Name:_____ HR:_____ Date:_____

Science Finals Review Packet

Class Work – Required & due on Mon 6/11

Instructions:

1. Complete the quizzes for each of the following learning standards. Because the final exam will focus mostly on units 4 and 5, you may want to start with the quizzes from those units.
2. Correct the answers you wrote by comparing them to the answer sheet at the end of this packet.
3. Score yourself using our standard quiz-scoring rubric (see below) and record your score for each learning standard in the box below.

Scoring Rubric:

0 – You have not yet demonstrated any understanding. ***(no questions right)***

1 – You demonstrate partial understanding of the simpler ideas. ***(question #1 is partially correct)***

2 – You demonstrate understanding of the simpler ideas, but make errors regarding the more complex ideas. ***(question #1 is correct, but question #2 is incorrect)***

3 – You demonstrate proficient understanding of both simple and complex ideas. ***(questions #1 and #2 are correct)***

4 – You demonstrate understanding of complex ideas, and you are able to apply these ideas beyond what was taught. ***(questions #1, #2 and #3 are all correct)***

OVERVIEW OF LEARNING STANDARDS:

	Use this column to rank your current understanding of each LS →	**0,1,2,3,4**
1.1	Make detailed qualitative and quantitative observations and describe several physical properties of matter	
1.2	Distinguish between and describe properties of the three states of matter	
1.3	Make accurate measurements of mass and volume of both regular and irregular objects using appropriate units.	
1.4	Given mass and volume, calculate density using appropriate units.	

1.5	Use multiple methods to compare and depict relative densities of two objects/substances	
1.6	Distinguish between mass and weight and explain why there is a difference in weight and gravitational pull on objects on the moon v. Earth.	
2.1	Describe the meaning of and distinguish between temperature and heat.	
2.2	Describe the position, motion and kinetic energy of particles in the three phases of matter.	
2.3	Give examples of and describe what happens to the particles during the 4 phase changes: melting, freezing, condensation and vaporization.	
2.4	Identify and give examples of the 3 methods of heat transfer: conduction, convection and radiation.	
2.5	Explain the meaning of Thermal Equilibrium and describe how heat will travel to reach thermal equilibrium over time.	
3.1	Distinguish between and give examples of atoms and molecules; and elements and compounds.	
3.2	Read, write and interpret element symbols and chemical formulas; And use them to draw models of molecules	
3.3	Distinguish between and give examples of pure substances and mixtures	
3.4	Describe several methods for how to separate mixtures into pure substances	
4.1	Distinguish between and give examples of chemical changes and physical changes	
4.2	Write, read and interpret a chemical equation, and identify the products and reactants.	
4.3	Describe what happens to molecules during a chemical reaction, and show that chemical reactions create new substances.	
4.4	Explain the Law of Conservation of Mass and show how matter is always conserved in a closed system	
5.1	Draw and interpret distance v. time graphs, identifying constant or accelerating speed, and change in direction.	
5.2	Given two of the following variables, calculate the third: speed, distance and time.	
5.3	Define and give examples of forces and explain how they can accelerate objects (including the acceleration due to gravity)	
5.4	Distinguish between Potential Energy and Kinetic Energy and identify places where objects have maximum PE or KE	
5.5	Explain the Law of Conservation of Energy, and describe how energy is transformed from PE to KE and vice versa.	

Name:_____ HR:_____ Date:_____

Quiz Re-take: LS 1.1 and LS 1.2

LS 1.1: Make detailed qualitative and quantitative observations and describe several physical properties of matter

LS Mastery:

1. Write 1 qualitative and 1 quantitative observation of the classroom.

2. A student has a sample of a mystery solid. Below, list 2 qualitative and 2 quantitative physical properties that the student could observe and write them in the table below. Then explain additional information about each property.

	Property	Additional Information
Qualitative property #1		*What is the meaning of this property?*
Qualitative property #2		*What is the meaning of this property?*
Quantitative property #2		*How could you measure it?*
Quantitative property #2		*How could you measure it?*

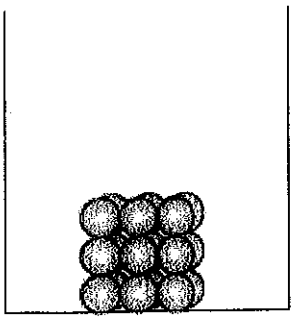
3. A student is given a sample of an unknown liquid to test in the laboratory. The student thinks that the liquid is water. Which of the following physical properties of the sample is **most** helpful to determine if the liquid is water?

A. transparency of the liquid
B. mass of the liquid
C. temperature of the liquid
D. freezing point of the liquid

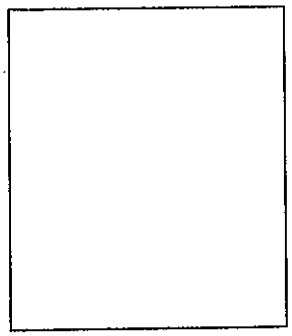
LS 1.2: Distinguish between and describe properties of the three states of matter

LS Mastery:

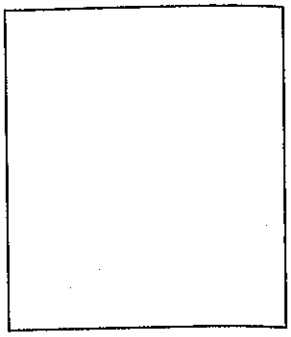
1. The diagram below shows a model in an open container. The model represents the arrangement of particles of matter in a solid phase. Draw what the particles would look like in the liquid and gas phase.



Solid



Liquid



Gas

2. Think about how scientists define solids, liquids, and gasses.

   a. What characteristic do liquids and solids have in common?

   b. What characteristic do liquids and gasses have in common?

3. A student brings a scuba tank of compressed air into the classroom. The student opens the valve and lets all the air out. What happens to the volume of the air in the tank once it is released into the classroom?

Name:_____ HR:_____ Date:_____

Quiz Retake (c): L.S. 1.3

LS 1.3: Make accurate measurements of mass and volume of both regular and irregular objects using appropriate units.

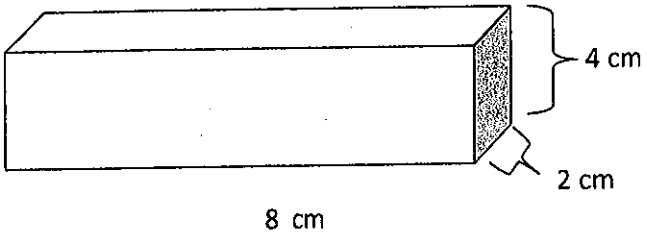
LS Mastery:

1. What is the scientific unit for mass? _____

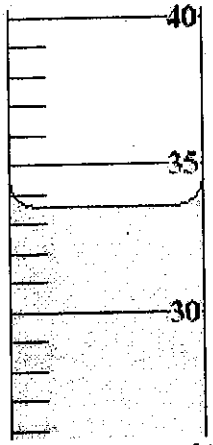
   What are the <u>two</u> scientific units for volume (that we use in this class)?

