第七单元：水的性质	**Unit 7: Properties of Water**
主要观念:	**Key Ideas:**
7.1 观察，形容，和探索水的物理性质。	7.1 Observe, describe, and explore the physical properties of water.
7.2 探索不同的因素如何影响蒸发。	7.2 Explore how different factors affect evaporation.
7.3 形容水的循环。	7.3 Describe the Water Cycle.
7.4 测试物体来决定它们是否沉浮。	7.4 Test objects to determine whether they sink or float.
7.5 预测，观察，和检视不同的物质来决定它们和水相容的能力。	7.5 Predict, observe, and examine different substances to determine their ability to mix with water.
7.6 检视和形容实体从一个状态到另一个状态的转变。	7.6 Examine and describe the transformation of matter from one state to another.
7.7 预测和查证热能对物体和材料所产生的效应。	7.7 Predict and investigate the effect of heat energy on objects and materials.
7.8 形容材料的物理改变。	7.8 Describe the physical changes of materials
单元大纲	**Unit Overview**
水是地球上最重要的物质。没有水，将会没有植物，没有动物，没有生命。人类的大脑大约有百分之八十是水，如果你流失你身体里百分之十的水份，你将无法走路。流失百分之二十的水份，你的生命将会结束。 我们不断的流失水份，我们就必须不断的补充。虽然地球上有大量的水，但是百分之九十七的水是海洋，太咸而无法饮用。至於清水，大部份是位於南北极冰层地带。尽管如此，大部份的地方仍是充满了以河川和湖的形式存在的水，地面上和地面下。当我们使用这些水的时候，水会被自然的过程而取代，是水的循环的一部份。	Water is the most important substance on Earth. Without it, there would be no plants, no animals, and no life. The human brain is approximately 85% water, and if you lost 10% of the water in your body you would not be able to walk. A loss of 20% would be fatal. As we are constantly losing water we need to take in more to replace it. Although there is a huge amount of water on Earth, 97% of it is in the oceans and far too salty to drink. Of the fresh water, most is frozen in the polar ice caps. Even so, there is plenty of water around (in most places anyway) in the form of rivers and lakes, both above and below ground. As we use this water, it is replaced by natural processes as part of the water cycle.

水有许多不寻常的性质，并且是一种特别的化合物，因为许多的物质都可以在水里溶解。	Water has many unusual properties and it is a special compound because many substances dissolve in it.

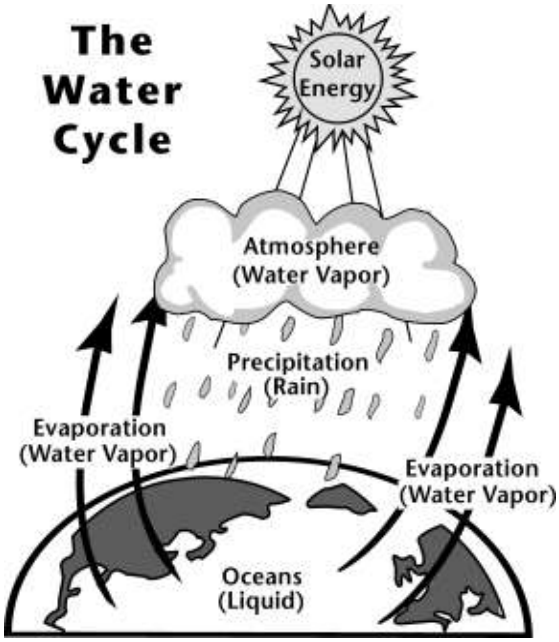
第七单元：水的性质	**Unit 7: Properties of Water**
关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.1 主要观念 观察，形容，和探索水的物理性质。	**Key Idea 7.1:** Observe, describe, and explore the physical properties of water.
科学用语： 1. 实体　2. 实体的状态　3. 固体 4. 液体　5. 气体　6. 体积	**Scientific Terms:** 1. matter　2. state of matter　3. solid 4. liquid　5. gas　6. volume
内容: 围绕在你周围的每一样东西都是**实体**。你的桌子，其他的人，空气，饮水器的水都是不同种类的实体。实体有不同的形态，称作状态。我们可以观察到的三种实体的状态是**固体**，**液体**，和**气体**。 当实体是固体的时候，它保持它的固定形状。它的体积，空间可以容纳的大小，保持不变。 当实体是液体的时候，它的形状可以改变，但是体积保持不变。例如，我们可以把水装在玻璃瓶子里或塑料袋里，来改变水的形状。塑料袋里装的水来自玻璃瓶。水的体积是一样的，但是形状已经改变。 当实体是气体的时候，它无法保持它的形状或体积。空气是由不同种类的气体组合而成。 你把空气灌入气球里，空气便形成气球的形状。当你把空气从气球里放掉，空气中的气体便在你四周散开，佔有更多的空间。	**Content:** Everything around you is **matter**. Your desk, other people, the air, and the water in the drinking fountain are all different kinds of matter. Matter has different forms, called states. The three **states of matter** we can observe are **solids**, **liquids**, and **gases**. When matter is solid, it holds its shape. Its volume, which is the space it fills, stays the same. When matter is a liquid, its shape can change, but its volume stays the same. For example, we can change the shape of water in a glass by pouring it into a plastic bag. The plastic bag holds the water from the glass. The water's volume is the same, but its shape has changed. When matter is a gas, it cannot hold its shape or its volume. Air is made up of different kinds of gases. After you put air in balloons, the air takes the shape of the balloon. When you let the air out of the balloon, the gases in the air spread out around you and take up more space.
复习： 1. 三种实体的状态中，哪一种状态无法保持形状或体积？ 2. 如果一个液态从一个高瓶子倒入一个扁盘子，它的形状或体积改变了吗？ 3. 比较固体，液体，和气体的特性。	**Review:** 1. Which of the three states of matter cannot hold shape or volume? 2. If a liquid is poured from a tall bottle into a shallow pan, does its shape or volume change? 3. Compare the properties of solids, liquids, and gases.

