1. **S 253 States of Matter**: Different physical forms in which a substance can exist.

Defining Features

* 1. Solid:
     1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. Liquid:
     1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. Gas:
     1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. 3 Things About Matter
   1. All matter is made of particles called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Particles attract each other; the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the attraction, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the particles get.
   3. Particles are constantly in motion and bumping into each other.
      1. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a substance is related to the speed at which its particles move.
      2. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a substance depends on how fast its particles move and how strong the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is between properties.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Solid | Liquid | Gas |
| Describe vibration or particle movement |  |  |  |
| Describe forces between particles |  |  |  |
| Diagram of particles |  |  |  |

1. **S 253: Changing States of Matter**
   1. Melting: from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      1. Melting Point is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. Cause of melting:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Freezing: from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      1. Freezing Point is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. Cause of freezing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Vaporization: from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      1. Boiling Point is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. Cause of vaporization/boiling: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Condensation: from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      1. Condensation Point: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. Cause of condensation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **S 255: Atoms**
   1. Atom is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      1. All matter is made up of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & all elements are made up of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are considered the building blocks of matter.
3. **S 256: Atomic Structure**
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ center area of an atom where these two particles are found:
      1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
         1. Positively charged particle
         2. An atom of an element is identified by the number of protons in its nucleus
            1. Example: at atom with 1 proton is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
            2. Example: at atom with 8 protons is \_\_\_\_\_\_\_\_\_\_\_\_\_\_
         3. **All atoms of the same element have the same number of protons.**
      2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
         1. No charge--electrically neutral
         2. All are identical.
         3. Some atoms have different numbers of neutrons.
            1. Atoms of the same element with different number of neutrons are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Electron Clouds
      1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are found outside the nucleus
         1. Negatively charged particle
         2. The number and arrangement of electrons determine its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Electrons travel around the nucleus in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ paths in areas called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ determine the electron’s average distance from the nucleus
   5. The charge of an electron is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in size but \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in sign from a proton.
   6. Electrons and protons exert \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrical forces on one another.
      1. These forces hold electrons to the atom.
4. **S257 Atomic Size**
   1. Protons and neutrons have about the same mass.
      1. Most of the mass of an atom is in the nucleus
   2. Electrons have a much smaller mass; about 1/2000 the mass of a proton or neutron
5. **S258 Evolution of Atomic Theory**
   1. **Democritus**: Greek philosopher proposed existence in **440 B.C.**
   2. **John Dalton, early 1800s**
      1. Proposed all substances were made of \_\_\_\_\_\_\_\_\_\_\_\_
      2. Small, hard, dense spheres that could not be created, destroyed, or changed.
   3. **J.J. Thomson, 1898**
      1. Proposed that atoms were made of smaller particles
      2. Discovered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged particles
         1. Theorized these were spread \_\_\_\_\_\_\_\_\_\_\_\_\_\_ throughout positively charged material
         2. “Plum-Pudding” model
   4. **Ernest Rutherford, 1911**
      1. Proposed that atoms had a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, positively charged \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ surrounded by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   5. **Neils Bohr, 1913**
      1. Electrons revolved around the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in circular paths called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. Electrons could only exist in certain \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.
   6. **Current Model 1920: Electron Cloud Model**
      1. Electrons surround the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. Electrons do not travel in specific paths but in regions of various thicknesses called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

***Make and label a sketch of each type of model.***