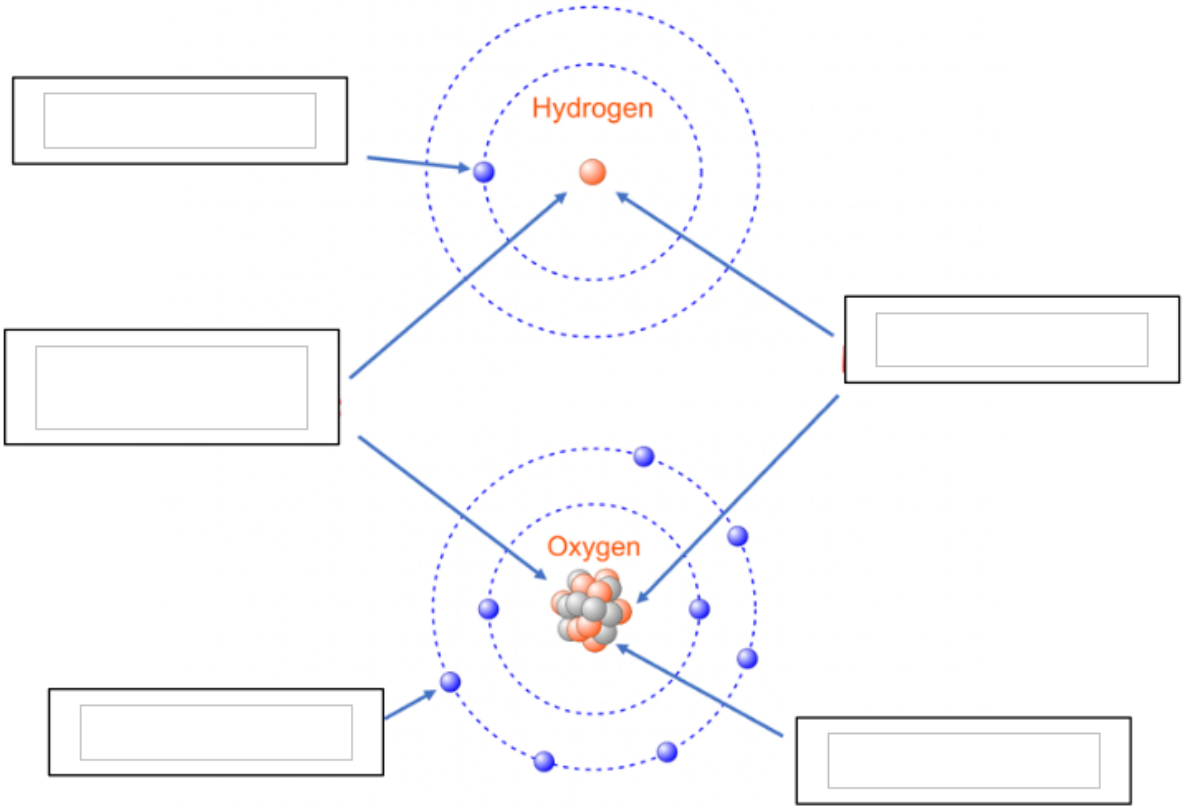
name:_____ period:_____ lesson 1.3: forces on matter

1 Lesson One

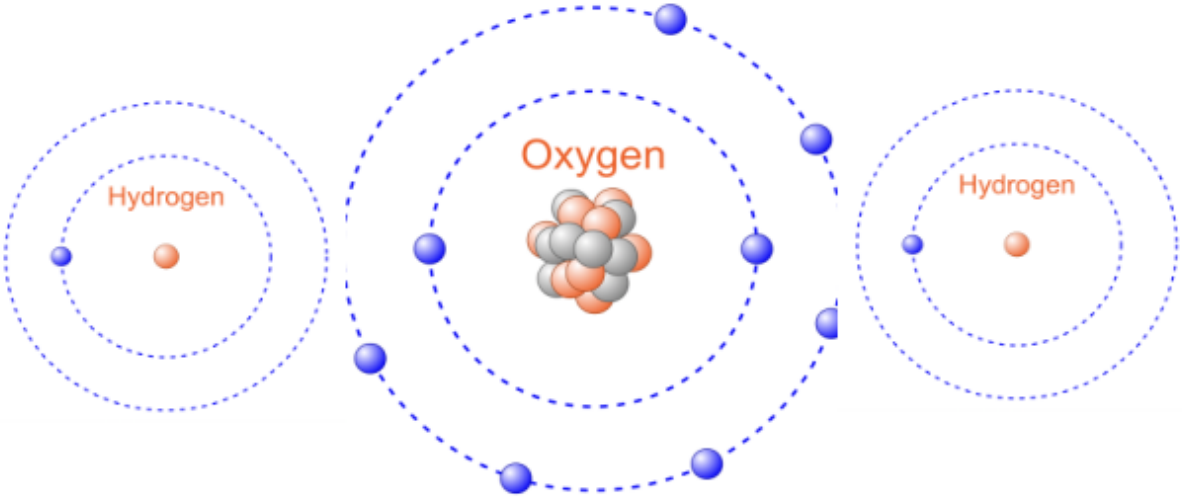
1.1 Composition of Matter

1. Matter is made of ___**atoms**___ that cannot be broken apart.
2. Atoms are mostly ___**empty**___ space, but inside atoms there are three kinds of particles:
   __**protons**__ and __**neutrons**__ are in the nucleus of the atom. __**electrons**__ are outside the nucleus.



