

**Information Page:**

**Unit Plan – Grade 8: Matter and Energy**

**Imaginary High School of Amazing**

**123 Education Blvd., Wilmington, PA 54321**

**Grading Policy Standards:**

|  |  |
| --- | --- |
| **A+** | **96.5% and above** |
| **A-** | **92.5 - 96.4%** |
| **A-** | **89.5 - 92.4%** |
| **B+** | **86.5 - 89.4%** |
| **B+** | **82.5 - 86.4%** |
| **B-** | **79.5 - 82.4%** |
| **C+** | **76.5 - 79.4%** |
| **C+** | **72.5 - 76.4%** |
| **C-clo** | **69.5 - 72.4%** |
| **F-** | **69.4% and below** |

I. PDA Standards

A. CHEM.3.2.C.A3: Describe the three normal states of matter in terms of energy, particle motion, and phase transitions.

B. CHEM.A.1.1.1: Classify physical or chemical changes within a system in terms of matter and/or energy.

C. CHEM.A.1.2.2: Differentiate between homogeneous and heterogeneous mixtures (e.g., how such mixtures can be separated).

D. CHEM.A.1.1.2: Classify observations as qualitative and/or quantitative.

E. CHEM.A.1.1.3: Utilize significant figures to communicate the uncertainty in a quantitative observation.

F. CHEM.A.1.1.4: Relate the physical properties of matter to its atomic or molecular structure.

II. Objectives - SW:

A. Define matter and explain how it applies to the study of chemistry.

1. Understand the differences between physical and chemical changes.

2. Define chemistry and name some of its applications.

3. Explain how changes in energy correlate with changes in physical states of matter.

4. Understand mixtures

5. Understand elements and compounds

6. Understand physical and chemical changes

7. Comprehend and apply the law of the conservation of mass.

8. Utilize stoichiometry and significant figures.

B. Specific Objectives

**1.0 – States of Matter**

1.1. Identify the characteristics and differences between the three main phases: solid, liquid, and gas.

1.2. Discuss what a chemist does and what different jobs involve chemistry.

a. Chemistry is the study of composition, structure, and properties of matter.

b. Matter is anything that occupies space.

c. Chemistry also involves the energy matter contains. Together, matter space, and energy make up the physical universe.

1.3. Give characteristics of each state of matter.

a. A solid has definite shape and volume. It is hard compress and is comparatively low-energy. Solids are the densest of the three states of matter.

b. A liquid has indefinite shape and definite volume. It is hard to compress and contains a medium amount of energy.

c. A gas has indefinite shape and indefinite volume. It is easy to compress and the highest of the three basic energy states. Gases are often invisible to the naked eye.

1.4. Define and apply the differences between qualitative and quantitative information.

a. Qualitative information is information based on intuition. It usually refers to the quality or characteristic of a substance. Ex: color, texture, smell, appearance

b. Quantitative information is measurable data. Ex: mass, volume, temperature, time

1.5. Recognize different kinds of physical (phase) changes in real-life situations.

a. Ex: baking weather, fashion/beauty, sports

1. Mixing together substances

2. Dyeing icing

3. Slicing a cake

b. Weather

1. Freezing rain

2. Condensation of dew

3. Freezing and melting of condensation and how it affects driving

c. Fashion/beauty

1. Solidifying of nail polish

2. Importance of humidity

3. How the states of matter affect the selection of hair products

d. Sports

1. Ice skating and the transition between solid and liquid

2. Why the states of matter affect ground type

3. How the states of matter affect grip/slipperiness and how each state of matter is overcome

1.6. List characteristics of physical changes, and use those characteristics to distinguish between the two types of change.

a. In a physical change, no substances are destroyed and no new substances are created; only the physical properties change.

b. Physical properties are a quality or condition of a substance that can be observed or measured.

Some examples of physical properties are the state of the substance (solid, liquid, or gas), texture, melting point, boiling point, color, volume, luster (shininess). Generally, they are characteristics perceivable by the senses.

1.6. List properties/characteristics of objects in the room.

a. Explain how you know what state of matter the object is qualitatively.

b. Propose how you might go about obtaining information quantitatively.

1.7. Identify given examples as a physical change.

1.8. List and identify a few verbs associated with a physical change. Ex: melt, freeze, dye, mix, pulverize, etc.

1.9. List the three states of matter according to energy level.

1.10. Analyze and read data provided by a phase diagram chart.

a. Label the axes and states of matter appropriately

b. Define and label on a phase diagram the following terms:

i. A triple point is the point on a phase diagram that represents the only Set of conditions at which all three phases exist in equilibrium with one another. (Prentice R1117)

ii. A critical point it the point farthest to the right in a phase diagram. It is the maximum temperature at which a liquid can exist.

iii. Vaporization is the change from a liquid to a gas.

iv. Condensation is the change from a gas to a liquid.

v. Sublimation is the change from a solid to a gas.

vi. Deposition is the change from a gas to a solid.

vii. Melting is the change from a solid to a liquid.

viii. Freezing is the change from a liquid to a solid.

1.11. Apply the concepts of heat and pressure to the three states of matter.

1.12. Recognize that water breaks the traditional trend for density.

**2.0 – Identifying Changes**

2.1. Define and give examples of a mixture (both homogeneous mixtures and heterogeneous mixtures)

a. Heterogeneous mixtures are a mixture in which the composition is not uniform throughout. (Prentice 45) In other words, the different parts can be separated, even though the separation might not be practical. (imagine a mini-person to separate the mixture)

b. Homogeneous mixtures are mixtures in which the composition is uniform throughout.

i. The mixture is definitely *not* heterogeneous if it exists in multiple phases.

ii. Heterogeneous mixtures cannot be separated by picking them apart. Separation is possible but takes more effort.

c. Examples of heterogeneous: salad, pizza, ice water, sand in a fish tank, uncooked dough

d. Examples of homogeneous: blood, tea, saltwater, glue, milk

2.2. Relate and provide examples that physical changes can be applied to separate a mixture.

a. Define filtration and distillation.

i. Filtration is separating solids from liquids

ii. Distillation is separating impurities from water

b. Identify and explain why filtration is used for heterogeneous mixtures and distillation is used for homogeneous mixtures.

2.3 Define and explain the differences between elements and compounds.

a. An element is the simplest form of matter. Elements have unique properties and can be found on the periodic table of the elements. If in doubt, check the chart.

b. A compound is a substance that contains two or more elements chemically combined in a fixed proportion. In other words, the substance has a chemical formula. This formula can’t be changed without changing the substance itself. Even though compounds are made up of elements, a compound is very different from the elements that make it up.

2.4 Define and relate how chemical changes apply to elements and compounds.

a. A chemical change produces a new compound with a new proportion of atoms. A completely new substance is formed and the process can’t easily be reversed.

b. Identify and list some verbs that signal a chemical change.

