

Exercises for Unit 3: Matter

Lesson 1: Atoms and Density Exercises

1. What is the smallest stable building block of matter?

6. Where have almost all atoms come from?

2. When you go swimming, what are you moving through?

7. What five elements are in all living things?

3. What are three particles inside an atom?

8. True or false: Matter is made of hard, tightly packed, little particles.

4. What makes one atom different from another?

9. What do you call a bunch of atoms stuck together?

About Electrons:

1. How do electrons move?

5. What is an element?

2. Do electrons just go all over the place in an atom?

7. How many shells does a sodium atom have? Sodium has 11 electrons.

3. What is a shell?

8. Why do atoms come together to form molecules?

4. How many shells can an atom have?

About Density:

1. What is density?

5. What determines how many shells an atom has?

2. Which is denser, a one pound can of beans or a one pound loaf of bread?

6. How many electrons can be in the third shell of an atom?

3. Which is denser, a gallon of water that weighs 8 lbs. or a gallon of gasoline that weighs 6 lbs.?

4. Which is denser, a school bus filled with children or an empty school bus?

Lesson 2: Solids Exercises

1. What is the lowest energy form of matter found naturally?

4. If I bend a pencil so far that it breaks, what have I done to it?

2. What is the highest energy form of matter?

5. I love to play with paper clips. However, by the time I'm done with them they are all bent out of shape. (Paper clips run when they see me coming!) How can you explain that using a term from this lesson?

3. Why do many solids form crystals?

6. Why do crystals tend to break along specific lines?

Answers to Atoms and Density Exercises

About Atoms

1. The atom.
2. Billions and billions of atoms.
3. Neutron, proton (in the nucleus), and electron.
4. The number of particles inside the atom. Atoms are made of identical stuff. It's the number of particles (neutrons, protons, and electrons) that make atoms have different characteristics.
5. Elements are specific kinds of atoms. Each element (each specific atom) has a different behavior from every other element.
6. Exploded stars.
7. Carbon, hydrogen, oxygen, nitrogen, calcium: CHONC.
8. False. Matter is made of atoms that have incredible distances between their incredibly tiny bits of matter.
9. A molecule.

About Electrons

1. They pop in and out of existence.
2. No. They tend to stay a certain distance away from the nucleus.
3. A shell is the distance that electrons tend to stay in as they pop around the nucleus.
4. Up to seven.
5. The number of electrons an atom has.
6. 18. Remember $2n^2$. So $2 \times 3^2 = 18$.

7. Two atoms fill the first shell, 8 fill the second, and 1 is left in the third. So sodium has 3 shells.

8. Because they are "unsatisfied". They have too many or not enough electrons in their outer shell.

About Density

1. Density is a measurement of how heavy something is and how much space it takes up. In other words, it is a measurement of its mass and its volume.

2. The beans are denser since they have less volume (the can of beans is smaller than the loaf of bread).

3. Believe it or not, gasoline is less dense than water.

4. A full school bus. Both have the same volume but the full one will have more mass.

Answers to Solids Exercises

1. Solids. Remember BEC is only found in science labs.
2. Plasma.
3. The molecules are pulled so tightly together that they tend to fall into specific patterns.
4. I have bent it beyond its tension and/or compression point.
5. I have bent the paper clip beyond its point of elasticity so it no longer snaps back to its original shape.
6. Crystals break along cleavage lines which are there due to the way the molecules lined up when the crystal formed.