

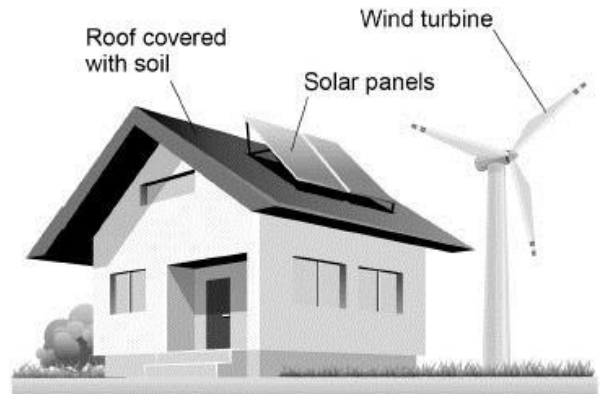
KS4 Combine Science (Trilogy) Homework 4 – Energy

Q1. An eco-house is designed to be environmentally friendly.

The diagram below shows a picture of an eco-house.

- (a) The solar panels and a wind turbine are used to generate electricity for the eco-house.

Solar and wind are both renewable energy resources.



What does renewable energy resource mean?

.....

(1)

- (b) Biomass, nuclear and natural gas are three other energy resources.

Complete the table to show whether each energy resource is renewable or non-renewable. Tick (✓) **one** box for **each** energy resource.

Energy resource	Renewable	Non-renewable
Biomass		
Nuclear		
Natural gas		

(2)

- (c) Moving air makes the wind turbine spin.

The wind turbine generates electricity which is used to charge a battery.

Complete the sentences.

Choose answers from the box.

chemical	electrical	gravitational	kinetic
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When the wind turbine spins faster there is an increase in its _____ energy.

Charging the battery increases the _____ store of energy of the battery.

(2)

- (d) The roof of the eco-house is covered with soil. Covering the roof with soil decreases the thermal conductivity of the roof.

What are the advantages of having a roof with a lower thermal conductivity?

Tick (✓) **two** boxes.

Less energy is needed to heat the house.

The rate of energy transfer by conduction is greater.

The roof is a better insulator.

The roof is less likely to leak.

Weather will have a greater effect on the temperature of the house.

(2)

- (e) The average power transferred to the solar panels by sunlight is 26 000 W

Calculate the average energy transferred to the solar panels in 30 seconds.

Use the equation: **energy transferred = power × time**

Average energy transferred to solar panels = _____ J

(2)

- (f) Write down the equation that links efficiency, total power input and useful power output.

(1)

- (g) The solar panels on the roof of the eco-house have an efficiency of 0.15

The average power input to the solar panels is 26 000 W

Calculate the average useful power output from the solar panels.

Average useful power output = _____ W

(3)

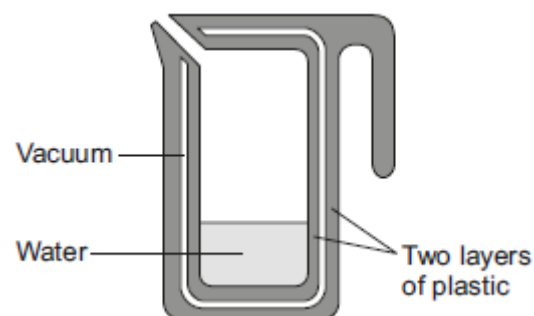
- (h) Explain why it is a good idea for the eco-house to have both a wind turbine and solar panels.

(2)
(Total 15 marks)

Q2.

A new design for a kettle is made from two layers of plastic separated by a vacuum. After the water in the kettle has boiled, the water stays hot for at least 2 hours.

The new kettle is shown in the picture



- (a) The energy transferred from the water in the kettle to the surroundings in 2 hours is 46 200 J.

The mass of water in the kettle is 0.50 kg.

The specific heat capacity of water is 4200 J/kg °C.

The initial temperature of the water is 100 °C.

Calculate the temperature of the water in the kettle after 2 hours.

Temperature after 2 hours = _____ °C

(3)

- (b) Calculate the average power output from the water in the kettle to the surroundings in 2 hours.

Average power output = _____ W

(2)

(Total 5 marks)

