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Chapter 1 : How does heat energy affect the movement of water molecules? | Socratic

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What are the Main Properties of Water? This article will discuss the five main properties of water: Its attraction to polar molecules High-specific heat The lower density of ice High polarity 1. The hydrogen bonds in water hold other water molecules together. Liquid water has surface tension. This allows for insects, such as Water Striders, to walk on water. Water is a liquid at moderate temperatures, and not a gas. Water is adhesive to any molecule it can form hydrogen bonds with. High-specific heat is the amount of energy that is absorbed or lost by one gram of a substance to change the temperature by 1 degree celsius. Water molecules form a lot of hydrogen bonds between one another. In turn, a lot of energy is needed to break down those bonds. Breaking the bonds allows individual water molecules to move freely about and have a higher temperature. The hydrogen bonds between water molecules absorb the heat when they break and release heat when they form, which minimizes temperature changes. Water helps maintain a moderate temperature of organisms and environments. Water takes a long time to heat up, and holds its temperature longer when heat is not applied. Water also needs a lot of energy in order to break down the hydrogen bonds. The evaporation of water off a surface causes a cooling effect. Much like among humansâ€”when we get hot, or energy inside our body is breaking chemical bonds, we sweat as a cooling effect. In this case, the same process occurs: The Lower Density of Ice At cooler temperatures, the hydrogen bonds of water molecules form ice crystals. The hydrogen bonds are more stable and will maintain its crystal-like shape. Iceâ€”the solid form of waterâ€”is less dense than water because of the hydrogen bonds being spaced out and being relatively apart. The low density is what allows icebergs to float and are the reason that only the top part of lakes are frozen. Water can form hydrogen bonds, which make it a powerful solvent. Water molecules are attracted to other molecules that contain a full charge, like an ion, a partial charge, or polar.

Chapter 2 : Temperature Changes Everything - Science NetLinks

Faster movement Heat energy transforms in to kinetic energy in water molecules, thus water molecules vibrate more/move faster (in a sense).

The Universe is made up of matter and energy. Matter is made up of atoms and molecules groupings of atoms and energy causes the atoms and molecules to always be in motion - either bumping into each other or vibrating back and forth. The motion of atoms and molecules creates a form of energy called heat or thermal energy which is present in all matter. Even in the coldest voids of space, matter still has a very small but still measurable amount of heat energy. Energy can take on many forms and can change from one form to another. Many different types of energy can be converted into heat energy. Light, electrical, mechanical, chemical, nuclear, sound and thermal energy itself can each cause a substance to heat up by increasing the speed of its molecules. So, put energy into a system and it heats up, take energy away and it cools. For example, when we are cold, we can jump up and down to get warmer. Here are just a few examples of various types of energy being converted into thermal energy heat. To see a demonstration of how this happens click here A thermal infrared image of a ball before left and after right being bounced. When you heat up a pan of water, the heat from the stove causes the molecules in the pan to vibrate faster causing the pan to heat up. The heat from the pan causes water molecules to move faster and heat up. So, when you heat something up, you are just making its molecules move faster. A thermal infrared image of a hair dryer and a flourescent light bulb. For example when you rub your hands, sharpen a pencil, make a skid mark with your bike, or use the brakes on your car, friction generates heat. A thermal infrared image of a pencil after being sharpened left and of hot brakes in a car right. Notice the hot tip of the pencil. There are many other examples. Can you think of some more? The more energy that goes into a system, the more active its molecules are. The faster molecules move, the more heat or thermal energy they create. So, the amount of heat a substance has is determined by how fast its molecules are moving, which in turn depends on how much energy is put into it. Let students pretend to be molecules. First have them stand still and close together. Then have the students wiggle and then walk and move around to demonstrate more energy entering the system. Have them move faster and jump up and down as even more energy enters the system. Then have the students stop and notice where they are. They should be much farther apart and should feel much warmer than they were originally. Although molecules are too small to see, we can detect and measure their movement. To do this experiment you will need 2 clear bowls and food color. Fill one clear bowl with hot water and another with the same amount of cold water. When the water is still, put a drop of food color into the center of each bowl. As the water molecules bump into the food color molecules, the food color will move around. Since the hot water molecules are moving faster, they will bump into the food color harder and more frequently causing it to spread more quickly than the food color in the cold water. Heat is the energy an object has because of the movement of its atoms and molecules which are continuously jiggling and moving around, hitting each other and other objects. When we add energy to an object, its atoms and molecules move faster increasing its energy of motion or heat. Even objects which are very cold have some heat energy because their atoms are still moving.

