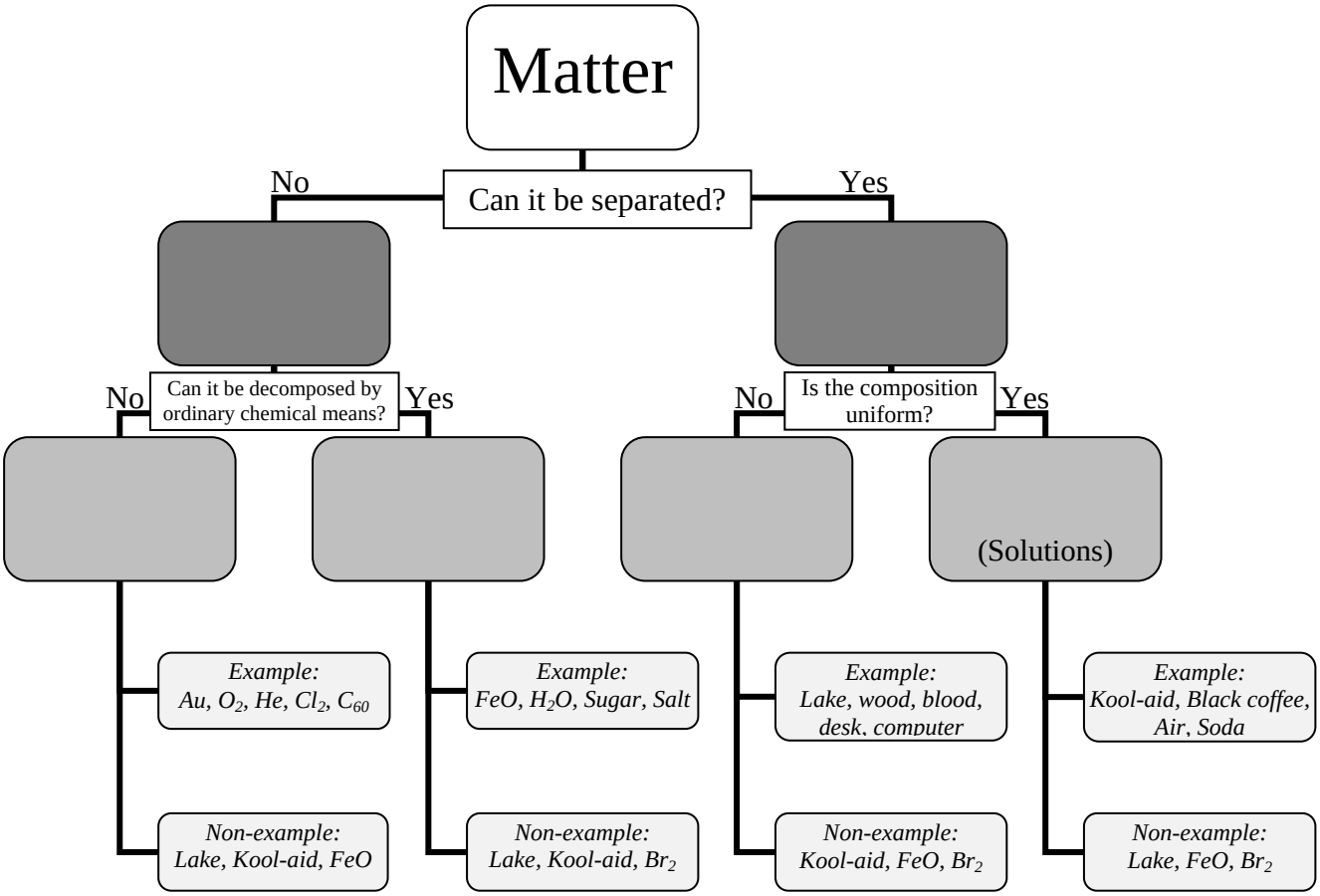
Vocabulary Word:	Examples:
What does it mean? (definition):	Non-Example:
	Picture/Graphic:
How would you describe it? (own words):	

Vocabulary Word:	Examples:
What does it mean? (definition):	Non-Example:
	Picture/Graphic:
How would you describe it? (own words):	

Day 3

- Grade their Vocabulary Boxes (completion grade) while the students are asked to fill-in a classification flow chart.
- Classifying/Separating Matter Rotation Lab
  - The students classify matter into the different categories based on appearance of model systems (similar to the Benchmark question from last year)
  - Once the students are done with the first few lab stations, they design their own experiment to separate a mixture using the substances' physical properties.

Warm-Up:



Substance or Mixture?

1. Sand _____
2. Copper _____
3. Sodium Chloride _____
4. Lake _____

Homogeneous or Heterogeneous?

1. Rocky Road Ice Cream _____
2. Black Coffee _____
3. Salt Water _____
4. Muddy Water _____

Classifying and Separating Matter Rotation Lab

Question

How do I classify matter?
How can I separate mixtures since they are able to be separated?

Information

In chemistry, as in all the sciences, it is very important to be able to classify substances. One way substances are classified is as an element, a compound, or a mixture. In one part of this experiment you will learn to identify substances as elements, compounds, or mixtures by observing their physical properties.

In the second part of the lab we will use physical properties of matter to determine how to separate mixtures.

	Magnetic	Soluble in water	Density (g/mL)	Color
sand	no	no	2.2	light brown
salt (NaCl)	no	yes	2.2	white
iron filings	yes	no	7.9	brownish-black
poppy seeds	no	no	0.59	bluish-gray
water	no	N/A	1.0	colorless

Hypothesis

If I classify matter, then I can decide whether it can be separated by physical means. If it can be separated by physical means, then I can figure out how to separate the mixture.

Materials

Samples in vials (do not let students open the vials)
Baggie of mixture
Filter paper
Erlenmeyer flask
Forceps
Beaker
Ring Stand
Goggles
Aprons
Magnets

Procedure

Stations 1-7

Follow the teacher's instructions about rotating from station to station. In the data table, record the name, symbol or formula (if applicable), color, physical state, and classification of each substance. Be sure to record each substance by the appropriate number on the data table.

Station 8

1. Obtain samples of each mixture component – sand, salt, iron filing, poppy seeds. Use the equipment you have available to observe the components and their properties.
2. Design a method to separate your mixture and write in on a piece of notebook paper. For each step, include the reasoning behind your plan. Obtain teacher approval for your procedure before going any further. Attach the procedure to this paper.
3. Obtain a sample of the mixture. Using the equipment you have available, carry out your procedure. Record your observations as you perform each step.
4. Clean up your lab station and return all equipment to its proper place. Dispose of substances in the containers designated by your teacher. Wash your hands thoroughly before leaving the lab.
5. Attach your procedure and your observations to your lab.

Safety

Do not open the vials.
Make sure the vials are not dropped on the floor.
Let your instructor know immediately if anything is broken so that he/she can clean up the broken glass.
Goggles and aprons must be worn at all times.
Any procedure MUST BE APPROVED by the teacher before performing it to ensure that necessary safety measures are being followed.

Name: _____ Period: _____ Date: _____

Classifying and Separating Matter Rotation Lab

Data

Stations 1-7

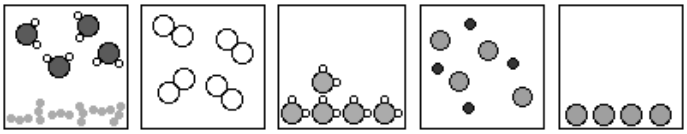
Name of Substance	Symbol or Formula (if given)	Color	Pure Substance?		Mixture?		Pure Substance?		
			Element	Compound	Solution	Hetero. Mixture	Gas	Liquid	Solid
1. Iron									
2. Oxygen									
3. Water									
4. Brass									
5. Salt Water									
6. Milk									
7. Pudding									

Questions

1. Looking at the symbols and formulas column, what do all the pure substances have in common that the mixtures do not?

2. How were you able to tell the difference between a solution and a heterogeneous mixture?

3. In this lab you made macroscopic observations (large-scale). The pictures below represent the particles in a sample of matter (atomic-scale). Identify each picture as an element, compound, solution, or heterogeneous mixture. Briefly describe how you determined each classification.



