



# **GEOLOGY Lo.9**

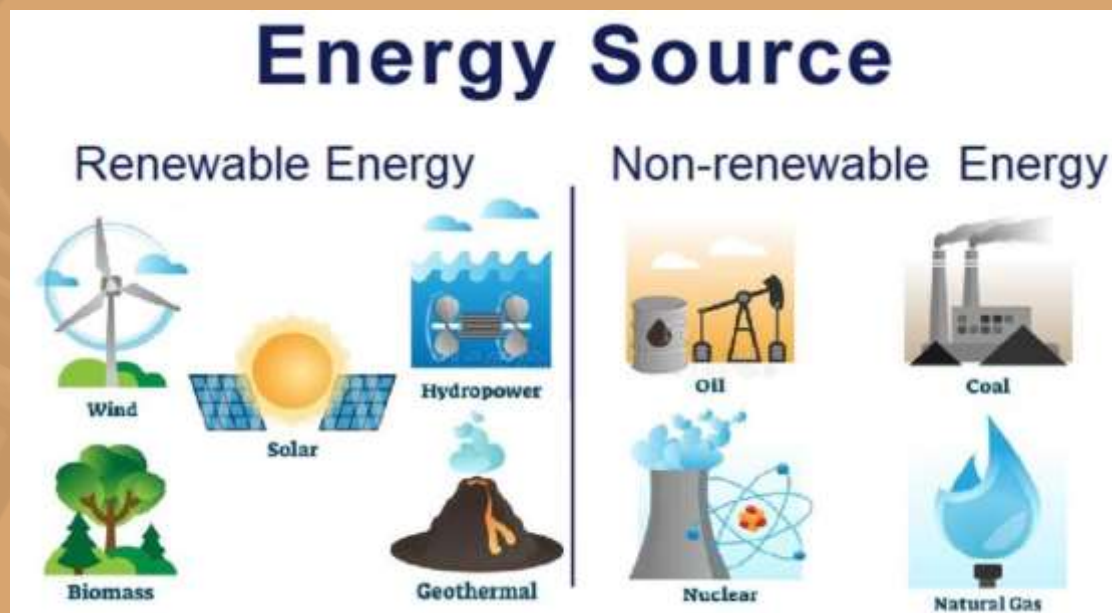
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**Qena Student Club**



# RENEABLE AND Nonrenewable Energy Resource

- Both are type of energy sources found in nature
- Both have special costs and benefits that make one ore preferable than the other



# NON-RENEWABLE ENERGY RESOURCES

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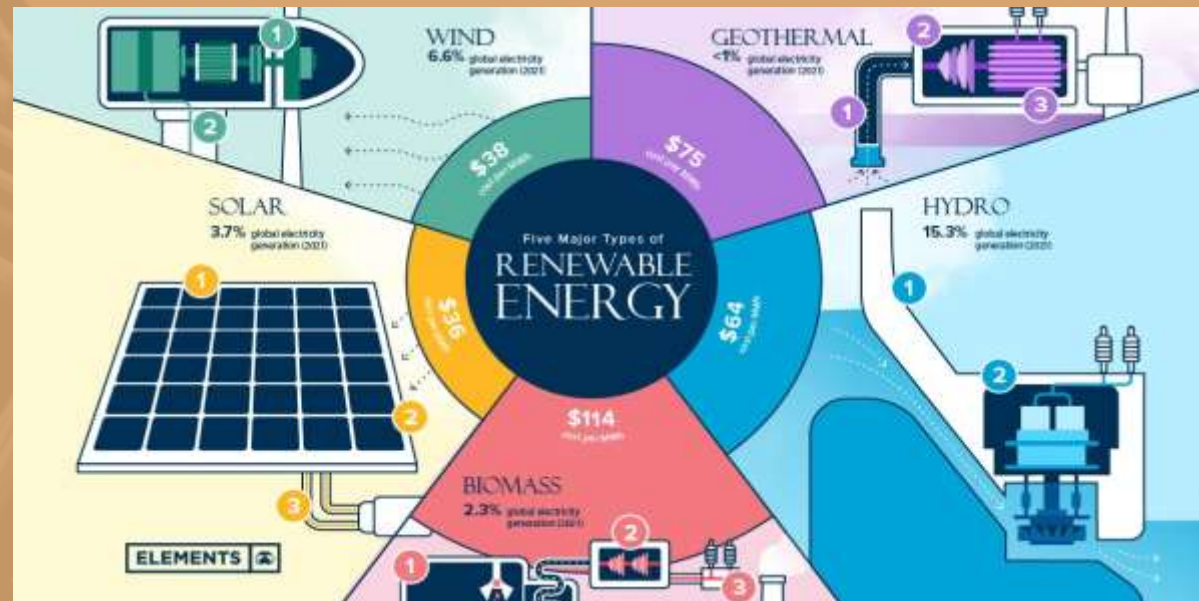
- **Nonrenewable resources are natural resources that are limited in supply and cannot be replaced except over millions of years.**
- **It can not be reduced or recycled**
- **Nonrenewable energy resources include fossil fuels ,natural oil, coal, radioactive elements such as uranium**