Chapter 3 : Properties of water - Wikipedia

Heat, temperature and the motion of molecules are all related. Temperature is a measure of the average kinetic energy of the molecules in a material. Heat is the energy transferred between materials that have different temperatures.

Some water molecules have enough energy to overcome the attractions keeping them together. These molecules break away to become the gas, water vapor. This process is evaporation. Some molecules of water vapor contact the liquid water and are attracted by the molecules in the liquid. These water vapor molecules can form associations with other molecules in the liquid and join the liquid water. This process is condensation. This video appears courtesy of Roy Tasker. Temperature is a measure related to the motion of the atoms, ions, or molecules of a substance. Temperature can be measured with a thermometer. Heat is the energy transferred from one substance or object to another. Adding or removing heat energy increases or decreases the motion of molecules, resulting in a higher or lower temperature. Heat is always transferred from the warmer substance to the cooler one based on the temperature difference between them. An example When you place a drop of room temperature water on your hand, the heat energy will move from your hand into the water. The temperature of the water will increase while the temperature of that part of your hand will decrease. Your brain will register that your hand feels cooler. Summary Matter exists in three states or phases: A combination of the motion of molecules and their attraction for one another determines whether a substance is a solid, liquid, or gas. Adding heat energy increases the motion of molecules. Removing heat energy, or cooling, decreases the motion of molecules. If heat is added to a solid, the molecules can move fast enough to change from a solid to a liquid. Melting If heat is added to a liquid, the molecules can move fast enough to change from a liquid to a gas. Evaporation If heat is removed from a gas, the molecules can slow down enough to change from a gas to a liquid. Condensation If heat is removed from a liquid, the molecules can slow down enough to change from a liquid to a solid. Freezing Heat always moves from an object at a higher temperature to an object at a lower temperature. Molecular Animation Downloads The animations featured in the slideshow above are available for download by clicking on the "Download this animation" link below each file. Each video is offered for download in both Quicktime Movie. To play these videos, you will need either Quicktime or Windows Media Player.

Chapter 4 : Motion of Molecules (grades)

In fact, heat is kinetic energy, the kinetic energy of molecules.1 Your hands feel warmer because, after rubbing, the molecules are shaking back and forth faster 1 Molecules are collections of atoms stuck to each other; an example is O.

Mass of the object remains the same, however. Solids, liquids and gases all expand when heat is added. When heat leaves all substances, the molecules vibrate slower. The atoms can get closer which results in the matter contracting. Again, the mass is not changed. Liquid at Different Temperatures Solids: Sidewalks, bridges, telephone lines, railroad tracks, and other countless objects all expand on a hot summer day. They contract when they lose their heat. In the picture to the left, some workers are trying to reconnect two rails that have separated due to the extreme cold. To fix the problem, the workers have lit an oil-soaked rope that lies next to the track. The heat of the fire will cause the tracks to expand so that they can be reconnected once again. Liquids expand when heated and they contract when cooled. Think about mercury in a thermometer! Ice however, expands when it freezes. As the water molecules lose heat, they vibrate less, and are able to form geometric patterns that take up more space. As the volume of ice increases, the density of ice decreases and the ice floats. Gases expand when heated and contract when cooled. For instance, a balloon will expand if it is left in a hot car. It will get smaller if it is put in the refrigerator. Students have difficulty understanding that molecules are constantly moving in all states of matter. Many students accept the fact that molecules are moving in liquid water because they can see water flow. However, these students have difficulty believing that the molecules in ice are also moving. Nevertheless, molecules are always moving, even in substances such as ice where no motion of the substance is visible.

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Chapter 5 : Hydrogen bonds in water (article) | Khan Academy

Air molecules vibrate and bump against each other when heated. The molecules take up more space during these motions, causing air to expand. Because the molecules occupy a larger or same-size space with increased pressure, the air becomes lighter, or less dense.