第七单元：水的性质	**Unit 7: Properties of Water**
关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.2 主要观念 探索不同的因素如何影响蒸发。	**Key Idea 7.2:** Explore how different factors affect evaporation.
科学用语： 1. 分子　2. 水蒸气　3. 蒸发 4. 湿气　5. 凝结	**Scientific Terms:** 1. molecule　2. water vapor　3. evaporation 4. humidity　5. condensation
内容: 水**分子**通常都是移动的。在水的表面，有些分子被下面的分子撞击而有足够的速度脱离，跑到空气中成为气体（**水蒸汽**）. 这种表面分子脱离称作**蒸发**。它牵涉到形态的改变，从液体到气体。蒸发在任何时间，任何温度下都会发生。越高的温度，蒸发的速度就越快。当水的温度增加（例如，用强力的聚光灯照射），水分子得到更多的能量，活动的更快，也以更快的速度脱离。 当蒸发產生的时候，水蒸气聚集在水的表面之上。当有风的时候，水蒸气一形成就马上被移走。这样产生空间可以让更多的水分子脱离到空中。越强的风，蒸发的速度就越快。 装在碗里的水，它的表面范围直接接触空气。这只是占碗里的水的体积的一小部份。如果水洒在桌上，几乎所有的水都暴露在空气里。暴露的范围越大，任何时候都有更多的热和风可以和水分子接触。因此，蒸发的速度比水在碗里面要来得快。暴露的范围越大，蒸发的速度越快。 如果水是在一个密闭的容器里蒸发，水上方的空间会充满越来越多的水蒸气。当空气中充满了水蒸	**Content:** Water **molecule**s are always moving. At the water's surface, some molecules are bumped by molecules below them and gain enough speed to break free and escape into the air as gas (**water vapor**). This escape of surface molecules is called **evaporation**. It involves a change of state, from liquid to gas. Evaporation takes place all the time and at any temperature. The higher the temperature, the higher the rate of evaporation. When the temperature of water is increased (e.g. shining a powerful spotlight on it), the water molecules gain more energy, move faster and escape at a faster rate. When evaporation takes place, the water vapor gathers above the water's surface. When it is windy, the water vapor is removed as soon as it is formed. This makes space for more water molecules to escape into the air. The stronger the wind, the higher the rate of evaporation. The surface area of the water in a bowl is in direct contact with the air. This is only a small fraction of the total amount of water in the bowl. If the water is spilled onto the table, almost all of the water is exposed to the air. With a larger exposed area, more heat and wind can come into contact with the water molecules at any time. Therefore, the rate of evaporation is higher than that of the water in the bowl. The larger the exposed surface area, the higher the rate of evaporation. If water evaporates in an air-tight container, the space above the water is filled with more and

气，湿气就会高。**湿气**指的是空气中水蒸气的含量。当湿气高的时候，水蒸发的就比较困难。就好像空气中已经充满了水蒸气，已经不再如此饥渴。空气“吃”得少，造成蒸发的速度变慢。如果水面以上的空间变成完全充满了水蒸气，蒸发便会被相反的过程，凝结，来均衡。	more water vapor. When the air contains a lot of water vapor, **humidity** is high. Humidity refers to the amount of water vapor in the air. When humidity is high, it is more difficult for water to evaporate. It is like the air is full and not hungry for more water vapor. Thus the air will “eat” less at one time, resulting in a slower rate of evaporation. If the space above the water becomes completely filled with water vapor, then evaporation is balanced by the opposite process, condensation.
复习： 1. 当你站在风扇旁边，为什么你会觉得凉爽？ 2. 什么因素影响蒸发的速度？ 3. 为什么我们应该把我们湿的衣物打开来晒干? 4. 当我们想要水烧滚得更快，我们应该打开还是盖上盖子？为什么？	**Review:** 1. Why do you feel cool when you stand next to a fan? 2. What factors affect the rate of evaporation? 3. Why should we spread out our wet clothes to dry? 4. When we want to boil water faster, should we open or close the lid? Why?

