Multiple Choice

Which of the following is a renewable source of energy?

A. Coal

B. Hydropower

C. Natural gas

D. Petroleum

Multiple Choice

If you are using biomass as a source of energy you might be:

A. Heating with coal.

B. Heating with natural gas.

C. Heating with petroleum.

D. Heating with a wood stove.

Multiple Choice

In which decade was wind-generated electricity first sold to the public?

A. 1940s

B. 1960s

C. 1980s

D. 2000s

Multiple Choice

In which century was the first electrical power plant built?

A. 1600's

B. 1700's

C. 1800's

D. 1900's

Answer

Biomass is an energy source that comes from organic matter (anything once living) like wood, crops and animal waste. People have been burning wood to heat their homes and cook their food for thousands of years. This makes biomass the energy source that has been used the longest. Biomass is a ***renewable*** energy source because plants can be re-grown, and animals always produce waste. Although fossil fuels (like coal, petroleum and natural gas) also formed from animal and plant remains, it took millions of years for these fuels to form, and many chemical reactions to change them, and they cannot be replaced; this makes them nonrenewable, unlike biomass.

The answer is: D. Heating with a wood stove.

Answer

Non-renewable energy sources are limited in supply because they cannot be replenished at all or not in a short amount of time. For example, coal, petroleum (oil) and natural gas were formed millions of years ago when tiny plants and animals died and sank to the bottom of the oceans. They were buried under thousands of feet of sand and sediment that compressed into rock that continued to squeeze those remains so hard that the pressure and temperature turned them into oil and propane- very slowly. ***Renewable*** energy sources don't run out or can be replenished in a very short time. For example, the water cycle replenishes river water for hydropower daily. Also, the sun shines and the wind blows every day. These are renewable energy sources.

The answer is: B. Hydropower

Answer

The Edison Company built the first large-scale, permanent power plant, Pearl Street Power Station, that opened on September 4, 1882 in New York. The steam-driven plant was rated at 100 kilowatts and served 500 customers. On September 30, 1882, the first commercial hydroelectric power plant opened in Appleton, Wisconsin, rated at 12 kilowatts. It initially serviced the Appleton and Vulcan paper mills as well as the home of the Appleton Paper Mill president. In 1887, the Oakland Electric Light Company in Maine serviced the local mill and streetlights in the small town, generating 22.5 kW. Walter Wyman acquired it in the 1890's, along with other small plants, which combined became Central Maine Power in 1910.

The answer is: C. 1800's

Answer

Humans have been using wind energy for centuries to do things like sail boats. Individual windmills were originally used to pump water out of the ground. Once the ability to distribute electricity over lines was developed in the late 1880's it became possible to generate electricity on a small, local scale using windmills. By the 1930s many rural areas were serviced by such small windmills. In 1941 the first large-scale wind turbine, the Putnam-Smith Wind Turbine, was built in Castleton, VT, and generated 1.25 megawatts (1250 kW) of power. Its electricity was sold to the Central Vermont Public Service Corporation for sale to customers. In Maine today, there are 9 commercial wind farms producing anywhere from 4.5-132 MW each, the first having been built at Mars Hill in 2007.

The answer is: A. 1940s

Multiple Choice

How long ago did humans first use natural gas as a fuel?

A. 100 years ago

B. 250 years ago

C. 1000 years ago

D. 2500 years ago

Multiple Choice

Which of the following accounts for the largest use of petroleum (oil) in the United States?

A. Electricity generation

B. Home heating

C. Industry

D. Transportation

Multiple Choice

When was nuclear power first used to generate electricity commercially?

A. 1930's

B. 1940's

C. 1950's

D. 1960's

Multiple Choice

Which of the following energy sources produces the most electricity in the United States?