Heat is not temperature. Often the concepts of heat and temperature are thought to be the same, but they are not. More heat, more temperature - they must be the same, right? Turns out, though, this is not true. Initial Definitions Temperature is a number. That number is related to energy, but it is not energy itself. Temperature is a number that is related to the average kinetic energy of the molecules of a substance. Read that last sentence carefully. It does not say that temperature is kinetic energy, nor does it state exactly what is the relation between temperature and kinetic energy. Here is the relation: If temperature is measured in Kelvin degrees, then the value of temperature is directly proportional to the average kinetic energy of the molecules of a substance. Note that temperature is not energy, it is a number proportional to a type of energy. Heat, on the other hand, is actual energy measured in Joules or other energy units. Heat is a measurement of some of the energy in a substance. When you add heat to a substance, you are adding energy to the substance. This added heat energy is usually expressed as an increase in the kinetic energies of the molecules of the substance. Again, About Temperature So, temperature is not energy. It is, though, a number that relates to a type of energy possessed by the molecules of a substance. Temperature directly relates to the kinetic energy of the molecules. Temperature can be measured in a variety of units. If you measure it in degrees Kelvin, then the temperature value is directly proportional to the average kinetic energy of the molecules in the substance. Notice we did not say that temperature is the kinetic energy. We said it is a number, if in degrees Kelvin, that is proportional to the average kinetic energy of the molecules of a substance. That means if you double the Kelvin temperature of a substance, you double the average kinetic energy of its molecules. When the average kinetic energy of the molecules goes up a rise in temperature , the average speed of the molecules increases. And lower average kinetic energy of the molecules means they have lower speed. However, a change in average kinetic energy is not directly proportional to a change in average speed. When you add heat to a substance, you are adding energy. When heat energy goes into a substance one of two things can happen: The substance can experience a rise in temperature. The heat the added energy can be realized as an increase in the average kinetic energy of the molecules. The molecules now, on average, have more kinetic energy. This increase in average kinetic energy is registered as a number called temperature that changes proportionally with it. Note that this increase in the average kinetic energy of the molecules means that they will now, on average, be traveling faster than before the heat arrived. The substance can change state or phase. For example, if the substance is ice, it can melt into water. Perhaps surprisingly, this change does not cause a rise in temperature. At the exact moment before melting, the average kinetic energy of the ice molecules is the same as the average kinetic energy of the water molecules at the exact moment after melting. That is, the melting ice and the just melted water are at the same temperature. Although heat energy is absorbed by this change of state, the absorbed energy is not used to change the average kinetic energy of the molecules, and thus proportionally change the temperature. The energy is used to change the bonding between the molecules. Changing the manner in which the molecules bond to one another can require an absorption of energy heat as in the case of melting, or require a release of energy heat as in the case of freezing. So, when heat comes into a substance, energy comes into a substance. That energy can be used to increase the kinetic energy of the molecules, which means an increase in their temperature which means an increase in their speed. Or at certain temperatures the added heat could be used to break the bonds between the molecules causing a change in state that is not accompanied by a change in temperature.

Chapter 6 : What is heat? Simple science - Chemistry | calendrierdelascience.com Study Guides

The heat from the pan causes water molecules to move faster and heat up. So, when you heat something up, you are just making its molecules move faster. (3) Electrical energy is converted into thermal energy when you use objects such as heating pads, electrical stove elements, toasters, hair dryers, or light bulbs.

