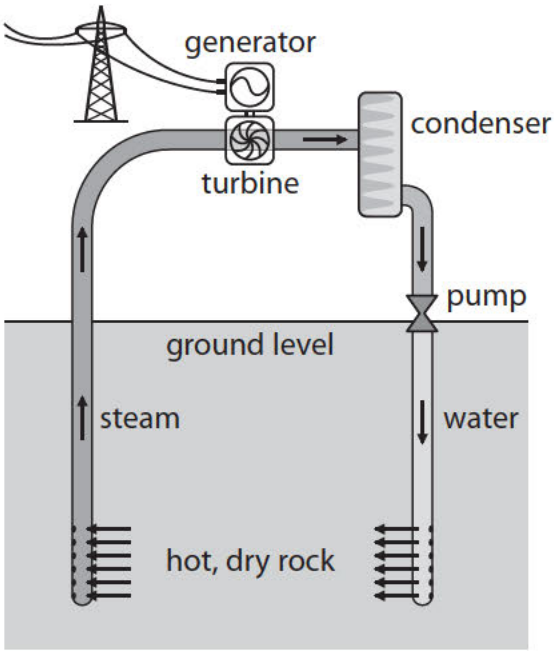
1 The diagram shows a type of power station used to generate electricity.



(a) (i) What type of renewable resource does this power station use?

(1)

.....

(ii) Name another renewable resource.

(1)

.....

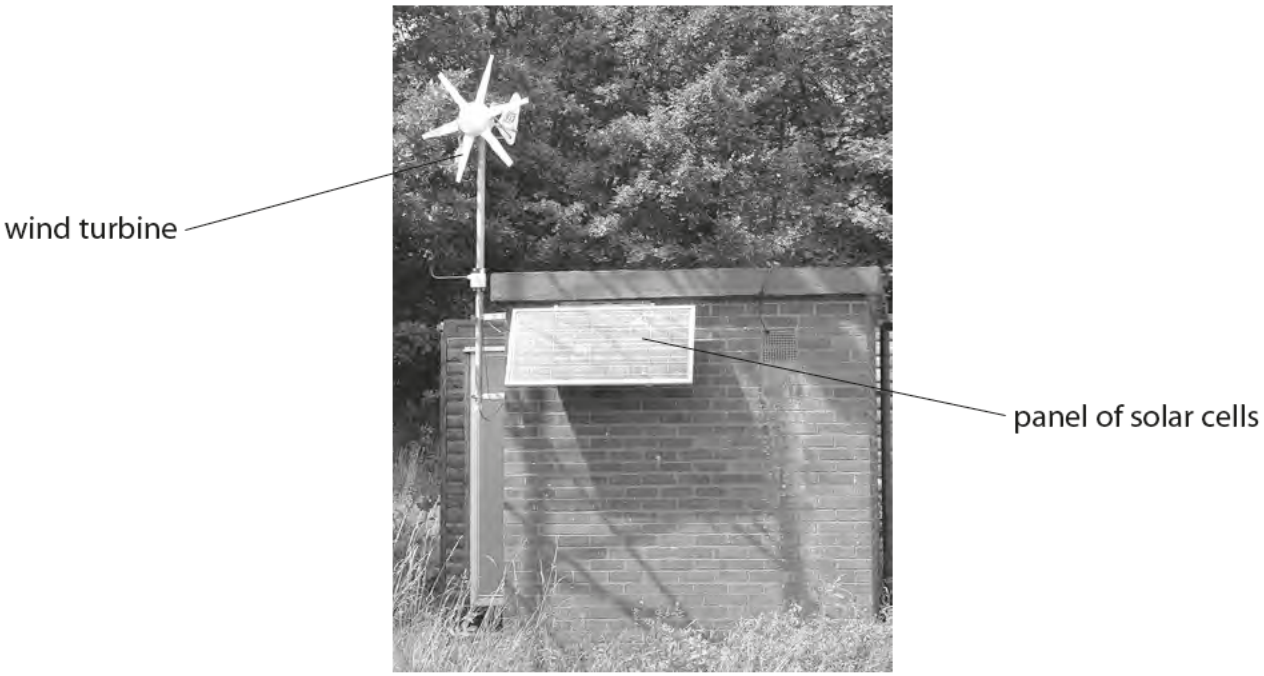
(b) Cold water is pumped down into the hot, dry rock.

Describe the energy transfers at each stage of electricity generation from this resource.

(4)

(Total for Question 1 = 6 marks)

2 The photograph shows equipment used for generating electricity from renewable sources.



(a) Complete the sentences using words from the box.

chemical	**t**	**kinetic**	**light**	**sound**

(i) The panel of solar cells transforms ..... energy into electrical energy.

(1)

(ii) The wind turbine transforms ..... energy into electrical energy.

(1)

(b) On a windy day, the wind turbine transfers 78 W of power.

(i) State the equation linking power, energy transferred and time.

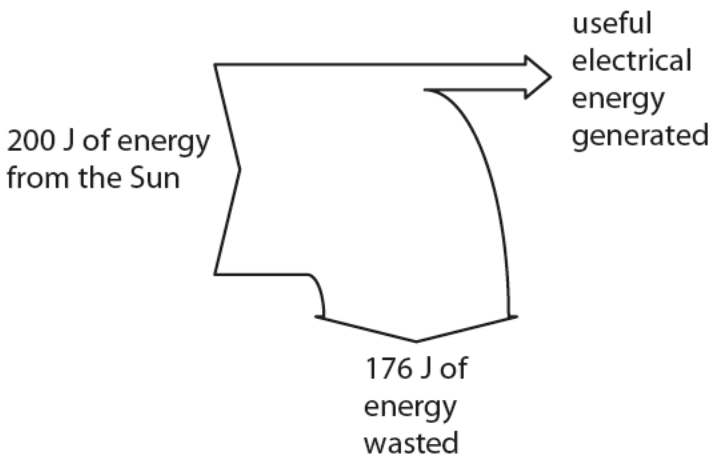
(1)

(ii) Calculate the amount of energy the turbine transfers in 10 s.

(3)

Energy transferred = ... J

(c) The Sankey diagram shows the energy transferred by the panel of solar cells.



Show that the efficiency of the panel of solar cells is 12%.

(2)

(Total for Question 2 = 8 marks)

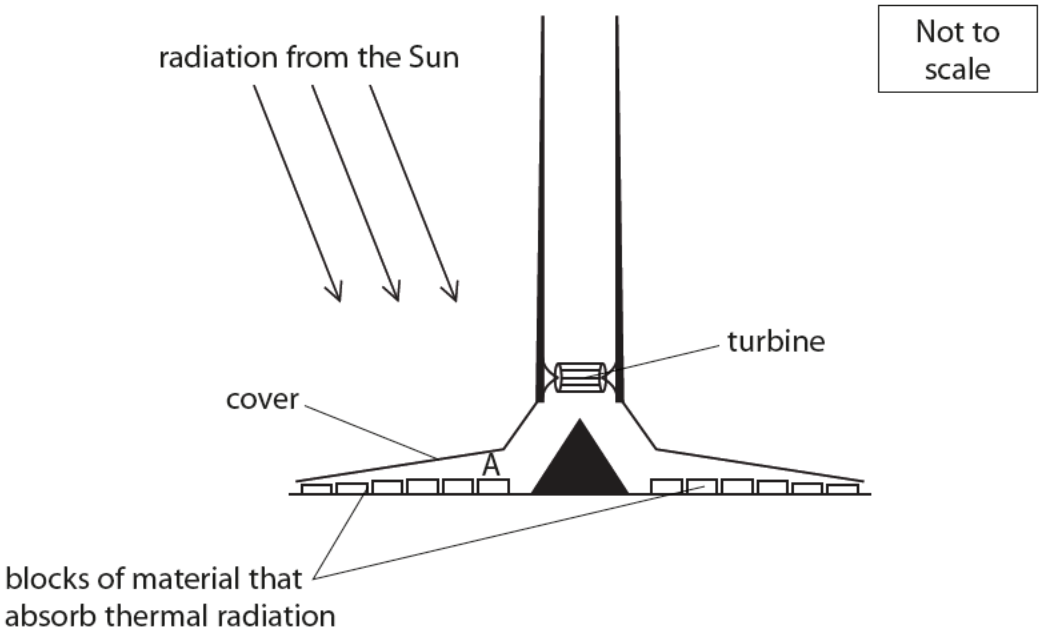
3 An experimental solar updraft tower (SUT) was built in the south of Spain.