   _____ & _____

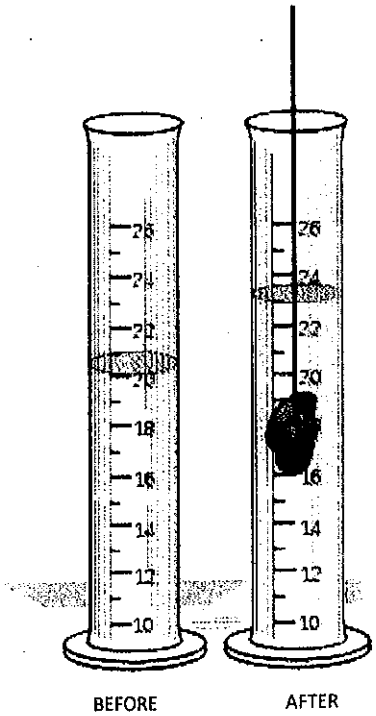
2. Perform the following measurements, and <u>use the correct units</u>!



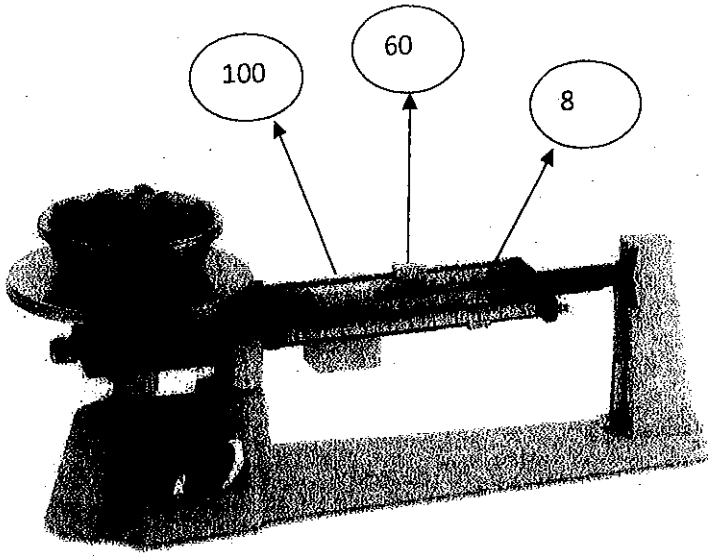
a. What is the volume of the above object?



b. What is the volume of the liquid in this graduated cylinder?



c. What is the volume of this rock shown on the left?



d. The above picture shows a zoomed-in reading of each of the three beams on a triple beam balance. What is the mass of the bowl of candy being measured? Don't forget the units.

3. If you were performing the measuring shown in the above picture, how could you determine the mass of just the candy (not including the bowl)? Describe what you would do...

Name:_____ HR:_____ Date:_____

Quiz Re-take (c): L.S. 1.4 and L.S. 1.5

LS 1.4: Given mass and volume, calculate density using appropriate units.

LS 1.4 Mastery:

1. What are the <u>two</u> possible units used to express density?

   _____ & _____

   What is the equation to calculate density? _____

2.
   a. A student measures that ball has a mass of 100 g and a volume of 20 mL. What is the density of the ball? <u>Don't forget the units (and show your work)</u>

   b. Ms. Schwarzenbach has 200 mL of mud in a graduated cylinder. She determines that its mass is 100 g. What is the density of the mud? <u>Don't forget the units (and show your work)</u>

3. Ms. Schwarzenbach has a cup of juice and she measures the density of the juice to be 3.0 g/mL. She measures the mass of the syrup to be 150 g. What is the volume of the juice that Ms. Schwarzenbach has?

LS 1.5: Use multiple methods to compare and depict relative densities of two objects/substances.

LS 1.5 Mastery:

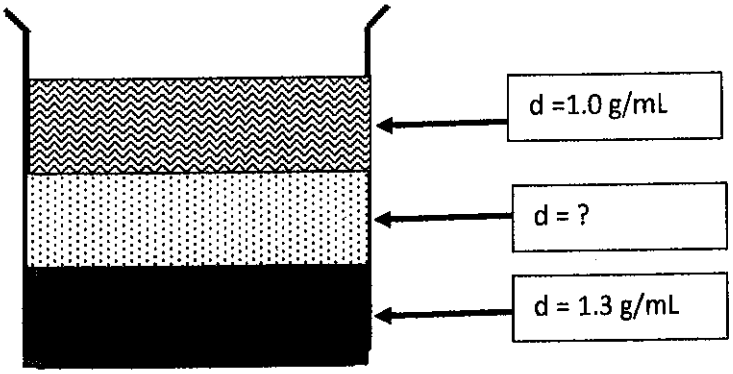
1. What is the density of pure water? (don't forget units)_____

2.

Object	Density (g/mL)
Cat Toy	0.16
Iron Washer	7.87
Plastic Bracelet	0.78
Chalk	2.18
Fork	3.81

a. All of the objects in the above table are dropped into a bucket of pure water. List <u>all objects that will float</u>.

b. Below is an image of a density column. Three liquids are layered and do not mix. The densities of two of the liquids is shown. What can you tell about the density of the middle liquid?



3. What do you think happens to the density of the atmosphere as you go higher into the sky? <u>Explain your reasoning.</u>

Name:_____ HR:_____ Date:_____

Quiz Retake (b): L.S. 1.6

LS 1.6: Distinguish between mass and weight and explain why there is a difference in weight and gravitational pull on objects on the moon v. Earth.

LS 1.6 Mastery:

1. Choose the correct answer for each question below and write the letter of that answer on the line.

   i. How do scientists define mass? _____

   ii. How do scientists define weight? _____

   A. A measure of the force of gravity on an object
   B. The amount of matter in an object
   C. The amount of space an object takes up
   D. A measure of how long an object is

2. Circle the best answer for each question. There can only be one correct answer.

   i. If you were to take a solid object, like a rock, from Earth into outer space, which of its properties would change the most?
      a. Its color
      b. Its mass
      c. Its density
      d. Its weight

   ii. Why is there more gravity on the Earth than on the moon?
      a. Because the Earth is older
      b. Because the Earth has water on it
      c. Because the Earth has more mass
      d. Because the Earth has an atmosphere

iii. Based on the chart below, what would happen to an alien's weight and mass if he traveled in a spaceship from Jupiter to Mercury?

PLANET	GRAVITY
Mercury	3.7 m/s^2
Earth	9.8 m/s^2
Venus	8.8 m/s^2
Jupiter	25.9 m/s^2

a. Both the alien's mass and weight would decrease
b. Both the alien's mass and weight would increase
c. The alien's mass would stay the same and his weight would decrease.
d. The alien's mass would stay the same and his weight would increase

3. If a huge asteroid were to crash into the Earth and cause the total mass of the Earth to increase, what would happen to your weight? Do you think it would change? Explain your answer.