A. Coal

B. Hydropower

C. Natural gas

D. Uranium (nuclear power)

Answer

Here is the breakdown of petroleum use in the United States based on the U.S. Energy Information Administration (EIA), 2009: Electricity generation 1%, Home heating 3.8%, Industry 22.5%, Transportation 71%. About 2/3 of the fuel used for transportation is used by individual car & truck owners; the rest is used by commercial trucks, planes, buses and trains.

The answer is: D. Transportation

Answer

In the United States natural gas was first used to fuel street lamps in 1816. However, the Chinese beat us by a couple thousand years. They piped natural gas from shallow wells and burned it to evaporate seawater to make salt. Today about 50% of U.S. homes use natural gas for heating.

The answer is: D. 2500 years ago

Answer

According the to the U.S. Energy Information Administration's 2009 numbers, the breakdown of electricity generation in the United States is as follows:

Nonrenewable Sources
45.9% Coal
22.0% Natural Gas
20.9% Uranium (nuclear)
0.9% Petroleum (oil)

Renewable Sources
7% Hydropower
1.9% Wind
0.7% Biomass
0.4% Geothermal
0.3% Other

The answer is: A. Coal

Answer

Radioactivity was first discovered in the 1890's. In the 1930's it was discovered that this radioactivity was due to the natural decay or splitting of atoms, and in 1939 it was discovered that once one atom splits it causes a chain reaction that splits other similar atoms. The first use of this nuclear energy was for creating the atom bomb used in World War II. At the end of the war, world focus shifted to harnessing this energy for human use and in June of 1954 the first nuclear power plant went online in Obninsk, Russia capable of generating 30 megawatts of power. The first commercial nuclear reactors in the U.S. went online in 1960.

The answer is: C. 1950's

Multiple Choice

What percent of the average home's electric bill is for lighting?

A. About 10%

B. About 20%

C. About 30%

D. About 40%

Multiple Choice

When an incandescent light bulb is turned on, what percent of the electricity is converted to light energy?

A. 10%

B. 30%

C. 50%

D. 70%

Multiple Choice

Multiple Choice

Answer

When we talk about how ***energy efficient*** something is, we are asking how much of the energy put into it is actually used to do the intended job. The job of a light bulb is to produce light. However, only about 10% of the electrical energy consumed by an incandescent light bulb is converted to light energy. The other 90% is converted to heat energy and makes the light bulb hot.

The answer is: A. 10%

Answer

A little more than 11% of the average residential electric bill is for lighting. If the country converted to new technologies, like CFLs (compact fluorescent light bulbs) or LEDs (Light-Emitting Diodes), we could reduce our electricity consumption for lighting by up to 70%.

The answer is: A. About 10%

Answer

Answer

Definitions

Of the following choices, which best describes or defines BIOMASS?

A. **Massive living things**

B. **Inorganic matter that can be converted to fuel**

C. **Organic matter that can be converted to fuel**

D. **Petroleum**

Definitions

Of the following choices, which best describes or defines *GEOTHERMAL ENERGY*?

A. **Heat energy from volcanic eruptions.**

B. **Heat energy from hot springs.**

C. **Heat energy from inside the earth.**

D. **Heat energy from rocks on Earth's surface.**

Definitions

Of the following choices, which best describes or defines *FISSION*?

A. **Breaking rocks**

B. **Combining atoms**

C. **Splitting atoms**

D. **Splitting cells**

Definitions

Of the following choices, which best describes or defines *ELECTRICITY*?

A. **Chemical energy**

B. **Moving electrons**

C. **Potential energy**

D. **Power**

Answer

Geothermal energy is heat from within the earth. The core and lower part of the mantle (Earth's innermost layers) generate large amounts of heat as the radioactive elements there decay. This heat travels through all the layers of the earth. Rocks and water deep in the crust absorb heat from the mantle. This deep, super-heated water can be pumped to the surface and used to produce electricity in power plants. If the underground heat source is close enough to the surface, homes can run pipes full of water in a closed loop into the ground where they can absorb the Earth's heat and bring it back up into the home.