This part of Spain has little rainfall and is hot in summer months.

The SUT was used as a 50 kW electricity generator.

The diagram shows the component parts of the tower.

The cover allows visible light to pass through but traps infrared. Rows of blocks under the cover absorb thermal radiation.



(a) (i) Explain what happens to the air at A just under the cover.

(3)

.....

.....

.....

.....

.....

.....

(ii) On the diagram, mark the directions of the air movements over the blocks of material and through the turbine.

(2)

(iii) State the name of this effect.

(1)

.....

(b) (i) Complete the energy transfer diagram for a SUT.

(2)

..... → ..... → electrical

(ii) Describe how a SUT can be used to generate electricity.

(2)

.....

.....

.....

.....

(c) (i) Suggest why the SUT generates most electricity during daylight hours.

(1)

.....

.....

(ii) Suggest why there are blocks of material that absorb thermal radiation in the SUT.

(1)

.....

.....

(iii) Suggest an alternative to these blocks that would improve the total energy output of the SUT.

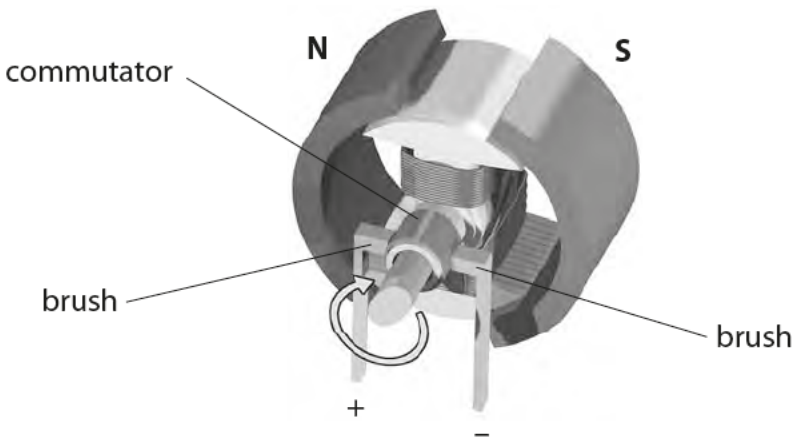
(1)

.....

.....

(Total for Question 3 = 13 marks)

4 The diagram shows an electric motor.



(a) This electric motor needs a direct current (d.c).

(i) Explain what is meant by the term direct current.

(1)

.....

.....

(ii) Explain the purpose of the brushes and the commutator in a d.c. motor.

(3)

.....

.....

.....

.....

.....

.....

(iii) The motor turns clockwise when the direction of the current goes from + to – .

State what happens to the motor when both the magnetic field and the current are reversed.

(1)

.....

.....

(b) The photograph shows a machine at a coal mine.



© Andrew Curtis

The machine lifts up containers of coal from the mine and lowers empty containers down.

The machine uses an electric motor connected to a 600 V d.c. supply.

The maximum current in the motor is 4000 A.

(i) State the equation linking power, current and voltage.

(1)

(ii) Calculate the maximum power available from the motor.

(2)

maximum power = ... MW

(c) The machine lifts a load weighing 400 000 N through 190 m.

(i) State the relationship between work done, force and distance moved.

(1)

(ii) Calculate the work done on the load.

(2)

work done on load = ... J

(d) The machine uses an average (mean) power of 1.9 MW to do 67 MJ of work.

(i) Calculate the time needed to do this work.

(3)

time = ... s

(ii) State the effect of using a lower average power to do this work.

(1)

.....

.....

(Total for Question 4 = 15 marks)