DOWNLOAD PDF MATTER (FIRST SCIENCE)

Chapter 1 : www.nxgvision.com: Matter: Definition and Overview

Everything around us is matter. Matter is anything that has mass and occupies space. There are three different states of matter - solid, liquid, and gas.

Read on to learn more! These three states of matter have different characteristics. Learning to identify these differing properties will help your students understand how each state appears in their world and responds to elements of nature. To the tune of "Frere Jacques" you sing the first line and the students echo. Sing the song repeatedly during the unit on the properties of matter. Have the girls sing the first lines and the boys echo. Change it up a variety of ways. Use a one-burner hot plate for the boiling water with caution in the classroom. For the ice example, two nights before you do the display, fill a latex glove up with water and freeze it. Peel the glove off and you have a frozen hand that will take some time to completely melt. Hold up labels - solid, liquid and gas. Ask the students to decide which label goes with each item. Tape the labels to the white board or bulletin board behind your display. The water in the pitcher is liquid, ice hand is solid and the boiling pot of water is showing gas in the form of steam. Beforehand write properties of each state of matter on sentence strips. If you have an interactive whiteboard, you can adapt this lesson to an interactive whiteboard lesson. Ask the students to help you place the properties under the correct state of matter. Use statements to identify each. Takes the shape of its container. Label them solid, liquid or gas. Provide pictures from magazines you have prepared ahead of time or clipart of examples of solids, liquids or gases. The students sort the pictures. Using this activity as a partner activity will promote discussion of the properties between the group mates. Provide a list of the correct items for each box on the bottom of the boxes for the students to self-check their choices. Draw the molecules on the board of each state. Liquid molecules take the shape of the container. Solid molecules are compact and tight. Draw the molecules, short hash marks, very close together in a cube shape. Gas molecules are depicted as escaping out of a pot. They are not contained by the shape of their container. Gas molecules disperse into all areas of the room. If the door is opened they will escape out of the room. Divide the students into three groups of equal size. Assign each group a different molecule to represent. Give the liquid molecules a large box or carpet square to fill up. Have each group show the placement and movement of their molecules. Show the students some examples of both -a picture of a piece of paper burning, chemical change, and a piece of paper being crumpled up, physical change. A physical change is an alteration of the look of the item. A chemical change is the alteration of the item into another substance. Water can be used to show physical changes - solid ice to liquid water. Make a batch of cookies in the classroom to display a chemical change. The flour, chocolate chips, eggs and butter are turned into a new substance. There is no way to reverse it back to its original state. With their family, the students find 10 examples of solids and liquids. The most common gas is air, which is in every household. See if the families can find two more examples of a gas. Make a comprehensive list the next day in class of all of the examples.

Chapter 2 : Weird state of matter produced in space for first time | Science | AAAS

As a first-grade teacher, you can help your students understand basic principles about the properties of matter -- solid, liquid and gas -- by performing classroom experiments.