The answer is: C. Heat energy from inside the earth

Answer

Biomass is ***organic matter*** (anything that was once alive) that can be used as an energy source, such as wood, crops, and animal waste. Biomass is a renewable energy source because it can be grown in a short period of time. Humans have been using biomass since they learned about fire, using wood to heat and cook. Up until the mid-1800's wood provided 90% of the energy American's used, today it provides only about 4%, having been replaced mostly by fossil fuels. The largest use of biomass today is still burning wood, but there are uses. Bacteria are used to decay biomass creating methane gas, which can be burned. Yeast added to biomass like corn creates ethanol that is added to gasoline. Other biomass is converted into liquid bio-fuels.

The answer is: C. Organic matter (from something once alive)

Answer

Atoms are tiny particles that make up everything in the universe, and they're made up of even tinier parts. The center, or nucleus, of an atom is made up of protons and neutrons. Buzzing around the nucleus are even tinier electrons. Protons have a positive electrical charge and electrons have a negative charge. The negative electrons are attracted to the positive protons in the nucleus. The electrons farthest away from the protons have the weakest attraction, though, and applying a force can make them move from one atom to another. This movement of electrons across atoms is ***electricity***.

The answer is: D. Moving electrons

Answer

Atoms are tiny particles that make up everything in the universe. They are themselves made up of even tinier parts that are held together by bonds that contain very large amounts of energy. There are two ways to release energy from atoms. One way is fusion, or combining atoms into larger atoms. This is how the sun produces so much energy. Nuclear power plants use ***fission***, where atoms are split into smaller atoms, releasing large quantities of energy. This energy is used to heat water into steam, to turn turbines that spin generators, to make electricity. Nuclear power plants use Uranium atoms. The only nuclear power plant in Maine, Maine Yankee, closed in 1997 after 25 years in service. It was dismantled over 2 years, starting in 2004.

The answer is: C. Splitting atoms

Definitions

Of the following choices, which best describes or defines *WATT*?

A. **Amount of electricity used**

B. **Amount of useful energy**

C. **Measure of electrical efficiency**

D. **Measure of electrical power**

Definitions

Of the following choices, which best describes or defines *KILOWATT-HOUR*?

A. **Equal to 1,000 watt-hours**

B. **Measure of amount of electrical energy used in one hour**

C. **Unit the utility companies use to bill customers**

D. **All of the above**

Definitions

Of the following choices, which best describes or defines *VOLTAGE*?

A. **How quickly electrical energy is used**

B. **Measure of electrical energy used in one hour**

C. **Pressure applied to move electrons in a circuit**

D. **Rate at which electrons move through a circuit**

Defintions

Answer

The amount of ***electrical energy*** something uses to do a job depends on how long it's used and is measured in ***watt-hours*** (W-h). It is calculated by multiplying the electrical power (Watts) the device requires by the amount of time it was used. A watt-hour is a very small amount of electrical energy, so most of the time ***kilowatt-hours*** (kWh) are used (1 kWh = 1,000 W-h). Most utility companies bill their customers based on the number of kWh of electrical energy consumed. At 350°, the average electric oven requires 2000 watts (2 kW) of energy. Baking brownies for 30 minutes (½ hour) uses 2 kW x ½ h = 1 kWh of energy. At an average cost of 12¢ per kWh, baking this batch of brownies cost you 12¢ (12¢ x 1 kWh). Eat up!

The answer is: D. All of the above

Answer

A ***watt*** is a measure of the ***electrical power*** an appliance uses. Every appliance requires a certain number of watts to work correctly. For example, some light bulbs require 60 watts while others require 100 watts. A microwave may require anywhere from 900-1500 watts. Electric power is a result of the pressure used to move the electrons (measured in volts) and the rate at which the current of electrons flows (measured in amps). All appliances have a nameplate listing various pieces of information about the appliance. Usually the wattage is listed, but if not it can be calculated by multiplying volts x amps.