第七单元：水的性质	**Unit 7: Properties of Water**
关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.3 主要观念 形容水的循环。	**Key Idea 7.3:** Describe the Water Cycle.
科学用语： 1. 降水 2. 水的循环 3. 蒸发 4. 水蒸气 5. 凝结 6. 雨 7. 雪雨 8. 雪 9. 冰雹 10. 径流 11. 地下水	**Scientific Terms:** 1 precipitation. 2. water cycle 3. evaporation 4. water vapor 5. condensation 6. rain 7. sleet 8. snow 9. hail 10. runoff 11. groundwater
内容: 如果地球上所有的水都保持在海洋里，会发生什么？土地将如何得到水来让植物生长？土地上的动物喝什么？幸运的是，水是到处移动的。 落到地球上的水(**降水**)不是新的水。这是经由地球和空气不断循环的同样的水。由太阳的能量来产生的这个过程称作**水的循环**。 水存在於三种状态：气体，液体，和固体。太阳将地球上的水加热， 造成**蒸发**，将水转变成看不见的**水蒸汽**。水蒸气上升到地球的高空，温度变低。在那里，产生**凝结**。低温将水蒸汽再转变回液状的细小水珠。这些细小的水珠形成云。**雨**，**雪雨**，**雪**，和**冰雹**是不同形式的降水，它们从云落到地球上。因为风会将云层和暴风雨四处移动，因此水会降落在和它蒸发时不同的地点。如果水蒸汽凝固，它落下来的是雪。 如果雨在落下来的途中凝固，它落下来的是雪雨。当云层里的雨或雪形成冰，它落下来的便是冰雹。 一旦水落到地球，它不会停留在一个地方。大部份的水从地上或水坑立刻蒸发。剩余的水渗入地下形成**地下水**，或沿著地面形成**径流**。径流将水带入河	**Content:** What would happen if all the water on Earth stayed in the oceans? How would the land get water to grow plants? What would land animals drink? Fortunately, water moves around. **Precipitation** that falls to Earth is not new water. The same water is constantly recycled through the Earth and the air. The Sun's energy powers what is called the **water cycle**. Water exists in three states: gas, liquid, and solid. The Sun heats liquid water on Earth, causing **evaporation**, turning it into invisible **water vapor**. Water vapor rises high above the Earth where temperatures are lower. There, **condensation** takes place. The lower temperatures turn the water vapor back into tiny drops of liquid water. These tiny drops form clouds. **Rain**, **sleet**, **snow**, and **hail** are different forms of precipitation and they fall to Earth from the clouds. Because wind moves clouds and storms around, the water often falls in a different place from where it evaporated. If the water vapor freezes, it falls as snow. If rain freezes on the way down, it falls as sleet. When pieces of ice form in the clouds from rain or snow, they fall as hail. Once water lands on Earth, it does not stay in one place. Much of it evaporates from the ground or puddles right away. The rest of the water soaks into the ground as **groundwater**, or runs along the

川，最终流入大海。地下水也会慢慢的往河川和海洋流动。	ground as **runoff**. Runoff carries water to rivers, which empty themselves into the oceans. Groundwater also moves slowly toward the rivers and oceans.
水在地底下，在河川里，在湖里，在海洋里，和以冰的形态存储一段时日。然后太阳的热造成蒸发，循环又再次开始。	Water is stored for a time in the ground and in rivers, lakes, oceans, and as ice. Then the heat of the Sun causes it to evaporate, and the cycle starts again.
因为水的循环，土地被水降临而土地上的植物得以生长。水从一个地方流到另一个地方，如此人类和动物才可以从山泉，小溪，河川，和湖里利用水。人类并且可以凿井，利用地下水。	Because of the water cycle, the land is watered and plants can grow. Water moves from place to place, so people and animals can use water from springs, streams, river, and lakes. Humans can dig wells and use the groundwater too.
复习： 1. 地下水和逕流有何相同之处？ 2. 什么造成水蒸气的凝结？ 3. 雪和雪雨如何不同？ 4. 什么造成水的蒸发？ 5. 如果任何时候都会发生蒸发，为什么海洋不会乾掉？ 6. 如果风不会移动空气，云层，和暴风雨，那将会发生什么在地球上？	**Review:** 1. How are groundwater and runoff alike? 2. What causes condensation of water vapor? 3. How are snow and sleet different? 4. What causes evaporation of water? 5. If evaporation is happening all the time, why don't the oceans dry up? 6. What would happen to Earth's water if wind did not move air, clouds, and storms?