1. The ___**mass**___ of an atom is almost all in the protons and neutrons in the nucleus.
2. Electrons have a very ___**small**___ mass.
3. The unit of mass is the __**kilogram**__.
4. Protons have a __**positive(+)**__ electric charge and electrons have a __**negative(-)**__ electric charge.

5. Neutrons have a __**neutral**__ charge
6. Two or more atoms attached together are a __**molecule**__.
7. The connections between atoms in a molecule are called **chemical bond**.
8. Example a molecule of water (H_2O) has __**two**__ hydrogen atoms and __**one**__ oxygen atom.



1. The dimensions of matter are described as __**length**__.
2. The unit of length is the __**meter**__ (m).
3. The flat surfaces of matter are described as surface __**area**__.
4. The unit of surface area is **square meter** (m^2).
5. The space matter occupies is described by its __**volume**__.
6. The unit of volume is **cubic meter** (m^3).

1.2 Volume, Mass and Density

1. The **density** of a material is defined as:
   $density = \frac{mass}{volume}$
2. If the density of a substance is **less** than the density of a liquid, the substance **float** on the liquid.
3. If the density of a substance is **greater** than the density of a liquid, the substance **sink** in the liquid.
4. Cell Phone

$$V = volume = 150\ cm^3$$
$$M = mass = 200\ g$$
$$Density_{phone} = \textbf{1.33 g/ml}$$

5. will the phone sink? **yes**
6. Pencil

$$V = volume = 10\ cm^3$$
$$M = mass = 7\ g$$
$$Density_{phone} = \textbf{0.7 g/ml}$$

7. will the pencil sink? **no**

Warm Up

1. What are the three particle that make up an atom? Which one is positive, negative, and neutral?

particle	charge

2. Draw a picture of a $^{4}_{2}$He atom. Label the nucleus, protons, neutrons and electrons.

1.3 Forces on Matter

3. A force is a _____or a _____on an object.

4. We draw a force with an arrow that shows the _____of the force.
5. There are two kinds of forces:
   (a) _____ force
   (b) _____ force

Gravitational Force

6. Gravity is a force on the _____of an object caused by the mass of _____object.
7. Gravity is always a _____force between two masses.
8. The gravitational force between two masses happens no matter how _____the masses are from each other.
9. The gravitational force gets _____when the masses get farther apart.
10. On Earth the gravitational force on objects is always _____.

Electromagnetic Force

11. The electromagnetic force is caused by the pushing and pulling between the electric charges of _____and _____in an object no matter how far apart they are.

12. The electromagnetic force gets _____when the electric charges are farther apart.

13. Two positive charges (protons) will _____(repel) each other away.

14. Two negative charges (electrons) will _____(repel) each other away.

15. A positive charge (proton) and a negative charge (electron) will pull (_____) each other.

Examples of Electromagnetic Force

16. _____electric charges (protons) in a metal can pull on (_____) negative electric charges (electrons) in a balloon.

17. The positive (protons) and negative (_____) electric charges in a magnet can either push the magnets apart (_____) or pull them together (attract).

18. The negative electric charges (electrons) in your hand _____on the negative electric charges (electrons) in an object that you touch.

19. When you stretch a rubber band the protons attract the electrons and _____back.

1.4 Temperature and Matter

20. Temperature measures the _____of the _____of atoms and _____in a material.

21. The modern metric system unit of temperature is degrees _____(°C) or degrees _____(°K).

22. Degrees Kelvin (°K) = degrees Celcius (°C) + _____°

23. The symbol for temperature is _____.

Phet Temperature Simulation

1. Click on the "States" box.

2. Click on "Water" in in the box in the upper right.

3. Use the "Heat" or "Cool" controls to add or remove energy from the water. Observe what happens to the water temperature and to the water molecules. Try using the "Cool" control to lower the temperature to 0 K.

4. Note that you can change the units of the temperature to either Celsius or Kelvin.

Answer the questions below

1. What happens to the molecules of matter when the temperature goes up?

2. What happens to the molecules of matter when the temperature goes down?

1.5 States of Matter

1. Matter has three states: _____, _____, and _____(vapor). We want to understand what determines which state matter is in.

2. In a material there are electromagnetic forces between molecules. These forces are called _____forces.

3. In solids the intermolecular forces are _____, so solids cannot change their shape or volume.

4. In liquids the intermolecular forces are moderately strong, so liquids can change their shape but not their _____.

5. In gasses the intermolecular forces are _____, so gasses can change their shape and volume.

6. When the temperature of matter increases, the molecules move _____and the intermolecular forces become weaker.

7. When the temperature of a solid increases the solid becomes a liquid by _____.

8. When the temperature of a liquid increases the liquid becomes a gas by _____or by evaporation.

9. When the temperature of a gas decreases the gas becomes a liquid by _____.

10. When the temperature of a liquid decreases the liquid becomes a solid by _____.

11. Solids can become gas without first becoming liquid. This is called _____. Dry ice is an example of sublimation.

12. A physical change in matter is when there is a change in the form of the matter but no chemical bonds are broken, so the molecules of the material stay the _____.

13. Melting, evaporation, boiling, condensation, and freezing are examples of _____changes.

14. Other examples of physical changes are: ∘ Adding food _____to cake batter ∘ _____a material into smaller pieces like slicing bread ∘ _____materials like in preparing cake batter ∘ _____an egg

15. What example of a physical change can you think of? Write your answer below.