The answer is: D. Measure of electrical power

Answer

Answer

Voltage (V) is a measure of the pressure used to push electrons to make them move through a circuit. The larger the voltage is, the bigger the push. A 1.5V AA battery can light a small flashlight bulb. A 12V battery can run the electrical parts of a car. ***Electrical power*** (watts) is a measure of how quickly electrical energy is used. A kilowatt-hour (kWh) indicates how much ***electrical energy*** was used in one hour by a device. How quickly the electrons move through a circuit is measured in ***amps*** (A).

The answer is: C. Pressure applied to move electrons in a circuit

Odd One Out

Which of the following is NOT a form of kinetic energy (energy of motion)?

A. Chemical energy

B. Electrical energy

C. Heat energy

D. Sound energy

Odd One Out

Which of the following is NOT a renewable source of energy?

A. Geothermal

B. Propane

C. Solar

D. Wind

Odd One Out

Which of the following has nothing to do with hydropower?

A. Burning

B. Gravity

C. Sun

D. Water cycle

Odd One Out

Which of the following is NOT a fossil fuel?

A. Biomass

B. Coal

C. Natural gas

D. Petroleum

Answer

Non-renewable energy sources are limited in supply because they cannot be replenished at all or not in a short amount of time. For example, petroleum (oil) & propane were formed millions of years ago when tiny plants & animals died and sank to the bottom of the oceans. They were buried under thousands of feet of sand and sediment that compressed into rock that continued to squeeze those remains so hard that the pressure & temperature turned them into oil & propane- very slowly. ***Renewable*** energy sources don't run out or can be replenished in a very short time. Geothermal energy is constantly produced in the Earth's core, the sun shines & the wind blows every day; all are examples of renewable energy sources.

The answer is: B. Propane

Answer

Kinetic energy is energy of motion, but not always of things we can see. ***Sound*** waves move through the air or water. ***Heat*** energy is the motion of atoms or molecules that make up a substance. ***Electricity*** is the movement of electrons, a tiny part of atoms. ***Chemical*** energy is stored energy in the bonds that hold atoms and molecules to each other. Oil and natural gas are examples of chemical energy that can be turned into kinetic energy when it is burned. The burning breaks the bonds between the atoms and molecules and releases the energy so that it can be used.

The answer is: A. Chemical energy

Answer

Fossil fuels were formed millions of years ago when tiny plants & animals died and sank to the bottom of the oceans. They were buried under thousands of feet of sand and sediment that compressed into rock that continued to squeeze those remains so hard that the pressure & temperature turned them into oil, coal, propane and natural gas. Although ***biomass*** also comes from living things, it comes from organisms living today, not from ancient fossils. Wood, crops (like corn) and animal waste are examples of biomass that can be used to provide useful energy. Biomass can be burned directly (like wood), or converted into gas or liquid fuel that can then be burned.

The answer is A. Biomass

Answer

The ***sun*** drives the ***water cycle***. It causes water to evaporate and enter the air as water vapor. As this water vapor cools and condenses, it falls as rain, much of which lands in rivers or streams that flow into rivers. ***Gravity*** causes rivers to flow downhill. Larger rivers with lots of water flowing downhill quickly are used to turn large turbines to generate electricity at hydropower plants. In other types of power plants, water is heated to steam and the steam turns the turbines to generate electricity. Heating the water requires burning something like coal.

The answer is: A. Burning

Odd One Out

Which of the following is NOT a petroleum product?

A. Crayons
B. Gasoline
C. Plastic
D. Concrete

Odd One Out

Which of the following countries is NOT in the list of top 3 consumers of energy in the world?

A. China
B. India
C. Russia
D. United States

Odd One Out

Which of the following is NOT related to energy efficiency?

A. Useful energy
B. Heat
C. Energy transformations
D. Kilowatts

Odd One Out

Which of the following is NOT one of the largest uses of coal in the U.S. today?