A **B** **C** **D** **E**

A: _____

B: _____

C: _____

D: _____

E: _____

Conclusions & Reflections

1. (Station 8) Briefly describe the method you used to separate each substance from the mixture. For each substance, explain which physical property enabled you to use this method.

2. (Station 8) Analyze the success of your procedure. On a scale of 1 to 10, with 1 being the best and 10 being the worst, how successful were you in separating and recovering each of the four components?

3. (Station 8) What improvements to your procedure could be made to achieve better results or to make the process more efficient (i.e. faster and/or easier)? Consider changes in the following: techniques, sequence, equipment, etc.

4. How did your group work together to solve the problem?

5. How will this laboratory exercise help you in the future?

6. Do you have any personal problems or criticisms?

Day 4

- Mini-Test over the Elements (Runs throughout the class for students to familiarize themselves with the periodic table)
- Twizzler Lab
  - Students take notes over Chemical and Physical Properties in the information section of the Twizzler lab
- Students complete a worksheet over Chemical and Physical Properties

Name: _____ Period: ____ Date: _____

Twizzler Lab

Problem

How do can I observe the physical properties of matter?

Information

What is matter?

What are the four states of matter in which a substance can exist?

Properties are the _____ or _____ of an object.

Physical properties are properties that can be _____ without changing the _____.

Ductility is the ability of an object to _____ or _____ without breaking.

Qualitative observations are observations made with your _____.

Quantitative observations use _____ to describe properties.

Hypothesis

If we vary the method of observation, then the list of physical properties should _____

Experiment

Materials:

Procedure:

Safety:

Data

Property	Observation	Property	Observation
Color		**Mass**	
Length		**Volume**	
Diameter or Width		**Density**	
Smell		**Viscosity**	
Texture		**Conductivity**	
Shape		**Flammability**	
Ductility		**Taste**	

Questions

1. Write a hypothesis for determining the solubility of the Twizzler. _____

2. What types of properties were identified in today's investigation? _____
3. In what state of matter does your Twizzler exist? _____
4. Which properties were identified through qualitative observations? _____

5. Which properties were identified through quantitative observations? _____

6. What is ductility? _____

7. If you put your Twizzler in the freezer overnight, would its ductility change? _____

Conclusions and Reflections

1. How would you improve the experiment? _____

2. How will this lab help you in the future? _____

Day 5

- Catch-Up Day

Day 6

- **Introduce the Essential Question: What Happens To A Substance When It Changes?**
- Notes on Physical and Chemical Changes
- Homework: Worksheet to practice identifying Physical and Chemical Changes (Two Kinds of Change)

The Only Thing that Stays the Same Is That Everything Changes…

Is it Physical or Chemical?

Physical	Chemical
Definition: A change in a substance that does not include a change in the identity of that substance	**Definition**: A change in which one or more substances are converted into different substances (Formula Change)
Examples: Bend (Ductile) Cut Break Color Phase Change Hammer into a sheet (malleable) Pull into a wire (Ductile) Mold into a specific form Dissolve In Water Flows Slowly (Viscosity)	**Examples**: Formula Change 1. Gives Off or Takes-Up Energy • endergonic takes up energy • exergonic gives off energy (becomes something new) 2. Change Color (becomes something new) 3. Evolve Gases/Bubbles (becomes something new) 4. Form a precipitate (becomes something new) Burn something

Name: _____

Period: _____ Date: _____

Two Kinds of Change

*A **physical change** occurs when the appearance of a substance changes, but chemically the substance is the same. The individual molecules do not change, and no new matter is formed. During some physical changes, matter simply changes from one state to another. Evaporating, melting, freezing, and sublimating are examples of physical changes in which matter changes from one state to another.*

***Chemical change** occurs when a chemical reaction takes place. The substances produced during a chemical reaction are different from the original substances. Energy is involved in all chemical reactions.*

Directions: Examine the list of changes below. Write *C* before each chemical change. Write *P* before each physical change.

_____ 1. Erosion of a riverbed by water

_____ 2. Leaves changing color

_____ 3. Glass breaking

_____ 4. Carving a statue out of marble

_____ 5. A rusting bicycle

_____ 6. Sanding a piece of wood

_____ 7. Ice cream melting

_____ 8. Fireworks exploding

_____ 9. Baking a cake

_____ 10. Chocolate melting

_____ 11. Frying an egg

_____ 12. Cutting grass

_____ 13. Water evaporating from a pond

_____ 14. Vinegar is mixed with baking soda

_____ 15. Spoiling food

_____ 16. Burning toast

_____ 17. Melting butter for popcorn

_____ 18. Cooking waffles

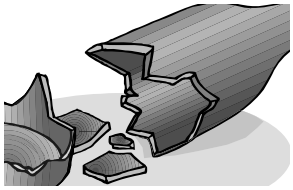
_____ 19. Lighting a match

_____ 20. Mothballs disappear over time

_____ 21. Plants undergo photosynthesis

_____ 22. A red mark appears after a bee sting

_____ 23. A drop of hydrochloric acid on marble produces carbon dioxide gas (bubbles)



Name: _____

Period: _____ Date: _____

Day 7

- Observing a Chemical Reaction Lab

CLASS SET OF DIRECTIONS, DO NOT WRITE ON THIS PAPER.

Lab – Observing a Chemical Reaction

Problem

What can I learn from observing a chemical reaction?

Information

The science of chemistry is based upon observation. In this experiment, you will observe a chemical reaction and use filtration to separate the products of that reaction. As you observe the reaction in this experiment, try to make as many observations as possible. Be aware that a **quantitative** observation is an observation that involves a measurement. A **qualitative** observation is a general description and does not involve a measurement. "The liquid is hot" is a qualitative observation. "The temperature of the liquid is 95°C" is a quantitative observation.

Sometimes liquids contain particles of insoluble solids, present either as impurities or as precipitates formed by the interaction of the chemicals used in the experiment. These particles can be separated from the liquid by filtration. The liquid that passes through the filter is known as the **filtrate**.

Materials

In Basket:
- ❖ 125 mL Erlenmeyer flask
- ❖ 250 mL beaker
- ❖ thermometer
- ❖ magnifying glass
- ❖ funnel
- ❖ wash bottle

On Lab Counter:
- ❖ ring
- ❖ ring stand

At weighing station:
- ❖ chemical spatula
- ❖ balance
- ❖ weighing boat

- ❖ copper(II) chloride dihydrate

filter paper

aluminum foil, 7 cm × 7 cm

Safety

- Smell chemicals cautiously, wafting a hand across the top of the container, toward your nose.
- **DO NOT** use a thermometer as a stirring rod.
- Copper (II) chloride is an irritant. Avoid skin contact with this chemical. Wash your hands thoroughly after use.

Procedure

As you perform this experiment, record your observations in the data table on your laboratory worksheet.

1. Find the data table on your laboratory worksheet and on the back of these directions.
2. Obtain approximately 1.5 g of copper (II) chloride dihydrate, $CuCl_2 \cdot 2H_2O$, in a weighing boat. Using the magnifying glass, **describe the crystals** in as much detail as you can, and make as many observations as possible (Note: make sure to write down the exact weight of the crystals you use and answer all of the questions found in the data table on the back of this sheet).
3. Add 50 mL of water to the 150 mL Erlenmeyer flask. Without stirring, add the 1.5 g to the 150 mL Erlenmeyer flask. **Record your observations** of the mixture. Observe both the crystals and the water. Record. Make sure you answer the questions found in the data table on the back of this sheet.
4. Swirl the mixture until the crystals are completely dissolved. **Record your observations** of the solution. Make sure you answer the questions found in the data table on the back of this sheet.
5. Place a thermometer in the copper (II) chloride solution and note the temperature. **Record the temperature** to one decimal place as the initial temperature. Remove the thermometer from the solution.

