

Topic 1 Energy Extended Writing Questions

Name: _____

Class: _____

Date: _____

Time: **31 minutes**

Marks: **31 marks**

Comments:

Q1.(a) Iceland is a country that generates nearly all of its electricity from renewable sources.

In 2013, about 80% of Iceland's electricity was generated using hydroelectric power stations (HEP).

Describe how electricity is generated in a hydroelectric power station. Include the useful energy transfers taking place.

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(4)

(b) The UK produces most of its electricity from fossil fuels.

Many people in the UK leave their televisions in 'stand by' mode when not in use, instead of switching them off.

It is better for the environment if people switch off their televisions, instead of leaving them in 'stand by' mode.

Explain why.

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(3)

(c) A scientist wrote in a newspaper:

'Appliances that do not automatically switch off when they are not being used should be banned.'

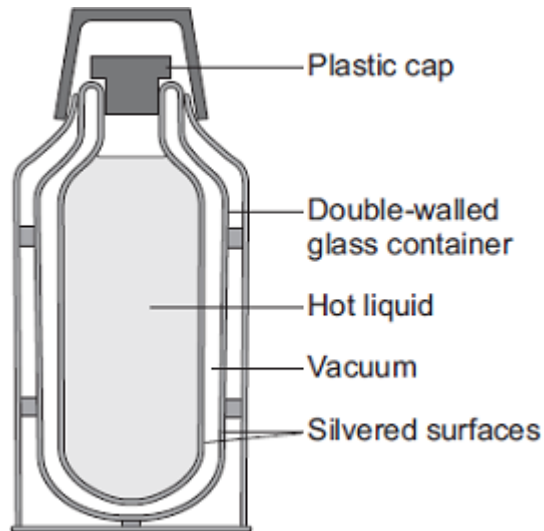
Suggest why scientists alone cannot make the decision to ban these appliances.

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(1)
(Total 8 marks)

Q2.(a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagram shows the structure of a vacuum flask.



A vacuum flask is designed to reduce the rate of energy transfer by heating processes.

Describe how the design of a vacuum flask keeps the liquid inside hot.

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(6)

(b) Arctic foxes live in a very cold environment.



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Arctic foxes have small ears.

How does the size of the ears help to keep the fox warm in a cold environment?

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(2)

(Total 8 marks)

Q3.(a) Nuclear fuels and the wind are two of the energy sources used to generate electricity

in the UK.

Explain the advantages of using energy from nuclear fuels to generate electricity rather than using energy from the wind.

Include in your answer a brief description of the process used to generate electricity from nuclear fuels.

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(4)

- (b) In the UK, most electricity is generated in power stations that emit carbon dioxide into the atmosphere. The impact of these power stations on the environment could be reduced by the increased use of 'carbon capture' technology.

Describe how 'carbon capture' would prevent the build-up of carbon dioxide in the atmosphere.

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(2)

(Total 6 marks)

- Q4.** (a) Geothermal energy and the energy of falling water are two resources used to generate electricity.

- (i) What is geothermal energy?

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(1)

- (ii) Hydroelectric systems generate electricity using the energy of falling water.
A pumped storage hydroelectric system can also be used as a way of storing energy for future use.

Explain how.

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(2)

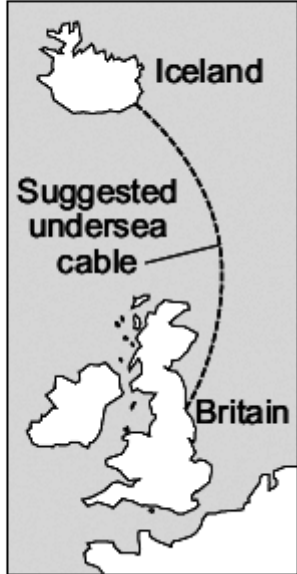
- (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Read the following extract from a newspaper.

Britain may be switched on by Iceland

Iceland is the only country in the world generating all of its electricity from a combination of geothermal and hydroelectric power stations. However, Iceland is using only a small fraction of its energy resources. It is estimated that using only these resources, the amount of electricity generated could be increased by up to four times.

To help supply the future demand for electricity in Britain, there are plans to build thousands of new offshore wind turbines. It has also been suggested that the National Grid in Britain could be linked to the electricity generating systems in Iceland. This would involve laying a 700 mile undersea electricity cable between Iceland and Britain.



The map shows the geographical locations of Iceland and Britain. A dashed line, labeled 'Suggested undersea cable', connects the two countries across the North Atlantic Ocean. The labels 'Iceland' and 'Britain' are placed next to their respective landmasses.

Discuss the advantages and disadvantages of the plan to build thousands of offshore wind turbines around Britain **and** the suggested electricity power link between Britain and Iceland.