Name:_____ HR:_____ Date:_____

Quiz Retake - LS 2.1 and LS 2.2 (b)

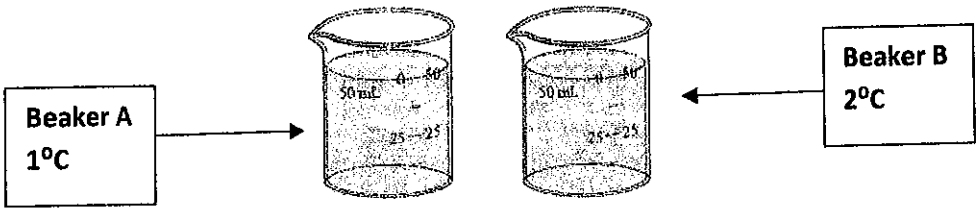
LS 2.1: Distinguish between heat and temperature.

LS 2.1 Mastery:

1. Name 2 possible units that can be used to measure temperature:

   Which unit will we be using in this class? _____

2. The beakers shown below both contain water. Use the diagram and the information provided to answer the questions below.



   i. Which beaker has the higher temperature?
      a. Beaker A
      b. Beaker B
      c. Both beakers are the same

   ii. Which beaker contains particles that are moving faster?
      a. Beaker A
      b. Beaker B
      c. Both beakers are the same

   iii. Which beaker contains more heat?
      a. Beaker A
      b. Beaker B
      c. Both beakers are the same

3. In the above example, there are two ways to increase the amount of heat in Beaker A. What are they ?

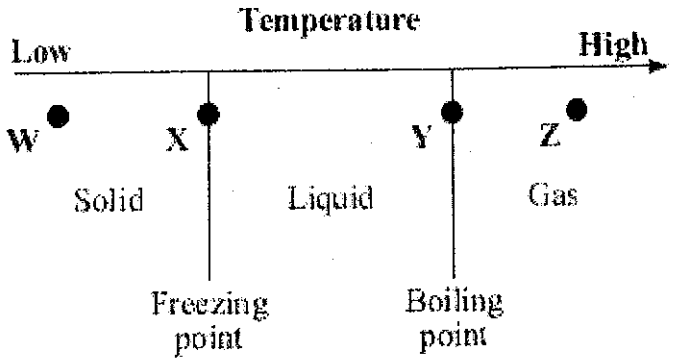
   1._____

   2._____

LS 2.2: Describe the motion and kinetic energy of the particles in the 3 phases of matter

LS 2.2 Mastery:

1. The diagram below shows how a change in temperature affects the physical state of a substance. Each of the labeled points represents the same substance at a different temperature.



Which point represents the substance in the physical state with the particles moving the **most**?

a. W
b. X
c. Y
d. Z

2.

a. Describe exactly how the particles in a solid move:

b. In which phase of matter, do the particles have the **lowest** kinetic energy?

3. If the temperature were to drop to -273°C, the Earth would be a very different place. Describe what you think would happen to the oceans and the atmosphere on Earth if it became that cold, and explain your reasoning.

Name:_____ HR:_____ Date:_____

Quiz Retake - LS 2.3 (b)

LS 2.3: Describe what happens during the four phases changes: freezing, melting, vaporization and condensation.

LS 2.3 Mastery:

1. Which of the following things might cause matter to go through a phase change?
    a. Heat is taken away from matter
    b. Matter is mashed up
    c. Water is added to matter
    d. Matter is poured into a beaker

2. For each of the below phase changes, identify which of the four basic phase changes is occurring. Please write the symbol for the phase change on the line. The symbols for each phase change are listed below:

    Freezing = F
    Melting = M
    Vaporization = V
    Condensation = C

    i. When you take a shower, the water vapor in the air cools off on the surface of the bathroom mirror and turns into liquid water drops. _____

    ii. The water level in a fisg bowl slowly gets lower over time. This is because the liquid water is becoming gas and going into the air. . _____

    iii. A candle-maker pours liquid wax into a mold so it can harden and become a candle.

    _____

    iv. When a volcano forms, magma from the center of the Earth rises in the Earth's crust. This causes the solid rock near the surface to become so hot that it turns into liquid rock, which scientists call magma. _____

3. At night, as it cools down outside, dew (water droplets) forms on the blades of grass. Describe which phase change this is and explain exactly how this happens. (ex: where does the water come from? Why does it get left on the grass)

Name:_____ HR:_____ Date:_____

Quiz Retake- LS 2.4/2.5 (c)

LS 2.4: Identify and give examples of the 3 methods of heat transfer: conduction, convection and radiation.

LS 2.4 Mastery:

1. Match each type of heat transfer with their correct definition

   i. Conduction _____

   ii. Convection _____

   iii. Radiation _____

   a. When heat is transferred by electromagnetic waves.
   b. When heat is transferred from one particle colliding with another particle.
   c. When heat is transferred by the mixing or moving of gas or liquid particles.

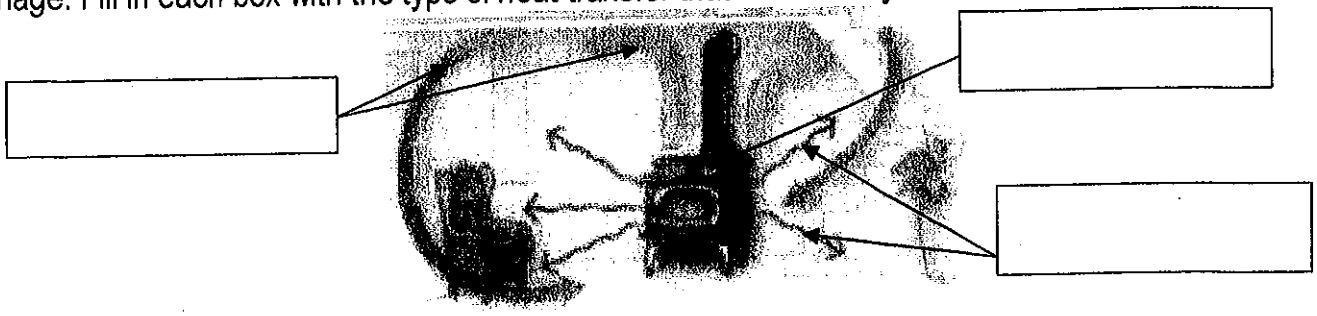
2. For each of the below real-world examples, choose which type of heat transfer is occurring. Write "conduction", "convection" or "radiation" on the line to show your choice.

   a. An egg gets hot and cooks as it sits on a hot frying pan _____.

   b. A student gets hot while sitting in the sun_____.

   c. Warm air from the bedroom flows into the hallway and warms up the rest of the house _____.

3. The picture below a fireplace heating up a room. All three types of heat transfer can be seen in this image. Fill in each box with the type of heat transfer that is shown by each arrow.

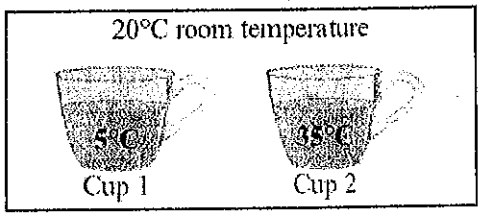


LS 2.5: Explain the meaning of Thermal Equilibrium and describe how heat will travel to reach thermal equilibrium over time.