# RENEWABLE ENERGY RESOURCES



- **Renewable resources will not run out because they are replaced as quickly as they are used**
- **Renewable energy is energy derived from natural sources that are replenished at a higher rate than they are consumed. Sunlight and wind, for example, are such sources that are constantly being replenished. Renewable energy sources are plentiful and all around us.**
- **It can be reduced or recycled and used many time**
- **It use sustainable particles, an action that reduce the environmental pollution and protect earth biodiversity**



# Fossil fuels

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- Fossil fuels are mixtures of hydrocarbons that formed over millions of years from the remains of dead organisms.
- They include petroleum (commonly called oil), natural gas, and coal. Fossil fuels provide most of the energy used in the world today.
- They are burned in power plants to produce electrical energy, and they also fuel cars, heat homes, and supply energy for many other purposes

Fossil fuels contain stored chemical energy that came originally from the sun.

- Ancient plants changed energy in sun light to stored chemical energy in food, which was eaten by other organisms.
- After the plants and other organisms died, their remains gradually changed to fossil fuels as they were pressed beneath layers of sediments.
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**Petroleum and natural gas formed from marine organisms and are often found together. Coal formed from giant tree ferns and other swamp plants.**

- **When fossil fuels burn, they release thermal energy, water vapor, and carbon dioxide.**
- **Carbon dioxide produced by fossil fuel use is a major cause of global warming.**
- **The burning of fossil fuels also releases many pollutants into the air.**
- **Pollutants such as sulfur dioxide form acid rain, which kills living things and damages metals, stonework, and other materials.**
- **Pollutants such as nitrogen oxides cause smog, which is harmful to human health.**
- **Tiny particles, or particulates, released when fossil fuels burn also harm human health.**
- **Natural gas releases the least pollution; coal releases the most**
- **Petroleum has the additional risk of oil spills, which may seriously damage ecosystems.**

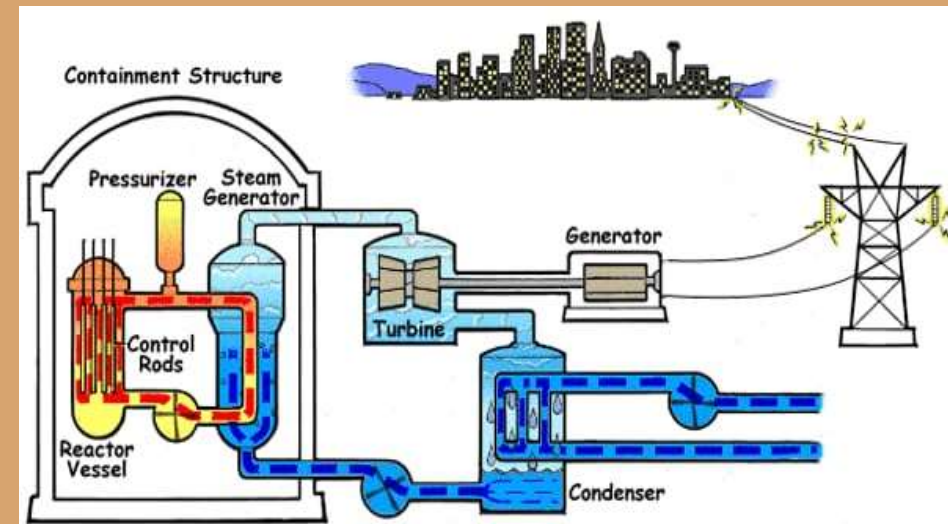


# Nuclear Energy



**Like fossil fuels, the radioactive element uranium can be used to generate electrical energy in power plants. In a nuclear power plant, the nuclei of uranium atoms are split in the process of nuclear fission.**

