

1.2 National & Global Energy Resources

Question Paper

Course	AQA GCSE Physics
Section	1. Energy
Topic	1.2 National & Global Energy Resources
Difficulty	Medium

Time allowed: 80
Score: /62
Percentage: /100

Question 1a

(a) The UK is starting to use wind turbines to generate more of its electrical energy.

Some people think this is a good idea, other people do not.

Suggest reasons why people think that building more wind turbines is a good idea.

[3 marks]

[3 marks]

Question 1b

(b) Suggest reasons why people think that building more wind turbines is a bad idea.

[3 marks]

[3 marks]

Question 1c

(c) It is difficult to store electrical energy that is produced by any kind of power plant.

One solution is a pumped storage dam.

Figure 1 shows a diagram of a pumped storage system.

Figure 1



Read the following passage:

During times of low demand, water is pumped up into the upper reservoir. During times of high demand, sluice gates are opened and water flows down through the generator, producing electrical energy. Pumped storage stations are designed to meet sudden, high demand for electrical energy, such as when thousands of people put their kettle on at half time of a major football game at the same time.

A pumped storage station has a very short start-up time.

Why is it important for the pumped storage station to have a short start-up time?

[1 mark]

[1 mark]

Question 1d

- (d) Other than a short start-up time, give **two** other advantages of a pumped storage power station.

[2 marks]

[2 marks]

Question 1e

- (e) Describe the energy transfers that take place when electricity is generated at a pumped storage power station.

[3 marks]

[3 marks]

Question 2a

(a) **Figure 2** shows some solar panels on the roof of a house.

Figure 2



The amount of solar energy hitting the solar panels in one day is equal to 700kWh.

The amount of energy the solar panels generate is 175 kWh.

The kWh is a unit of energy.

Calculate the efficiency of the solar panels.

[3 marks]

[3 marks]

Question 2b

(b) In 2010 the UK government passed legislation to encourage people to put solar photovoltaic panels on the roof of their houses.

A photovoltaic panel generates electrical energy.

Suggest why the government wanted people to use solar power rather than fossil fuels.

[3 marks]

[3 marks]

Question 2c

(c) State the energy transfer taking place in a solar panel.

[2 marks]

[2 marks]

Question 2d

- (d) Suggest reasons why solar power alone is unlikely to totally replace fossil fuels as a means of generating electrical energy.

[3 marks]

[3 marks]

Question 2e

- (e) The UK government has also made money available to help to build houses that are well insulated.

Describe the features of the walls of a building that cools down very slowly.

[2 marks]

[2 marks]

Question 3a

(a) A company wishes to build a science park at a coastal location in the UK.

To demonstrate its commitment to sustainability, the company wants to develop a renewable method of powering the buildings.

They are considering three options:

- biofuel
- geothermal power
- wind turbines

Evaluate the use of renewable resources to power the science park.

[6 marks]

[6 marks]

Question 3b

- (b) A company that builds nuclear reactors suggests that nuclear power might be suitable for powering the science park.

Representatives from the people who live near the site do not like this idea.

Suggest arguments for both the nuclear company and for the people who live close by.

[4 marks]

[4 marks]

Question 3c

- (c) The company also wishes to use renewable energy for the transport around the science park.

Due to the low amount of energy that batteries can store, battery powered cars need to be very efficient.

State the equation for efficiency.

[1 mark]

[1 mark]

Question 3d

(d) A typical electric car battery can store 144 MJ of energy before it needs to be recharged.

Using the battery, the car can produce 50 MJ of useful energy before it needs to be recharged.

Calculate the efficiency of the car.

[2 marks]

[2 marks]

Question 3e

(e) Calculate the amount of energy that is 'wasted' by the car and suggest the forms in which this energy may have been dissipated.

[3 marks]

[3 marks]

Question 4a

The electrical power demand of the UK is at least $3 \times 10^{10} \text{ W}$ at any given time.

An average gas-fired power station has a power output of $8.75 \times 10^8 \text{ W}$.

(a)

Determine how many gas-fired power stations are needed to meet the demand of the UK.

[2 marks]

Number of gas-fired power stations needed =

[2 marks]

Question 4b

(b)

The UK only has 32 active gas-fired power stations.

Calculate the shortfall.

[4 marks]

Power shortfall = W

[4 marks]

Question 4c

(c)
Suggest an energy resource that could make up the shortfall without producing further carbon emissions.

[1 mark]

[1 mark]

Question 4d

(d)
Discuss the advantages and disadvantages of gas-fired power stations.

[4 marks]

[4 marks]

Question 5a

Energy from the sun is released by the process of nuclear fusion.

(a)
Describe the process of nuclear fusion.

[2 marks]

[2 marks]

Question 5b

(b)
Scientists are working hard to create the process of nuclear fusion on Earth. This is referred to as cold fusion.
Nuclear fusion is difficult to achieve on Earth. State two reasons why.

[2 marks]

[2 marks]

Question 5c

(c)
For the fusion of deuterium on Earth, electricity is used to raise the temperature of the deuterium.
The specific heat capacity of deuterium is $5200 \text{ J/kg } ^\circ\text{C}$
Calculate the energy required to increase the temperature of 6.5 g of deuterium by $60\,000\,000 \text{ } ^\circ\text{C}$.
Give your answer in MJ.

[4 marks]

Energy required = MJ

[4 marks]

Question 5d

(d)

The current record for energy release by fusion, is 16 MW of fusion power for 24 MW of input power.

Suggest why cold fusion is not yet considered a viable energy resource.

[2 marks]**[2 marks]**