See the Top 10 Questions Matter is all around us. Matter is the air you are breathing. Matter is the computer you are reading from now. Matter is the stuff you touch and see. And it is more. Matter is defined as anything that has mass and takes up space. Matter is found in 3 major states; solid, liquid and gas. So what is matter made of? All matter is made of atoms. Atoms are the smallest particle of matter. They are so small that you cannot see them with your eyes or even with a standard microscope. A standard sheet of paper is about a million atoms thick. Science has come up with a technology to identify atoms called a scanning tunneling microscope STM which uses electricity to map atoms. Solids Matter that is composed of atoms packed tightly together are known as solids. You cannot walk through a solid wall. The matter is packed so tight that it prevents you from moving through it. Solids hold their shape at room temperature. The pencil that you left in the desk at school will still be the same shape when you return tomorrow. Even in solids there is a small space between the atoms. Depending on how tight the atoms are packed determines the density of matter. This means that a one inch block of wood is not as dense as a one inch block of gold. There is more space between the atoms of the wood than the atoms of the gold. Liquids Liquids do not hold their shape at room temperature. There is space between the atoms of a liquid and they move slightly all of the time. This allows you to stick your finger into water and pull it back out, letting the water fill back in where your finger once was. Liquids flow or pour and can take on the shape of a container. If the liquid is poured into a wider or narrower container, the liquid will take on that new shape. Liquids are affected by gravity. If you pour only half a cup of milk, the top half of the container would have no milk. Liquids cannot be handed to another person well without the container. Imagine going into a restaurant and asking for lemonade. Could you lay the lemonade on the table to drink in a few minutes? Gases are always moving. There is so much space between the atoms in gas that you can move around in them easily. When you walk from one side of the room to the other, you have walked through a bunch of gases that make up our air. You barely even know they are there. Gases will take on the shape of their container and can be compressed into a smaller space. Gases will fill up the space too. For a better understanding, take a look at these animations of the behavior of solids, liquids and gases. Change of State Matter can move from one state to another, but can still be the same substance. A change of state, also called a phase change , is a physical change from one state of matter to another, for example, from solid to liquid or from liquid to gas. How does matter move from one phase to another? If the motion of the atoms is altered by pressure or temperature, the state can change too. By lowering the temperature of water, it can freeze into a solid. By heating water, it can become steam which is a gas. Pressure can change matter from one state to another. Deep in the earth solids turn to liquids because the heavy weight of layers and layers of the earth push down on the solids causing them to turn to liquid magma. This is just one example of how pressure can change matter too. Other matter changes too, but often only exists in two states or requires the help of humans and technology to move through all three phases. Water is the only matter on earth that can be found naturally in all three - solid, liquid and a gas. They are called subatomic particles. Electrons circle around this nucleus. Atoms tend to have the same number of electrons as the number of protons in the nucleus. This number is very significant. Each kind of atom has a different number of protons. That means it also has 8 electrons. The 8 is known as its atomic number. But gold has 79 protons and 79 electrons. If you wanted to know how many protons and electrons are found in any given atom, the Periodic Table of the Elements is the place to find out. Elements The table only tells us about the atoms of the or so elements found on the earth. An element cannot be broken down into smaller components. The smallest possible piece of gold is just gold. Of these elements, some are solids like gold or silver. Others are gases like oxygen and hydrogen, and still others can be liquid like mercury. Of course this is based on room temperature. If an element is heated or cooled, or if enough pressure is applied to the element that could change its state of matter. You can find both of those on the table. The sodium and chloride atoms of salt are linked together

much like magnets can link together. We call this a compound. Water is a compound made of oxygen and hydrogen. Lots of the substances around us are compounds. Properties All matter has qualities about it that describe it scientifically. We call these properties. They can explain the physical or the chemical qualities of a matter. Some of the ways that we describe matter are by its color, its shininess, and its state at room temperature or its odor. Mass, temperature at which it changes states, electric conductivity and flexibility are also properties of matter. These are different for each type of matter and can help scientists identify a matter. Plasma We often talk about the three states of matter; solid, liquid and gas. Most of the matter that we use is in one of those three forms. It is often called the fourth state of matter. Plasma is electrically charged, does not hold its shape, has a huge amount of energy and is very difficult state to manipulate without a laboratory. Plasma can be found here on the earth in flames, lightning, and the polar auroras. The sun, the stars, and some other space events and objects are also made of plasma matter. More States of Matter? Did you know that there are more phases of matter? Some exist only in theory, others can be reproduced in laboratories, some are so new that scientists are still figuring out the details and others might exist, but have not yet been found in nature. What is meant by room temperature? State of matter of an element or atom is based on its behavior at room temperature. But what exactly is room temperature? Room temperature refers to air temperature not being specifically heated or cooled. While the actual temperature could be hotter or cooler than these figures, it simply means that the matter has not been placed in an oven or a freezer, but was left out in the room to attain the temperature of the rest of the room. If an ice cube was left out in the room for a period of time, it would melt and become liquid water. Water is a liquid at room temperature. A diamond, on the other hand, is a solid at room temperature and will not change state no matter how long it sits there. Click on a Topic:

Chapter 3 : Science 1st Grade Matter Worksheets - Printable Worksheets

Science Classroom, Kindergarten Classroom, Elementary Science, Kindergarten Science, Teaching Science, Science Education, Physical Science, Classroom Ideas, Stem Science Find this Pin and more on 1st grade matter by Christina Morrison.