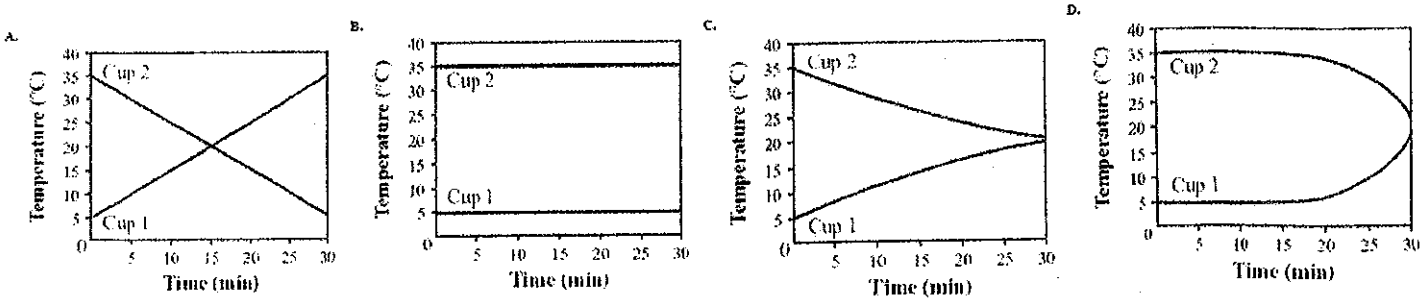
LS 2.5 Mastery:

1. A cup of coffee has been sitting in a room for 10 minutes and has cooled off to 30°C. The air in the room is 25°C. Are the coffee and the room at Thermal Equilibrium? Explain your answer.

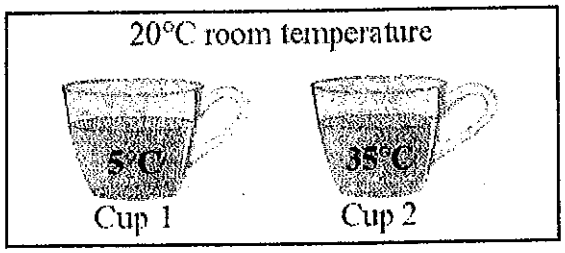
2. During an investigation, Steven filled two cups with the same amount of water and placed them in a 20°C room for 30 minutes. Cup 1 was filled with 5°C water. Cup 2 was filled with 35°C water. The diagram below shows the temperatures of the cups at the beginning of the investigation..



i. Which of the following graphs shows how the temperatures of the two cups of water **most likely** changed over 30 minutes?



ii. In the following image draw arrows showing how the heat transferred (1) between cup 1 and the surrounding air, and (2) between cup 2 and the surrounding air.



3. Doctors can sterilize their tools by boiling them in water. If you were to boil a silver knife in a pot of boiling water, what is the hottest you think the knife will get? Explain your answer.

Name:_____ HR:_____ Date:_____

Quiz - LS 3.1 and LS 3.2

LS 3.1: Distinguish between and give examples of atoms and molecules; and elements and compounds.

LS 3.1 Mastery:

1. For the below substances, identify if they are an element or a compound. Write "E" for element, and "C" for compound.

   a. Water _____
   b. Oxygen _____
   c. Gold _____
   d. Sodium _____
   e. Salt _____
   f. Carbon Dioxide _____

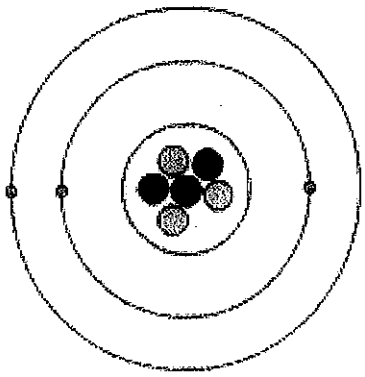
2.

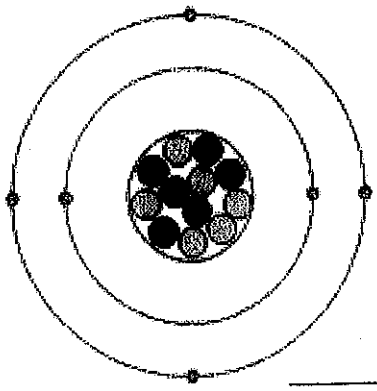
   i. Fill in the blanks using the words from the word bank to the right.

   - _____ **are the simplest form of pure substances, and there are 111 of them on Earth.**
   - **Molecules are the smallest particles of** _____, **and are made up of two or more** _____.

   Word Bank:
   Atoms
   Molecules
   Elements
   Compounds

   ii. Use the below images of atoms and your periodic table to identify which element each atom is showing. Write that element (or the element symbol) on the line next to the image.



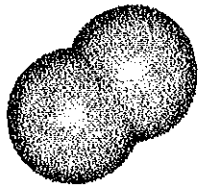


= Proton
= Neutron

_____ _____

3. Below is an image of an Oxygen particle, O_2, that exists naturally as a gas in our atmosphere.

   a. Is this an element or a compound? _____
   b. Is this an atom or a molecule? _____



LS 3.2: Read, write and interpret element symbols and chemical formulas; And use them to draw models of molecules

LS 3.2 Mastery:

1. What is the chemical formula for water? _____

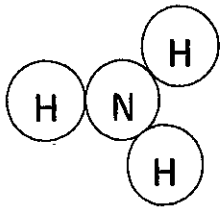
2.

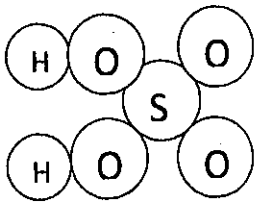
a. Below are two chemical compounds, with their chemical formulas. Draw a molecule of each compound in the box.

Potassium Hydroxide - KOH

Chalk - $CaCO_3$

b. Below are pictures of two molecules. Write the chemical formula that goes with each molecule on the line.





_____ _____

3. How many **protons** are in one molecule of the compound Glucose, $C_6H_{12}O_6$?

Name:_____ HR:_____ Date:_____

Quiz Retake (a)- LS 3.3 and LS 3.4

LS 3.3 Mastery:

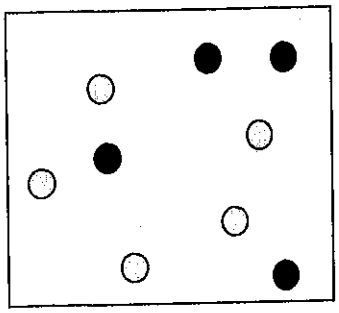
LS 3.3: Distinguish between and give examples of pure substances and mixtures

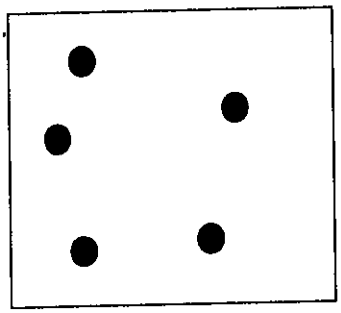
1. Choose the description that best defines the following vocabulary words.
   i. Pure Substance _____
   ii. Mixture _____
      a. Solid and liquid matter
      b. Matter that contains only one element
      c. Matter that has a chemical formula
      d. Matter that does not have a chemical formula and contains more than one substance
      e. Matter that chemically reacts with water

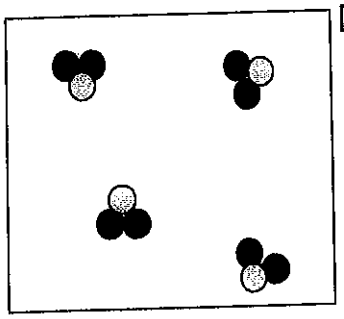
2.
   i. Choose whether each of the following examples is a mixture or a pure substance. Write "PS" for pure substance and "M" for mixture.