CLASS SET OF DIRECTIONS, DO NOT WRITE ON THIS PAPER.

6. **Cut** the 7 cm × 7 cm piece of aluminum foil into smaller pieces. Place the pieces of aluminum in the solution. Swirl the mixture and record your observations. CAUTION: *Observe the mixture from the side. Do not look directly down into the beaker.* Continue to swirl and observe the mixture until there is no longer huge pieces of aluminum foil (some smaller pieces will remain). **Record the final temperature** and calculate **the overall change in temperature**.

$$\mathbf{T_{fianl} - T_{initial} = \Delta T \text{ (change in temperature)}}$$

7. When the reaction is complete, set up the filtration apparatus as shown in Figure 2. Support a funnel on a small ring on the ring stand. Use a beaker to collect the filtrate. Adjust the funnel so that the stem of the funnel just touches the inside wall of the beaker.

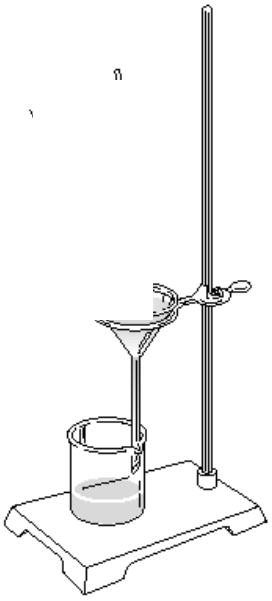
8. Fold the filter paper along its diameter, and then fold it again to form a quadrant. Separate the folds of the filter, with three thicknesses on one side and one on the other; then place in the funnel. Then funnel should be wet before the paper is added. Use your plastic wash bottle. Then wet the filter paper with a little water and press the edges firmly against the sides of the funnel so no air can get between the funnel and the filter paper while the liquid is being filtered.

9. Filter out the solid substances by pouring the liquid and solid particles into the filter, observing the following suggestions:

   a. The filter paper should not extend above the edge of the funnel.

   b. Do not fill the filter. It must never overflow.

   c. Try to establish a flow of liquid in the stem of the funnel, thus excluding air bubbles, and then add the liquid just fast enough to keep the level about 1 cm from the top of the filter.



Figure

10. Dispose of the filtrate down the drain with water. Dispose of the solids as directed by your teacher.

Data

Dry copper(II) chloride dihydrate	*Be sure to note: Color, Mass, Size, etc.*
Copper(II) chloride in water ***Without mixing***	*Be sure to note: Type of Mixture, color, amount of water added, etc.*
Stirred solution of copper(II) chloride in water ***After some swirling***	*Be sure to note: Type of Mixture, color, etc.*
Copper(II) chloride solution and aluminum foil ***After a lot of swirling***	*Be sure to note: Type of Mixture, color, color of foil before, color of solution after, any indications of chemical change. Is there a precipitate?*
Temperature recordings (°C)	$\mathbf{T_{initial} =}$ $\mathbf{T_{final} =}$ $\mathbf{\Delta T =}$

Name: _____

Period: ____ Date: _____

Lab – Observing a Chemical Reaction

Data

Dry copper(II) chloride dihydrate	
Copper(II) chloride in water *Without mixing*	
Stirred solution of copper(II) chloride in water *After some swirling*	
Copper(II) chloride solution and aluminum foil *After a lot of swirling*	
Temperature recordings (°C)	**$T_{initial}$ =** **T_{final} =** **ΔT =**

Questions

1. List the observation changes that occurred in each step (*color change, bubbles, precipitate, temperature change*):
    a. Pour the crystals into the water _____
    b. Mixing the crystals into the water _____
    c. Adding the aluminum foil _____
    _____
2. From your observations, label the steps as either physical or chemical changes:
    a. Pour the crystals into the water _____
    b. Mixing the crystals into the water _____

c. Adding the aluminum foil _____

3. Which of the observations you made were quantitative? _____

4. Which of the observations you made were qualitative? _____

5. What is the difference between an exergonic reaction and an endergonic reaction? _____

6. What should the temperature do if the reaction is endergonic? _____

7. What should the temperature do if the reaction is exergonic? _____

8. Was our reaction endergonic or exergonic? _____
9. How is an exothermic reaction different from an endothermic reaction?_____

10. Was our reaction exothermic or endothermic? _____
11. How could this lab be improved? _____

12. What could you have done to make this lab better? _____

Day 8

- Quiz over matter.
- **Introduce the Essential Question: How is it possible that all matter is in constant motion?**
- KMT Notes & Phase Change Notes

Matter and Its Properties Quiz

____ 1. What is the main difference between physical properties and chemical properties?
   a. Chemical properties are cooler than physical properties
   b. Chemical properties are observed with the senses, physical properties are observed by changing the substance
   c. Physical properties are observed with the senses, chemical properties are observed by changing the substance
   d. There is no difference

2. Give one example of a physical property.

3. Give one example of a chemical property.

4. Circle whether each of the following is a physical change or a chemical change:

a. Tearing a sheet of paper	Physical	Chemical
b. Melting a piece of wax	Physical	Chemical
c. Burning a log	Physical	Chemical

5. Label the following as a quantitative (N) or qualitative (L) observation by placing an N or L in the blank.

____a. The blanket is blue	____d. The reaction took 5 seconds
____b. The window is wide	____e. This quiz is cool
____c. He's 5'9" tall	____f. This quiz has 6 questions

6. Contrast mixtures with pure substances.

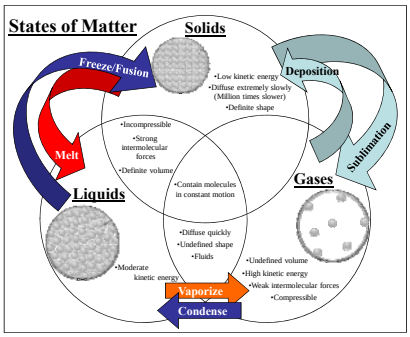
KMT Notes & Phase Change Notes:

Kinetic Molecular Theory (KMT)

- The Kinetic Molecular Theory explains the forces between molecules and the energy that they possess.
- This theory has 3 basic assumptions.
  - Matter is composed of small particles (molecules).
  - The measure of space that the molecules occupy (volume) is derived from the space in between the molecules and not the space the molecules contain themselves.
  - The molecules are in constant motion.

KMT (*s*, *l*, and *g*)

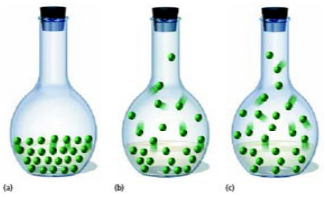
- This motion is different for the 3 states of matter.
  - ***Solid*** - Molecules are held close to each other by their attractions of charge. They will bend and/or vibrate, but will stay in close proximity.
  - ***Liquid*** - Molecules will flow or glide over one another, but stay toward the bottom of the container. Motion is a bit more random than that of a solid.
  - ***Gas*** - Molecules are in continual straight line motion. The kinetic energy of the molecule is greater than the attractive force between them, thus they are much farther apart and move freely of each other.
    - When the molecules collide with each other, or with the walls of a container, there is no loss of energy.



Day 9

- Mini-Test Elements (Runs throughout the class for students to familiarize themselves with the periodic table)
- Finish Phase Change Notes
- Notes on Phase Diagram and Heating Curves

Notes on Phase Diagram and Heating Curves



What state of matter is (a)? What about (b)?

_____ is occurring at (c)?

Equilibrium

- Let's look again at our equilibrium system as an equation…

  Liquid + heat energy⇄vapor

- Which direction is the endothermic reaction?
- Which direction is the exothermic direction?
- If the reaction is at equilibrium, what happens to the heat energy?