Over the course of the 20th century, it became clear that there is much more to the universe than meets the eye. The reality of this missing mass remained in question for decades, until the s when American astronomers Vera Rubin and W. Kent Ford confirmed its existence by the observation of a similar phenomenon: In general, the speed with which stars orbit the centre of their galaxy is independent of their separation from the centre; indeed, orbital velocity is either constant or increases slightly with distance rather than dropping off as expected. The presence of this missing matter in the centres of galaxies and clusters of galaxies has also been inferred from the motion and heat of gas that gives rise to observed X-rays. For example, the Chandra X-ray Observatory has observed in the Bullet cluster , which consists of two merging galaxy clusters, that the hot gas ordinary visible matter is slowed by the drag effect of one cluster passing through the other. The mass of the clusters, however, is not affected, indicating that most of the mass consists of dark matter. Clowe Matter is The rest is dark matter. Two varieties of dark matter have been found to exist. The first variety is about 4. Most of this baryonic dark matter is expected to exist in the form of gas in and between the galaxies. This baryonic, or ordinary, component of dark matter has been determined by measuring the abundance of elements heavier than hydrogen that were created in the first few minutes after the big bang occurred The dark matter that comprises the other The absence of light from these particles also indicates that they are electromagnetically neutral. The precise nature of these particles is not currently known, and they are not predicted by the standard model of particle physics. However, a number of possible extensions to the standard model such as supersymmetric theories predict hypothetical elementary particles such as axions or neutralinos that may be the undetected WIMPs. Extraordinary efforts are under way to detect and measure the properties of these unseen WIMPs, either by witnessing their impact in a laboratory detector or by observing their annihilations after they collide with each other. There is also some expectation that their presence and mass may be inferred from experiments at new particle accelerators such as the Large Hadron Collider. However, most of the proposals are unsatisfactory on theoretical grounds as they provide little or no explanation for the modification of gravity. These theories are also unable to explain the observations of dark matter physically separated from ordinary matter in the Bullet cluster. This separation demonstrates that dark matter is a physical reality and is distinguishable from ordinary matter.

Chapter 4 : States of Matter: Facts (Science Trek: Idaho Public Television)

In this episode of Crash Course Kids, Sabrina talks about what matter is and the three states of matter: Solid, Liquid, and Gas. She also does a quick experiment that you can do at home to prove.

Students should be able to visualize many of the differences and make their own inferences, such as that gases generally weigh less than solids and properties of matter can change by raising or lowering the temperature. Involve your students in hands-on discovery to increase their interest and understanding. Ice, Water and Gas Balloons Help your students explore differences in properties of matter through sight and touch. Pass the balloons around the class and have your students take turns squeezing them softly. Ask them to explain what they see and feel. Introduce the terms "solid," "liquid" and "gas. Students should learn different characteristics of the balloons, such as which one is the heaviest, most pliable or softest to squeeze. Mystery Item Categorizing Create a three-column chart on your blackboard or white board to help students understand property differences and categorize items accordingly. Label the columns "solid," "liquid" and "gas. For example, you might use an apple, a box of playing cards or a toy car for solids; a liquid glue tube, baby doll bottle or boxed juice drink are examples of liquids; and the words "air," "oxygen" and "helium" might work for gas. One at a time, ask students to open their sacks, reveal their item and explain why the item falls under a specific category. Write the item in the appropriate column. After all the sacks have been opened, ask your students to describe features in each column: For example, liquids are runny, gases are invisible and solids can be held in your hand. Sciencing Video Vault Water Wonders With Ice Illustrate how water exists in three states so first-graders understand that outside factors, such as temperature, affect properties of matter. You will need a microwave for this. Give each student a clear plastic cup containing an ice cube, and ask students to guess what will happen to it outside the freezer. Have students divide a piece of paper into three columns, labeled "solid," "liquid" and "gas. Ask students to draw a picture of the water in the cup in column two. Heat the water in the microwave to the boiling point and show students -- from a distance -- the resulting steam. Instruct them to draw a picture of the steam in the last column. Explain that water freezes to solid form at 32 degrees Fahrenheit and boils at degrees, emitting water vapor. Fizzy Gas Bubbles Perform a classroom experiment to teach your first-graders how interactions between liquids and solids can produce gases. In front of your students, pour three tablespoons of vinegar and three tablespoons of water into a slender, clear bottle, such as a soft drink bottle. Use a funnel to fill a deflated balloon half full of baking soda. Introduce the term "hypothesis," and ask your students to guess what might happen when you attach the balloon to the bottle. Attach the balloon, allowing the baking soda to dump rapidly into the vinegar. Ask your students to examine the sounds and sights -- fizzy bubbles and a gas-inflated balloon.