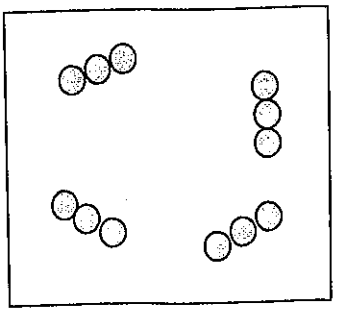
Pure Water _____ Carbon Dioxide _____
Ocean Water _____ Gold _____
Pancake Batter _____ Air _____

   ii. Which of the following diagrams best represents the particles in a mixture?

A. 

B. 

C. 

D. 

3. Which of the following is an example of the formation of a mixture?
   a. Rust forming on an iron nail
   b. Sodium and Chlorine forming table salt
   c. Carbon and Dioxide reacting to produce Carbon Monoxide, CO.
   d. Salt dissolving in water

LS 3.4: Describe several ways to separate mixtures into their pure substances

LS 3.4 Mastery:

1. Which of the following is true for all mixtures?

   a. They are soluble
   b. They have a chemical formula
   c. They contain more than 3 substances
   d. They chemically react with water
   e. They can be separated into pure substances by physical means

2. For each of the following mixtures, describe how you would separate the two substances.

   a. Citric Acid and Sand

   b. Sugar dissolved in water

   c. A substance with a very high density and a substance with a very low density

3. A teacher wants to separate a mixture that contains two substances. Substance A has a density of 1.3 g/mL and Substance B has a density of 1.9 g/mL. How can the teacher separate the two substances?

Name:_____ HR:_____ Date:_____

LS 4.1 Mastery:

Quiz 4.1

LS 4.1: Distinguish between and give examples of chemical changes and physical changes.

1. Choose the correct definitions for physical and chemical change. Write the corresponding letter on the lines below.

   Physical Change = _____
   Chemical Change = _____

   a. A change that alters the chemical formula and produces a new substance.
   b. A change of body type, like losing or gaining weight.
   c. A change that alters the appearance of a substance, but not the chemical make-up of a substance.
   d. A change that alters the types of elements present in a substance.
   e. A change in temperature.

2. i. For each of the below examples, choose whether it is a physical change or a chemical change. On the line, write "P" for a physical change and "C" for a chemical change:

   a. An ice cube melting: _____
   b. A piece of wood burning: _____
   c. Digesting your food: _____
   d. Dissolving sugar in hot tea: _____
   e. Photosynthesis:_____

   ii. Write 2 signs that a chemical change has occurred (DO NOT write examples of chemical changes, but write the observable characteristics of chemical changes)

   _____ & _____

3. There are several signs that a chemical reaction is occurring, but sometimes these signs exist during a physical change. Give an example of a physical change that exhibits some of the signs of a chemical reaction. *(you may write your answer on the back)*

Name:_____ HR:_____ Date:_____

LS 4.2 Mastery:

Quiz Retake (c) - 4.2 and 4.3

LS 4.2: Write, read and interpret a chemical equation, and identify the products and reactants.

Use the chemical equation below to answer question #1:

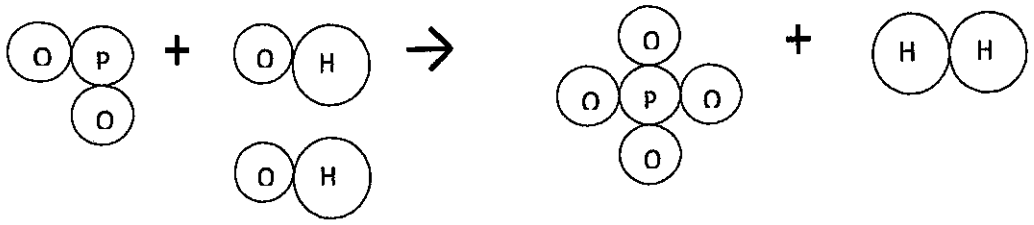
$$NH_3 + 3OBr \rightarrow N_2 + 3Br + 3H_2O$$

1. What are the reactants? _____
   What are the products?_____

2. i. Use the chemical equation to draw the molecules of the reactants and the products. Be sure to draw the correct amount of each molecule:

$$2NH_3 + 3OBr \rightarrow N_2 + 3Br + 3H_2O$$

ii. Use the below image of molecules to write the chemical equation for this reaction:



Chemical Equation = _____

3. Chemical equations are "balanced" when there are the same amount of each atom in the reactants as there are in the products. Add coefficients to the chemical equation below so that it is "balanced".

$$\_\_\_Al + \_\_\_O_2 \rightarrow \_\_\_Al_2O_3$$

LS 4.3: Describe what happens to molecules during a chemical reaction, and show that chemical reactions create new substances.

LS 4.3 Mastery:

1. During a chemical reaction, _____.
   a. Atoms of one element turn into atoms of a different element
   b. New atoms are created
   c. Atoms of the reactant disappear, and are replaced by different atoms in the product
   d. Atoms are rearranged to create new molecules

2. The below reaction shows how NH_3 and OBr can react to form pure Nitrogen, pure Bromine, and a mystery product. Use this chemical equation to answer the below question:

$$2CeO_2 + 8HCl \rightarrow 2\_\_\_\_ + Cl_2 + 4H_2O$$

Which of the following compounds could possibly be the mystery product in the above chemical equation?

   a. H_2O
   b. NH_3
   c. NaOH
   d. Cl_2
   e. $CeCl_3$

3. One molecule of Sodium Carbonate (Na_2CO_3) undergoes a chemical reaction, where it breaks up and produces one molecule of Carbon Dioxide and one molecule of Sodium Oxide. What is the chemical formula for Sodium Oxide? [hint – try writing out the chemical equation based on the information above. Then, draw pictures of molecules to determine what a Sodium Oxide molecule must look like].

Name:_____ HR:_____ Date:_____

LS 4.4 Mastery:

Quiz Retake - 4.4 (b)

LS 4.1: Describe the Law of Conservation of Mass and use it to solve mass conservation problem

1. Fill in the blanks in the sentence below:

"Matter cannot be _____ or _____."