第七单元：水的性质	**Unit 7: Properties of Water**
关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.4 主要观念 测试物体来决定它们是否沉浮。	**Key Idea 7.4:** Test objects to determine whether they sink or float.
科学用语： 1. 漂浮　2. 下沉　3. 位移 4. 质量　5. 密度	**Scientific Terms:** 1. float　2. sink　3. displacement 4. mass　5. density
内容: 当一个物体**漂浮**的时候，它可以停留在液体的表面。不同的固体，液体，和气体可以漂浮。例如，软木塞和油都可以漂浮在水的表面。有些气体，例如氦气，可以上升，或“飘浮”在空中。当一个物体**下沉**的时候，它跟随着地心引力往下移动。不同的固体，液体，和气体会下沉。例如，一个硬币会在一杯水里往下沉。比空气重的气体，例如丙烷和丁烷，都会下沉。 **位移**解释为什么物体下沉或漂浮。位移发生在当你放置一些东西在流体里，或任何会流动的物质里，它把流体推挤到旁边。当你丢一个物体到一杯水里，水的高度上升，你便看到移位產生。地心引力把物体往下拉，但是物体之上和物体之下的压力不同，因此造成上升的力。物体把水往旁边推挤，造成水位升高。如果一个物体的重量大过它推挤的水量，这个物体会下沉。如果一个物体的重量小过它推挤掉的水量，这个物体便会漂浮。 希腊数学家阿基米德(Archimedes)发现被物体移位的水量是根据那个物体的**质量**。质量是一个物体里面材料的量。密度（体积除以质量）是在一定的实体体积里含有多少质量。如果一个固体有比水大的**密度**，它就会在水里下沉。如果一个固体有比水小的密度，它就会在水里漂浮。大部份的人都会漂浮。因为他们的密度比水的密度小一	**Content:** When an object **float**s, it can stay on the surface of a liquid by itself. Different solids, liquids, and gases can float. For example, both cork and oil will float on the surface of water. Some gases, such as helium, can rise, or “float” in the air. When an object **sink**s, it moves down with gravity. Different solids, liquids, and gases sink. For example, a solid coin will sink in a cup of water. Gases that are heavier than air, such as propane and butane, can sink as well. **Displacement** explains why objects sink or float. Displacement occurs when you place something in a fluid, or any substance that flows, and it moves the fluid out of its way. You can watch displacement at work when you drop an object in a cup of water and the water level rises. Gravity pulls the object down, but the difference in pressure above and below the object causes an upward force. The object pushes the water out of its way, making the water rise. An object will sink if it weighs more than the water it pushes away, and an object will float if it weighs less than the water it pushes away. The Greek mathematician Archimedes discovered that the amount of water displaced by an object depends on the **mass** of that object. Mass is the amount of material that an object has in it. **Density** (mass divided by volume) is how much mass is in a certain volume of matter. If a solid object has a greater density than water has,

点。 形状也会帮助一个物体漂浮。一团黏土会下沉，但是用同样份量的黏土做成独木舟的形状就可以漂浮，因为它移位比较多的水。一个物体里含有的空气也可以帮助它漂浮。儘管船是由很重，很稠密的材料製成，它仍是可以漂浮，因为在船体里面有大量的空气。空心的物体，例如乒乓球或空塑胶瓶，都比实心的物体漂浮的好。	it will sink in water. If an object has a lower density than water has, it will float. Most people can float. Their density is slightly less than the density of water. Shape can also help an object float. A ball of clay will sink, but a canoe shape made from the same amount of clay can float because it displaces more water. The amount of air inside of an object can also help it float. Boats can float despite the heavy and dense materials used to build them because of the large amount of air inside the hull. Hollow objects, such as table tennis balls or an empty plastic bottle, are able to float better than solid objects.
复习： 1. 我们如何决定物体是会下沉还是漂浮？ 2. 形容形状如何帮助一个物体漂浮。 3. 解释为什么有些很重的物体例如船会漂浮，相对而言很轻的物体例如硬币反而会下沉。	**Review:** 1. How do we determine if objects sink or float? 2. Describe how shape helps an object float. 3. Explain why some heavy objects like boats float, while relatively lighter objects such as coins sink?