Ex. Burn, electrocute, heat, decompose

c. Identify some characteristics that signal a chemical change.

i. Smoke or some other gas is given off.

ii. The substance changes color.

iii. The substance’s smell changes.

**3.0 – Using Lab Equipment**

3.1 Utilize lab equipment safely and according to procedure.

3.2 Apply knowledge to weigh samples accurately.

3.3 Practice time management and cleaning up after their own procedures.

**4.0 – Putting it All Together**

4.1 Analyze real-life chemical situations and form conclusions as to whether it is a physical or chemical change. Defend a position as why a change is physical or chemical.

4.2 Analyze real-life chemical situations and form conclusions as to whether a substance is a mixture or a substance.

4.3 Analyze real-life chemical situations and logically defend their conclusions as to why the substance is an element or a compound, or a homogeneous or a heterogeneous mixture.

4.4 Recognize what makes up an element and locate that element on the periodic table, and vice versa.

**5.0 – Chemical Reactions**

5.1 Name the elements based off of their symbols on the periodic table.

5.2 Find an element on the periodic table given the name of an element, including the following non-English based abbreviations:

Na - Sodium (*natrium*) – found in nature

K - Potassium (*kallium*) – p.k.; pretty kool – burns in water (see video)

Sb – Antimony (*stibium*) – stingy banks are afterthemoney

Cu – copper (*cuprum*) – cupric, recuperate

Au – gold (*aurum*) - aura, aural

Ag – silver (*argentum*) – like gold, but say “ag” when you realize it’s not

Fe – iron (*ferrum*) – ferric, ferreous, ferry made of iron

Pb – lead (*plumbum*) – plumbers work with lead pipes

Sn – tin (*stannum*) – a tin man named Stan

5.3 Differentiate between reactants and products in a chemical reaction.

a. A reactant is a compound or element present at the start of a chemical reaction. This substance gets used up (not always completely) to make the product.

b. A product is a compound or element produced by a chemical reaction. It is a new substance that is formed by the reactants.

c. A chemical reaction changes a Set of substance(s) into a new substance(s). A chemical reaction involves a chemical change.

5.4 Define and give examples of chemical properties

a. A chemical property is the ability of a substance to undergo a specific chemical change.

Ex: pH, reactivity; properties that don’t change in a substance no matter what you do to that compound or element.

b. A chemical change produces natter with a different composition than the original matter.

(Prentice R108)

5.5 List and identify verbs associated with chemical change and chemical reactions.

a. Identify these verbs as irreversible procedures.

b. Recall that some of these verbs were used in the description of a chemical change.

Ex: burn, rot, corrode, ferment, rust, explode, electrocute, precipitate

c. Identify that precipitation is different from a mixture Settling.

i. Define precipitation and differentiate it logically from a substance being evaporated out, as with salt and powdered drinks.

\*Powder falling out of lemonade is not a chemical reaction because no new product is formed. Dissolving is a physical change. Precipitates are completely new solids that weren’t there when the reaction started.

ii. Precipitation is defined as when as solid forms and falls out of a liquid mixture. This solid is called a *precipitate*.

5.6 Identify a description of a chemical change and back up their reasoning as to why it isn’t only a physical change.

5.7 Apply the law of the conservation of mass to chemical changes.

a. Recall that gases have mass as well as liquids and solids.

b. Use this knowledge to begin balancing out chemical equations.

c. Apply the idea that matter is not created or destroyed, but only changes form.

d. Reason that mass is not lost in gaseous form

e. Recall that any violation of this law means change on a submolecular level, as with a hydrogen bomb.

5.8 Recognize, memorize, and utilize Avogadro’s number in basic conversions.

a. Locate the atomic mass of given atoms on the periodic table.

b. Apply the atomic mass in conjunction with Avogadro’s number to perform simple calculations.

c. Define a limiting reagent as any reactant that is used up first in a chemical reaction; it determines the amount of product that can be formed in the reaction. (Prentice R113)

d. Identify and account for limiting reagent(s) in basic conversions.

5.9 Implement stoichiometry for basic chemical reactions.

a. Convert moles to atoms and atoms to moles using the stoichiometrical method.

b. Analyze word problems and use stoichiometry, knowledge of moles, and knowledge of molecules to answer the questions appropriately.

c. Recognize and understand the basic concept of significant figures.

III. Procedure of Presentation

A. Daily Lessons & Activities

Day 1 - Sections 1.0 – 1.4 CHEM.3.2.C.A3, CHEM.A.1.1.2

a. Note taking and presentation of crucial definitions

b. Class discussion of the states of matter

c. Class discussion of qualitative/quantitative

i. Individual work to list some qualitative and quantitative characteristics

ii. Division into groups to list some qualitative observations and quantitative observations

iii. Class brainstorming session to list qualitative and quantitative characteristics

d. Teacher discussion as to how these definitions tie into the states of matter

e. Present video as to how the states of matter correspond to energy and motion.

Day 2 - Sections 1.5 – 1.12CHEM.3.2.C.A3, CHEM.A.1.1.1

a. Define a physical change and correlate it with the phase changes discussed yesterday.

b. Identify physical changes in different aspects of their lives in a verbal discussion.

c. Have students list some verbs associated with physical changes. Encourage students to take notes on the emphasized verbs, as they will have to recognize physical changes for the test.

d. Define physical properties and explain how it correlates with a physical change.

e. Question and drill students as to how physical changes correlate with qualitative and quantitative observations.

f. Introduce the phase diagram and give students their own blank copy.

i. Have students fill in terms they already know

ii. Give vocabulary for the remaining terms necessary to understand a phase diagram.

iii. Drill students on identifying the phase of a given substance given its pressure and temperature

g. Homework: have students turn in handwritten vocabulary terms associated with the phase diagram. Homework also includes a short answer section requiring the students to explain basic concepts of phase changes.

Day 3 – Sections 2.0 – 2.2 CHEM.A.1.1.1, CHEM.A.1.2.2

a. Begin with the importance of mixtures – very few substances in daily life are made up of pure substances.

b. Define (on the board) homogeneous and heterogeneous mixtures. Have students copy down the definitions and examples.

c. Correlate mixtures with physical change and reversible processes, as well as the verbs discussed beforehand concerning physical change.

d. Drill students on some practical examples of homogeneous and heterogeneous mixtures.

e. Give students the definition of filtration and distillation and explain how they correlate to the different kinds of mixtures.

f. Show animation of the distillation process.

Day 4 – Sections 2.2 – 2.4 CHEM.A.1.1.1, CHEM.A.1.2.2

a. Begin with a review from yesterday and have the students list some examples of homogeneous and heterogeneous mixtures, and remind them that creating and separating mixtures is a physical change.

b. Draw a flow chart on the board representing matter and mixtures. Introduce the vocabulary for chemical changes and compounds.

c. Give students their own blank flow chart for personal reference.

d. List verbs and cues for the students that signal a chemical change has taken place.

e. If permissible, burn sugar to demonstrate the traits of a chemical change.

i. Question students as to how this differs from a physical change

ii. Ask them if it is reversible process and why.

iii. Introduce chemical formulas for table sugar and begin explaining what the symbols represent.

