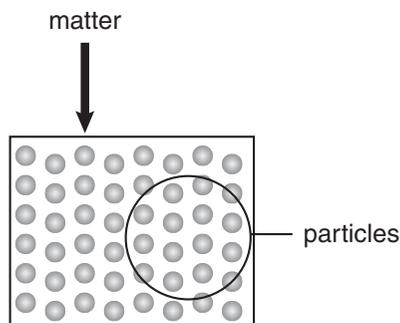


SUGGESTED ANSWERS

WHAT DO YOU REMEMBER?

- Matter is anything that has mass and takes up space.
- (a) The five main points of the particle theory are:
 - all matter consists of tiny particles;
 - there are empty spaces between particles;
 - particles move continuously in random directions;
 - heating particles increases their speed and the distance between them;
 - since particles attract each other, they tend to stay together.
- (b) All matter consists of tiny particles. A sample diagram is shown below:



- (a) The three states of matter are solids, liquids, and gases. All are composed of particles that are attracted to each other. The particles in a solid are not moving fast enough to overcome this attraction so solids have definite shapes and volumes. The particles in a liquid are moving fast enough to partly overcome this attraction, but not fast enough to completely escape the pull of the other particles. So liquids take the shape of their containers, but have a definite volume. The particles in a gas are moving very quickly and easily overcome this attraction; thus, gases do not have definite volumes or shapes.

(b) Sample answer: Water particles form ice when solid, water when liquid, and water vapour when gas.
- The particles of a solid are strongly attracted to each other. Consequently, they vibrate but cannot move; this holds solids together in definite shapes and volumes. The particles of a gas are much less attracted to each other. Consequently, they move quickly, so that gases take the shapes and volumes of their containers.
- (a) A pure substance contains only one kind of particle.

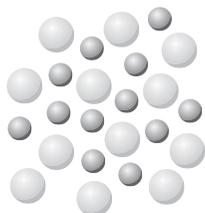
(b) A mixture contains two or more different kinds of particles.
- A sample picture is shown below:



(a) pure substance

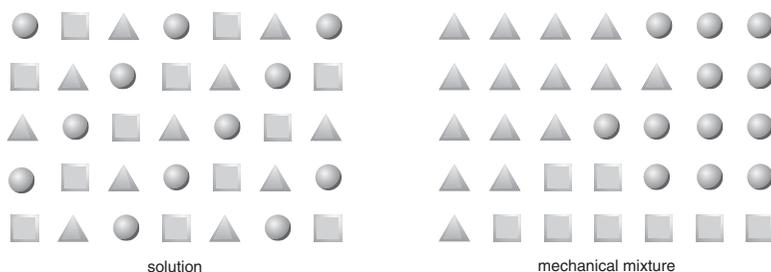


pure substance



(b) mixture

7. Although it looks like a pure substance, clear apple juice is a mixture. It is made up of different kinds of particles, including water, sugar, and various vitamins.
8. Because tap water contains small amounts of various minerals and chemicals in addition to water particles, tap water is a mixture.
9. (a) Mechanical mixtures are mixtures in which the various types of materials in the mixture are visible.
(b) The various kinds of particles in a solution are evenly mixed together. Consequently, solutions have a uniform appearance very similar to that of pure substances.
10. (a) A fruit salad is a mechanical mixture.
(b) Clear liquid hand soap is a solution.
(c) Oil-and-vinegar salad dressing is a mechanical mixture.
11. Sample answer: Two solutions that you can drink are milk and tea.
12. The particles in a mechanical mixture do not mix uniformly together. Because there are so many identical particles clumped together, each type of matter is visible. In a solution, the particles mix uniformly together. Each individual particle is too small to see, so the solution takes on a uniform appearance.
13. Sample pictures are shown below:



14. Sample answer: A piece of wood, a salad, and my body are all made up of tiny particles. There are many different kinds of particles in each of these three things. Since these different kinds of particles are not mixed uniformly together, we can see the different kinds of matter that make up the wood (i.e., bark, knots), the salad (i.e., lettuce, tomatoes), and my body (i.e., hair, fingers, eyes).

WHAT DO YOU UNDERSTAND?