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关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.5 主要观念 预测，观察，和检视不同的物质来决定它们和水相容的能力。	**Key Idea 7.5:** Predict, observe, and examine different substances to determine their ability to mix with water.
科学用语: 1. 物质 2. 混合物 3. 分子 4. 溶解 5. 溶液 6. 悬浮液	**Scientific Terms:** 1. substance 2. mixture 3. molecule 4. dissolve 5. solution 6. suspension
内容: 葡萄和一些橘子，香蕉，和苹果混合在水果沙拉里。水果合在一起的滋味很好，但是每一片水果都还保有自己原有的味道。每一片水果可以很容易的被分别出来。它们并没有混合在一起变成一个新的**物质**。 一个**混合物**是两个或更多的物质放在一起，或混合在一起，但是可以很容易被分离出来。一个混合物里的每一个物质保有它自己的性质。一个混合物可以有不同份量的各种实体。例如，你可以用任何种类的水果做一个水果沙拉。你也可以用任何数量的各种水果来做。 一个固体和液体可以做成一个混合物。将沙子搅拌到水里就形成一个固体和液体的混合物。就像所有的混合物，沙子和水可以很容易的被分离出来。 如果我们在杯子里混合砂糖和水，砂糖和水就形成一个混合物。然而，我们无法看到砂糖。砂糖的**分子溶解**, 或平均地扩散在液体里。一个物质平均地扩散在另一个物质里，便形成一个溶液。溶液里的物质仍是可以容易的被分离。如果水份蒸发，砂糖就会遗留在杯子里。 换句话说，一碗水果沙拉不是一个溶液。我们可以分辨出其中的成份。沙子不会溶解在水里。相反	**Content:** Grapes and pieces of orange, banana, and apple are mixed in a fruit salad. The fruits taste good together, but each piece of fruit keeps its own taste. The pieces of fruit can easily be separated. They do not join together to make a new **substance**. A **mixture** is two or more substances that are placed, or mixed, together but can be easily separated. Each substance in a mixture keeps its own properties. A mixture can have different amounts of each kind of matter. For example, you can make fruit salad with any kinds of fruit. You also can use any number of pieces of each kind of fruit. A solid and a liquid can make a mixture. Stirring sand into water makes a mixture of a solid and liquid. Like all mixtures, sand and water are easy to separate. If we mix sugar and water in a glass, sugar and water make a mixture. However, we cannot see the sugar. The **molecule**s of sugar **dissolve**, or spread evenly, in the liquid. One substance spreading evenly throughout another substance forms a **solution**. The substances in a solution can be separated easily. If the water evaporates, the sugar is left in the glass. On the other hand, a bowl of fruit salad is not a solution. We can always tell the ingredients apart.

的，它们沉到底下。沙子和水不是一个溶液。 一些混合物里，成份不是平均地扩散出去。当这些混合物沉淀，有些成份会浮升到最上面，或沉到最底下。这种混合物称作**悬浮液**。一点一点的油会悬浮在水上。醋和油是一种混合物用作沙拉调味酱。我们必须先摇晃才可以使用，不然，我们很可能只倒出油在我们的沙拉上。同样的，我们必须先摇晃柳橙汁罐， 因为果肉和果汁是分离的。	Sand doesn't dissolve in water. Instead the grains of sand fall to the bottom. Sand in water is not a solution. In some mixtures, the ingredients are not spread out evenly. When these mixtures sit, some of the ingredients rise to the top or sink to the bottom. This kind of mixture is called a **suspension**. Bits of oil are suspended in water. Vinegar and oil is a mixture that makes salad dressing. We must shake it; otherwise, we might have just oil on our salad. We must shake the orange container too, because the pulp settles at the bottom of the container.
复习： 1. 为什么比萨饼是一个混合物但不是一个溶液？ 2. 除了沙子以外，举出两样不能溶解在水里的东西。 3. 你如何分辨一个混合物是否是一个悬浮液？	**Review:** 1. Why is pizza a mixture but not a solution? 2. Name two things besides sand that are not soluble in water. 3. How can you tell whether a mixture is a suspension?