A. Industry
B. Heating homes
C. Generating electricity
D. Transportation

Answer

According to 2008 numbers, the total world energy consumption was 493 quadrillion Btu (a unit to measure LARGE amounts of energy consumption). In that same year, ***China*** consumed 85 quad Btu, ***India*** consumed 20 quad Btu, ***Russia*** consumed 30 Btu, and the ***United States*** consumed 100 Btu. The U.S. accounts for about 5% of the world population but consumes 20% of the total world energy. A country's energy consumption is in part based on the lifestyles of its residents and the wealth of the country, not just on how many people live there. As countries like China & India, with over 1 billion people each, continue to develop and their lifestyles become more like those in the U.S., what will happen to the world's energy consumption?

The answer is: B. India

Answer

You probably won't be surprised to know that heating oil, fuel oil, liquefied gases like propane, jet fuel, diesel and ***gasoline*** are all produced from petroleum (also called crude oil or just oil). There are many products you may not be aware of that are produced, at least in part, from petroleum. Here is a short list: ***plastic***, nail polish, ink, toothpaste, deodorant, DVDs, some medicines like aspirin, fertilizers, glue, perfumes, shampoo, ***crayons***, and many more.

Concrete is mostly made from rock. It is a mixture of ground up limestone, shale, and clay that forms a cement that is mixed with crushed rock and water.

The answer is: D. Concrete

Answer

Most coal in the United States today is used to generate electricity. The coal is burned to heat water into steam. The steam then turns the turbines that spin the generators to make electricity. Steel, iron, paper, brick, and cement industries still use coal. Very little coal is used to heat homes today. Although coal was a popular source of energy for transportation during the days of steam engines, it is not used in transportation today.

The answer is: D. Transportation

Answer

Energy efficiency describes how much of the energy put into a device gets used to do the intended job. A 100% efficient device would convert all the energy put into it to usable energy for that job. As ***energy changes form***, some of it gets turned into ***heat*** that does no work. For example, a light bulb produces light, but only a small amount of the electrical energy that goes into a light bulb is converted into light. The rest is converted into heat, making the bulb hot. More efficient light bulbs produce more light and less heat.

Kilowatts are a unit used to measure the amount of electric power an appliance uses, whether or not it's used efficiently.

The answer is: D. Kilowatts

True or False

Energy takes many forms.

True or False

Using biomass as an energy source does not pollute the environment.

True or False

Coal forms from plants.

True or False

Geothermal energy (heat energy from deep inside the Earth) can be used to heat homes.

Answer

Biomass is an energy source that comes from living things like wood, crops and animal waste. It is transformed into useful energy in a number of ways, and one of these is by burning it. Burning anything can introduce pollutants to the environment in the form of smoke, ash, and other chemicals. However, biomass does not pollute as much as burning fossil fuels like oil and coal. For example, it doesn't produce certain pollutants that cause acid rain. Unlike coal which comes from fossil plants and is nonrenewable, biomass comes from living plants & animals and is renewable because we can always grow more trees & crops, and animals continue to poop.

The answer is: False

Answer

Let's use a hydropower plant as an example. The water behind the dam stays put until the spillways are opened to let it flow. It has potential energy- energy waiting to do something. Once the spillways are opened the water starts flowing and that potential energy is transformed into kinetic energy- energy of motion. The flowing water turns the blades of a turbine, which is a different form of kinetic energy- mechanical energy. This turbine runs the generator that produces yet another form of energy- electrical energy. That electrical energy may travel through lines & wires to your television producing other forms of energy like sound, light, and heat. It's all energy, no matter what form it takes.

The answer is: True

Answer

The top 500 feet of the earth stores energy absorbed from the sun. Rocks deeper than that are heated by radioactive decay in the core and mantle and are intensely hot. Where such large quantities of heat rise to the surface, via hot springs or vents, it can be used by power plants to generate electricity. In places like the northern U.S. where such heat rarely makes it to the surface, we tap into the steady 40-55^{o}F heat supply 30-500 feet deep in the earth. That energy can heat our homes and water. A system of pipes full of water or antifreeze extends from the building deep into the ground. A heat pump allows the liquid to absorb the Earth's heat and bring it back up into the home to heat it, or in the summer, sends the heat back down into the ground to cool the home. There are several companies in Maine that install geothermal systems such as these.

