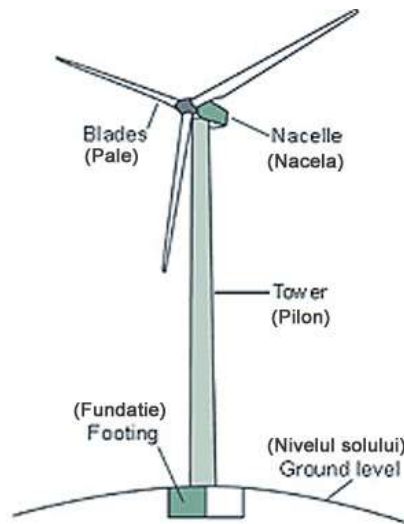


Renewable Energy

1.1 Read the following excerpt and answer the questions that follow. You may use a dictionary.

A wind turbine, windmill or wind generator is a device for converting [wind](#) power to mechanical rotation with a low velocity [turbine](#) designed for compressible fluids



Location is Critical

Wind generators are impractical in many areas. The available power grows as the cube of the average wind speed. A site with prevailing winds of 30 kph is eight times as valuable as a site with only 15 kph. As a general rule, wind generators are practical where the average windspeed is greater than 19 kph.

The normal way of prospecting for wind-power sites is to look for trees or vegetation that is permanently "cast" or deformed by the prevailing winds. Another way is to use a wind-speed survey map, or historical data from a nearby meteorological station, although this is less reliable.

In typical land-based installations, a tower lifting the bottom of the turbine 30 meters will pay for itself by placing the turbine in faster air.

In areas with dramatic topography, moving a generator 30m can sometimes double its output. Often the winds are monitored and modeled before wind generators are installed.

Wind power is practical in most areas of the North American great plains, and the central Eurasian plains, as well as selected ridges of major mountain-chains. Some authorities claim that the mountain ridges alone have enough wind energy to power their respective continents. In areas with storms, it often practical to replace or supplement solar cells with a wind-generator. The greatest reservoir of wind energy is in the open oceans, especially around 40 degrees south.

1.1.1 How can a suitable location for a wind-power site be found?

(3)

Look for trees or vegetation that has changed shape and become damaged by winds. Alternatively, look at windsurvey maps or historical data from meteorological stations.

1.1.2 Explain how lifting the bottom of a turbine by 30m can be highly beneficial. (2)

By lifting a turbine the blades are exposed to faster moving air√, thereby increasing the amount of energy generated√.

1.1.3 40 degrees south is referring to which line of latitude? (1)

The Equator

1.2 What is most of renewable energy used for? (1)

The production of electricity

1.3 In a paragraph, explain how biomass fuels are used to produce electricity. (4)

The fuel is burned√ – heats water√ – into steam√ – drives turbines√ – produces electricity

1.4.1 List **six** examples of renewable energy sources. (6)

biomass, water, geothermal, wind, solar, tidal

1.4.2 Draw a table in which you explain either, how you think each renewable energy source could be used in Cape Town, or give a reason why you do not think it could be used in Cape Town. (6)

Renewable Energy Source	How it could be used/Why it can't be used in Cape Town
Biomass	Wood can be grown etc.
Hydropower	Water can be pumped from one dam to another, then used as it flows back.
Geothermal	We don't have any geothermal sites in Cape Town
Wind	Wind turbines can be erected e.g in Lakeside
Solar	All houses can be fitted with solar panels
Tidal/Wave energy	Any reasonable site in Cape Town e.g Waterfront

Marks can be awarded if argument is reasonable.

Coal

2.1 From the list below, identify 5 places where coal is mined in South Africa. (5)

Knysna, Upington, **Witbank**, Cape Town, **Newcastle**, **Vryheid**, Durban, **Dundee**, **Sasolburg**



2.2 In a paragraph, fully explain the process by which coal is formed. (9)

Plants grew near water ✓. They died and fell into the water ✓. They were covered by sand and mud ✓. The wood turned into peat ✓. More layers of soil caused more pressure so that gas ✓ and water ✓ were squeezed out of the peat. This hardened layer is called lignite ✓. Over millions of years ✓ more layers of sand and mud covered the lignite which eventually became coal ✓.

2.3 Give the **two** main disadvantages of coal usage. (2)
It is a **non-renewable resource, pollution**

Energy

3. What two pieces of equipment are needed to generate an electrical current? (2)
A magnet, (copper) wire.

4. Give a definition of the following terms:

4.1 Electricity. **A flow of electrons**(or similar) (1)

4.2 Kinetic energy **Movement energy** (1)

4.3 Potential energy **Stored energy** (1)

5. **Multiple Choice:**

Complete the following statements by choosing the most correct answer. Write only the letter that corresponds with the correct answer.

5.1 Which of the following is not a bio-mass source?

- a) Methane
- b) Coal
- c) Wood
- d) Nuclear energy**

5.2 Which of these is not a renewable source of energy?

- a) The sun
- b) Petroleum**
- c) Wind
- d) Ocean tidal energy

5.3 A solar cell converts _____

- a) heat energy into electrical energy
- b) solar energy into electrical energy**
- c) heat energy into light energy
- d) solar energy into light energy

5.4 The fuel used in the nuclear reactor is _____

- a) Cadmium
- b) Radium
- c) Uranium**
- d) Thorium

5.5 Nuclear power plants produce energy through

- a) fusion
- b) fission**
- c) radiation
- d) contamination

5.6 In the nuclear process the nucleus of an atom is split apart when it is hit by:

- a) an x-ray
- b) a proton
- c) an electron
- d) a neutron**

5.7 What prevents the escape of radiation in the event of an accident at a nuclear plant?

- a) containment structures**
- b) cooling towers
- c) control rooms
- d) control rods of boron

(7)

6. Draw a table in which you list the pros and cons of nuclear energy.

(6)

Pros	Cons
Clean energy	Nuclear waste is dangerous
Technology already exists and doesn't have to be developed	Nuclear accidents can be catastrophic
Can generate lots of electricity from power plant	Radioactive waste can be used for nuclear weapons

7. Design a form of transport that uses a renewable source of energy. Label your diagram.

(3)

Any design using a renewable source of energy.

- ✓ **For using a renewable source of energy.**
- ✓ **For a feasible idea. Could it work?**
- ✓ **Explanatory label**