第七单元：水的性质	**Unit 7: Properties of Water**
关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.6 主要观念 检视和形容实体从一个状态到另一个状态的转变。	**Key Idea 7.6:** Examine and describe the transformation of matter from one state to another.
科学用语： 1. 降低　2. 增加　3. 蒸汽	**Scientific Terms:** 1. decrease　2. increase　3. steam
内容: 水是唯一的物质可以自然的存在於三种实体的状态： • 当下雨的时候或从水龙头流出来的时候，水是一种液体。 • 当下雪的时候或结冰的时候，水是一种固体。 • 当热让它变成空气中看不见的水蒸气时，水是一种气体。 当水的温度降低，水结成冰的时候，水变成一个固体。冰库里的水变成冰块。当水被加温，温度升高，水变成气体。火炉将锅子里的水加热，水转变成水蒸气。 水蒸汽是一种看不见的气体。你看到一锅滚水上方的蒸汽，是水蒸汽移动到冷空气里而变成水滴。这个蒸汽就好像一朵小云。当蒸汽蒸发，它就变成水蒸汽。当水蒸汽遇到冷的表面，例如一扇冷的窗户，它变回液体。当我们洗一个热水澡的时候，我们可以看到蒸汽，也可以看到水珠在镜子上。那是因为当水蒸汽蹤到冷面，镜子的表面，它变回液态的水。太阳提供热量将下雨过后的水坑变成水蒸气。当水蒸气上升到空中，它冷却，变成液态的水珠，就是我们看到的云层。	**Content:** Water is the only substance that exists naturally as all three states of matter: • Water is a liquid when it rains or flows from a faucet. • Water is a solid when it is snow or frozen ice. • Water is a gas when heat causes it to become invisible water vapor in the air. Water changes into a solid when the temperature of the water decreases and the water freezes into ice. Water in the freezer of a refrigerator turns to ice. Water changes into gas when the water is heated and the temperature increases. The burner on a stove heats water in a pan and the water turns into water vapor. Water vapor is an invisible gas. The steam you see above a pot of boiling water is water vapor moving into colder air and changing into water droplets. This steam is like a small cloud. When the steam evaporates, it changes into water vapor. When water vapor meets a cold surface, such as a cold window, it turns back into liquid water. When we are taking a hot shower, we can see the steam, but we also can see the water droplets on the mirror. Because when the water vapor touches the cold surface, the mirror, it changes into liquid water. The Sun provides the heat that changes rain puddles in to water vapor. When the water vapor rises in the air, it cools, and changes into liquid water droplets that you see as clouds.
复习： 1. 如果一滴水掉到一个热炉上，可能会发生什	**Review:** 1. What will most likely happen if a drop of

么？ 2. 如果把冰块放到滚水里，冰块会有什么样的改变？ 3. 水蒸气是一种看不见的气体。那蒸汽是什么？	liquid water falls on a hot stove? 2. What change will occur to ice cubes if they are placed into the boiling water? 3. Water vapor is an invisible gas. What is steam?

第七单元：水的性质	**Unit 7: Properties of Water**
关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.7 主要观念 预测和查证热能对物体和材料所产生的效应。	**Key Idea 7.7:** Predict and investigate the effect of heat energy on objects and materials.
科学用语： 1. 释放　2. 结合　3. 融化　4. 岩浆	**Scientific Terms:** 1. release　2. combine　3. molten　4. lava
内容: 热可以由许多不同的方式释放出来，例如，经由燃烧，摩擦，或两种物质结合产生热。 热能加在物体和材料上可以改变物质的实体状态。金属，通常是一个固体，可以加热后变成液体。一些首饰品是经由这种方法成形的。金属加热直到它成为液体。然后倒入模型。当金属冷却以后，它又变回固体，并保有模型的形状。 石头是一个固体， 在地球表面深深的底下被加热，然后融化的，液体的岩浆从火山口爆发出来。当岩浆在地球表面冷却，它变回成一个固体。	**Content:** Heat can be released in many ways, for example, by burning, rubbing (friction), or combining one substance with another. Heat energy on objects and materials can change the substances' state of matter. Metal, which is usually a solid, can be heated to turn into a liquid. Some jewelry is formed this way. The metal is heated until it is a liquid. Then it is poured into a mold. When the metal cools and becomes a solid again, it holds the shape of the mold. Rock, which is a solid, might be heated deep below Earth's surface and then erupt from a volcano as molten, or liquid, lava. When the lava cools on Earth's surface, it changes back to a solid.
复习： 1. 如果固体的金属被加热到一个非常高的温度，会有什么样的改变？ 2. 当融化的，或液态的石头在地球表面冷却，会发生什么？	**Review:** 1. What change occurs if solid metal is heated to a very high temperature? 2. What happens when molten, or liquid, rock cools on Earth's surface?