Day 5 – Section 3 CHEM.3.2.C.A3, CHEM.A.1.1.1, CHEM.A.1.2.2, CHEM.A.1.1.2

a. Have students enact a separation of mixtures lab.

b. Have students fill out a vocabulary and comprehension worksheet as they complete the lab.

c. Have students turn in their worksheets for a lab grade.

d. Teach students basic lab skills and niceties that will be necessary for this lab and future labs.

Day 6 – Section 4 CHEM.3.2.C.A3, CHEM.A.1.1.1, CHEM.A.1.2.2, CHEM.A.1.1.2

a. Review day – divide the day into several different review sessions

i. Worksheet review: filling out charts, classifying, definitions, etc.

ii. Class discussion/drill on the different kinds of mixtures and changes

iii. Competitive board drill to conclude the day, perhaps awarding an extra exam point to the winning team

Day 7 – Sections 5.0 – 5.3 CHEM.A.1.1.4

a. Introduce the symbols on the periodic table.

b. Provide students with helpful memorization hints on the board for the more difficult elements.

c. Have students identify and define atomic mass

d. Begin defining reactants and products with a chemical reaction example

e. State that we are transitioning into the heart of chemistry and beginning with chemical reactions.

i. Have students recall some verbs or signals that imply a chemical reaction.

ii. Introduce the idea of a balanced chemical formula in light of the conservation of mass law.

f. Explain that gases have mass and weight too. Introduce the concept of moles.

Refer to textbook image to help explain this concept

g. Worksheet/homework – have students practice the concept of the conservation of mass mathematically.

Day 8 – Sections 1 – 5.3 CHEM.3.2.C.A3, CHEM.A.1.1.1, CHEM.A.1.1.2, CHEM.A.1.1.4

a. Take the time to review the entire chapter. The test will mostly include the identification and classification of matter. Review qualitative and quantitative reasoning, and physical vs. chemical changes.

Day 9 – Sections 1-5.3, CHEM.3.2.C.A3, CHEM.A.1.1.1, CHEM.A.1.2.2, CHEM.A.1.1.2

a. Exam day – exam is in the form of chart labeling, short answer vocabulary, and categorizing substances according to kinds of mixtures and changes given a physical description of a process. i.e., dissolving lemonade powder

Day 10 – Sections 5.0 – 5.5 CHEM.A.1.1.1, CHEM.A.1.1.3

a. Here’s where it all comes together. Introduce stoichiometry as an abstract concept.

b. Work through a few examples as a class, then let students try a few simple conversions on their own. Let the students show their work on the board and go over it together as a class.

c. Introduce Avogadro’s number and show how to implement it to chemistry using stoichiometry on the front board.

d. Give the students more practice with conversions between atomic mass, Avogadro’s number, and moles. Assign problems from the textbook – both word problems and raw numerical conversion.

Day 11 – Sections 5.6 – 5.9 CHEM.A.1.1.3

a. Verbally explain why significant figures are necessary in mathematics, statistics, and subjects like chemistry. Place a few hypothetical examples on the board so students can reason as to why sig figs are so crucial.

b. Outline the steps for sig figs for addition and subtraction.

c. Place some examples on the board (use this time to make sure they remember scientific notation)

d. Let them get started on assignments from the book and work on them together if they wish.

e. The homework will be required for the next day’s beginning activity.

Day 12 – Sections 5.6 – 5.9 CHEM.A.1.1.3

a. Go over the answers to the homework as a class.

b. Write down the rules for significant figures concerning multiplication and division.

c. Go over examples as a class.

d. Assign private working time

e. Assign another worksheet as homework for multiplication and division with sig figs.

Day 13 – Sections 5.7 – 5.9 CHEM.A.1.1.3

a. Go over the answers to the homework as a class.

b. Invite the students to ask for additional help and practice if they feel unsure.

c. Spend the rest of the period going over additional weak areas, like scientific notation and word problems.

Day 14 – Section 5.0 – 5.9 CHEM.A.1.1.3

a. Switch back to the periodic table and using an element’s atomic mass to determine the number of moles.

b. Do more practice problems with stoichiometry that require moles as an intermediate.

Ex: grams 🡪 moles 🡪 grams

c. Define percent yield as actual product/expected product on the board

d. Demonstrate an example or two on the board.

e. Let the students gain practice with this abstract thinking method with more practice problems.

Day 15 – Sections 1-5 CHEM.A.1.1.1, CHEM.A.1.2.2, CHEM.A.1.1., CHEM.A.1.1.3, CHEM.A.1.1.4, CHEM.3.2.C.A3

a. Scientific Notation and Sig Fig Quiz

B. List of Materials

1. Wilbraham, Anthony C., Staley, Dennis D., Matta, Michael S. and Waterman, Edward L.. *Prentice Hall Chemistry*. Pearson Prentice Hall: Boston, 2008. Print.

2. Computer enabled for Java applications and thumb drive file transfers.

3. Any working computer with a projector or Smartboard hookup.

4. Blackboard/whiteboard and writing implements.

C. Provisions for Individual Differences

1. Extra study sessions are available for students who are falling behind, want to keep up, or just want to get ahead. Homework is graded for completion instead of accuracy and individual time may be taken to go over then answers.

2. Vocabulary is available in the textbook in Spanish as well as English. Class demonstrations are meant to inspire contributions and participation from the entire class.

3. The pre-test review project allows for creativity on the part of the students. Additionally, labs are meant to involve and engage all kinds of learners in the unit and help to convey the message as clearly and concretely as possible.

4. Students wanting more help may participate in the peer tutoring program aside from the review sessions and coming in during my available office hours.

D. Blocking out of Unit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Day 1 - States of Matter  Teacher Talk  Class Brainstorming  No HW | Day 2 - Phase Diagram  Teacher Talk  Student Drilling  HW - handwritten vocab and short answers about phase changes | Day 3 - Homogeneous/Heterogeneous Mixtures  Teacher Talk  Student Drilling  Animation of distillation process  No HW | Day 4 - Mixtures  Student brainstorming  Flow chart  Burning sugar demonstration  Student questioning/drilling  No HW | Day 5 - Mixture Separation Lab  Lab Materials:  Lab stations, metric scale, plastic bags, magnets, iron/sand/salt (or sugar) mixture, hot plate, petri dishes/watch glasses, beakers, tongs, ceramic plates, funnel, funnel paper  Worksheet  HW - complete lab worksheet questions |
| Day 6 - Mixtures Review/Lab Wrap-up  Competitive review game  Q/A time  HW - finish filling out lab for tomorrow | Day 7 - Elements & Atomic Mass  Teacher talk  Board math examples  Individual work time  Worksheet  HW - if incomplete, finish class work | Day 8 - Matter Classification  Review day  Teacher Talk  Workbook questions  HW - Study for tomorrow's test | Day 9 - Exam Day  Written exam - definitions, fill-in-he-blank, categorization, filling in charts  No HW | Day 10 - Stoichiometry  Teacher talk  Examples on board |
| Day 11 - Sig Figs (addition/subtraction)  Teacher talk  Distribute sig fig identification sheet  Class problems on board  HW - sig fig worksheet | Day 12 - Sig Figs (multiplication/division)  Go over homework as a class  Teacher talk  Class problems on board  HW - sig fig worksheet | Day 13 - Sig Fig Wrap Up  Go over homework as a class  Teacher talk  No HW | Day 14 - Moles  Teacher talk  Class problems  Individual/small group time for worksheet  HW - study for quiz | Day 15 - Quiz  Scientific Notation and Sig Figs math quiz |