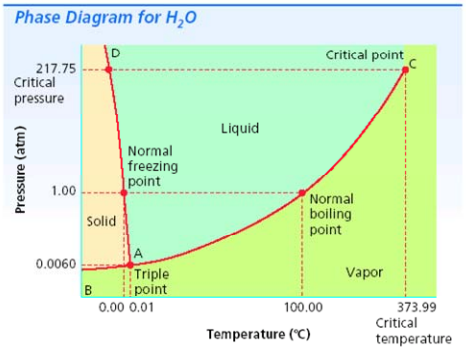
Liquid + heat energy ⇄ vapor

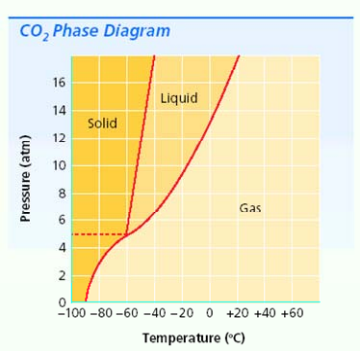
Volatile and Nonvolatile Liquids

- Volatile liquids- liquids that evaporate readily
- Nonvolatile liquids- evaporate slowly, have strong attractive forces between particles

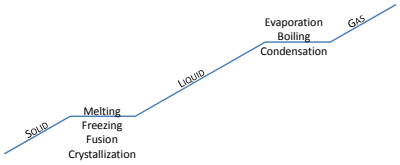
Phase Diagrams

- Phase diagrams- a graph of pressure versus temperature that shows the conditions under which the phases of a substance exist
- Triple point- indicates the temperature and pressure conditions at which the solid, liquid, and vapor of the substance can coexist at equilibrium
- Critical temperature- the temperature above which the substance cannot exist in the liquid state
  - Water 373.99°C
- Critical pressure- the lowest pressure at which the substance can exist as a liquid at the critical temperature
  - Water 217.75 atm





Heating Curve



Phase Change Vocabulary

- Freezing Point (Fusion & Crystallization Point) – Temperature at which the liquid becomes a solid
- Melting Point– Temperature at which the solid becomes a liquid

Melting Point and Freezing Point are the **SAME** Temperature

Phase Change Vocab. (Cont'd)

- Boiling Point – Temperature at which the liquid becomes a gas
  - Normal Boiling Point is at atmospheric pressure (1 atm/760 torr/101.3 kPa)
- Condensing Point – Temperature at which the gas becomes a liquid

The Boiling and Condensing Point are the **SAME** Temperature

Day 10

- Freezing/Melting Point of Water Lab

Experiment

2

Freezing and Melting of Water

Freezing temperature, the temperature at which a substance turns from liquid to solid, and melting temperature, the temperature at which a substance turns from a solid to a liquid, are characteristic physical properties. In this experiment, the cooling and warming behavior of a familiar substance, water, will be investigated. By examining graphs of the data, the freezing and melting temperatures of water will be determined and compared.

Review: Kinetic energy is the energy of motion. Potential energy is the energy of position. For example, a rock on a ledge has a lot of stored up potential energy because it has a high position relative to the earth. When it falls, its potential energy gets converted to kinetic energy as it falls.

Kinetic Energy = 1/2(mass∗velocity^2) **KE = ½(mv^2)**

Potential Energy = mass∗gravity acceleration∗height **PE = mgh**

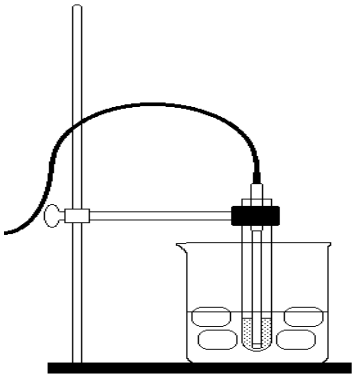


Figure 1

MATERIALS

Macintosh or IBM-compatible computer
Serial Box Interface or ULI
Logger*Pro*
Vernier Temperature Probe
Ring stand
Utility clamp
Test tube
400-mL beaker
Water
10-mL graduated cylinder
Ice
Salt
Stirring rod
Graph paper

PROCEDURE

Part I: Freezing

1. Put about 100 mL of water and a hand full of ice cubes into a 400-mL beaker.
2. Put 5 mL of water into a test tube and use a utility clamp to fasten the test tube to a ring stand. The test tube should be clamped above the water bath. Place a temperature probe into the water inside the test tube.

3. Go to start/applications/loggerpro 2.2.1. Go to file/open/chem with computers/exp 2. Double-click the direct connect option. If the temp reading is not between 20-25°C, ask your teacher for help. The horizontal axis should have time scaled from 0 to 15 minutes.

4. When everything is ready, click Collect to begin data collection. Then lower the test tube into the ice-water bath.

5. Soon after lowering the test tube, add 5 spoons of salt to the beaker and stir the ice-water bath with a stirring rod. Continue to stir the ice-water bath during Part I.

6. Slightly, but continuously, move the probe during the first 10 minutes of Part I. Be careful to keep the probe in, and not above, the ice as it forms. When 10 minutes have gone by, or when the water in the test tube begins to freeze, stop moving the probe and allow it to freeze into the ice. Add more ice cubes to the beaker as the original ice cubes get smaller. Keep the ice-water bath cold!

7. When 15 minutes have passed, data collection will stop. **Keep the test tube *submerged* in the ice-water bath until Step 10.**

8. On the displayed graph, analyze the flat part of the curve to determine the freezing temperature of water:
   - Move the mouse pointer to the beginning of the graph's flat (horizontal) part. Press the mouse button and hold it down as you drag across the flat part to *select* it.
   - Click on the Statistics button, STAT. The mean temperature value for the selected data is listed in the statistics box on the graph. Record this value as the freezing temperature in your data table.
   - To remove the statistics box, click on the upper-right corner of the box.

Part II: Melting

9. Prepare the computer for data collection. From the Data menu, choose Store Latest Run. This stores the data so it can be used later.

10. Now you will look at a warming curve. The test tube of water should still be in the ice-water bath. The water inside the test tube should still be frozen. Click Collect to begin data collection. Then raise the test tube out of the ice-water bath and fasten it in a position above the ice-water bath. *Do not move the temperature probe during Part II.*

11. Drain the water out of the ice. (Into the sink.) Pour the salted ice into the disposal tub. Add 250 mL of tap water to the beaker. When 10 minutes have passed, lower the test tube and its contents into this tap water bath.

12. When 15 minutes have passed, data collection will stop.

13. On the displayed graph, analyze the flat part of the curve to determine the melting temperature of water:
   - Move the mouse pointer to the beginning of the graph's flat part. Press the mouse button and hold it down as you drag across the flat part to *select* it.
   - Click the Statistics button, STAT. The mean temperature value for the selected data is listed in the statistics box on the graph. Record this value as the melting temperature in your data table.
   - To remove the statistics box, click on the upper-right corner of the box.

DATA TABLE

Freezing temperature of water	_____°C
Melting temperature of water	_____°C

Sketch the graph of temperature vs. time from the computer screen onto graph paper.(Don't forget to label the axes and designate which line is freezing and which is melting.)

PROCESSING THE DATA (Use complete sentences.)

1. What happened to the water temperature during freezing? During melting?

2. According to your data and graph, what is the freezing temperature of water? The melting temperature? Express your answers to the nearest 0.1°C.

3. How does the freezing temperature of water compare to its melting temperature?

4. Temperature is a measure of what kind of energy, kinetic or potential?

5. If particles are moving away from each other, or closer to each other (positions are changing), what kind of energy changes are involved, kinetic or potential?

6. Tell if the *kinetic energy* of the water in the test tube increases, decreases, or remains the same in each of these time segments during the experiment.
   a) When the temperature is changing at the beginning and end of Part I

   b) When the temperature remains constant in Part I

   c) When the temperature is changing at the beginning and end of Part II

   d) When the temperature remains constant in Part II

7. In those parts of Question 4 in which there was no kinetic energy change, tell if *potential energy* increased or decreased.