Chapter 5 : 1st Grade Science Lesson Plans | www.nxgvision.com

Science 1st Grade Matter. Showing top 8 worksheets in the category - Science 1st Grade Matter. Some of the worksheets displayed are Science 1st grade matter crossword name, All things matter, Whats the matter, Science stars 1st grade lesson plan states of matter, Why does matter matter, Physical and chemical changes work, First grade lesson plan solids and liquids first grade, Whats the matter.

Matter is everything around you. Atoms and compounds are all made of very small parts of matter. Those atoms go on to build the things you see and touch every day. Matter is defined as anything that has mass and takes up space it has volume. Mass is the amount of matter in an object. You might have a small object with a lot of mass such as a statue made of lead Pb. You might have a large object with very little mass such as a balloon filled with helium He. You should also know there is a difference between mass and weight. Volume is the amount of space something occupies. Words such as big, little, long, or short are used to describe volumes. A marble takes up a small volume while a star occupies a large volume. Different states of matter will fill volumes in different ways. Even though matter can be found all over the Universe, you will only find it in a few forms states on Earth. We cover five states of matter on the site. Each of those states is sometimes called a phase. There are many other states of matter that exist in extreme environments. Scientists will probably discover more states of matter as we continue to explore the Universe. Five States of Matter What are the main states of matter? Everyone should know about solids , liquids , gases , and plasmas. Scientists have always known about solids, liquids, and gases. Plasma was a new idea when it was identified by William Crookes in The scientists Cornell, Ketterle, and Wieman who worked with the Bose-Einstein condensate received a Nobel Prize for their work in What makes a state of matter? Physical properties of a solid often include "hard" and "brittle. Gases are always around you, but the molecules of a gas are much farther apart than the molecules in a liquid. The BEC is all about atoms that are closer and less energetic than atoms in a solid. Changing States of Matter What is a physical change in matter? Molecules can move from one physical state to another phase change and not change their atomic structure. Oxygen O2 gas has the same chemical properties as liquid oxygen. The liquid state is colder and denser less energy , but the molecules are the same. Water H2O is another example. A water molecule is made up of two hydrogen H atoms and one oxygen O atom. It has the same molecular structure whether it is a gas , liquid , or solid. Although its physical state may change because of different amounts of energy, its atomic structure remains the same. So what is a chemical change in matter? If the formula of water were to change, that would be a chemical change. If you could add a second oxygen atom to a water H2O molecule, you would have hydrogen peroxide H2O2. The molecules would not be "water" anymore. In reality, there are a variety of steps that go into creating hydrogen peroxide from water. Physical changes are related to changes in the immediate environment such as temperature, pressure, and other physical forces. Chemical changes occur when the bonds between atoms in a compound are created or destroyed. Generally, the basic chemical structure does not change when there is a physical change. Of course, in extreme environments such as the Sun, no molecule is safe from destruction.