<http://www.youtube.com/watch?v=xxNfJLMNS4E> - Distillation Animation

IV. Assessment and Summary

A. Unit test: located at the end of handouts

B. Other evaluation strategies: homework and labs, graded for accuracy, completion, and timeliness.

C. Overall grading scheme:

1. Tests and quizzes – 70 points

2. Labs – 20 points

3. Homework – 10 points

4. Participation and attendance – 5 points

🡪 105 points total

D. All students will obtain a final percentage score no lower than 70% out of the total 105 possible points.

Matter

Made up of

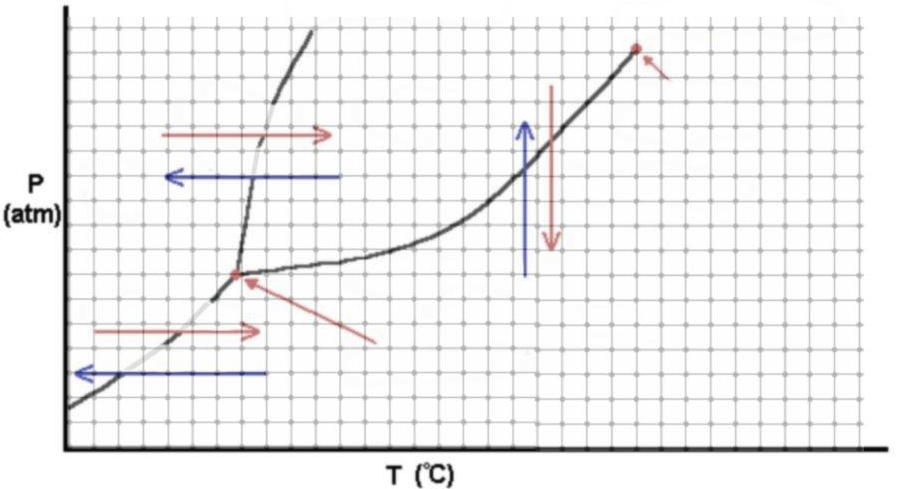
Can be

Or can be

(Mixtures are made up of pure substances at the smallest level)

Mixture

Pure Substance



SEPARATION OF MIXTURES LAB

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period \_\_\_\_\_\_

MATERIALS:

Mixture (10g sand, 0.5g salt, 1.0g iron filings), funnel, filter paper, petri dish, beaker, balance, plastic bags,

PROCEDURE:

1. Use the balance to measure out the mass of each of the different materials. Put the materials together into a plastic bag.

2. Write down the physical characteristics of sand, salt and iron which may be different (see notes for physical characteristics) and list the step of the procedure where a separation is taking place, based on that physical characteristic.

|  |  |  |
| --- | --- | --- |
| Material / Compound | Physical Property | Step of Separation |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

3. Put the magnet inside a plastic bag. Move the magnet and the plastic bag around the mixture. Lift the magnet and the bag out of the mixture and put it over another container. Take the magnet out of the plastic bag--the iron filings should fall into the container. Repeat the process with the filings again to remove any sand or salt which may have stuck to the iron filings. Find the mass of the iron filings.

4. Fill a petri dish with water. Add the water to the bag with the sand/salt mixture. Move the mixture around to stir the water and the mixture.

5. Put a filter paper into the funnel. Put the funnel in the beaker. Cut a hole in the bottom of the plastic bag and dump the material into the filter. Be careful not to let the water mixture go over the sides of the filter paper. You may have to wait quite a while for the mixture to filter out.

6. Label a petri dish and pour the salt water into the petri dish. Put the petri dish with the dissolved salt on a shelf to evaporate. Find the mass of the salt after the water has evaporated.

7. Spread the sand out on the filter paper to dry. Find the mass of the sand after the sand has dried. Create a data table showing the mass of each material before the experiment, the mass after the experiment and the amount lost or gained.

|  |  |  |  |
| --- | --- | --- | --- |
| Material | Starting Mass | Final Mass | Error |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

8. Given the following vocabulary terms, identify which substances in this experiment fit the vocabulary.

* **Element:**
* **Compound:**
* **Mixture:**
* **Solution:**
* **Homogeneous Mixture:**
* **Heterogeneous Mixture:**
* **Element Symbol:**
* **Compound (Chemical) Formula:**
* 9. Write an error paragraph describing where you may have lost or gained mass for each material. Tell how each error contributed to the loss or gain of material. Describe how you could make the error smaller if you did the experiment again.

**Review Worksheet – Physical and Chemical Changes**

1. Label each process as a physical (p) or chemical change (c):

a. perfume evaporating on your skin k. fogging a mirror with your breath

b. butter melting l. breaking a bone

c. wood rotting m. mending a broken bone

d. charcoal heating a grill n. slicing potatoes for fries

e. autumn leaves changing color o. a nail rusting

f. a hot glass cracking when placed in cold water p. mixing water and food coloring

g. melting copper metal q. writing on paper

h. burning sugar r. dyeing fabric

i. mixing sugar in water

j. digesting food

Which of the following would NOT be a physical change?