8. What do you think the melting curve would look like if you decreased the amount of water? If you increased the amount of water?

9. Sketch the temperature vs. time graph if water was heated from 4°C to 110°C.

10. Explain how energy is related to phases?

Day 11

- Introduce Project
- Start Project Work

Phases of Matter Project

As part of a new research team, your employer has asked you and your partner to explain the properties of a molecule in the solid, liquid, and gaseous state as a possible inclusion to the research program. In so doing, you will need to determine, summarize, and write about the usage, transportation, storage, and precautions for a chemical compound.

You will construct (either one you find from a resource or you make from data) a phase diagram with the important sections, lines, and points colored and labeled (properly). Once you have constructed the phase diagram, your group should choose a pressure at which all three phases can be attained and create a heating curve that demonstrates the changes from solid to liquid and liquid to gas (using the correct melting and boiling points from your phase diagram).[1]

To aide in putting your information together, you will be required to make a cube with six sides and to write a short paragraph and bibliography.

On the cube, you will have six sides, the sections should be:

1. Names and Period, Element or Compound Name, and Symbol or Formula
2. Major Use, Storage Precautions, Transporting Guidelines, and General Safety Information
3. Any interesting physical and chemical properties.
4. The phase of matter your compound is in at room temperature (25°C) and pressure (1 atm/760 torr/101.3kPa)
5. The phase diagram you have drawn, colored, and correctly labeled.
6. Your heating curve constructed from the data at one pressure.

In your written assignment, you should have:

1. A summary of the usage, transportation, storage, and precautions for your element or compound.
2. Any interesting facts that you found out about your element or compound.
3. Bibliography (Work's Cited)
    a. All of your resources for your research correctly cited in MLA format (http://citationmachine.net/index.php?reqstyleid=1)
    b. After each resources' entry, please list the information you got for your project from that source.

[1] Some of the information might be difficult to obtain, so you might have to consult various resources. One such resource is called the CRC Handbook of Chemistry and Physics; this contains many useful tables and charts that might have information useful to you. Other books and chemical research papers might be helpful.

Possible Compounds

Naphthalene	Acetylene
Hydrogen	Hydrobromic Acid
Oxygen	Hydrosulfuric Acid
Nitrogen	Acetic Acid
Methane	Nitrogen Monoxide
Ammonia	Silicon Tetrafluoride
Carbon Monoxide	Sulfur Hexafluoride
Hydrochloric Acid	Hydrocyanic Acid
Hydroiodic Acid	Sulfur Dioxide

Project Time Line:

Monday	Tuesday	Wednesday	Thursday	Friday
[11] Introduce Project Start Project Work	[12] Quiz Over States of Matter Project Work	[13] Project Work	[14] Project Work	[15] Unit Test
[16] ***Project and Self Assessment Due***	1 day late (90 maximum)	2 days late (80 maximum)	3 days late (70 maximum)	4-End of Six Weeks (60 maximum)

Example Cube

Names:

Period:

Element/Compound Name:

Formula:

Phase at room temperature and pressure.

Phase Diagram

Heating Curve

Interesting Physical and Chemical Properties

Use, Storage, transportation, and safety precautions

Student Handout

Categories	Exceeds Expectations (100-90%)	Meets Expectations (80-75%)	Does Not Meet Expectations (74-50%)
Industrial Information and Paragraph (25 points)	☐ Relevant materials identified and used ☐ Vocabulary terms are properly used (where appropriate) ☐ The usage, transportation, storage, and safety precautions are summarized and well understood ☐ Interesting "extras" are included in the written project ☐ No spelling or grammar errors are found 25-23 pts	☐ Relevant materials identified and used ☐ Vocabulary terms are properly used (where appropriate) ☐ The usage, transportation, storage, and safety precautions are summarized and understood ☐ No spelling or grammar errors are found 22-19 pts.	☐ A few relevant materials identified and used ☐ Vocabulary terms are sometimes incorrectly and/or inappropriately used ☐ The usage, transportation, storage, and safety precautions are summarized and somewhat understood ☐ Some spelling or grammar errors are found 18-13 pts
Phase Diagram (25 points)	☐ The phase diagram is properly labeled and colored with accuracy 25-23 pts	☐ The phase diagram is properly labeled and colored with accuracy 22-19 pts	☐ The phase diagram is properly labeled, but includes some inaccuracy 18-13 pts
Heating Curve (25 points)	☐ The heating curve is properly labeled o Melting/Fusion/Freezing Point Labeled with the value o Boiling/Condensing Point Labeled with the value o Correct Pressure Chosen and labeled o Title ☐ Regions Labeled 25-23 pts	☐ The heating curve is properly labeled o Melting/ Freezing Point Labeled o Boiling/Condensing Point Labeled o Correct Pressure Chosen o Title ☐ Regions Labeled 22-19 pts	☐ The heating curve is not properly labeled o Melting/Fusion/Freezing Point Label missing o Boiling/Condensing Point Label missing o Incorrect Pressure Chosen and/or label missing o Title missing ☐ Regions not Labeled 18-13 pts
Phase at Room Temperature and Pressure (10 points)	☐ Correctly Identified the State of Matter at Room Temperature and Pressure ☐ The state is listed as well as the conditions 10-9 pts	☐ Correctly Identified the State of Matter at Room Temperature and Pressure 8 pts	☐ Incorrectly Identified the State of Matter at Room Temperature and/or Pressure 7-5 pts
Interest/Creativity (10 points)	☐ The project in all facets is well put together and well designed 10-9 pts	☐ The project in most facets is well put together and well designed 8 pts	☐ The project lacks design and creativity 7-0 pts
Annotated Bibliography (15 points)	☐ The resources are properly cited using MLA style ☐ The attribution is short and concise, but thorough, for all of the information gathered from the sources. 15-14 pts	☐ The resources are properly cited using MLA style ☐ The attribution is short and concise, but some things are missing 13-11 pts	☐ The resources are properly cited using MLA style ☐ The attribution of information is incomplete, non-existent, or verbose 10-8 pts
Group Participation [Individual grades] (10 points)	☐ Both members of the group agree that the work was shared evenly with respect to the project (together) 10-9 pts	☐ Both members of the group agree that the work was divided evenly with respect to the project (parts) 8 pts	☐ Parts of the project were clearly divided and lack coherence ☐ One partner has shared more than his or her portion 7-0 pts

Project Checklist

Written Portion:

- ❏ Usage
- ❏ Storage
- ❏ Transportation
- ❏ Safety Precautions
- ❏ Physical Properties
- ❏ Chemical Properties

Bibliography (With Written Portion):

- ❏ Correctly Cited Sources
- ❏ List of what you got from each source

Cube:

- ❏ Name, Period, Element/Compound Name, and Formula
- ❏ State at Room Temperature and Pressure
- ❏ Use, Storage, Transportation, Safety Precautions
- ❏ Physical and Chemical Properties
- ❏ Phase Diagram
- ❏ Heating Curve

Project Checklist

Written Portion:

- ❏ Usage
- ❏ Storage
- ❏ Transportation
- ❏ Safety Precautions
- ❏ Physical Properties
- ❏ Chemical Properties

Bibliography (With Written Portion):

- ❏ Correctly Cited Sources
- ❏ List of what you got from each source

Cube:

- ❏ Name, Period, Element/Compound Name, and Formula
- ❏ State at Room Temperature and Pressure
- ❏ Use, Storage, Transportation, Safety Precautions
- ❏ Physical and Chemical Properties
- ❏ Phase Diagram
- ❏ Heating Curve

Project Checklist

Written Portion:

- ❏ Usage
- ❏ Storage
- ❏ Transportation
- ❏ Safety Precautions
- ❏ Physical Properties
- ❏ Chemical Properties

Bibliography (With Written Portion):

- ❏ Correctly Cited Sources
- ❏ List of what you got from each source

Cube:

- ❏ Name, Period, Element/Compound Name, and Formula
- ❏ State at Room Temperature and Pressure
- ❏ Use, Storage, Transportation, Safety Precautions
- ❏ Physical and Chemical Properties
- ❏ Phase Diagram
- ❏ Heating Curve

Project Checklist

Written Portion:

- ❏ Usage
- ❏ Storage
- ❏ Transportation
- ❏ Safety Precautions
- ❏ Physical Properties
- ❏ Chemical Properties

Bibliography (With Written Portion):

- ❏ Correctly Cited Sources
- ❏ List of what you got from each source

Cube:

- ❏ Name, Period, Element/Compound Name, and Formula
- ❏ State at Room Temperature and Pressure
- ❏ Use, Storage, Transportation, Safety Precautions
- ❏ Physical and Chemical Properties
- ❏ Phase Diagram
- ❏ Heating Curve

Grading Rubric

Categories	Exceeds Expectations (100-90%)	Meets Expectations (80-75%)	Does Not Meet Expectations (74-50%)
Industrial Information and Paragraph (25 points)	☐ Relevant materials identified and used ☐ Vocabulary terms are properly used (where appropriate) ☐ The usage, transportation, storage, and safety precautions are summarized and well understood ☐ Interesting "extras" are included in the written project ☐ No spelling or grammar errors are found _____pts	☐ Relevant materials identified and used ☐ Vocabulary terms are properly used (where appropriate) ☐ The usage, transportation, storage, and safety precautions are summarized and understood ☐ No spelling or grammar errors are found _____pts	☐ A few relevant materials identified and used ☐ Vocabulary terms are sometimes incorrectly and/or inappropriately used ☐ The usage, transportation, storage, and safety precautions are summarized and somewhat understood ☐ Some spelling or grammar errors are found _____pts
Phase Diagram (25 points)	☐ The phase diagram is properly labeled and colored with accuracy _____pts	☐ The phase diagram is properly labeled and colored with accuracy _____pts	☐ The phase diagram is properly labeled, but includes some inaccuracy _____pts
Heating Curve (25 points)	☐ The heating curve is properly labeled o Melting/Fusion/Freezing Point Labeled with the value o Boiling/Condensing Point Labeled with the value o Correct Pressure Chosen and labeled o Title ☐ Regions Labeled _____pts	☐ The heating curve is properly labeled o Melting/ Freezing Point Labeled o Boiling/Condensing Point Labeled o Correct Pressure Chosen o Title ☐ Regions Labeled _____pts	☐ The heating curve is not properly labeled o Melting/Fusion/Freezing Point Label missing o Boiling/Condensing Point Label missing o Incorrect Pressure Chosen and/or label missing o Title missing ☐ Regions not Labeled _____pts
Phase at Room Temperature and Pressure (10 points)	☐ Correctly Identified the State of Matter at Room Temperature and Pressure ☐ The state is listed as well as the conditions ____pts	☐ Correctly Identified the State of Matter at Room Temperature and Pressure _____pts	☐ Incorrectly Identified the State of Matter at Room Temperature and/or Pressure ____pts
Interest/Creativity (10 points)	☐ The project in all facets is well put together and well designed ____pts	☐ The project in most facets is well put together and well designed ____pts	☐ The project lacks design and creativity ____pts
Annotated Bibliography (15 points)	☐ The resources are properly cited using MLA style ☐ The attribution is short and concise, but thorough, for all of the information gathered from the sources. _____pts	☐ The resources are properly cited using MLA style ☐ The attribution is short and concise, but some things are missing _____pts	☐ The resources are properly cited using MLA style ☐ The attribution of information is incomplete, non-existent, or verbose _____pts
Group Participation (10 points)	☐ Both members of the group agree that the work was shared evenly with respect to the project (together) ___pts	☐ Both members of the group agree that the work was divided evenly with respect to the project (parts) ___pts	☐ Parts of the project were clearly divided and lack coherence ☐ One partner has shared more than his or her portion ____pts

Names: _____ & _____

Grades:_____ _____

My Name: _____ Period ____

My Partner's Name: _____

Please score your partner on the following criterion by circling one number in each of the columns (5 is the best; 1 the worst):

Shared the Workload Equally	Was Helpful	Would Work with him/her again	Additional Comments?
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	

My Name: _____ Period ____

My Partner's Name: _____

Please score your partner on the following criterion by circling one number in each of the columns (5 is the best; 1 the worst):

Shared the Workload Equally	Was Helpful	Would Work with him/her again	Additional Comments?
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	

My Name: _____ Period ____

My Partner's Name: _____

Please score your partner on the following criterion by circling one number in each of the columns (5 is the best; 1 the worst):

Shared the Workload Equally	Was Helpful	Would Work with him/her again	Additional Comments?
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	

Student Self-Assessment

Categories	Exceeds Expectations (100-90%)	Meets Expectations (80-75%)	Does Not Meet Expectations (74-50%)
Industrial Information and Paragraph (25 points)	☐ Relevant materials identified and used ☐ Vocabulary terms are properly used (where appropriate) ☐ The usage, transportation, storage, and safety precautions are summarized and well understood ☐ Interesting "extras" are included in the written project ☐ No spelling or grammar errors are found _____pts	☐ Relevant materials identified and used ☐ Vocabulary terms are properly used (where appropriate) ☐ The usage, transportation, storage, and safety precautions are summarized and understood ☐ No spelling or grammar errors are found _____pts	☐ A few relevant materials identified and used ☐ Vocabulary terms are sometimes incorrectly and/or inappropriately used ☐ The usage, transportation, storage, and safety precautions are summarized and somewhat understood ☐ Some spelling or grammar errors are found _____pts
Phase Diagram (25 points)	☐ The phase diagram is properly labeled and colored with accuracy _____pts	☐ The phase diagram is properly labeled and colored with accuracy _____pts	☐ The phase diagram is properly labeled, but includes some inaccuracy _____pts
Heating Curve (25 points)	☐ The heating curve is properly labeled o Melting/Fusion/Freezing Point Labeled with the value o Boiling/Condensing Point Labeled with the value o Correct Pressure Chosen and labeled o Title ☐ Regions Labeled _____pts	☐ The heating curve is properly labeled o Melting/ Freezing Point Labeled o Boiling/Condensing Point Labeled o Correct Pressure Chosen o Title ☐ Regions Labeled _____pts	☐ The heating curve is not properly labeled o Melting/Fusion/Freezing Point Label missing o Boiling/Condensing Point Label missing o Incorrect Pressure Chosen and/or label missing o Title missing ☐ Regions not Labeled _____pts
Phase at Room Temperature and Pressure (10 points)	☐ Correctly Identified the State of Matter at Room Temperature and Pressure ☐ The state is listed as well as the conditions ____pts	☐ Correctly Identified the State of Matter at Room Temperature and Pressure _____pts	☐ Incorrectly Identified the State of Matter at Room Temperature and/or Pressure ____pts
Interest/Creativity (10 points)	☐ The project in all facets is well put together and well designed ____pts	☐ The project in most facets is well put together and well designed ____pts	☐ The project lacks design and creativity ____pts
Annotated Bibliography (15 points)	☐ The resources are properly cited using MLA style ☐ The attribution is short and concise, but thorough, for all of the information gathered from the sources. _____pts	☐ The resources are properly cited using MLA style ☐ The attribution is short and concise, but some things are missing _____pts	☐ The resources are properly cited using MLA style ☐ The attribution of information is incomplete, non-existent, or verbose _____pts
Group Participation (10 points)	☐ Both members of the group agree that the work was shared evenly with respect to the project (together) ___pts	☐ Both members of the group agree that the work was divided evenly with respect to the project (parts) ___pts	☐ Parts of the project were clearly divided and lack coherence ☐ One partner has shared more than his or her portion ____pts

Name: _____ Grade: _____

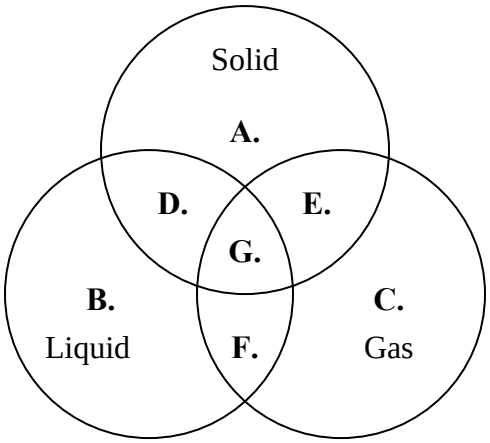
Day 12

- Partner Quiz over States of Matter
- Project Work

Name: _____ Date: _____

Period: ____

States of Matter Partner Quiz



_____1. has surface tension

_____2. the state with the lowest kinetic energy

_____3. incompressible

_____4. helium at room temperature

_____5. changing from solid to this state would be endothermic

_____6. have indefinite shape

_____7. particles are in constant motion

_____8. particles have random motion

_____9. the particles have a fixed average position

_____10. the state with intermolecular forces

_____11. decreasing the kinetic energy of liquid results in a phase change to this state

_____12. group 2 on the periodic table

_____13. period 3 on the periodic table

_____14. molecules with London-dispersion forces at room temperature

Match the following with the correct term:

_____ 15. Solid to liquid
_____ 16. Liquid to gas
_____ 17. Gas to solid
_____ 18. Solid to Gas
_____ 19. Gas to Liquid
_____ 20. Liquid to Solid

A. Deposition
B. Sublimation
C. Freezing
D. Melting
E. Condensation
F. Boiling

21. What is meant by a change in state?

22. What is the difference between state of matter and phase of matter?

Day 13

- Go over Quiz
- Hand out Review
- Project Work

Name: _____ Date: _____

Test Review

What are the indicators of chemical change?

What is a chemical change? Examples?

What is a physical change? Examples?

Ice melting is a physical or chemical change?

What is exergonic?

What is endergonic?

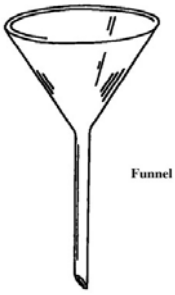
Water freezing is exergonic or endergonic?

A reaction gives off light. Is that exergonic or endergonic?

A reaction feels cold after the reaction is complete. Is that exergonic or endergonic?

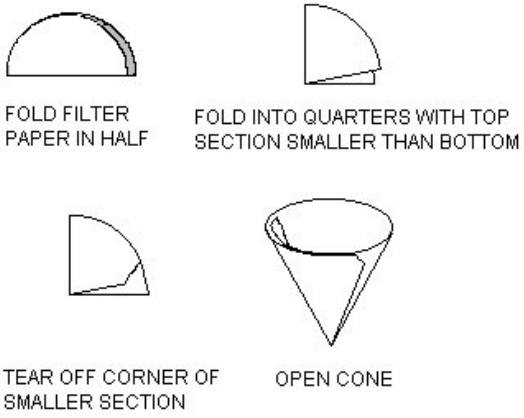
Be able to identify the following by site:

1. Funnel

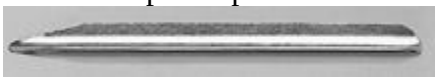


2. Weighing boat

3. Filter paper

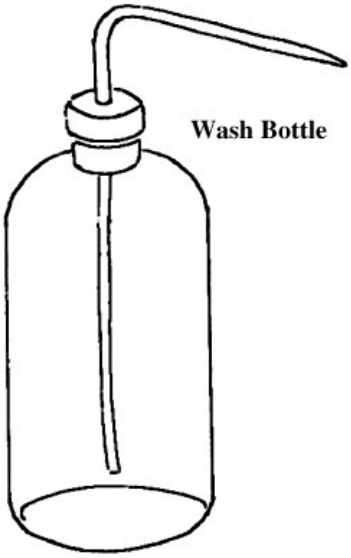


4. Chemical spoon/spatula



5. Electronic balance

6. Wash bottle



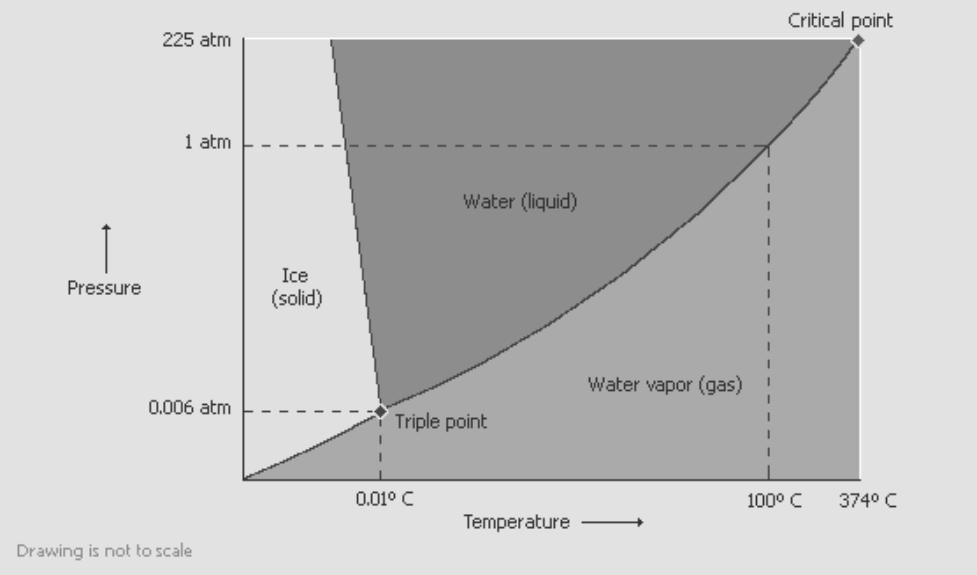
What does MSDS Stand for?

What does the fire safety diamond tell you?

Label the fire safety diamond.

What is the safest way to smell a chemical?

How do you use a fire extinguisher?



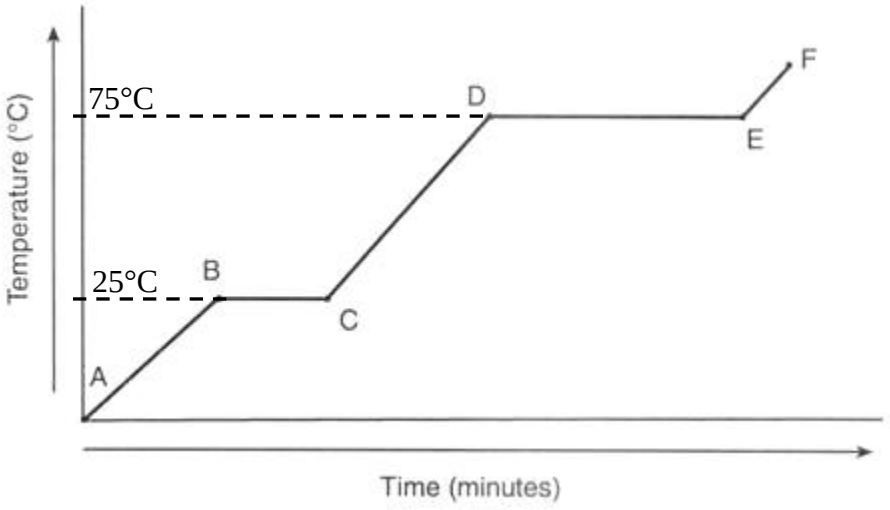
Tell me what state you would be in if you were at:

a. 0.5atm and 0.001°C

b. 5.0atm and 4°C

c. 1.0atm and 110°C

Look at the heating curve below.



