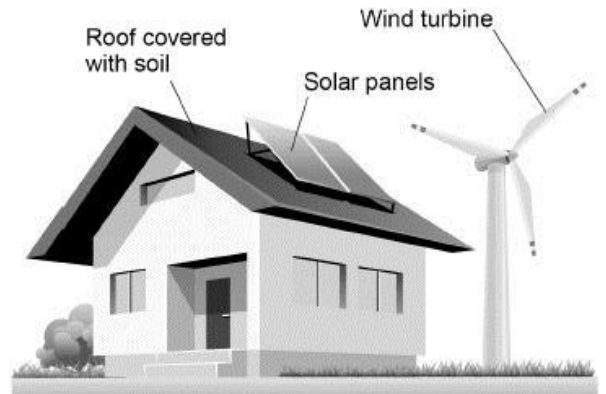


# KS4 Combine Science (Trilogy) Homework 4 – Energy

**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.

<b>chemical</b>	<b>electrical</b>	<b>gravitational</b>	<b>kinetic</b>
-----------------	-------------------	----------------------	----------------

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.

---

---

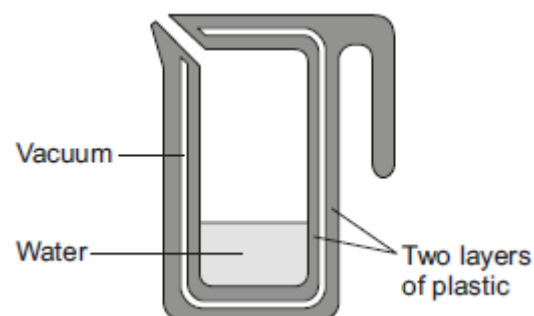
---

(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)