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(6)
(Total 9 marks)

M1.(a) water moves (from a higher level to a lower level) 1

transferring GPE to KE 1

rotating a turbine to turn a generator
*accept driving or turning or spinning for rotating
moving is insufficient* 1

transferring KE to electrical energy
*transferring GPE to electrical energy gains 1 mark of the 2
marks available for energy transfers* 1

(b) (TVs in stand-by) use electricity
accept power / energy 1

generating electricity (from fossil fuels) produces CO₂
*accept greenhouse gas
accept sulfur dioxide* 1

(CO₂) contributes to global warming
*accept climate change for global warming
accept greenhouse effect if CO₂ given
accept acid rain if linked to sulfur dioxide* 1

(c) a factor other than scientific is given, eg economic, political or legal
personal choice is insufficient 1

[8]

M2.(a) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the [Marking guidance](#).

0 marksNo relevant content.

Level 1(1-2 marks)There is a basic explanation of **one** feature or a simple statement relating reduction in energy transfer to **one** feature.

Level 2(3-4 marks)There is a clear explanation of **one** feature or a simple statement relating reduction in energy transfer to **two** features.

Level 3(5-6 marks)There is a detailed explanation of at least **two** features or a simple statement relating reduction in energy transfer to all **four** features.

Examples of the points made in response

extra information

accept throughout:

heat for energy

loss for transfer

plastic cap:

- plastic is a poor conductor
accept insulator for poor conductor
- stops convection currents forming at the top of the flask so stopping energy transfer by convection
- molecules / particles evaporating from the (hot) liquid cannot move into the (surrounding) air so stops energy transfer by evaporation
- plastic cap reduces / stops energy transfer by conduction / convection / evaporation

glass container:

- glass is a poor conductor so reducing energy transfer by conduction
 - glass reduces / stops energy transfer by conduction

vacuum:

- both conduction and convection require a medium / particles

- so stops energy transfer between the two walls by conduction and convection
- vacuum stops energy transfer by conduction / convection
 - silvered surfaces:
 - *silvered surfaces reflect infrared radiation*
accept heat for infrared
 - *silvered surfaces are poor emitters of infrared radiation*
 - *infrared radiation (partly) reflected back (towards hot liquid)*
 - *silvered surfaces reduce / stop energy transfer by radiation*

6

(b) (the ears have a) small surface area
ears are small is insufficient

1

so reducing energy radiated / transferred (from the fox)
accept heat lost for energy radiated
do **not** accept stops heat loss

1

[8]

M3. (a) answers must be in terms of nuclear fuels

concentrated source of energy
idea of a small mass of fuel able to generate a lot of
electricity

1

that is able to generate continuously
accept it is reliable
or can control / increase / decrease electricity generation
idea of available all of the time / not dependent on the
weather
ignore reference to pollutant gases

1

the energy from (nuclear) fission

1

is used to heat water to steam to turn turbine linked to a generator

1

(b) carbon dioxide is not released (into the atmosphere)

1

but is (caught and) stored (in huge natural containers)

1

[6]

M4. (a) (i) *energy from hot rocks in the Earth
accept heat that occurs naturally in the Earth
accept steam / hot water rising to the Earth's surface
accept an answer in terms of the energy released by
radioactive decay in the Earth
heat energy is insufficient*

1

(ii) *water is pumped / moved*

1

up (to a higher reservoir)

this mark point only scores if first mark point is awarded

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content

Level 1 (1-2 marks)

There is a brief description of at least one advantage or disadvantage for either the planned wind turbines or the suggested electricity power link.

Level 2 (3-4 marks)

There is a description of advantages and disadvantages for either the planned wind turbines or the suggested electricity power link.

or

A description of the advantages or disadvantages for both the planned wind turbines and the suggested electricity power link.

Level 3 (5-6 marks)

There is a clear and detailed description of at least one advantage and one disadvantage for both the planned wind turbines and suggested electricity power link.

examples of the points made in the response

Offshore wind turbines

advantages

- *renewable (energy resource)*
 - *low running costs*
 - *energy is free*
- *no gas emissions (when in use)*
accept a named gas eg CO₂
accept no fuel is burned
accept less dependent on fossil fuels
- *land is not used (up)*

disadvantages

- *unreliable – accept wind does not always blow*
ignore references to destroying or harming habitats
 - *hazard to birds / bats*
- *visual pollution – do not accept noise pollution*
*do **not** allow if clearly referring to onshore wind turbines*
*do **not** accept spoils landscape*
- *difficulty of linking turbines to the National Grid*
 - *large initial cost*

- *difficult to erect / maintain*
accept a lot of maintenance needed
- *CO₂ emissions in manufacture (of large number of turbines)*

Suggested Link

advantages

- *income for Iceland*
 - *using Iceland's (available) energy (resources)*
accept using (Iceland's) renewable energy (resources)
*do **not** accept reduce the amount of Iceland's wasted energy*
 - *provide electricity when wind does not blow / reliable*
 - *provide electricity at times of peak demand*
 - *even out fluctuations in supply*
- *excess electricity from Britain (windy days) to Iceland and used to pump water up to store energy*
 - *Britain less dependent on fossil fuels*
accept Britain needs fewer (new) power stations
accept conserves fossil fuels

disadvantages

- *large initial cost*
accept expensive (to lay cables)
 - *power loss along a long cable*
- *(engineering) difficulties in laying / maintaining the cable*
accept difficult to repair (if damaged)

6

[10]