- **This process releases a tremendous amount of energy from just a small amount of uranium.**
- **The total supply of uranium in the world is quite limited, however, and cannot be replaced once it is used up.**
- **This makes nuclear energy a nonrenewable resource.**
- **Although using nuclear energy does not release carbon dioxide or cause air pollution, it does produce dangerous radioactive wastes.**
- **Accidents at nuclear power plants also have the potential to release large amounts of radioactive material into the environment.**



# Nuclear fission

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Radioactive uranium is concentrated and made fuel rods that generate large amount of heat as a result of the radioactive decay.

The heat used to turn into the water steam.

Expansion of steam is used to drive a turbine and generator

- Advantages

- Does not emit CO<sub>2</sub> pollutants
- Continuously generates electricity.

- Disadvantages:

- Expensive to start and maintain power plants.
- Safety concerns.
- Waste that remains toxic for many years.
- Non-renewable

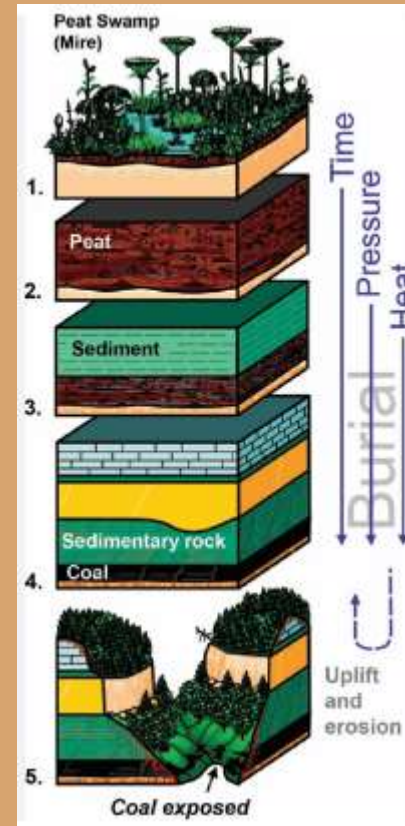


# coal

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- Energy in coal is form of solar radiation that is stored as a chemical energy in rock
- It is a sedimentary or metamorphic rock produced in swamps where is a large scale acumination to first become peat .
- Compaction of peat is due to burial drives off volatile components like water and methane, eventually producing a black result in more caron rich coal called lignite.
- Further compaction and heating the result in more carbon rich coal called bituminous coal .
- If the rock became metamorphed, a high grade coal called anthracite is produced .
- However if temperature and pressure become extremely High, all of the carbon is converted to graphite.
- Graphite will burn only at high temperature and is therefore not useful as an energy source
- Anthracite coal produce the most energy when it burned, with less energy produced by bituminous coal and lignite