15. The copper wire and table sugar are pure substances. Fruit salad is a mechanical mixture. Iced tea and seawater are solutions. Salad dressing may be a mechanical mixture or a solution, depending on whether you can see the different ingredients.
16. It was hotter outside, since the balloon got bigger outside. Heat causes particles to move more quickly and to travel greater distances. The heated particles inside the balloon pushed with greater force against the balloon, causing it to expand.
17. No, the particles do not change to different types of particles. The difference is that they are moving more quickly, which causes them to break the bonds holding them in solid form.
18. Pedro is correct. Since you can see the pulp in the orange juice, it is considered a mechanical mixture.
19. No, you cannot tell the difference between pure substances and solutions by looking at them. The particles in a solution are mixed uniformly together; consequently, no single kind of particle stands out and the solution takes on a uniform appearance, as though it were composed of a single kind of particle.
20. The dough will be a mechanical mixture. Since the solid peas and onions will not dissolve in the oil mixture, Madur will see them as distinct chunks in the dough.
21. (a) The unopened ginger ale is a solution. It possesses a clear, uniform appearance.
(b) Once the ginger ale begins to fizz, it becomes a mechanical mixture. The fizz results from the carbon dioxide that had been dissolved in the water escaping to the surface as bubbles.

22. Ken made a solution. The salt particles have dissolved completely in the water, creating a uniform mixture that appears indistinguishable from pure water.
23. Sample answer: I agree with Deepa. A solution can have many different kinds of particles. The only requirement is that they mix evenly together, giving the result a uniform appearance.
24. Sample answer: I agree with Lakisha. A mechanical mixture is defined as a mixture containing different parts that you can see. These parts can be solids, liquids, gases, or any combination thereof. For instance, cookie batter contains both solids such as chocolate chips and liquids such as melted butter.

SOLVE A PROBLEM!

25. (a) Sample answer: The white solid could be the residue of the minerals and other particles that were dissolved in the tap water. When the tap water was heated, these particles might have come out of solution and attached to the inside of the kettle, where they hardened as the kettle cooled.
- (b) Sample answer: Jayzee could boil distilled or filtered water for her tea. If she continues to use unfiltered tap water, simply washing the inside of the kettle after each use could be effective.

CREATE AND EVALUATE!

26. Sample answer:

Wherever there is matter, there are particles too
 Tiny, fast, and zooming around you
 Attracted to each other—in solids they're tight
 In liquids and in gases they move quicker than light
 Heat 'em up to speed 'em up, cool 'em to slow
 These particles in motion really make the world go.

Sample answer: I covered most of the five main ideas in the particle theory, although certain crucial details got left out, such as that particles have empty spaces between them or that particles move randomly. Also, nothing in the known physical universe moves faster than the speed of light.

REFLECT ON YOUR LEARNING

27. (a) Sample answer: I find the idea of pure substances easiest to understand because pure substances are the simplest—there is only kind of particle to imagine.
- (b) Sample answer: I find solutions to be most difficult to understand. I don't quite understand how particles can be too small to see by themselves, but when lots of different particles mix evenly together, they all look alike.
- (c) Sample answer: Maybe the key is to realize that the particles don't "all look alike." Instead, they blend together, almost like the colours blue and yellow blend together to form green. The colour green looks like a single colour (or pure substance), but it is actually a blend of two colours (or a solution).
28. (a) Sample answer: Matter can be classified in different ways. One way is to divide it according to the variety of particles found in it: pure substances contain only one kind of particle, while mixtures contain more than one kind of particle. Mixtures can further be divided based on whether the particles mix uniformly together (as in solutions), or whether the particles remain clumped together in distinct, visible groups (as in mechanical mixtures). Matter can also be classified according to the speed at which the particles move and the spaces between them. In solids, the closely packed particles vibrate but do not move, giving solids definite shapes and volumes. In liquids, the particles are still close together but they do move, giving liquids definite volumes but indefinite shapes. Gases have indefinite shapes and volumes because their fast-moving particles are far apart from each other.
- (b) Sample answer: Why does heating particles speed them up?
 Why do some particles mix uniformly together but others do not?