These are limited to one typographic line of symbols, which may include subscripts and superscripts. Molecules with the same atoms in different arrangements are called isomers. Also carbohydrates, for example, have the same ratio carbon: The molecular formula reflects the exact number of atoms that compose the molecule and so characterizes different molecules. However different isomers can have the same atomic composition while being different molecules. The empirical formula is often the same as the molecular formula but not always. For example, the molecule acetylene has molecular formula C_2H_2, but the simplest integer ratio of elements is CH. For network solids , the term formula unit is used in stoichiometric calculations. Structural formula 3D left and center and 2D right representations of the terpenoid molecule atisane For molecules with a complicated 3-dimensional structure, especially involving atoms bonded to four different substituents, a simple molecular formula or even semi-structural chemical formula may not be enough to completely specify the molecule. In this case, a graphical type of formula called a structural formula may be needed. Structural formulas may in turn be represented with a one-dimensional chemical name, but such chemical nomenclature requires many words and terms which are not part of chemical formulas. Molecular geometry Structure and STM image of a "cyanostar" dendrimer molecule. A pure substance is composed of molecules with the same average geometrical structure. The chemical formula and the structure of a molecule are the two important factors that determine its properties, particularly its reactivity. Isomers share a chemical formula but normally have very different properties because of their different structures. Stereoisomers , a particular type of isomer, may have very similar physico-chemical properties and at the same time different biochemical activities. Spectroscopy Hydrogen can be removed from individual H_2TPP molecules by applying excess voltage to the tip of a scanning tunneling microscope STM, a ; this removal alters the current-voltage I-V curves of TPP molecules, measured using the same STM tip, from diode like red curve in b to resistor like green curve. While scanning image d , excess voltage was applied to H_2TPP at the black dot, which instantly removed hydrogen, as shown in the bottom part of d and in the rescan image e. Such manipulations can be used in single-molecule electronics. Microwave spectroscopy commonly measures changes in the rotation of molecules, and can be used to identify molecules in outer space. Infrared spectroscopy measures changes in vibration of molecules, including stretching, bending or twisting motions. It is commonly used to identify the kinds of bonds or functional groups in molecules. Changes in the arrangements of electrons yield absorption or emission lines in ultraviolet, visible or near infrared light, and result in colour. Nuclear resonance spectroscopy actually measures the environment of particular nuclei in the molecule, and can be used to characterise the numbers of atoms in different positions in a molecule. Theoretical aspects[edit] The study of molecules by molecular physics and theoretical chemistry is largely based on quantum mechanics and is essential for the understanding of the chemical bond. With the development of fast digital computers, approximate solutions for more complicated molecules became possible and are one of the main aspects of computational chemistry. When trying to define rigorously whether an arrangement of atoms is sufficiently stable to be considered a molecule, IUPAC suggests that it "must correspond to a depression on the potential energy surface that is deep enough to confine at least one vibrational state". In fact, it includes weakly bound species that would not traditionally be considered molecules, such as the helium dimer , He_2 , which has one vibrational bound state [25] and is so loosely bound that it is only likely to be observed at very low temperatures. Whether or not an arrangement of atoms is sufficiently stable to be considered a molecule is inherently an operational definition.

Chapter 7 : How atoms are affected by heat

The heat (energy) could be used to change the bonding between the molecules rather than be used to speed up the molecules. This would be a situation where heat goes into a substance, and the temperature does not rise, as when ice melts or water boils.

Click this button to see the computer code for the above animation. The program will then work as per your changes. Of course, your changes, especially random changes, can introduce errors, miscalculations, and browser crashes. The intention here is to conveniently show the inner workings of this program so that you understand how the diagram is drawn. Can you figure out how to change things so that the molecules move at a different speed? Compare their speeds carefully. The ones on the right are faster. These are faster by a factor of the square root of two, 1. This makes the average kinetic energy of these molecules to be twice that of those to the right, since the kinetic energy of a body is proportional to the square of the speed of the body. Consequently, this right container represents a gas at twice the Kelvin temperature than the gas in the container on the left. The area of the right container higher temperature is twice as large as the area of the left container lower container so that the pressure of the gas is properly simulated as being equal in both. This allows us to properly visualize the effect of a temperature change on the speed of gas molecules without concerns about other effects due to pressure changes. What you should notice in the right container is that the higher temperature is tied to a higher average speed. This results in the molecules having a higher average kinetic energy. In the right container there is an increase in the kinetic energies of the molecules due to an input of heat. Why are those molecules on the right going faster than those on the left? Well, we could imagine that they were once going the same speed as those on the left and then they received an input of heat energy. After the heat input, they move faster. Heat, as stated earlier, is energy. If the kinetic energies of the molecules go up, then the heat energy within the gas has gone up. Therefore, we see an input of heat can cause an increase in temperature because the input of heat is realized as an increase in the kinetic energies of the gas molecules. When the average kinetic energy of the gas molecules goes up, the temperature goes up. An input of heat is not always accompanied by an increase in temperature, however. That is very important to understand. The heat energy could be used to change the bonding between the molecules rather than be used to speed up the molecules. This would be a situation where heat goes into a substance, and the temperature does not rise, as when ice melts or water boils. In these cases the increase in heat energy is used to change bonding between the molecules rather than change their kinetic energies.

Chapter 8 : 5 Properties of Water | Owlcation

Heat energy is the result of the movement of tiny particles called atoms, molecules or ions in solids, liquids and gases. Heat energy can be transferred from one object to another. The transfer or flow due to the difference in temperature between the two objects is called heat.

Balance Transfer of heat to water kettle, 13 December Context One of the most important concepts for students to understand is that temperature affects the motion of molecules. As air is warmed, the energy from the heat causes the molecules of air to move faster and farther apart. Some students may have difficulty with this concept because they lack an appreciation of the very small size of particles or may attribute macroscopic properties to particles. Students might also believe that there must be something in the space between particles. Finally, students may have difficulty in appreciating the intrinsic motion of particles in solids, liquids, and gases; and have problems in conceptualizing forces between particles Benchmarks for Science Literacy, p. In order to clarify student thinking about molecules and their relationship to temperature, instruction has to make the molecular world understandable to students. The primary purpose of these activities is to introduce the students to the concept that temperature causes molecules and atoms to move faster and farther apart, which in turn causes the change from solid to liquid, and liquid to gas. Students need to come to this activity with the knowledge that some solids turn into liquids when heated. They also need to understand the observable differences between a solid and a liquid. In "The Balloon and the Bottle," students experience the effects of increased temperature on air inside a balloon. As the air contained inside the balloon begins to warm, the molecules begin to strike the sides of the balloon harder and more often. This increases the air pressure and causes the balloon to expand. This activity also provides an opportunity to reinforce concepts related to the conservation of matter. Measuring the weight of the bottle, balloon, and water at room temperature, after heating and after cooling, may help students dispel this misconception. If the balloon is not broken, the weight should stay the same. Research also states that many students can understand qualitatively that matter is conserved in transforming from solid to liquid. They also start to understand that matter is quantitatively conserved in transforming from solid or liquid to gas - if the gas is visible. Benchmarks for Science Literacy, p. Motivation Before you start the activity, students need to understand the difference between particles in a gas, liquid, and a solid. Here they will see how the characteristics of solids, liquids, and gases can be explained by particle motion. Discuss what happens at both the observable and molecular level in these scenarios: Water is placed in the freezer. Use the following demonstration to begin a discussion of the effect of temperature on particle movement. Blow up a balloon, and then aim a hair dryer on low setting at the balloon, and watch it rise. What happens when I blow hot air on the balloon? What is happening to the air inside the balloon? What do you think would happen if the balloon was placed in a cold car? What would happen to the balloon as the temperature increases in the car? Ask the students to think about what might happen to a balloon in a bottle when it is heated. Development The Balloon and the Bottle Give each student a copy of the Balloon and the Bottle student sheet, which includes questions and procedures. Briefly review the procedure with students: Pour about 15 ml. Weigh the bottle, water, and balloon using the balance. Record the weight on the data table. Stretch the open balloon over the top of the bottle. Heat the bottle until the water boils vigorously. Write down your observations of the water and the balloon on the data table. Using an oven mitt, place the bottle with balloon on the balance. Allow the bottle to cool. Write down observations of the balloon and the bottle. Weigh the bottle and the balloon. Record information on the data table. After students understand the procedure, ask them to make these predictions: After students have completed the activity, ask them to record their answers to these questions on the student worksheet: Compare your observations to your predictions. Were your predictions correct? Did anything surprise you during the experiment? If so, describe it. What do you think caused the balloon to expand? Why do you think the balloon was sucked into the bottle? What did you observe inside the bottle as it cooled? How did this experiment demonstrate water changing from liquid to gas? What would have happened if the bottle were placed in the freezer? Assessment In this assessment activity, students will illustrate in a cartoon scene the idea of how temperature affects the motion of molecules. Students should present their cartoon to the class and explain how it relates to the idea of temperature affecting the motion of molecules and states of matter. Students should be assessed on how well their cartoons convey the following scientific ideas: How heating and cooling affects the movement of particles. How states of matter may change with heating and cooling. Give the students these instructions: You are a cartoonist. Your task is to create a cartoon scenario illustrating the effect of temperature on the movement of molecules in a solid, liquid, or a gas. You will use your cartoon to teach your classmates about the movement of molecules in the different states of matter and how an increase or decrease in temperature affects them. Extensions Go to Full of Hot Air! This activity allows the students to find out what happens when you heat a gas and cool it down. Have them compare the results of this activity to those of "Balloon in a Bottle. They could also find out about real life illustrations of how temperature affects everything. This would be a good opportunity to help students learn how to do a guided Web search at home or in school. Kinetic Cards The purpose of this activity is to allow students the opportunity to review new concepts and terminology related to states of matter. This would be a great way for students to review for tests. Generate words, phrases, or drawings that come to mind when they think of: States of Matter and Temperature Work in small groups to share ideas and group them into categories. Observe and analyze the work of other groups. One student stays behind at the table to answer questions and to note which cards are clear to the other students and which ones need further clarification.. Create a class set of the cards. Students can keep their cards in an index box for further study.