a. freezing water to make ice cubes

b. melting gold to make jewelry

c. burning gasoline in a lawnmower

d. boiling water for soup

e. tearing a piece of aluminum foil

3. Which of the following is NOT a physical change?

a. grating cheese

b. melting cheese

c. fermenting of cheese

d. mixing two cheeses in a bowl

4. Which are physical and which are chemical changes? Label each as p or c.

a. boil

b. burn (combustion)

c. condense

d. corrode

e. crumple

f. ferment

g. melt

h. rust

i. crush

j. freeze

k. oxidize

l. tarnish

m. explode

n. grind

o. rot

p. vaporize

q. photosynthesis

r. sublimation

5. If a certain mixture is homogeneous, you would properly conclude that the physical properties and the composition:

a. are different from one part of the sample to another

b. vary smoothly from top to bottom of the sample

c. are the same in every small volume element from the sample

d. none of these

6. Label each process as a physical or chemical change:

a. Moth balls gradually vaporize in a closet

b. Hydrofluoric acid attacks glass (used to etch glassware)

c. A chef making a sauce with brandy is able to burn off the alcohol from the brandy, leaving just the brandy flavoring

d. Chlorine gas liquefies at -35 °C under normal pressure

**Worksheet Answers - Physical and Chemical Changes**

1. Label each process as a physical or chemical change:

a. perfume evaporating on your skin - **physical**

b. butter melting - **physical**

c. wood rotting - **chemical**

d. charcoal heating a grill - **see below**

e. autumn leaves changing color - **chemical**

f. a hot glass cracking when placed in cold water - **physical**

g. melting copper metal - **physical**

h. burning sugar - **chemical**

i. mixing sugar in water - **physical**

j. digesting food – **chemical**

k. fogging a mirror with your breath - **physical**

l. breaking a bone - **physical**

m. mending a broken bone - **chemical**

n. slicing potatoes for fries - **physical**

o. a nail rusting - **chemical**

p. mixing water and food coloring - **physical**

q. writing on paper - **physical**

r. dyeing fabric - **see comment below**

Part (d) of this question can be understood two ways: is it asking about the charcoal producing the heat or about the metal grill getting hot? The metal grill getting hot is a physical change, the charcoal reacting with oxygen (which produces the heat) is a chemical change.

Part (r) of this question can be understood two ways: the dye can simply be absorbed by the fabric (this is a physical change) or it can react chemically with the fabric (this is a chemical change). Depending on the fabric and the dye involved, one or both processes may occur.

2. Which of the following would **NOT** be a physical change?

a. freezing water to make ice cubes

b. melting gold to make jewelry

c. burning gasoline in a lawnmower - **this one is NOT a physical change**

d. boiling water for soup

e. tearing a piece of aluminum foil

In part (c) there actually is a physical change, in that the gasoline must first evaporate before it burns. However, the question is asking about the burning, which is a chemical change. Burning does not include the physical change of evaporation.

3. Which of the following is NOT a physical change?

a. grating cheese

b. melting cheese

c. fermenting of cheese - **this one is NOT a physical change**

d. mixing two cheeses in a bowl

4. Which are physical and which are chemical changes?

a. boil - **physical**

b. burn (combustion) - **chemical**

c. condense - **physical**

d. corrode - **chemical**

e. crumple - **physical**

f. ferment - **chemical**

g. melt - **physical**

h. rust - **chemical**

i. crush - **physical**

j. freeze - **physical**

k. oxidize - **chemical**

l. tarnish - **chemical**

m. explode - **see comment below**

n. grind - **physical**

o. rot - **chemical**

p. vaporize - **physical**

q. photosynthesis - **chemical**

r. sublimation - **physical**

Part (m) of this question can be understood two ways: does 'explosion' means the actual opening up of the container (a bomb, for example) or does it refer to the chemical inside the bomb reacting? The explosion which throws pieces of the bomb about is a physical change, the chemical reacting inside the bomb (which produces the heat & pressure causing the bomb to shatter into pieces) is a chemical change.

5. If a certain mixture is homogeneous, you would properly conclude that the physical properties and the composition:

a. are different from one part of the sample to another

b. vary smoothly from top to bottom of the sample

c. are the same in every small volume element from the sample - **the correct answer**

d. none of these

6. Label each process as a physical or chemical change:

a. Moth balls gradually vaporize in a cloSet - **physical**

b. hydrofluoric acid attacks glass (used to etch glassware) - **chemical**

c. A chef making a sauce with brandy is able to burn off the alcohol from the brandy, leaving just the brandy flavoring - **chemical**

d. Chlorine gas liquefies at -35 °C under normal pressure - **physical**

e. hydrogen burns in chlorine gas - **chemical**

Part (c) actually has a physical process in it. The alcohol must first evaporate, which is a physical change, before it burns (the chemical change. The question explicitly uses the concept of burning, so answering this one as both a physical and a chemical change (if asked on a test) would probably garner partial credit.

|  |  |  |
| --- | --- | --- |
| ***Material*** | ***Pure Substance 🡪***  ***or Mixture 🡪*** | ***Element, Compound,***  ***Homogeneous, Heterogeneous*** |
| concrete |  |  |
| sugar + pure water  (C12H22O11 + H2O) |  |  |
| iron filings (Fe) |  |  |
| limestone (CaCO3) |  |  |
| orange juice (w/pulp) |  |  |
| Pacific Ocean |  |  |
| the air we breathe |  |  |
| aluminum (Al) |  |  |
| magnesium (Mg) |  |  |
| acetylene (C2H2) |  |  |
| tap water in a glass |  |  |
| soil |  |  |
| pure water (H2O) |  |  |
| chromium (Cr) |  |  |
| Chex mix |  |  |
| salt + pure water  (NaCl + H2O) |  |  |
| benzene (C6H6) |  |  |
| muddy water |  |  |
| brass  (Cu mixed with Zn) |  |  |
| baking soda (NaHCO3) |  |  |

**Worksheet – Classifying Matter**

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period\_\_\_\_\_\_\_\_\_\_

In the center column, state whether the material is a **pure substance** or a **mixture**. If the material is a pure substance, further classify it as either an **element** or **compound** in the right column. If the material is a mixture, further classify it as **homogeneous** or **heterogeneous** in the right column.

**Answer Sheet – Classifying Matter**

|  |  |  |
| --- | --- | --- |
| Material | Pure Substance 🡪 ***or Mixture 🡪*** | ***Element, Compound,***  ***Homogeneous, Heterogeneous*** |
| concrete | Mixture | ***Heterogeneous*** |
| sugar + pure water  (C12H22O11 + H2O) | Mixture | ***Homogeneous*** |
| iron filings (Fe) | Pure Substance | ***Element*** |
| limestone (CaCO3) | Pure Substance | ***Compound*** |
| orange juice (w/pulp) | Mixture | ***Heterogeneous*** |
| Pacific Ocean | Mixture | ***Homogeneous*** |
| air inside a balloon | Mixture | ***Homogeneous*** |
| aluminum (Al) | Pure Substance | ***Element*** |
| magnesium (Mg) | Pure Substance | ***Element*** |
| acetylene (C2H2) | Pure Substance | ***Compound*** |
| tap water in a glass | Mixture | ***Homogeneous*** |
| soil | Mixture | ***Heterogeneous*** |
| pure water (H2O) | Pure Substance | ***Compound*** |
| chromium (Cr) | Pure Substance | ***Element*** |
| Chex mix | Mixture | ***Heterogeneous*** |
| salt + pure water  (NaCl + H2O) | Mixture | ***Homogeneous*** |
| benzene (C6H6) | Pure Substance | ***Compound*** |
| muddy water | Mixture | ***Heterogeneous*** |
| brass  (Cu mixed with Zn) | Mixture | ***Homogeneous*** |
| baking soda (NaHCO3) | Pure Substance | ***Compound*** |