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Chapter 6 : What is matter? | SEP LESSONS

*Matter (First Science) [Julie Murray] on www.nxgvision.com *FREE* shipping on qualifying offers. Introduces the concept of matter, explaining its defining characteristics, the different forms it takes.*

Have students reflect on what they already know about matter by having them respond in their journals to the following questions: Give two examples of matter and two examples of non-matter. What parts of this statement do you agree with? Explain your answer in detail. Introduce the activity to the students: If chemistry is the study of matter then to understand chemistry they must first understand what matter is. By defining the term as a group, students will start to develop into a community of scientists. Science has its own language, but this language is built, collectively by the practicing community of scientists who agree on definitions for the terms they are using. Have students create a table to categorize their items: Matter, not matter or unsure Based on their categorizations, ask students to come up with properties the things in the matter category have in common and that apply to all matter. Ask students to make a list of these properties. What about things that are not matter or that they are unsure about? Have students report out Stress that the following two big ideas are critical to this and other report-outs: Constructing an argument and defending a position â€" as students share their conclusions with the class, challenge them to explain why they made that decision. What evidence do they have? Thinking critically and being skeptical. Explain that you want them to be working as a community and to really push all of their thinking. Encourage students to direct their report-out to the group, not to the teacher. Encourage students to ask one another questions. Ask a team to get the class started on this report out. Perhaps by sharing what item had the most interesting discussion for their pair. And what does this tell us about matter? Leave this discussion solely student-centered at this time. Have pairs report out, challenge and question each other, share their difficulties categorizing certain item etc. Refrain from judging, correcting or giving the "right" answer. After all "tricky" items have been discussed see Instructor background section above , ask students to share if they were able to find common characteristics of items in the matter category as well as of items in the non-matter category. Add and cross out characteristics of matter until all students agree that ALL matter shares those common characteristics. Based on that list of characteristics, ask students to create a definition of matter that everybody can agree on. Write down the definition on a wordwall or large poster to refer back to during later lessons. Share some textbook defintions of matter and have students compare these definitions to theirs. Are those definitions useful for them? Do they give them any more insights? Checking for student understanding: Extensions and Reflections Extensions and connections: Lessons dealing with the different states of matter, changes in the state of matter, investigations determining whether all matter truely has mass and volume, can follow this lesson. Important science skills such as measuring mass and volumes of liquids, gases and regular and irregular solids can be tied in as well. Trying to sort the cards into matter or non-matter items sounds easy - but it is not. Even adults can struggle with a lot of the tricky items. SEP does this activity during the Chemistry of Life summer course with teachers and it regulary sparks interesting discussions full of controversies.

Chapter 7 : States of Matter | ABCya!

The idea that matter was built of discrete building blocks, the so-called particulate theory of matter, was first put forward by the Greek philosophers Leucippus (~ BC) and Democritus (~ BC).

These new particles may be high-energy photons gamma rays or other particleâ€"antiparticle pairs. The resulting particles are endowed with an amount of kinetic energy equal to the difference between the rest mass of the products of the annihilation and the rest mass of the original particleâ€"antiparticle pair, which is often quite large. Depending on which definition of "matter" is adopted, antimatter can be said to be a particular subclass of matter, or the opposite of matter. Antimatter is not found naturally on Earth, except very briefly and in vanishingly small quantities as the result of radioactive decay , lightning or cosmic rays. This is because antimatter that came to exist on Earth outside the confines of a suitable physics laboratory would almost instantly meet the ordinary matter that Earth is made of, and be annihilated. Antiparticles and some stable antimatter such as antihydrogen can be made in tiny amounts, but not in enough quantity to do more than test a few of its theoretical properties. There is considerable speculation both in science and science fiction as to why the observable universe is apparently almost entirely matter in the sense of quarks and leptons but not antiquarks or antileptons , and whether other places are almost entirely antimatter antiquarks and antileptons instead. In the early universe, it is thought that matter and antimatter were equally represented, and the disappearance of antimatter requires an asymmetry in physical laws called CP charge-parity symmetry violation , which can be obtained from the Standard Model, [46] but at this time the apparent asymmetry of matter and antimatter in the visible universe is one of the great unsolved problems in physics. Possible processes by which it came about are explored in more detail under baryogenesis. Formally, antimatter particles can be defined by their negative baryon number or lepton number , while "normal" non-antimatter matter particles have positive baryon or lepton number. In October , scientists reported further evidence that matter and antimatter , equally produced at the Big Bang , are identical, should completely annihilate each other and, as a result, the universe should not exist. Conservation of matter Two quantities that can define an amount of matter in the quarkâ€"lepton sense and antimatter in an antiquarkâ€"antilepton sense , baryon number and lepton number , are conserved in the Standard Model. Even in a nuclear bomb, none of the baryons protons and neutrons of which the atomic nuclei are composed are destroyedâ€"there are as many baryons after as before the reaction, so none of these matter particles are actually destroyed and none are even converted to non-matter particles like photons of light or radiation. Instead, nuclear and perhaps chromodynamic binding energy is released, as these baryons become bound into mid-size nuclei having less energy and, equivalently , less mass per nucleon compared to the original small hydrogen and large plutonium etc. Even in electronâ€"positron annihilation , there is no net matter being destroyed, because there was zero net matter zero total lepton number and baryon number to begin with before the annihilationâ€"one lepton minus one antilepton equals zero net lepton numberâ€"and this net amount matter does not change as it simply remains zero after the annihilation. Other types Pie chart showing the fractions of energy in the universe contributed by different sources. Ordinary matter is divided into luminous matter the stars and luminous gases and 0. Ordinary matter is uncommon. Modeled after Ostriker and Steinhardt. Vertical axis is speed of rotation about the galactic center. Horizontal axis is distance from the galactic center. The sun is marked with a yellow ball. The observed curve of speed of rotation is blue. The predicted curve based upon stellar mass and gas in the Milky Way is red. The difference is due to dark matter or perhaps a modification of the law of gravity. Dark matter See also: Galaxy formation and evolution and Dark matter halo In astrophysics and cosmology , dark matter is matter of unknown composition that does not emit or reflect enough electromagnetic radiation to be observed directly, but whose presence can be inferred from gravitational effects on visible matter. The commonly accepted view is that most of the dark matter is non-baryonic in nature. Perhaps they are supersymmetric particles , [61] which are not Standard Model particles, but relics formed at very high energies in the early phase of the universe and still floating about. Its precise nature is currently a mystery, although its effects can reasonably be modeled by assigning matter-like properties such as energy density and pressure to