2. Use the Law of Conservation of Mass to solve the below problems:

a. Find the missing substance in the below chemical reaction, and write its chemical formula below.

$$NO_2 + OF \rightarrow \underline{\ ?\ } + F$$

b. The information below tells you how much reactants and products were present before and after the following reaction. Use this information to calculate the mass of Salt produced.

$$NaOH + HCl \rightarrow H_2O + NaCl$$

NaOH= 62 g
HCl = 27 g

H_2O = ?
NaCl = 43 g

3. In the below chemical equation, 45 g of Copper Oxide (Cu_2O) reacts with 45 g of Carbon (C) to produce Copper and Carbon Dioxide. After the reaction takes place, the mass of the Copper (Cu) is twice as much as the mass of the Carbon Dioxide. How much Copper was produced?

$$2Cu_2O + C \rightarrow 4Cu + CO_2$$

Name:_____ HR:_____ Date:_____

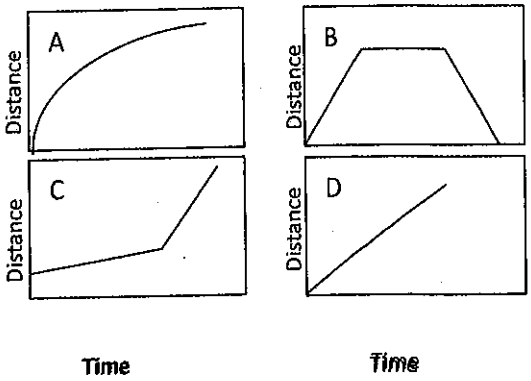
LS 5.1 Mastery:

Quiz Retake - 5.1 and 5.2 (b)

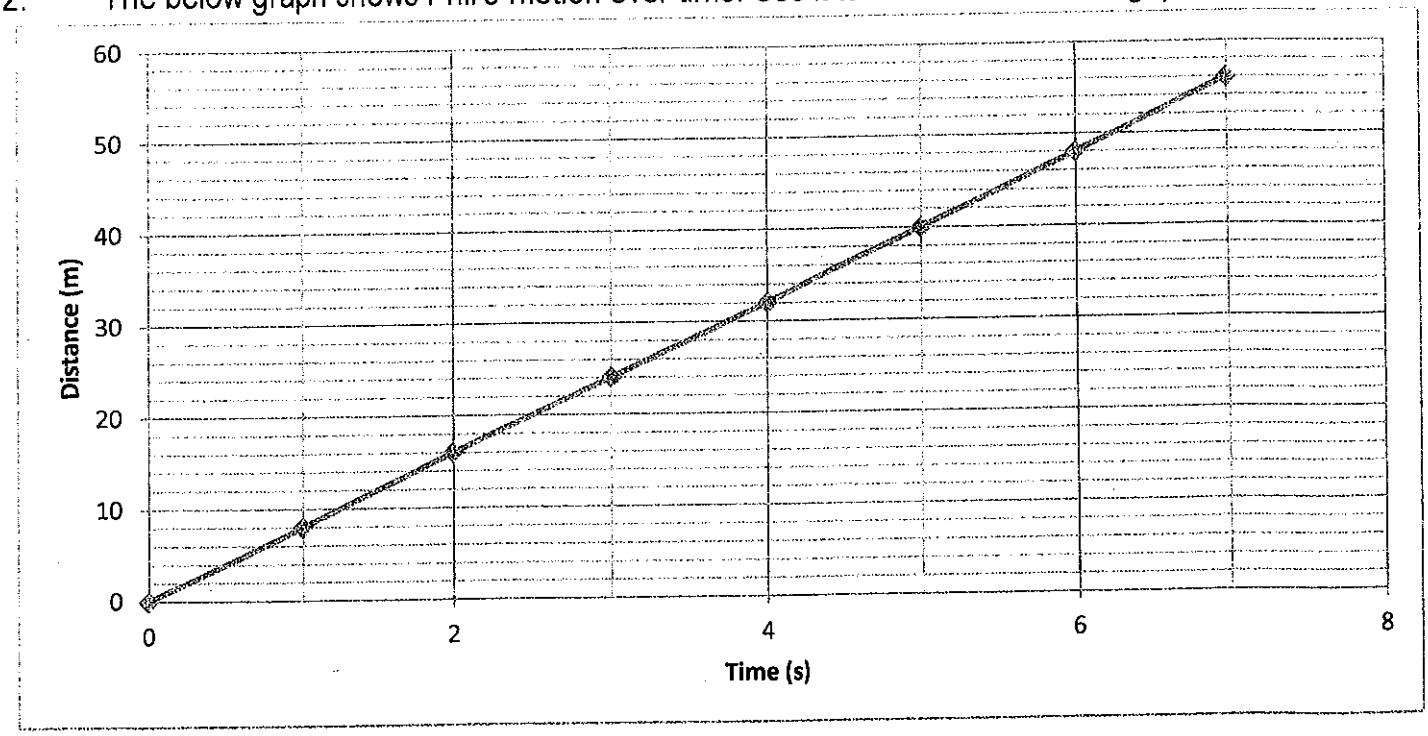
LS 5.1: Draw and interpret distance v. time graphs, identifying speed.

1. Next to each description of motion, write the letter of the matching distance v time graph on the line.

i. A student runs home at a constant speed . _____
ii. A student runs to the end of the street, takes a 5 second break, and then turns around and comes back. _____
iii. A speeding car gradually slows down and comes to a stop _____
iv. A student walks and then runs. _____



2. The below graph shows Phil's motion over time. Use it to answer the following questions:



a) How far away does Phil travel? _____
b) How fast is Phil moving?

3. When Phil begins walking, Peter is already 10 m away. He is walking in the same direction as Phil at a speed of 5 m/min. On the above graph, draw a line that shows Phil's movement.

LS 5.2: Calculate speed, distance and time.

LS 5.2 Mastery:

1. What is the equation to calculate speed? _____

2. Calculate the value of the underlined variable in the following word problems. For full credit, make sure you **label your answer with the correct unit!**

a) A motorcycle is driving from Chicago to Orlando, which is 2000 miles. It takes 25 hours to reach Orlando. What is the speed of the motorcylcle?

b) A snail moves slowly on the sand at a speed of 15 inches per hour. It is traveling for a total of 4 hours. What is the distance that the snail travels?

c) A roller-blader is skating at a speed of 12 meters per second. How much time will it take the skater to travel a distance of 120 meters?

3. A biker is riding from his office to a restaurant, which is a distance of 400 meters. He rides at a speed of 10 m/s for the first 200 meters of his journey. Then he stops for 30 seconds to take a break. After his break, he rides at a speed of 5 meters per second the rest of the way to the restaurant. How many seconds does it take the biker to get from his office to the restaurant?

Name:_____ HR:_____ Date:_____

LS 5.3:

Quiz 5.3

LS 5.3: Describe and give examples of forces, and show how they accelerate objects.

1. What is a force? _____

   What is the unit used to measure force? _____

2. Use the words from the word bank to fill in the blanks in the sentences below. You may only use each word once, so make sure you choose the best-fit word for each sentence. There should be one unused word left over.

Friction	Normal Force
Weight	Air Resistance
Net Force	Balanced
Unbalanced	Gravity

a. When forces are _____, the net force is zero and there will be no change in motion.

b. When forces are _____, the net force is not equal to zero and the object will accelerate.

c. _____ is the name for the downward-pulling force on an object that is caused by gravity.

d. _____ is a force that comes from whatever surface an object is sitting on and acts in the upward direction.

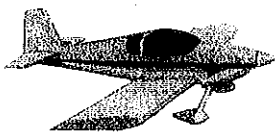
e. _____ is a specific kind of fluid friction that affects all moving objects on earth. It doesn't affect objects on the moon, however, because there is no atmosphere.

f. _____ is the resulting combined force of all individual forces acting on an object.

g. There are four main kinds of _____, which is a force that acts in the opposite direction of motion, causing objects to slow down.

3. Below is an airplane that is flying at an elevation of 30,000 ft. Gravity causes the airplane to have a weight of 80,000 N. Its wings also give the plane a lift (upward force) of 80,000 N. The plane's engines are creating a thrust (forward force) of 15,000 N, and the air resistance is providing a force of 20,000 N.

i. Draw arrows around the airplane to represent the forces that are acting on the airplane. Be sure to label each arrow with the size of each force.



ii. What is the net force on the plane? (A complete answer will include size and direction of force).

iii. Considering your answer to the above question, how would you describe the plane's motion at this time?

Name:_____ HR:_____ Date:_____

Quiz 5.4 and 5.5

LS 5.4: Distinguish between Potential Energy and Kinetic Energy and identify places where objects have maximum PE or KE.

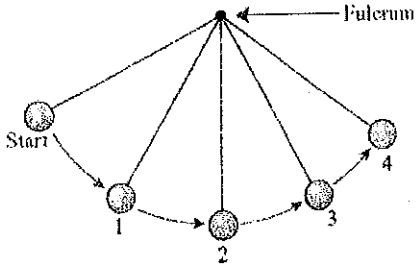
LS 5.4 Mastery:

1. What is the unit to measure Energy? _____

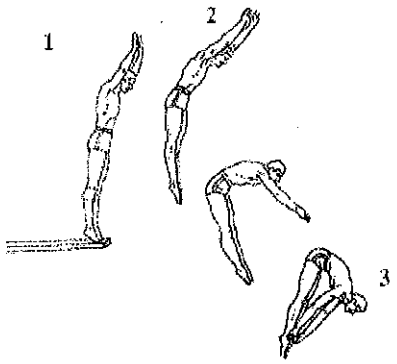
Gravitational Potential Energy depends on two variables. They are:

a. Height and mass
b. Speed and mass
c. Height and density
d. Mass and volume

2. Below is a picture of a **pendulum**. The pendulum is raised to the start position and released. At which position is the potential energy of the pendulum the greatest?

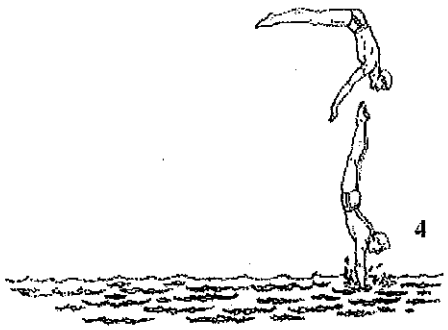


a. position 1
b. position 2
c. position 3
d. position 4

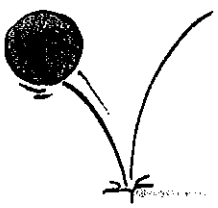


To the right is a picture of a **cliff diver**. At which position does the diver have the greatest kinetic energy?

a. position 1
b. position 2
c. position 3
d. position 4



3. The basketball in the picture below has both potential energy and kinetic energy. Due to its height, its potential energy is 18 J. It is also moving at a speed of 4 m/s and has a mass of 2 Kg. Use the equation for kinetic energy to calculate the KE and the total mechanical energy of the basketball.



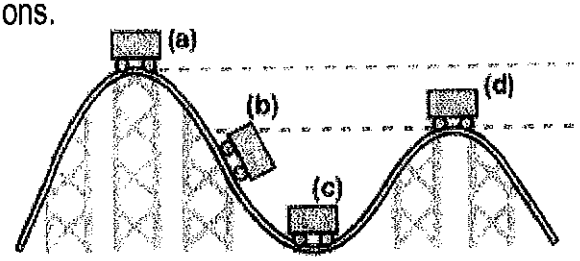
Kinetic Energy of Basketball = _____ Total Mechanical Energy of Basketball = _____

LS 5.5 Mastery:

LS 5.5: Explain the Law of Conservation of Energy, and describe how energy is transformed from PE to KE and vice versa.

1. The Law of Conservation of Energy states that energy cannot be _____ or _____, but it can be _____ from one kind of energy to another.

2. The below picture shows a roller coaster, with its car at many stages along the ride. Use this image to answer the below questions.

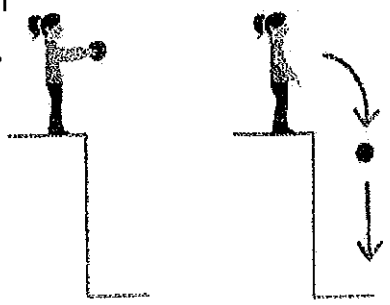


i. The cart traveling from position (a) to position (c) shows energy transforming_____
   a. From kinetic energy to gravitational potential energy
   b. From kinetic energy to elastic potential energy
   c. From gravitational potential energy to kinetic energy
   d. From elastic potential energy to kinetic energy

ii. If friction <u>does not</u> exists on the roller coaster, you would expect that ___
   a. The total mechanical energy at point (d) will be the same as at point (a)
   b. The total mechanical energy at point (d) will be more than at point (a)
   c. The total mechanical energy at point (d) will be less than at point (a)

iii. If friction <u>does</u> exist on the roller coaster, some of the kinetic energy of the car will be converted to
   a. Elastic Potential energy
   b. Chemical energy
   c. Electrical energy
   d. Thermal energy

3. The picture to the right shows a ball before and during a fall. Before the ball is dropped, it is not moving, but it has a gravitational potential energy of 180 J. During the fall, in the instant shown on the far right, the ball has only 75 J of gravitational potential energy. How much kinetic energy must the ball have at this exact moment?



Answer Key:

1.1:

1. Qualitative = the classroom is square shaped
   Quantitative = there are 25 stools in the classroom
2. Qualitative Property #1 = Color (ex: black, brown, red)
   Qualitative Property #2 = Texture (like whether something is smooth or rough)
   Quantitative Property #1 = Length (how long an object is)
   Quantitative Property #2 = Volume (how much space an object takes up)
3. D.

1.2:

1. *see drawings of states in notebook (liquid particles are touching, but filling the container. Gas particles are spread out all over container)*
2. a. they have a definite volume
   b. they take the shape of the container they are in.
3. The volume gets bigger as the gas particles spread out and the air expands to fill the room.

1.3:

1. mass = gram (g)
   Volume = cubic centimeter (cm^3) or milliliter (mL)
2. a. 64 cm^3
   b. 33.5 mL
   c. 3 mL
   d. 168 g
3. You could measure the mass of the bowl without the candy in it and subtract that mass from the mass of the bowl with the candy in it. This will give you the mass of just the candy.