Mass-Mole Conversion Handout

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period

Calculate the molecular mass for each of the following molecules:

1. KOH 2. N2O2 3. Sr3(PO4)2

Convert each of the following from grams to moles:

4. 15.0 g C2H6 5. 140.0 g NaOH

6. 27.2 g H2O 7. 45.7 g CaCO3

Convert moles to grams in each of the following:

8. 1.5 moles NH3 9. 0.65 moles H2SO4

Convert the following to moles:

10. 3.01 x 1023 atoms Na 11. 2.41 x 1024 molecules CO2

\*Avogadro’s number = 6.022 x 10­23

Convert the following to atoms or molecules:

12. 2.56 moles Ca 13. 0.75 moles AlCl3

Find the following:

14. The number of grams in 1.25 x 1025 molecules of aluminum oxide (Al2O3)

15. The number of molecules in 115 g of nitrogen dioxide. (NO2)

**Significant Figures Rules**

There are three rules on determining how many significant figures are in a number:

1. Non-zero digits are always significant.

2. Any zeros between two significant digits are significant.

3. A final zero OR trailing zeros ONLY in the decimal portion are significant.

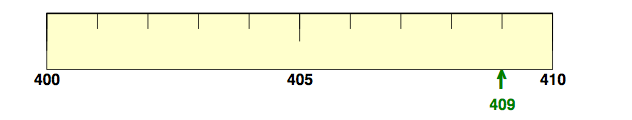
**Rule 1: Non-zero digits are always significant.**

If you measure something and the device you use (ruler, thermometer, triple-beam, balance, etc.) returns a number to you, then you have made a measurement decision and that ACT of measuring gives significance to that particular numeral (or digit) in the overall value you obtain. Hence a number like 46.78 would have four significant figures and 3.94 would have three.

**Rule 2: Any zeros between two significant digits are significant.**

Suppose you had a number like 409. By the first rule, the 4 and the 9 are significant. However, to make a measurement decision on the 4 (in the hundred's place) and the 9 (in the one's place), you HAD to have made a decision on the ten's place. The measurement scale for this number would have hundreds, tens, and ones marked.

Like the following example:

****These are sometimes called "captured zeros."

**Rule 3: A final zero or trailing zeros in the decimal portion ONLY are significant.**

This rule causes the most confusion. In the following example the zeros are significant digits and highlighted in blue.

0.0703**0** 0.008**00**

Here are two more examples where the significant zeros are highlighted in blue. 4.7**0** x 10-3  6.5**00** x 104

**When Zeros are Not Significant Digits:**

**Zero Type 1:** Space holding zeros in numbers less than one. In the following example the zeros are NOT significant digits and highlighted in red.

**0.0**9060 **0.00**400

These zeros serve only as space holders. They are there to put the decimal point in its correct location. They DO NOT involve measurement decisions.

**Zero Type 2:** Trailing zeros in a whole number. In the following example the zeros are NOT significant digits and highlighted in red.

2**00** 25,**000**

**Addition and Subtraction of Significant Digits**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period

|  |  |
| --- | --- |
| SET #1   1. 4.60 + 3 = 2. 0.008 + 0.05 = 3. 22.4420 + 56.981 = 4. 200 - 87.3 = 5. 67.5 - 0.009 = 6. 71.86 - 13.1 = | SET #2   1. 357.89 + 0.002 = 2. 17.95 + 32.42 + 50 = 3. 5.5 + 3.7 + 2.97 = 4. 84.675 - 3 = 5. 75 - 2.55 = 6. 10 - 9.9 = |
| SET #3   1. 2.25 + 6  = 2. .04 + 2.7 = 3. 18.640 + 670.445 = 4. 0.70 - 0.1 = 5. 640 - 627.03 = 6. 12.09 - 6.7 = | SET #4   1. 3.458 + 53.252 + 0.601 = 2. 74.160 - 4.8 - 0.470 = 3. 7000.40 + 6.2 + 6.32 = 4. 6.790 - 2 = 5. 6.790 - 2.5 = 6. 3.001 + 2.151 = |
| SET #5   1. 8.20 + 2 = 2. 13.59 + 23.25 + 20 = 3. 42.828 + 67.4629 = 4. 53.4028 - 14 = 5. 39.3 - 0.804 = 6. 91.68 - 19.1 = |  |

**Multiplication and Division of Significant Digits**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period

|  |  |
| --- | --- |
| Set #1   1. 13.7 x 2.5 = 2. 200 x 3.58 = 3. 0.00003 x 727 = 4. 5003 / 3.781 = 5. 89 / 9.0 = 6. 5000 / 55  = | Set #2   1. 50.0 x 2.00 = 2. 2.3 x 3.45 x 7.42 = 3. 1.0007 x 0.009 = 4. 51 / 7 = 5. 208 / 9.0 = 6. 0.003 / 5  = |
| Set #3   1. 3.14 x 5.6= 2. 300 x 10.6= 3. 0.059 x 6.95= 4. 80/0.675= 5. 0.003/106= 6. 8.5/0.356= | Set #4   1. 12.8 x 5.2 = 2. 100 x 8.57 = 3. 0.00005 x 538 = 4. 6008 / 8.724 = 5. 72 / 7 = 6. 600 / 38 = |
| Set #5   1. 7.6 x 21.9 = 2. 2.15 x 3.1 x 100 = 3. 5.00009 x 0.06 = 4. 38 / 7 = 5. 500 009 / 17.000 = 6. 500 000 / 5.002 = |  |

**Addition and Subtraction of Significant Digits**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Set #1**  8  0.06  79.423  1x102  67.5  58.8 | **Set #2**  357.89  1.0x102  12.2  82  72  0 | **Set #3**  8  2.7  689.085  0.6  13  5.4 | **Set #4**  57.311  68.9  7012.9  5  4.3  5.152 | **Set #5**  10.  6x102  110.291  39  38.5  72.6 |

**Multiplication and Division of Significant Digits**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Set #1**  34  700  0.02  1323  9.9  90 | **Set #2**  100.  59  0.009  7  23  0.0006 | **Set #3**  18  3000  0.41  100  0.00003  24 | **Set #4**  67  900  0.03  688.7  10  20 | **Set #5**  170  700  0.3  5  29412  100000 |

Elements, Compounds & Mixtures Test

Part 1: Read the following information on elements, compounds and mixtures, and fill in the blanks with the appropriate word or vocabulary term.

Elements:

* A pure substance containing only one kind of \_\_\_\_\_\_\_\_\_\_\_\_.
* An element is always uniform all the way through, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* An element \_\_\_\_\_\_\_\_\_\_\_\_\_ be separated into simpler materials (except during nuclear reactions).
* Over 100 existing elements are listed and classified on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Compounds:

* A pure substance containing two or more kinds of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* A compound is always \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Compounds \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ be separated by physical means.
* The properties of a compound are usually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the properties of the elements it contains.