Match the points with these letters:

____ 1. Heating solid

____ 2. Boiling

____ 3. Melting

____ 4. Heating gas

____ 5. Heating liquid

a. AB
b. BC
c. CD
d. DE
e. EF

Answer the following questions using the heating curve:

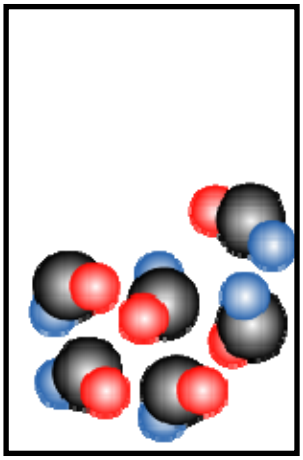
a. What is the melting point of the compound?

b. What is the freezing point of the compound?

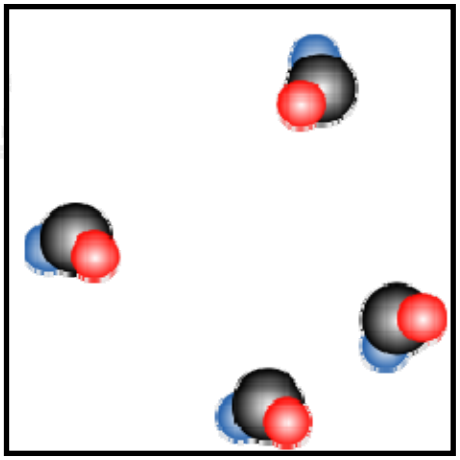
c. What is the boiling point of the compound?

d. What is the condensation point of the compound?

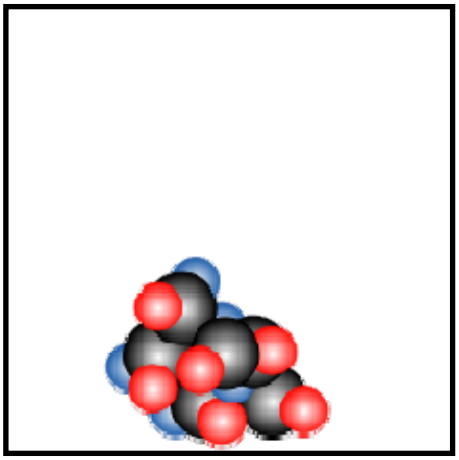
Label the following diagrams with the correct phase of matter.



1. _____



2. _____



3. _____

Day 14

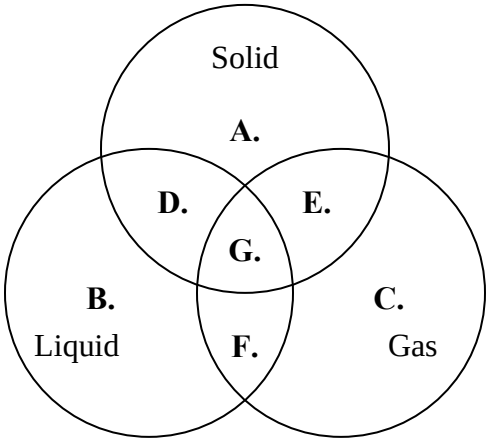
- Go over Questions from the Review
- Project work

Day 15

- Safety and States of Matter Test

Name: _____ Date: _____

Safety and States of Matter Test



____ 1. fluid

____ 2. diffuse

____ 3. particles glide over one another

____ 4. have moderate kinetic energy

____ 5. have viscosity

6. Fusion is a _____ changing state to a _____.

7. What is matter? (Write a complete sentence.)

____ 8. Which of these is a homogeneous mixture?
   a. Tree
   b. NaOH
   c. Cl_2
   d. Milk

____ 9. Which of these is a compound?
   a. Tree
   b. NaOH
   c. Cl_2
   d. Milk

____ 10. Which of the following is not an indicator of chemical change?
   a. Color change
   b. Gain or loss of heat
   c. Gain or loss of energy
   d. Perspiration
   e. Evolution of gas

____ 11. What is a chemical change?
   a. Change resulting in a change in the appearance of a substance
   b. Change that requires energy
   c. Change that results in a change in the chemical make-up of a substance
   d. Change the does not result in a change in the appearance of a substance

____ 12. Which is an example of a physical change?

a. Dissolving a solid in a liquid to make a solution, and the solution becomes cold
b. Dissolving a green solid in a liquid to make a cloudy blue solution
c. Heating solid iodine results in a purple gas
d. All of these
e. a & b
f. None of these

13. Steam condensing to water is a physical or chemical change?

____ 14. What is exergonic?

a. Gain of heat
b. Gain of energy
c. Loss of heat
d. Loss of energy

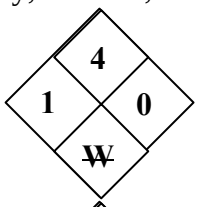
15. Water boiling is exergonic or endergonic?

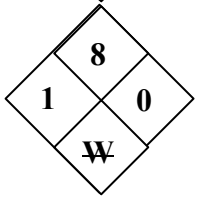
____ 16. Which of the following are exergonic?

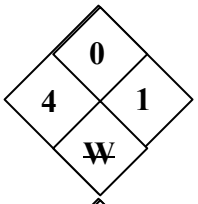
a. A reaction absorbs heat
b. A reaction gives off heat
c. A reaction gives off energy
d. A reaction gives off light
e. All of the above
f. a, b & c
g. b, c & d
h. None of these

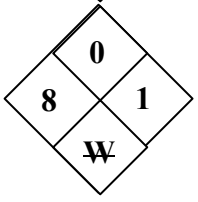
17. What does MSDS Stand for?

____ 18. Which would be the correct fire safety diamond for a chemical with high health, low reactivity, low fire, and water hazards?

a. 

b. 

c. 

d. 

____ 19. What is the safest way to smell a chemical?

a. Wifting your hand over the top of the container near your nose
b. Put your nose right over it to smell it directly
c. Wafting your hand over the top of the container near your nose
d. Putting a bit of the chemical in a weighing boat and taking a quick sniff

Match the tools:

____ 20. Thermometer

____ 21. Funnel

____ 22. Weighing boat

____ 23. Filter paper

____ 24. Bunsen burner

____ 25. Wash bottle

____ 26. Erlenmeyer flask

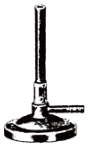
a. 

b. 

c. 

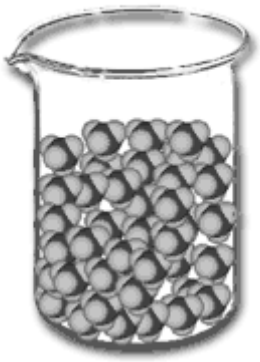
d. 

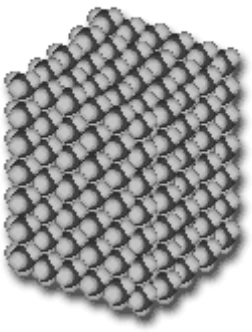
e. 

f. 

g. 

Label the following diagrams with the correct phase of matter.





27. _____ 28. _____ 29. _____

Essay:

30. Explain how aluminum could undergo a physical change. A chemical change.

31. Construct a heating curve for a substance that is heated to 150°C. The substance is originally a solid at 35°C, melts at 75°C, and boils at 126°C.

32. A recycling plant has asked you to explain how it separates its recyclable materials. The recycling plant recycles iron, aluminum, plastic, and glass. The recycling plant first uses a large magnet, and then puts the remaining mixture into a sugar water bath. Next, the recycling plant skims off the floating mixture and puts that in pure water. After these three steps all of the materials are separated. Explain which materials are removed in each step and how you know this. Use the following table to help you explain.

Material	**Magnetic**	**Dissolve in water?**	**Density (g/cm^3)**
Iron	Yes	No	7.85
Aluminum	No	No	2.7
Plastic	No	No	1.0
Glass	No	No	2.4
Tap Water	No	N/A	1.2
Sugar Water Mixture	No	N/A	2.6

Day 16

- Projects and Self-Assessment Due