1.4:

1. g/mL or g/cm^3
   Density = mass ÷ volume
2. a. 100 g ÷ 20 mL = 5 g/mL
   b. 100 g ÷ 200 mL = ½ g/mL
3. 3 g/mL = 150 g ÷ V
   V = 50 mL

1.5:

1. d=1.0 g/mL

2. a. Cat Toy, Plastic Bracelet
   b. It must have a density between 1.0 g/mL and 1.3 g/mL
3. The density becomes less. This is because gassesa and liquids with lower density "float" on top of those with higher density.

1.6:

1. i. B
   ii. A
2. i. d
   ii. c
   iii. c
3. Your weight would slightly increase. Because the mass of the earth is increasing, so is its gravitational pull. With more gravity on earth, you would weigh more.

2.1:

1. Degrees Celsius (°C), Degrees Fahrenheit (°F), or Kevin (K)
   We use °C in this class
2. i. b
   ii. b
   iii. b
3. Raise the temperature, or add more water (increasing the amount of total particles)

2.2:

1. d. Z
2. a. They vibrate in place
   b. solid
3. They would both become solid and all particle motion would stop completely. Scientists call this state absolute zero.

2.3:

1. a.
2. i. C
   ii. V
   iii. F
   iv. M
3. This is condensation. It happens when the water vapor particles in the air cool down as the night air gets colder. When they reach a certain temperature, these particles become a liquid and form drops of water.

2.4:

1. i. b

ii. c

iii. a

2. a. Conduction

b. Radiation

c. Convection

3. On the left, it is convection. On the upper right, it is conduction. On the bottom right, it is radiation.

2.5:

1. No, because they are not yet the same temperature.
2. i. c

ii. one arrow will show heat going from air into cup 1. The other arrow will show heat leaving cup 2 and going into the air.

3. The knofe will heat up until it reaches 100°C. This is the boiling point of water, so the water cannot get any hotter than this. Therefore the knife can not get any hotter than this either.

3.1:

1.

a. C

b. E

c. E

d. E

e. C

f. C

2. i. <u>Elements</u>, <u>Compounds</u>, <u>atoms</u>

ii. On the left, it is Sodium (Na) because it has 3 protons.

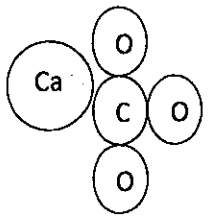
On the right, it is Carbon (C) because it has 6 protons.

3. a. Element

b. Molecule

3.2:

1. H_2O
2. a. 

and 

b. NH_3 and H_2SO_4

3. 96 protons

3.3:

1. i. c

ii. d

2. i. PS

M

M

PS

PS

M

ii. A

3. d.

3.4:

1. e

2. a. dissolve the citric acid in water and pour the mixture through a filter so that the sand is caught in the filter and the citric acid passes through.

b. evaporate the water

c. put the mixture water. The high density substance will sink and the low density substance will float. Then scrape off the low density substance.

3. put the mixture in a liquid whose density is between that of the two substances.

4.1:

1. Physical Change = c

Chemical Change = a

2. i. a. P

b. C

c. C

d. P

e. C

ii. light given off, change in temperature, color change, formation of a gas (bubbling), formation of a precipitate

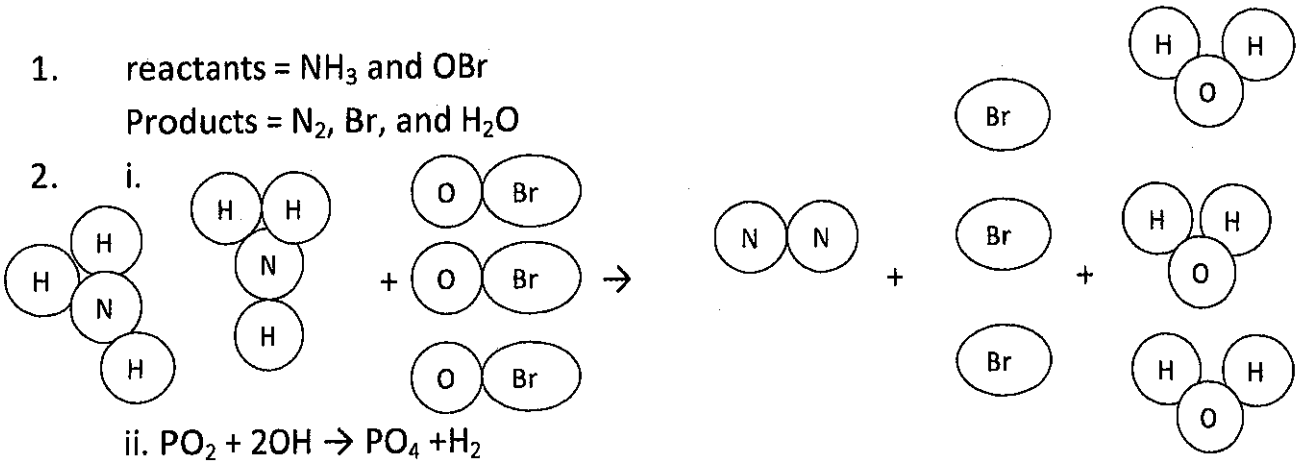
3. Vaporization – there are bubbles, but it is only a phases change so it is a physical change

4.2:

1. reactants = NH_3 and OBr

Products = N_2, Br, and H_2O

2. i.



ii. $PO_2 + 2OH \rightarrow PO_4 + H_2$

3. $4Al + 3O_2 \rightarrow 2Al_2O_3$

4.3:

1. d

2. e

3. Na_2O

4.4:

1. Created or Destroyed
2. a. NO_3
   b. 46 g
3. 60 g

5.1:

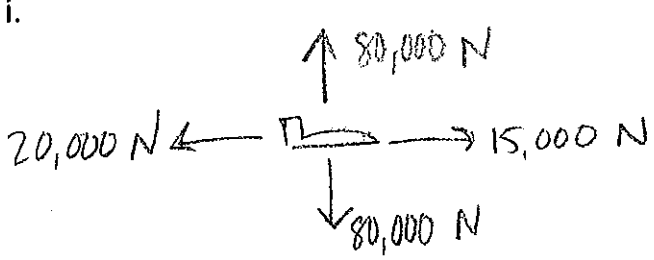
1. ` i. D
   ii. B
   iii. A
   iv. C
2. a. 56 m
   b. 8 m/s
3. *check answer with a peer*

5.2:

1. speed = distance ÷ time
2. a. 80 miles per hour
   b. 60 inches
   c. 10 seconds
3. 90 seconds

5.3:

1. Push or a Pull
   Newton
2. a. balanced
   b. unbalanced
   c. weight
   d. normal force
   e. air resistance
   f. net force
   g. friction
3. i.



   ii. 5,000 N to the left
   iii. the plane is slowing down.

5.4:

1. Joules

   a. height and mass

2. d.

   d.

3. $KE = .5 \times 2 \times 4^2 = 16$ J

   So Total Energy = 16 J + 18 J = 34 J

5.5:

1. Created, Destroyed, Transformed

2. i. c

   ii. a

   iii. d

3. 105 J