Mixtures:

* Two or more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ NOT chemically combined.
* Mixtures can be uniform (called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) and are known as solutions.
* Mixtures can also be non-uniform (called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
* The properties of a mixture are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the properties of its components.

**Part 2:** Classify each of the following as elements (E), compounds (C) or Mixtures (M). Write the letter X if it is none of these.

\_\_\_Diamond (C) \_\_\_Sugar (C6H12O6) \_\_\_Milk \_\_\_Iron (Fe)

\_\_\_Air \_\_\_Sulfuric Acid (H2SO4) \_\_\_Gasoline \_\_\_Electricity

\_\_\_Krypton (K) \_\_\_Bismuth (Bi) \_\_\_Uranium (U) \_\_\_Popcorn

\_\_\_Water (H2O) \_\_\_Alcohol (CH3OH) \_\_\_Pail of Garbage \_\_\_A dog

\_\_\_Ammonia (NH3) \_\_\_Salt (NaCl) \_\_\_Energy \_\_\_Gold (Au)

\_\_\_Wood \_\_\_Bronze \_\_\_Ink \_\_\_Pizza

\_\_\_Dry Ice (CO2) \_\_\_Baking Soda (NaHCO3) \_\_\_Titanium (Ti) \_\_\_Concrete

**Part 3:** Match each diagram with its correct description. Diagrams will be used once.

**A B C D E**

\_\_\_1. Pure Element

\_\_\_2. Mixture of two elements

\_\_\_3. Pure compound

\_\_\_4. Mixture of two compounds

\_\_\_5. Mixture of a compound and an element.

**Part 4:** Column A lists a substance. In Column B, list whether the substance is an element (E), a compound (C), a Heterogeneous Mixture (HM), or a Solution (S). (Remember a solution is a homogeneous mixture.) In Column C, list TWO quaalitative properties of the substance.

|  |  |  |
| --- | --- | --- |
| Column A | **Column B** | **Column C** |
| 1. Summer Sausage |  |  |
| 2. Steam |  |  |
| 3. Salt Water |  |  |
| 4. Pencil lead (Pb) |  |  |
| 5. Dirt |  |  |
| 6. Pepsi |  |  |
| 7. Silver (Ag) |  |  |
| 8. Toothpaste (Na2HPO4) |  |  |
| 9. A burrito |  |  |
| 10. Italian Dressing |  |  |
| 11. Chicken Soup |  |  |
| 12. Lemonade |  |  |

Elements, Compounds & Mixtures Answer Key

Part 1: Read the following information on elements, compounds and mixtures. Fill in the blanks where necessary.

Elements:

* A pure substance containing only one kind of \_\_atom\_\_\_\_.
* An element is always uniform all the way through, or \_\_homogeneous\_\_.
* An element \_\_cannot\_\_\_ be separated into simpler materials (except during nuclear reactions).
* Over 100 existing elements are listed and classified on the \_Periodic Table\_.

Compounds:

* A pure substance containing two or more kinds of \_\_atoms\_\_.
* The atoms are \_\_\_chemically\_\_\_ combined in some way. Often times (but not always) they come together to form groups of atoms called molecules.
* A compound is always \_\_homogeneous\_\_.
* Compounds \_\_\_cannot\_\_\_ be separated by physical means. Separating a compound requires a chemical reaction.
* The properties of a compound are usually \_\_different than\_\_ the properties of the elements it contains.

Mixtures:

* Two or more \_\_elements\_\_\_ or \_\_\_\_compounds\_\_ NOT chemically combined.
* No reaction between substances.
* Mixtures can be uniform (called \_\_homogeneous\_\_\_) and are known as solutions.
* Mixtures can also be non-uniform (called \_\_\_\_heterogeneous\_\_\_\_).
* Mixtures can be separated into their components by \_\_chemical\_\_ or \_\_\_physical\_\_ means.
* The properties of a mixture are \_\_similar to\_\_\_ the properties of its components.

**Part 2:** Classify each of the following as elements (E), compounds (C) or Mixtures (M). Write the letter X if it is none of these.

\_**E**\_Diamond (C) \_**C**\_Sugar (C6H12O6) \_**M**\_Milk \_**E**\_Iron (Fe)

\_**M**\_Air \_**C**\_Sulfuric Acid (H2SO4) \_**M**\_Gasoline \_**X**\_Electricity

\_**E**\_Krypton (K) \_**E**\_Bismuth (Bi) \_**E**\_Uranium (U) \_**M**\_Popcorn

\_**C**\_Water (H2O) \_**C**\_Alcohol (CH3OH) \_**M**\_Pail of Garbage \_**M**\_A dog

\_**C**\_Ammonia (NH3) \_**C**\_Salt (NaCl) \_**X**\_Energy \_**E**\_Gold (Au)

\_**M**\_Wood \_**M**\_Bronze \_**M**\_Ink \_**M**\_Pizza

\_**C**\_Dry Ice (CO2) \_**C**\_Baking Soda (NaHCO3) \_**E**\_Titanium (Ti) \_**M**\_Concrete

**Part 3:** Match each diagram with its correct description. Diagrams will be used once.

**A B C D E**

\_**C**\_1. Pure Element – only one type of atom present.

\_**E**\_2. Mixture of two elements – two types of uncombined atoms present.

\_**B**\_3. Pure compound – only one type of compound present.

\_**A**\_4. Mixture of two compounds – two types of compounds present.

\_**D**\_5. Mixture of a compound and an element.

**Part 4:** Column A lists a substance. In Column B, list whether the substance is an element (E), a compound (C), a Heterogeneous Mixture (HM), or a Homogeneous Mixture/Solution (S). (Remember a solution is a homogeneous mixture.) In Column C, list TWO qualitative properties of the substance.

|  |  |  |
| --- | --- | --- |
| Substance | **Kind of Matter** | **Qualitative Properties** |
| 1. Summer Sausage | HM | **Chunky, Brown** |
| 2. Steam | **C** | **Clear, Odorless** |
| 3. Salt Water | **S** | **Liquid, Clear** |
| 4. Pencil Lead (Pb) | **E** | **Grey, Solid** |
| 5. Dirt | HM | **Brown, Solid** |
| 6. Pepsi | **HM** | **Brown, Liquid** |
| 7. Silver (Ag) | **E** | **Silver, Solid** |
| 8. Toothpaste (Na2HPO4) | **C** | **White, Thick** |
| 9. A burrito | **HM** | **Multi-colored, Solid** |
| 10. Italian Dressing | **HM** | **Liquid, Greasy** |
| 11. Chicken Soup | **HM** | **Liquid/Solid, Brown** |
| 12. Lemonade | **S** | **Yellow, Liquid** |