第七单元：水的性质	**Unit 7: Properties of Water**
关键问题: 什么让水如此特别？	**Essential Question:** What makes water so special?
7.8 主要观念 形容材料的物理改变。	**Key Idea 7.8:** Describe the physical changes of materials.
科学用语： 1. 融化　2. 冻结　3. 沸腾 4. 凝结　5. 物理的改变 6. 溶解	**Scientific Terms:** 1. melting　2. freezing　3. boiling 4. condensing　5. physical change 6. dissolve
内容: 地球上的每一个物质都可以以固体，液体，或气体的形态存在。这些称作三种实体的状态。 一个状态的改变是发生在当一个物质从一种状态改变到另一种状态。每一个状态的改变有它自己的名称。如果一个固体加足够的热，它逐渐会转变成液体。这个称作**融化**。如果一个液体冷却足够，它会转变成固体。这个称作**冻结**。如果一个液体加足够的热，它会转变成气体。这个称作**沸腾**。如果一个气体冷却，它会转变成液体。这个称作**凝结**。 溶化的冰柱和烧滚的水有何共同点？它们都显示状态的改变。一张纸被切碎，另一张纸被剪开，木头被链锯锯下来。它们都有一些共同点。纸和木头都改变了，但是这些改变没有一个是状态的改变。它们显示的全部都是物理的改变。一个**物理的改变**是改变之后不会产生新的物质。状态的改变是物理改变的例子。切碎，剪开，锯下来，也都是物理改变的例子。 你如何知道一个状态的改变是一个物理的改变？我们知道冰，水，和蒸汽是同一样东西不同的形式。如果冰转变成水，或水转变成蒸汽，没有新的物质产生。因此，这种改变是物理的改变。	**Content:** Every substance on Earth can exist as a solid, as a liquid, or as a gas. These are called the three states of matter. A change of state occurs when a substance changes from one state to another. Each change of state has its own name. If a solid is heated enough, it will eventually turn into a liquid. This is called **melting**. If a liquid is cooled enough, it will turn into a solid. This is called **freezing**. If a liquid is heated enough, it will turn into a gas. This is called **boiling**. If a gas cools, it will turn into a liquid. This is called **condensing**. What do melting icicles and boiling water have in common? They both show changes of state. A sheet of paper is being shredded, another sheet of paper is being cut, and wood is being carved with a chain saw. They all have something in common. The paper and wood are being changed, but none of these changes is a change of state. All of them show physical changes. A **physical change** is a change that does not result in a new substance. Changes of state are examples of physical changes. So are shredding, cutting, and carving. How do you know that a change of state is a physical change? We know that ice, water and steam are all different forms of the same thing. If ice changes to water or water changes to steam, no new substance is made. So, that change is a physical change.

你在切碎一张纸以后，你得到什么？你得到许多切碎的纸。而当你把一张纸剪成两半， 你得到两张小一点的纸。尺寸和形状不同，但是它们仍然是纸。 链锯製造出许许多多的木片。它们很小，但是它们仍然是木头。因为木头并没有改变成另一种物质。这种改变是物理的改变。 **溶解**是另一种物理的改变。砂糖溶解，或变成平均的混合，在一罐热水里。我们知道溶解是一种物理的改变，因为我们可以让罐子里的水蒸发，这是另一个物理的改变。水份蒸发了以后，砂糖留在罐子里。砂糖没有改变成其他的物质。它仍然在那里。	After you shred a sheet of paper, what do you get? You get shreds of paper. And when you cut a sheet of paper in two, you get two smaller pieces of paper. The size and shape are different, but they are all still paper. The chain saw makes lots and lots of wood chips. They're small, but they're still wood. Since wood is not being changed into another substance, the change is a physical change. **Dissolving** is another kind of physical change. The sugar dissolves in, or becomes evenly mixed into, the hot water in the jar. We know that dissolving is a physical change because we can let the water in the jar evaporate, which is another physical change. After the water evaporates, the sugar is left behind in the jar. The sugar doesn't change into another substance. It's still there.
复习： 1. 所有的物理改变都有什么共同点？ 2. 一个玻璃杯掉到地上粉碎成上百个碎片。这是一种物理的改变吗？为什么是或不是？ 3. 一个厨师把油加到醋里，混合以后做成沙拉调味酱。这是一种物理的改变吗？为什么是或不是？ 4. 如果你加热一个物质，可能会发生什么？	**Review:** 1. What do all physical changes have in common? 2. A glass falls to the floor and smashes into hundreds of tiny pieces. Is this a physical change? Why or why not? 3. A cook adds oil to vinegar and then mixes it to make salad dressing. Is this a physical change? Why or why not? 4. What might occur if you heat a substance?

解答

7. 1

1. 气体无法保持它的形状或体积。
2. 形状已经改变但是体积不变。
3. 当实体是固体的时候，它的形状和体积保持不变。当实体是液体的时候，它的形状会随著盛装的容器而改变，但是体积不变。当实体是气体的时候，它无法有固定的形状和体积。

7. 2

1. 当你站在风扇旁边，风移走你的皮肤上蒸发的汗珠。这样產生空间可以让更多的水分子脱离到空中。风把热从你的皮肤趋走，让你感觉凉爽。
2. 温度，风，和曝露在空气中的表面范围。
3. 因为越大的范围曝露在空气中，蒸发的速度越快。
4. 我们应该盖上盖子，因为水在密闭的容器里，水上方的空间会充满越来越多的水蒸气。当空气中充满了水蒸气，**湿气**就会高。当湿气高，水蒸发的就比较困难。

7. 3

1. 它们以降水的方式掉落都是水的活动的名称。两者逐渐的都会移动到大的水域。
2. 比较冷的温度
3. 雪是冻结的水蒸气；雪雨是冻结的雨。
4. 一种温度的上升

Answer Key

7.1

1. Gas cannot hold shape or volume.
2. The shape is changed but the volume stays the same.
3. When matter is solid, it holds its shape and volume. When matter is liquid, it holds its volume, but its shape will change according to the container that holds it. When matter is gas, it cannot hold its shape or volume.