Chapter 9 : Moving Molecules - The Kinetic Molecular Theory of Heat | Cool Cosmos

Heat, cool and compress atoms and molecules and watch as they change between solid, liquid and gas phases. Describe characteristics of three states of matter: solid, liquid and gas. Predict how varying the temperature or pressure changes the behavior of particles. Compare particles in the three.

This point has been used to define the base unit of temperature, the kelvin , since , and is thus set as having a temperature of Kamb and others documented further triple points in the s. Electrical conductivity[edit] Pure water containing no exogenous ions is an excellent insulator , but not even "deionized" water is completely free of ions. Because water is such a good solvent, it almost always has some solute dissolved in it, often a salt. If water has even a tiny amount of such an impurity, then it can conduct electricity far more readily. It is known that the theoretical maximum electrical resistivity for water is approximately In ice, the primary charge carriers are protons see proton conductor. Chemical polarity A diagram showing the partial charges on the atoms in a water molecule An important feature of water is its polar nature. The structure has a bent molecular geometry for the two hydrogens from the oxygen vertex. The oxygen atom also has two lone pairs of electrons. One effect usually ascribed to the lone pairs is that the Hâ€"Oâ€"H gas phase bend angle is The lone pairs are closer to the oxygen atom than the electrons sigma bonded to the hydrogens, so they require more space. The increased repulsion of the lone pairs forces the Oâ€"H bonds closer to each other. Due to the difference in electronegativity , a bond dipole moment points from each H to the O, making the oxygen partially negative and each hydrogen partially positive. A large molecular dipole , points from a region between the two hydrogen atoms to the oxygen atom. The charge differences cause water molecules to aggregate the relatively positive areas being attracted to the relatively negative areas. This attraction, hydrogen bonding , explains many of the properties of water, such as its solvent properties. These properties include its relatively high melting and boiling point temperatures: H 2S is a gas at room temperature , in spite of hydrogen sulfide having nearly twice the molar mass of water. The extra bonding between water molecules also gives liquid water a large specific heat capacity. This high heat capacity makes water a good heat storage medium coolant and heat shield. Cohesion and adhesion[edit] Dew drops adhering to a spider web Water molecules stay close to each other cohesion , due to the collective action of hydrogen bonds between water molecules. These hydrogen bonds are constantly breaking, with new bonds being formed with different water molecules; but at any given time in a sample of liquid water, a large portion of the molecules are held together by such bonds. In biological cells and organelles , water is in contact with membrane and protein surfaces that are hydrophilic ; that is, surfaces that have a strong attraction to water. Irving Langmuir observed a strong repulsive force between hydrophilic surfaces. To dehydrate hydrophilic surfacesâ€"to remove the strongly held layers of water of hydrationâ€"requires doing substantial work against these forces, called hydration forces. These forces are very large but decrease rapidly over a nanometer or less. Surface tension prevents the clip from submerging and the water from overflowing the glass edges. Temperature dependence of the surface tension of pure water Water has an unusually high surface tension of Water is an excellent solvent due to its high dielectric constant. If a substance has properties that do not allow it to overcome these strong intermolecular forces, the molecules are precipitated out from the water. Contrary to the common misconception, water and hydrophobic substances do not "repel", and the hydration of a hydrophobic surface is energetically, but not entropically, favorable. When an ionic or polar compound enters water, it is surrounded by water molecules hydration. The partially negative dipole ends of the water are attracted to positively charged components of the solute, and vice versa for the positive dipole ends. In general, ionic and polar substances such as acids , alcohols , and salts are relatively soluble in water, and non-polar substances such as fats and oils are not. Non-polar molecules stay together in water because it is energetically more favorable for the water molecules to hydrogen bond to each other than to engage in van der Waals interactions with non-polar molecules. The ions are then easily transported away from their crystalline lattice into solution. An example of a nonionic solute is table sugar. The water dipoles make hydrogen bonds with the polar regions of the sugar molecule OH groups and allow it to be carried away into solution.