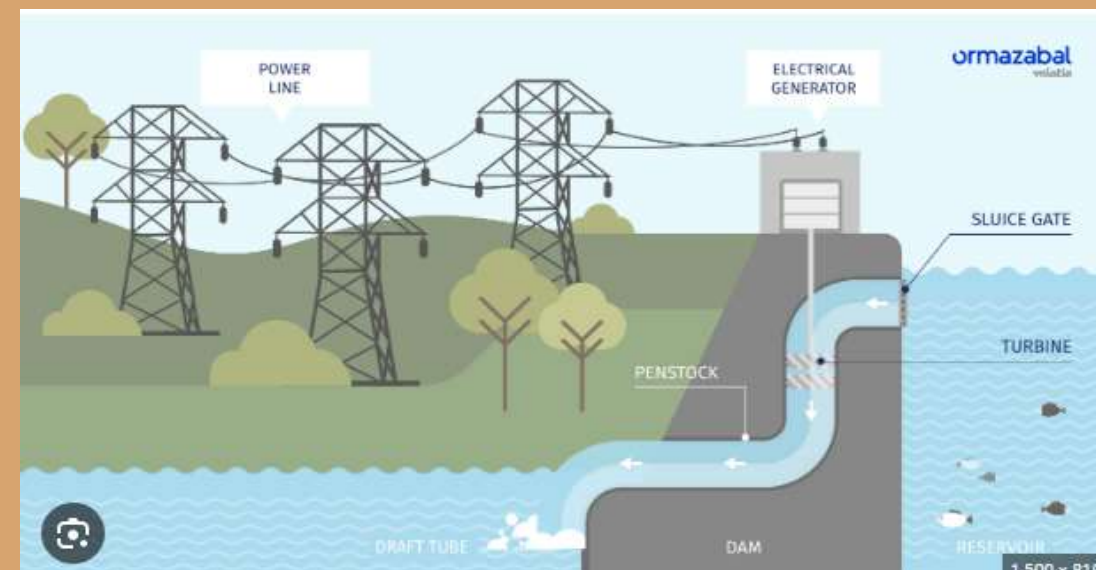


# HYDROELECTRIC POWER

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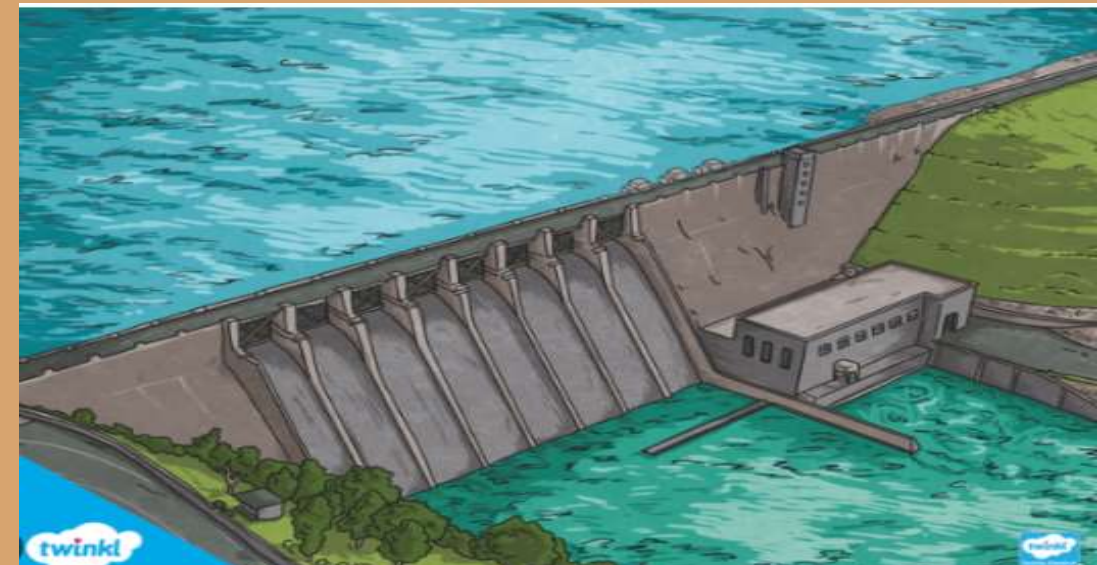
- Water is the top renewable resource used to generate electric power.
- Hydroelectric power is generated when flowing water spins a turbine.
- The turbine is connected to a generator. Hydroelectric plants are located where suitable waterways are available.
- Many of the best of these sites have already been developed. (Figure 3 shows the hydroelectric plants developed in the United States.)
- Seventy percent of the hydroelectric power in the United States is generated in the Pacific and Rocky Mountain states.
- There are two basic types of hydroelectric systems.
- One is based on falling water. The other is based on a natural river current.
- In a falling-water system, water builds up in reservoirs created by dams.
- This water then falls through large pipes.





The falling water applies pressure against the turbine blades.

- The blades drive the generator to produce electricity.
  - The second system is called a run-of-the-river system.
  - In it, the force of the river current applies pressure to the turbine blades to produce electricity.
  - Because they do not store water, these systems depend upon seasonal changes and stream flow.
  - Using water to generate electricity has advantages.
  - Water is a renewable resource and is a source of cheap power.
  - Compared to fossil fuels, there is little air pollution.
  - That is because there is no fuel combustion.
  - Also, there is limited thermal pollution compared to nuclear plants.
  - Hydroelectric power plants can start generating electricity quickly.
  - They do not need to wait for water to be heated into steam
- Also, the flow of water can be adjusted to make quick changes in power output during
  - peak demands for electricity.
  - Like other energy sources, the use of water has drawbacks.
  - These include impacts on the environment caused by damming rivers and streams.
  - Dams affect the habitats of the local plants and animals.
  - Another drawback to some hydroelectric power plants is that they depend upon the flow of water.
  - This can vary with seasons and during droughts

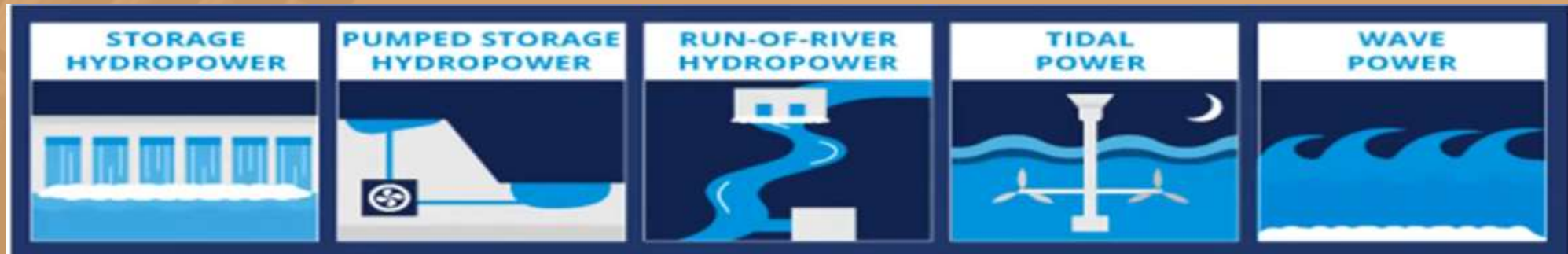






Advantages	Disadvantages
Reduces consumption of fossil fuels for electricity production	Dirt can build up at dams, decreasing their effectiveness
Reduces production of greenhouse gases, such as $CO_2$	Large-scale wildlife habitat destruction due to river valley flooding
Reduces production of pollution, such as particulate matter	Interferes with natural wildlife migration patterns, such as salmon
Can prevent uncontrolled flooding	Dam construction forces people to leave their homes if they live in or near the flooded river valley
Provides water for irrigation	Very expensive to build
Creates areas for certain types of recreation, such as boating and fishing	Reduces areas for certain types of recreation, such as fishing, camping, hunting, hiking
Is a renewable energy source!	Interferes with natural flow of water through environment
	If natural fisheries are affected, harms the livelihoods of people who rely on those fisheries to make a living
	Requires maintenance

## TYPES OF HYDROELECTRIC POWER





# WIND



THE WIND IS A RENEWABLE SOURCE OF ENERGY

THERE ARE TWO TYPES OF WIND TURBINES : HORIZONTAL AXIS WIND TURBINES HAWT AND VERTICAL AXIS WIND TURBINES VAWT  
THE HAWT IS THE MOST COMMON TYPE OF WIND TURBINES. THEY USUALLY HAVE TWO OR THREE LONG THIN BLADES THAT LOOK LIKE AN AIRPLANE

THE VAWT HAVE SHORTER, WIDER CURVED BLADES THAT RESEMBLE THE BEATERS USED IN AN ELECTRIC MIXTURE

Advantage	Disadvantage
The wind power industry creates employment opportunities.	Wind turbines can only be successfully installed in specific areas.
Wind energy has relatively low operating expenses.	Wind turbines are really quite difficult and expensive to install.
It is an everlasting and renewable energy source.	Wind blades include a safety concern to individuals working near them in windy conditions.
We are gradually reducing our reliance on fossil fuels by embracing wind energy to create electricity.	To be efficient and effective, a wind turbine necessitates a continuous supply of wind energy and is wholly unpredictable.



# GEO THERMAL ENERGY



IT COME FROM HEAT ENERGY BURIED BENEATH THE SURFACE OF THE EARTH. MOST OF THIS HEAT IS AT DEAPTH BRYOND CURRENT DRILLING METHODS. IN SOME AREAS OF THE COUNTRIES, MAGMA FLOWE CLOSE ENOUGH TO THE SURFACE OF EARTH TO PRODUSE STEAM. THAT STEAM CAN THEN BE USRD IN THE STEAM TURBINES PLANTES

Advantages	Disadvantages
Geothermal energy sourcing is good for the environment.	The extraction of geothermal energy causes greenhouse emissions.
Geothermal energy is a reliable source of renewable energy.	There is a possibility of depletion in geothermal sources.
Geothermal systems have high efficiency.	There is a high-cost investment needed for geothermal systems.
There is no too little geothermal system maintenance needed.	It is hard to implement geothermal systems in big cities.
There is an unlimited supply of geothermal energy.	Geothermal reservoirs cannot easily be found.



# DIGGING DEEPER

## MEETING ELECTRICITY NEEDS

### Energy Resources

The world's population continues to grow. This means that the need for energy will likely grow as well. Energy is needed for heating or cooling. It is needed to generate electricity. It is used in industrial processes. It is also used for transportation. Different energy resources can be used for many different purposes. Energy resources include coal, natural gas, and petroleum. Hydropower, **nuclear fission**, solar, wind, waste biomass, wood, and oceanic power are other sources. **Nuclear fusion** has been proposed as the long-term source. However, the progress made in research to make this possible has been very slow.

## Generating Electric Energy

Energy resources are used to generate electricity. Electricity is an energy source with which you are very familiar. **Electric power** is the rate at which electricity does work. It is measured at a point in time. The unit of measure for electric power is a watt (W). The rate at which an appliance transforms electric energy is called its capacity. You can check the tags or labels on electrical appliances for this information. For example, you might see a “1200-W hair dryer” or “40-W stereo receiver.” **Electric energy** is the amount of work that can be done by electricity. Its unit of measure is the watt-hour (Wh). A 1200-W hair dryer used for 15 min would require 300 Wh of electric energy

- **Fossil fuels** can be burned to generate electricity. Fossil fuels supply about
- 70 percent of the electricity in the United States. Coal, petroleum, and
- natural gas are examples of fossil fuels. They are the main ones used by the
- electrical power industry. When these fuels are burned, a variety of gases
- and particles are formed. Pollution-control equipment can be used to catch
- these. If they are not caught, they are let out into the atmosphere. Other
- sources of energy can also be used for electricity. These sources include
- water, **geothermal energy**, solar thermal energy, **photovoltaic energy**,
- and biomass. They have many advantages over fossil fuels.







- **Fossil Fuels and Nuclear Energy**

- Most of the electricity in the United States is produced in steam **turbines**.
- A turbine converts the kinetic energy of a moving fluid (liquid or gas) to
- mechanical energy. In a fossil-fueled steam turbine, the fuel is burned in
- a boiler to produce steam. The steam then turns the turbine blades. The
- blades turn the shaft of the generator to produce electricity. In a nuclear
- powered steam turbine, a reactor replaces the boiler. The reactor contains
- a core of nuclear fuel. (The fuel is mostly enriched uranium.) The fission of
- uranium produces the heat in the reactor. The heat is used to make steam.
- The steam is then passed through the turbine generator to produce
- electricity. This is the same as what occurs in the fossil-fueled steam
- turbine. *Figure 2* shows the nuclear power plant locations and uranium
- resources available in the United States



- **nuclear fission:** the process by which an atomic nucleus splits into two or more large fragments of comparable mass, simultaneously producing additional neutrons and vast amounts of energy.
- **nuclear fusion:** a nuclear process that releases energy when lightweight nuclei combine to form heavier nuclei.
- **electric power:** rate of power associated with the generation and transmission of electricity.
- **electric energy:** energy associated with the generation and transmission of electricity.
- **fossil fuel:** fuel derived from materials (mainly coal, petroleum, and natural gas) that were generated from fossil organic matter and stored deep in Earth for geologically long times.
- **geothermal energy:** energy derived from hot rocks and/or fluids beneath Earth's surface.
- **photovoltaic energy:** energy associated with the direct conversion of solar radiation to electricity.
- **turbine:** a rotating machine or device that converts the mechanical energy of fluid flow into mechanical energy of rotation of a shaft.
- **renewable resource:** a resource that can be replaced in nature at a rate close to its rate of use.
- **hydroelectric power:** electrical power derived from the flow of water on Earth's surface.
- **nonrenewable resource:** a resource that exists in a fixed amount or is used faster than it can be replaced in nature
- **Appliance capacity:** the rate at which an appliance transforms electric energy required , for example, you might see 1200 watt/hour. So, A dryer used for 15 min would require 300w/h of electric energy.

# TEST BANK



- 1. Energy experts have harnessed geothermal energy by:
  - A. Building dams.
  - B. Building wind generators.
  - C. Drilling wells.
  - D. Burning coal.
  - ANS: C
- 2. An example of a renewable resource is:
  - A. Ground
  - B. Water
  - C. Oil
  - D. Wind
  - ANS: D
- 3. Which of the following resources is NOT a fossil fuel?
  - A. Oil shale
  - B. Uranium-235
  - C. Coal
  - D. Tar sand
  - ANS: B
-



4. Which of the following shows the correct order for the products of ongoing coalification?

- A. Bituminous coal - lignite - anthracite – peat
- B. Peat - lignite - bituminous coal – anthracite
- C. Anthracite - lignite - bituminous coal – peat
- D. Lignite - peat - bituminous coal – anthracite

ANS: B

5. Most of our coal formed from plants that decayed in peat swamps that existed during the

- A. Carboniferous and Permian Periods
- B. Precambrian
- C. Devonian and Carboniferous Periods
- D. Industrial Revolution

ANS: A

6. Which of the following sources of energy is currently the most effective for supplying the energy needs of society?

- A. Hydroelectric energy
- B. Tidal energy
- C. Solar energy
- D. Geothermal energy

ANS: A





7. Which of the following statements about nuclear power is incorrect?

- A. Nuclear power is far more efficient than oil for generating energy.
- B. Nuclear power plants produce fusion reactions to generate power.
- C. The radioactive decay of uranium-235 is the basis for producing nuclear energy.
- D. Nuclear power supplies about 17% of the world's energy needs

ANS : B

8. Modern day northern hemisphere continents have a lot of coal that is Carboniferous in age. Keeping this in mind, which of the following statements is FALSE?

- A. There were a lot of swampy areas during the Carboniferous
- B. The northern hemisphere continents were closer to the equator in the Carboniferous
- C. The coal could have formed with the continents at their current latitudes
- D. Laurasia and Gondwana had very different climates during the Carboniferous

ANS : C

9. How much of the world's energy is obtained using nonrenewable resources?

- A. 30%
- B. 50%
- C. 75%

D. 90%

ANS: D

10. The type of fossil fuel that forms in a marine environment is a:

A. Coal

B. Peat

C. Biomass

D. Hydrocarbon

ANS: D

11. Which of the following is NOT a type of hydrocarbon?

A. Coal

B. Natural gas

C. Tar sands

D. Oil

ANS : A

12. The most viable source of energy that is an alternative to fossil fuels is:

A. Solar energy

B. Nuclear energy

C. Biomass energy

D. Hydroelectric energy

ANS: B





13. Which of the following forms of harnessing energy does NOT involve driving a turbine?

- A. Nuclear power stations
- B. Geothermal power stations
- C. Tidal dam power plants
- D. Photovoltaic power technology

ANS: D

14. What type of energy can be harnessed using photovoltaic cells?

- A. Solar
- B. Wind
- C. Tidal
- D. Hydroelectric

ANS: A

15. Which of the following statements about nuclear power is TRUE?

- A. Nuclear power is less efficient than oil for generating energy.
- B. Nuclear power plants utilize uranium fission reactions to generate power.
- C. Nuclear power supplies about 50% of the world's energy needs.
- D. Nuclear power is great because there are no environmental concerns.

ANS: B

16. Electricity generated by burning fossil-fuels is called:

- A. Hydro-electricity
- B. Tidal electricity
- C. Thermal electricity
- D. Nuclear energy

ANS: C

17. The commercial sources of energy are:

- A. Solar, wind, and biomass
- B. Fossil fuels, hydropower, and nuclear energy
- C. Wood, animal wastes and agricultural wastes
- D. None of the above

ANS: B

18. The proper indication of incomplete combustion is:

- A. High CO content in flue gases at exit
- B. High CO<sub>2</sub> content in flue gases at exit
- C. High temperature of flue gases
- D. The smoking exhaust from chimney

ANS: A







19. The main source of production of biogas is:

- A. Human waste
- B. Wet cow dung
- C. Wet livestock waste
- D. All above

ANS: D

20. In fuel energy, the \_\_\_\_\_ energy is converted into electrical energy.

- A. Mechanical
- B. Chemical
- C. Heat
- D. Sound

ANS: B

21. Solar thermal power generation can be achieved by:

- A. Using focus collector or heliostates
- B. Using flat plate collectors.
- C. Using a solar pond.
- D. All the above

ANS: D

22. The energy radiated by the sun on a bright sunny day is approximately

- A. 700 W/m<sup>2</sup>
- B. 800 W/m<sup>2</sup>



22. The energy radiated by the sun on a bright sunny day is approximately

- A. 700 W/m<sup>2</sup>
- B. 800 W/m<sup>2</sup>
- C. 1 KW/m<sup>2</sup>
- D. 2 KW/m<sup>2</sup>

ANS: C

23. Rankine cycle efficiency of a good steam power plant may be in the range of:

- A. 15 to 20 %
- B. 34 to 45 %
- C. 70 to 80 %
- D. 90 to 95 %

ANS: B

24. Rankine efficiency of a steam power plant:

- A. Improves in summer.
- B. Improves in winter.
- C. Is unaffected by climatic condition.
- D. None of the above

ANS: B



25. A steam power station requires space:

- A. Equal to the diesel power station
- B. More than the diesel power station
- C. Less than the diesel power station

ANS: B

26. The largest source of electricity generation in Pakistan is \_\_\_\_\_?

- A. Thermal
- B. Hydro
- C. Wind
- D. Solar

ANS: A

27. Fossil fuel that is formed underground from remains of partially decomposed plant material is known as:

- A. Petrol
- B. Natural gas
- C. Coal
- D. Uranium

ANS: C



28. Forms in which fossil fuels exist are:

- A. Solid and gas
- B. Solid and liquid
- C. Solid, liquid and gas
- D. Solid, gel(semi-solid), liquid and gas

ANS: C

29. A fuel cell, in order to produce electricity, burns:

- A. Helium
- B. Nitrogen
- C. Hydrogen
- D. None of the above

ANS: C

30. Which of the following resources is NOT a fossil fuel?

- A. Peat
- B. Coal
- C. Oil
- D. Carbon dioxide

ANS: D





31. Which of the renewable energy resources listed below ultimately involves driving a turbine to generate electricity:

- A. Geothermal
- B. Tidal
- C. Hydroelectric
- D. All of the above

ANS: D

32. Which of the following states is not one of the states that collectively contain 66% of all the oil shales on Earth?

- A. Montana
- B. Colorado
- C. Utah
- D. Wyoming

ANS: A

33. The most viable source of energy in mankind's future, which involves utilizing fission, is:

- A. Geothermal energy
- B. Solar energy
- C. Nuclear energy
- D. Tidal energy

ANS: C

34. Which of the following energy sources does NOT originally come from the Sun?

- A. Wind
- B. Ocean thermal energy conversion
- C. Geothermal
- D. Hydroelectric

ANS: C

35. One category of fossil fuel forms from the remains of marine organisms and is called a hydrocarbon. Which of the following is NOT a hydrocarbon?

- A. Peat
- B. Crude oil
- C. Natural gas
- D. Tar

ANS: A

36. Geothermal energy is commonly affected by all of the following problems except:

- A. Low efficiency
- B. Mineral deposits clogging pipes.
- C. Depletion of steam





**D. Corrosion**

**ANS: D**

**37. Which among the following is not a renewable source of energy?**

**A. Solar energy**

**B. Biomass energy**

**C. Hydropower**

**D. Geothermal energy**

**ANS: B**

**38. Which of the following is a disadvantage of most of the renewable energy sources?**

**A. Highly polluting**

**B. High waste disposal cost**

**C. Unreliable supply**

**D. High running cost**

**ANS: C**

38. Which of the following is a disadvantage of most of the renewable energy sources?

- A. Highly polluting
- B. High waste disposal cost
- C. Unreliable supply
- D. High running cost

ANS: C

39. Photovoltaic energy is the conversion of sunlight into:

- A. Chemical energy
- B. Biogas
- C. Electricity
- D. Geothermal energy

ANS: C

40. Horizontal axis and vertical axis are the types of:

- A. Nuclear reactor
- B. Wind mills
- C. Biogas reactor
- D. Solar cell

ANS: B







**Thanks**

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