the vacuum itself. Twenty-six percent is dark matter. So less than 1 part in 20 is made out of matter we have observed experimentally or described in the standard model of particle physics. The Trouble with Physics, p. Exotic matter Exotic matter is a concept of particle physics , which may include dark matter and dark energy but goes further to include any hypothetical material that violates one or more of the properties of known forms of matter. Some such materials might possess hypothetical properties like negative mass. Historical development Antiquity c. Anaximenes flourished BC, d. All of these notions had deep philosophical problems. Rather they, like everything else in the visible world, are composed of the basic principles matter and form. For my definition of matter is just thisâ€"the primary substratum of each thing, from which it comes to be without qualification, and which persists in the result. In other words, in contrast to the early modern conception of matter as simply occupying space, matter for Aristotle is definitionally linked to process or change: For example, a horse eats grass: The matter is not specifically described e. Matter in this understanding does not exist independently i. It can be helpful to conceive of the relationship of matter and form as very similar to that between parts and whole. For Aristotle, matter as such can only receive actuality from form; it has no activity or actuality in itself, similar to the way that parts as such only have their existence in a whole otherwise they would be independent wholes. He was primarily a geometer. Instead of, like Aristotle, deducing the existence of matter from the physical reality of change, Descartes arbitrarily postulated matter to be an abstract, mathematical substance that occupies space: So, extension in length, breadth, and depth, constitutes the nature of bodily substance; and thought constitutes the nature of thinking substance. Descartes makes an absolute distinction between mind, which he defines as unextended, thinking substance, and matter, which he defines as unthinking, extended substance. In short, Aristotle defines matter roughly speaking as what things are actually made of with a potential independent existence , but Descartes elevates matter to an actual independent thing in itself. In both conceptions, matter is passive or inert. In the respective conceptions matter has different relationships to intelligence. For Aristotle, matter and intelligence form exist together in an interdependent relationship, whereas for Descartes, matter and intelligence mind are definitionally opposed, independent substances. In the third of his "Rules of Reasoning in Philosophy", Newton lists the universal qualities of matter as "extension, hardness, impenetrability, mobility, and inertia". Like Descartes, Newton rejected the essential nature of secondary qualities. Carrying the logic forward more consistently, Joseph Priestley â€" argued that corporeal properties transcend contact mechanics:

Chapter 8 : Teach the Properties of Matter for First Graders

There is more about atoms later, but first let's learn about the three states of matter. Solids Matter that is composed of atoms packed tightly together are known as solids.