Ffdsfsdafs

Fdsa

Fdsa

Fdsa

Fdsa

Fdsa

**Quiz – Sig Figs and Scientific Notation**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period

1. Give the number of significant figures in each of the following.

 a)  10.0005 g   \_\_\_\_\_\_

 b)  0.003423 mm  \_\_\_\_\_\_

 c)  2900 + 100 ft  \_\_\_\_\_\_

 d)  8.9 x 105 L  \_\_\_\_\_\_

 e)  the number of minutes (60) that make up an hour         \_\_\_\_\_\_

2. Determine the answer for each of the following.  Be sure to  use the correct number of significant figures.

a)   27.34  + 6.90 + 13.124                               c)    2.8023 – 4.762

b)  0.32 x 14.50 x 120                                   d)  24.1 / 0.005

3. Round each of the following to 3 significant figures.

 a) 707.5  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_                      d) 2,300.2  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 b) 0.0003350   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_                     e) 10.26730   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 c) 18.95 x 1021   \_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Convert each of the following into correct scientific notation.

a)  1747    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b)  0.00000984     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c)  3200.0 x 102  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d)  0.002014 x 102  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e)  25600000000000000  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  (use 4 sig. fig. for the last one only)

5. Calculate the following using the correct number of significant figures.

 a)  2.34 x 1047 + 9.2 x 1046                                            b)  9132.0 - 1.6 x 103

6. Calculate the following using the correct number of significant figures.

 a)  (1.54 x 1058)(3.5 x 1060)

 b)  (7.9 x 1034) / (8.32 x 1023)

**Answer Key – Sig Figs and Scientific Notation**

1. Give the number of significant figures in each of the following.

a)  10.0005 g     **6**

b)  0.003423 mm    **4**

c)  2900 + 100 ft     **2**

d)  8.9 x 105 L     **2**

e)  the number of minutes (60) that make up an hour        **infinite**

2. Determine the answer for each of the following.  Be sure to use the correct number of significant figures.

a)  **47.36** c)    **-1.960**

b)  **5.6 x 102** d)   **5 x 103**

3. Round each of the following to 3 significant figures.

 a)  **708** d) **2.30 x 103**

 b) **0.000335**e) **10.3**

 c) **19.0 x 1021**

4. Convert each of the following into correct scientific notation.

 a) **1.747  x 103**

 b) **9.84  x 10-6**

 c) **3.2000 x 105**

 d) **2.014 x 10-1**

e) **2.560 x 1016**

5. Calculate the following using the correct number of significant figures.

a)  **3.26 x 1047**                  b)  **7.5 x 103**

6. Calculate the following using the correct number of significant figures.

 a)  **5.4 x 10118**

 b)  **9.5 x 1010**

Lesson Plan: Day 1 – States of Matter

I. PDA Standard: CHEM 3.2.C.A3

II. Objectives SW:

A. Understand how matter can take on different energy states.

B. Specific Objectives:

1. Define matter as: Anything that has mass and occupies space

2. Solve with the equations used for temperature conversions

a. K = C° + 273; F° = 9/5 (C°) +32; C° = 5/9 (F° - 32)

b. Label states of matter based on temperature change

3. Define and identify the states of matter

a. Solid: A form of matter that has a definite shape and volume. Solids are not readily compressible.

b. Liquid: A form of matter that flows, has a fixed volume, and an indefinite shape. Liquids are not readily compressible.

c. Gas: A form of matter that takes the shape and volume of its container; a gas has no definite shape or volume. Gases are easily compressible.

4. Define the following terms of scientific inquiry:

a. Quantitative Observations: observations that are made with instruments such as rulers, balances, graduated cylinders, beakers, and thermometers. These results are measurable.

b. Qualitative Observations: observations that use your senses to obtain the results. (Sight, smell, touch, taste and hearing.)

III. Procedures/Activities

A. Ask students if they can remember the three basic phases, or states, of matter. If they struggle, use water as an example.

1. Clarify that there are more states of matter, but these are the basic ones that you can encounter in everyday life.

2. Draw an arrow on the board and have a student label the states of matter from the hottest to the coldest.

3. If there is extra time, mention Bose-Einstein condensates and plasma to present an extra credit question.

B. Teach students how to convert temperatures and allow tem to try a few after a class demonstration.

C. Define the three states of matter and show the PASCO video.

D. Introduce the terms quantitative and qualitative observations.

1. Have the students explain why temperature is a quantitative observation.

2. Have the students brainstorm some quantitative and qualitative characteristics of matter.

IV. Materials

- Temperature conversion worksheet and answer sheet

- Whiteboard, projector, or similar for class demonstrations

- Projector and computer for PASCO video

V. Time: approx. 40 mins.

VI. Evaluation: Individual written test including the identification and application of quantitative and qualitative observations

VII. Notes:

Lesson Plan: Day 2 – Phase Diagrams

I. PDA Standard - 1.12CHEM.3.2.C.A3, CHEM.A.1.1.1

II. Objectives SW:

A. Understand physical changes and how they relate to phase changes

B. Specific Objectives:

1. Define a physical change in correlation to the different states of matter discussed yesterday

a. Physical Change – a change during which some properties of a material change, but the composition of the material does not change.

b. List some verbs associated with physical changes

2. Define physical properties; these are the properties that change during a physical change

a. Physical Property - a quality or condition of a substance that can be observed or measured without changing the substance’s composition.

b. List some physical properties

3. Correlate how physical properties and physical changes correlate with quantitative and qualitative observations.

4. Label the parts of a phase diagram

a. Label the axes and the three phases

b. Label the transitions between the phases

c. Locate and explain points of interest on a phase diagram

i. Triple Point – the point on a phase diagram that represents the only set of conditions at which all three phases exist in equilibrium with one another.

ii. Critical Point – the point farthest to the right on a phase diagram, between the liquid and gas phases.

5. Given a pressure and temperature, determine the phase of a given substance by reading the phase diagram

III. Procedures/Activities

A. Define a physical change on the board and correlate it to the states of matter discussed yesterday.

B. Identify physical changes to the different aspects of the students’ lives. Encourage participation from all aspects from as many students as possible.

C. Have students brainstorm some verbs associated with physical changes. Highlight important terms they may expect to see on the next test.

D. Define physical properties and explain how it correlates with a physical change.

E. Question and drill students as to how physical changes correlate with qualitative and quantitative observations.

F. Introduce the phase diagram and give students their own blank copy.

i. Have students fill in terms they already know

ii. Give vocabulary for the remaining terms necessary to understand a phase diagram.

iii. Drill students on identifying the phase of a given substance given its pressure and temperature

G. Homework: have students turn in handwritten vocabulary terms associated with the phase diagram. Homework also includes a short answer section requiring the students to explain basic concepts of phase changes.

IV. Materials

-Front board

-Unlabeled phase diagram worksheet

V. Time: approx. 40 mins.

VI. Evaluation: Individual written test including the identification and application of quantitative and qualitative observations, as well as the classification of physical changes and physical properties.

VII. Notes: