

Welcome to the Supercharged Science

Alternative & Renewable Energy Teleclass Webinar!

You can fill out this worksheet as we go along to get the most out of time together, or you can use it as a review exercise at the end of the class to see where your strengths are.

What we're going to cover today:

- Forms of energy
 - Nuclear power
 - Coal and Natural Gas
 - Solar Cells (Photovoltaics)
 - Wind Turbine
 - Solar Thermal Power
 - Hydroelectric Power
 - Wind & Tidal Technologies
 - Geothermal Power
 - Ocean Thermal Conversion
 - Biofuels
 - Algae Fuel
 - Fuel Cells
 - Photoelectric Effect
 - Electricity & Magnetism
 - Piezoelectric Effect
 - Stirling Engines
 - Waste-to-Energy
-

Do this NOW: Write down two things you want to learn about Alternative/Renewable Energy:

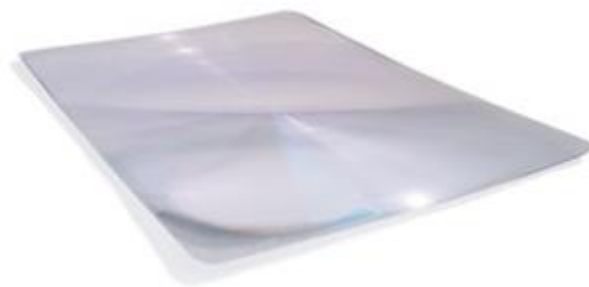
Do this NOW: Write down WHY you want to learn about the things you mentioned on the previous page. What will it give you, or provide you with, or make possible for you if you now understand these things that you wanted to learn?

IMPORTANT: During class, you can either fill out the worksheet, OR if that's too stressful or a hassle, just set it aside and fill it out after class is over so you can enjoy watching the class.

Answer key is on the last page, so put it in a place where you won't be tempted to peek at the answers until after you've given it your best shot.

Material List:

- Cardboard box, shoebox size or larger.
- Aluminum foil
- Plastic wrap (like Saran wrap or Cling wrap)
- Hot glue, razor, scissors, tape
- Wooden skewers (BBQ-style)
- Black construction paper
- Cookie dough (your favorite kind!)
- Chocolate, large marshmallows, & graham crackers if you want to make s'mores! If not, try just the large marshmallow.
- Large page magnifier (also called a Fresnel lens, found at office supply stores (like Staples), drug stores, and places that also sell reading glasses, or at [Amazon.com](https://www.amazon.com)) – the image above is a Fresnel lens.



If you want to do the Photoelectric Effect experiment, you'll also need:

- Tape
- Paper clip
- Sand paper
- Soda or steel soup can
- Brown paper bag
- Foam cup (any size)
- Tinsel (make your own with aluminum foil and scissors)
- PVC pipe (any size, about 12" long)
- OPTIONAL: [UV shortwave lamp](#) (also called a "germ-free portable lamp", and you can find it online at Amazon.com or from pet stores with "Urine-Off" product for cleaning floors). *(Image above is a portable germ-free lamp from link in shopping list.)*



NOTE: Keep this UV Lamp *away* from kids – it is *NOT* a toy and can cause sunburns to your eyes if mis-used. If you can't find one or it's too expensive, you can substitute sunlight for the UV lamp, but it will take longer for the experiment to progress.

During the Lesson:

You can look over the worksheet so you know what to listen for as you go through the class with me, or you can go through it along with me during class. OR... flip it over and forget about it and just enjoy the class. When class is over, flip it back over and fill it out and be amazed at how much you've picked up and learned!

1. _____ energy is generated from natural processes that are constantly replenished, like solar, wind, and waves.
2. _____ energy is an energy source that is an alternative to using fossil fuels and doesn't harm the environment, like fuel cells and natural gas.
3. _____ has different forms: kinetic, potential, thermal, chemical, electrical, sound, electrochemical, electromagnetic, and nuclear.
4. Light is _____ that can travel through _____.
5. Greenhouse _____ in the atmosphere trap and hold heat.
6. Nuclear reactors are used for generating _____ and propulsion in ships.
7. Solar panels can heat _____ or generate electricity.
8. The Photoelectric Effect is when _____ are emitted from an object when light hits the surface.

9. Solar cells convert _____ into electricity.
10. NEVER look at the _____ through anything with
_____!
11. Solar thermal power stations heat _____ into
_____ to generate electricity.
12. The energy in molten _____ heats water to make
_____ to generate electricity.
13. A _____ generates continuous power by having their blades
pushed by moving fluids (liquid or gas) which rotate a shaft.
14. Electricity _____ magnetism, and magnetism causes electricity.
15. Wind turbines convert the wind's _____ energy into electrical
energy.
16. Draw a picture of your favorite Wave Technology device:

17. Draw a picture of your favorite Tidal Stream Technology device:

18. Dams protect people, store _____ for drinking and growing plants, and make hydro-electric _____.

19. Hydroelectric power plants use _____ to generate electricity.

20. Geothermal power stations use _____ from the Earth's core to produce electricity.

21. Ocean thermal energy conversion uses the _____ difference in seawater to run a heat engine to produce electricity.

22. Biofuels are fuels made directly from _____.

23. _____ fuel is an alternative to liquid fossil fuels and other biofuels.