The answer is: True

Answer

Coal is a fossil fuel that formed from the remains of plants that lived and died millions of years ago. Those plants sank to the bottom of swampy areas and started to decay until more water and dirt covered them and stopped the decay process. Over time, even more sediment and water piled up squeezing this dead plant matter so hard that the temperature and pressure created caused it to undergo chemical and physical changes that resulted in a new substance- coal!

The answer is: True

True or False

Using hydropower does not impact the environment.

True or False

Propane comes from oil and natural gas wells.

True or False

Magnets are used to generate electricity.

True or False

Electricity is a nonrenewable resource.

Answer

Propane is a fossil fuel because it formed millions of years ago when tiny sea plants and animals sank to the bottoms of oceans, got covered with large masses of sediment and formed oil and natural gas. Propane is found mixed with oil and natural gas deposits underground. Propane is separated from natural gas at their processing plants and also from petroleum at oil refineries.

The answer is: True

Answer

Hydropower is a clean and renewable energy source. It creates no air pollution. Besides controlling the flow of water through the hydropower plant, the dams control floodwaters and provide lakes for recreation, which can boost tourism. There are many benefits to hydropower, but dams do alter the pattern and amount of river flow which affects wildlife like fish who need to swim up river to reproduce. Hydropower plants usually install some means for fish to bypass the dam. There are pros and cons to every energy source that need to be considered before they are put to use.

The answer is: False

Answer

Electricity is a secondary energy source, meaning that another energy source is used to make electricity. Those sources of energy may be renewable (like solar, wind, and geothermal) or nonrenewable (like fossil fuels), but the electricity itself is neither.

The answer is: False

Answer

Magnetism and electricity are related. Magnetic fields move electrons and moving electrons are electricity. In power plants, generators create electricity by either rotating a magnet inside a set of copper coils, or by rotating a set of copper coils inside a magnet. In either case the motion changes the magnetic field, which causes the electrons to start flowing, producing electricity. The coils or the magnet in a generator are connected to a long metal shaft of a turbine. The turbine is spun by burning fossil fuels to generate steam to move the turbine blades, or by the flow of river water in hydropower plants, or by other energy sources like geothermal or solar.

The answer is: True

True or False

It costs more to use CFLs (compact fluorescent light bulbs) than standard incandescent light bulbs.

True or False

Keeping our homes at a comfortable temperature uses more energy than any other system in our homes.

True or False

True or False

Answer

The average family's energy bill can broken down this way: 43% heating/cooling, 20% lighting/appliances, 12% water heating, 9% computer/electronics, 8% refrigeration, and 8% other. Much of the energy aimed at keeping our homes at a comfortable temperature is wasted. Our houses are leaky. The air we warmed or cooled inside can seep out, or outside air can seep in. This can happen through leaky doors and windows, and through vents, ceilings and uninsulated walls. Money can be saved in heating and cooling our homes by stopping up the leaks with caulking and insulation. Adjusting the thermostat down 2^{o} in the winter and up 2^{o} in the summer can also save energy and money.

The answer is: True

Answer

Purchasing compact fluorescent light bulbs (CFLs) costs more than standard incandescent bulbs, about $3.00 vs. $0.30 each. CFLs use less electrical power (13 watts vs. 60 watts) to produce the same amount of light, and they last about 10 times as long as standard light bulbs (10,000 hours vs. 1,000 hours). It would take 10 standard light bulbs to match one CFL. If we consider the average cost per kWh of electricity to be $0.12, and include the cost of the bulbs to run for 10,000 hours, it would cost about $75 for the standard incandescent bulbs and about $18.60 for the CFL. That's about ¼ the cost.

The answer is: False

Answer

Answer