Exoplanets Dark Energy, Dark Matter In the early s, one thing was fairly certain about the expansion of the universe. It might have enough energy density to stop its expansion and recollapse, it might have so little energy density that it would never stop expanding, but gravity was certain to slow the expansion as time went on. Granted, the slowing had not been observed, but, theoretically, the universe had to slow. The universe is full of matter and the attractive force of gravity pulls all matter together. Then came and the Hubble Space Telescope HST observations of very distant supernovae that showed that, a long time ago, the universe was actually expanding more slowly than it is today. So the expansion of the universe has not been slowing due to gravity, as everyone thought, it has been accelerating. No one expected this, no one knew how to explain it. But something was causing it. Eventually theorists came up with three sorts of explanations. It is called dark energy. What Is Dark Energy? More is unknown than is known. Other than that, it is a complete mystery. But it is an important mystery. The more shallow the curve, the faster the rate of expansion. The curve changes noticeably about 7. Astronomers theorize that the faster expansion rate is due to a mysterious, dark force that is pulling galaxies apart. Albert Einstein was the first person to realize that empty space is not nothing. Space has amazing properties, many of which are just beginning to be understood. The first property that Einstein discovered is that it is possible for more space to come into existence. Because this energy is a property of space itself, it would not be diluted as space expands. As more space comes into existence, more of this energy-of-space would appear. As a result, this form of energy would cause the universe to expand faster and faster. Unfortunately, no one understands why the cosmological constant should even be there, much less why it would have exactly the right value to cause the observed acceleration of the universe. Dark Matter Core Defies Explanation This image shows the distribution of dark matter, galaxies, and hot gas in the core of the merging galaxy cluster Abell The result could present a challenge to basic theories of dark matter. Another explanation for how space acquires energy comes from the quantum theory of matter. In this theory, "empty space" is actually full of temporary "virtual" particles that continually form and then disappear. But when physicists tried to calculate how much energy this would give empty space, the answer came out wrong - wrong by a lot. The number came out times too big. So the mystery continues. Another explanation for dark energy is that it is a new kind of dynamical energy fluid or field, something that fills all of space but something whose effect on the expansion of the universe is the opposite of that of matter and normal energy. Some theorists have named this "quintessence," after the fifth element of the Greek philosophers. That would not only affect the expansion of the universe, but it would also affect the way that normal matter in galaxies and clusters of galaxies behaved. This fact would provide a way to decide if the solution to the dark energy problem is a new gravity theory or not: But if it does turn out that a new theory of gravity is needed, what kind of theory would it be? There are candidate theories, but none are compelling. The thing that is needed to decide between dark energy possibilities - a property of space, a new dynamic fluid, or a new theory of gravity - is more data, better data. What Is Dark Matter? What is dark matter? We are much more certain what dark matter is not than we are what it is. First, it is dark, meaning that it is not in the form of stars and planets that we see. Second, it is not in the form of dark clouds of normal matter, matter made up of particles called baryons. We know this because we would be able to detect baryonic clouds by their absorption of radiation passing through them. Third, dark matter is not antimatter, because we do not see the unique gamma rays that are produced when antimatter annihilates with matter. Finally, we can rule out large galaxy-sized black holes on the basis of how many gravitational lenses we see. The blue shows a map of the total mass concentration mostly dark matter. However, at this point, there are still a few dark matter possibilities that are viable. Baryonic matter could still make up the dark matter if it were all tied up in brown dwarfs or in small, dense chunks of heavy elements. But the most common view is that dark matter is not baryonic at all, but that it is made up of other, more exotic particles like axions or WIMPS Weakly Interacting Massive Particles.

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Researchers were surprised when they uncovered galaxy NGC DF2 which is missing most, if not all, of its dark matter.

Chapter 9 : Matter - Wikipedia

Physical science, which includes chemistry and physics, is usually thought of as the study of the nature and properties of matter and energy in non-living systems. Matter is the "stuff" of the.