7.2

1. When you stand next to a fan, the wind removes evaporation of sweat droplets on your skin. This makes space for more water molecules to escape into the air. The wind draws heat away from your skin and you feel cool.
2. Temperature, wind, and the amount of surface area exposed to air affect the rate of evaporation.
3. We should spread out our wet clothes to dry because the larger the exposed surface area, the higher the rate of evaporation.
4. When we want to boil water faster, we should close the lid. Because the water is in an air-tight container, the space above the water is filled with more and more water vapor. When the air contains a lot of water vapor, **humidity** is high. When humidity is high, it is more difficult for water to evaporate.

7.3

1. Groundwater and runoff both name movements of water after it falls as precipitation. Both eventually move to large bodies of water.
2. Cooler temperatures cause condensation of water vapor.

5. 因为降水将水带回到海洋。

6. 水会从海洋蒸发到空中，形成云层，然后掉落回到海洋，土地没有水份，会枯乾。

7. 4

1. 我们必须测试物体来决定它是否可以漂浮或下沉。因为一个物体可以漂浮或下沉是依赖它推挤出去的水和自己重量之间的关系。如果一个物体的重量大过它推挤的水量，这个物体会下沉。如果一个物体的重量小过它推挤掉的水量，这个物体便会漂浮
2. 当你改变形状，你也同时改变物体的密度。如果你拿一个纸船放在水里，它会漂浮，但是如果你把纸形成一个球，它变得压缩，它就会下沉。那是因为它的重量大於被移位的水的重量。

3. 依照它们的密度（体积除以质量）。如果这个物体的密度高於水的密度，这个物体会下沉。如果这个物体的密度低於水的密度，这个物体会漂浮。

7. 5

1. 比萨饼是一个混合物，因为我们可以很容易的分离它的成份。它不是一个溶液因为它的物质没有平均的扩散在另一个物质。
2. （建议的答案）油，油漆，粉笔，蜡，砖头，玻璃，等等。
3. 当这个混合物沉淀，如果有些成份上升到表面或下沉到底部，这个混合物是一个悬浮液。

3. Snow is frozen water vapor; sleet is frozen rain.
4. A rise in temperature causes evaporation of water.
5. The oceans don't dry up because precipitation returns water to the oceans
6. If wind and air did not move air, clouds and storms, water would evaporate from oceans into the air, form clouds, and fall back into the ocean, leaving the lands dry.

7.4

1. We have to test the object to determine if it can sink or float. Because an object can sink or float depends on the water it pushes away and the weight of itself. An object will sink if it weighs more than the water it pushes away, and an object will float if it weighs less than the water it pushes away.
2. When you change the shape you are also changing the density of the object. If you take a paper boat and put it into water it will float, but if you shape the paper into a ball it becomes compact and will sink. That is because its weight is more than what the displaced water weighs.
3. It depends on their density (mass divided by volume). If the object's density is higher than the density of water, that object sinks. If it's lower, that object will float.

7.5

1. Pizza is a mixture， because we can easily separate its ingredients. It is not a solution because its substance doesn't spread evenly throughout another substance.
2. (Suggested answers): oil, paint, chalk, crayons, brick, glass, etc.
3. When the mixture sits, if some of the ingredients rise to the top or sink to the bottom, this mixture is a suspension.

7. 6 1. 水滴会马上蒸发成水蒸气。 2. 冰块会不见并转变成液体。 3. 蒸汽是水蒸气混合冷空气。	**7.6** 1. The drop of liquid water would evaporate right away and become water vapor. 2. The ice cubes will disappear and change into liquid. 3. Steam is water vapor mixed with cold air.
7. 7 1. 金属会从固体转变成液体。 2. 融化的，或液态的石头会转变回固体。	**7.7** 1. The metal will change from solid to liquid. 2. The molten, or liquid rock, will change back to a solid.
7. 8 1. 所有物理的改变都不会產生新的物质。 2. 这是一个物理的改变。因为就算它破碎成百片，它仍然是玻璃。 3. 这是一个物理的改变。因为我们仍然可以很容易的分离油和醋。这个混合物并没有產生新的物质。 4. 这个物质可能会改变成液体或气体。	**7.8** 1. All physical changes do not result in a new substance. 2. This is a physical change because even if the glass smashes into hundreds of tiny pieces, the pieces are still glass. 3. This is a physical change because we still can easily separate the oil from the vinegar. The mixture doesn't create a new substance. 4. If you heat a substance, the substance might change into liquid or gas.