24. Fuel cells produce electric current directly from a _____
reaction.

25. Fuel cell vehicles are a type of _____ vehicle that use a fuel cell
instead of a battery to power an electric motor.

26. A Fresnel lens is a type of _____ lens originally developed for
lighthouses.

27. Piezoelectric Effect: certain materials generate an electric _____
when mechanical stress is applied.

28. Waste-to-Energy Facilities produce electricity and heat through
_____.

29. What I didn't know about robotics until class today was:

Vocabulary Words

Alternative energy is an energy source that is an alternative to using fossil fuels and doesn't harm the environment, like fuel cells and natural gas.

An **atom** is the smallest bit of stable matter. Atoms are made of a group of neutrons and protons, with an electron cloud circling the nucleus.

Combustion is rapid chemical combination of a substance with oxygen, involving the production of heat and light.

Current is electric charge that is moving. Electric current flows in a closed loop of an electrical circuit.

Reservoirs created by **dams** not only suppress floods but also provide water for activities such as irrigation, human consumption, industrial use, aquaculture, and navigability. Hydropower is often used in conjunction with dams to generate electricity.

An **electrical circuit** is a closed loop path in which electrons flow.

An **electromagnet** is a soft metal core made into a magnet by the passage of electric current through a coil surrounding it.

Electrons carry the charge in an electric circuit. Electrons have a negative charge.

Energy has a number of different forms; kinetic, potential, thermal, chemical, electrical, electrochemical, electromagnetic, sound and nuclear. Energy is derived from the utilization of physical or chemical resources, especially to provide light and heat or to work machines.

Geothermal energy is the heat from the Earth that is clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma.

A **greenhouse gas** is any gaseous compound in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere.

Light is electromagnetic energy within a certain portion of the electromagnetic spectrum. The word usually refers to visible light, which is visible to the human eye and is responsible for the sense of sight.

A **magnet** is a piece of iron (or an ore, alloy, or other material) that has its component atoms so ordered that the material exhibits properties of magnetism.

Nuclear energy is the energy released during nuclear fission or fusion, especially when used to generate electricity.

The **photoelectric effect** explains the experimental observations of the emission of electrons from an illuminated metal surface. For a given metal, there exists a certain minimum frequency of incident radiation below which no photoelectrons are emitted. This frequency is called the threshold frequency.

Renewable energy is generated from natural processes that are constantly replenished, like solar, wind, and waves.

Solar panels are designed to absorb the sun's rays as a source of energy for generating electricity or heating.

A **static charge** is when there is an imbalance of electric charge (more protons or more electrons).

A **wind turbine** is a device that converts the wind's kinetic energy into electrical energy. Wind turbines are manufactured in a wide range of vertical and horizontal axis types.

Answer Key

1. Renewable energy is generated from natural processes that are constantly replenished, like solar, wind, and waves.
2. Alternative energy is an energy source that is an alternative to using fossil fuels and doesn't harm the environment, like fuel cells and natural gas.
3. Energy has different forms: kinetic, potential, thermal, chemical, electrical, sound, electrochemical, electromagnetic, and nuclear.
4. Light is energy that can travel through space.
5. Greenhouse gases in the atmosphere trap and hold heat.
6. Nuclear reactors are used for generating electricity and propulsion in ships.
7. Solar panels can heat water or generate electricity.
8. The Photoelectric Effect is when electrons are emitted from an object when light hits the surface.
9. Solar cells convert sunlight into electricity.
10. NEVER look at the sun through anything with lenses!
11. Solar thermal power stations heat water into steam to generate electricity.
12. The energy in molten salt heats water to make steam to generate electricity.
13. A turbine generates continuous power by having their blades pushed by moving fluids (liquid or gas) which rotate a shaft.
14. Electricity causes magnetism, and magnetism causes electricity.
15. Wind turbines convert the wind's kinetic energy into electrical energy.
18. Dams protect people, store water for drinking and growing plants, and make hydro-electric power.
19. Hydroelectric power plants use water to generate electricity.
20. Geothermal power stations use heat from the Earth's core to produce electricity.
21. Ocean thermal energy conversion uses the temperature difference in seawater to run a heat engine to produce electricity.
22. Biofuels are fuels made directly from living matter.
23. Algae fuel is an alternative to liquid fossil fuels and other biofuels.
24. Fuel cells produce electric current directly from a chemical reaction.
25. Fuel cell vehicles are a type of electric vehicle that use a fuel cell instead of a battery to power an electric motor.
26. A Fresnel lens is a type of compact lens originally developed for lighthouses.
27. Piezoelectric Effect: certain materials generate an electric charge when mechanical stress is applied.
28. Waste-to-Energy Facilities produce electricity and heat through combustion.