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Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE PHYSICS

Topic Paper: 1.3 & 2.4.3 National grid and global energy resources
Part 2

Time allowed: 45 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

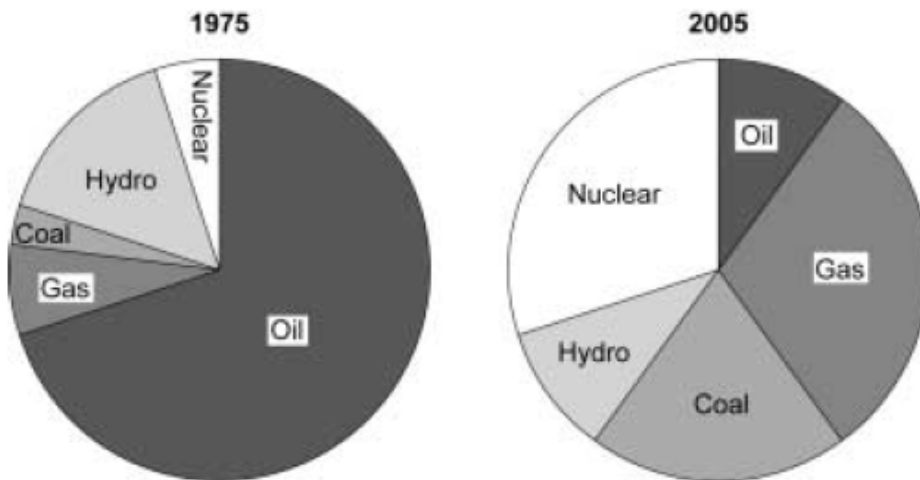
Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



42 Marks

Q6. The pie charts show the relative proportions of electricity generated in Japan from different energy sources in 1975 and 2005.



(a) Describe and suggest a reason for **two** differences in the energy sources used in 2005 compared with 1975.

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(2)



(b) Mining for coal often releases large amounts of methane gas. Methane is both explosive and a greenhouse gas. At the Sihe coal mine in China the methane is diverted to a gas burning power station where it is used to generate electricity.

(i) A newspaper reported a scientist as saying:

If the concentration of greenhouse gases in the atmosphere doubles, the average temperature of the Earth will increase by up to 5 °C over the next 100 years.

What has been stated in the newspaper?

Draw a ring a round your answer.

a fact

a guess

a prediction

Give a reason for your answer.

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(2)

(ii) Explain an environmental advantage of taking the methane gas from coal mines and using it to generate electricity.

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(2)



- (c) The average person in Britain uses 1930 kWh of electricity each year. Many people in the world's poorest countries do not have access to electricity.

Giving examples, explain why electricity is essential for both improving public health and for modern communications.

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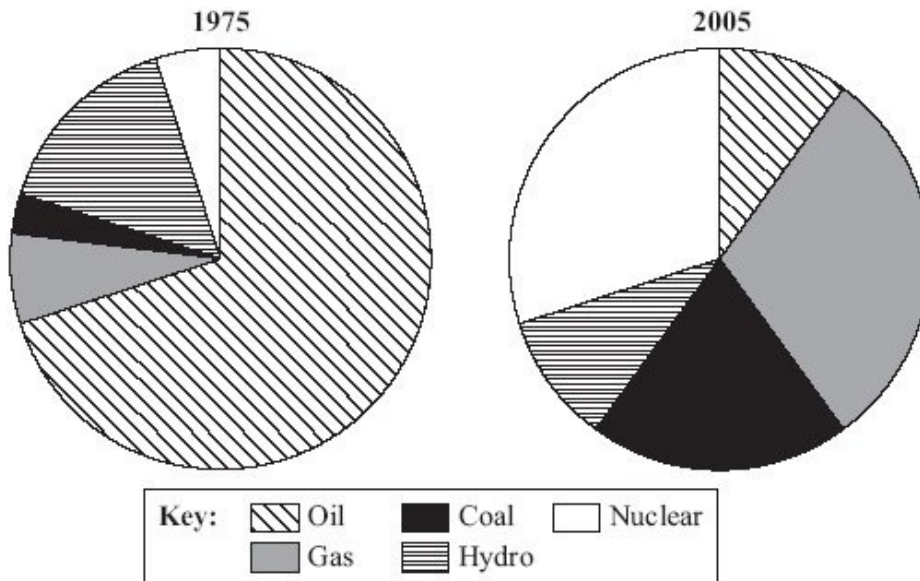
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(3)
(Total 9 marks)

- Q7.** The pie charts show the relative proportions of electricity generated in Japan from different energy sources in 1975 and 2005.



- (a) Describe the main differences in the energy sources used in 2005 compared with 1975.

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(1)



(b) In the UK, nuclear fuels are used to generate about 21% of the total electricity supply.

(i) What is the name of the process by which a nuclear fuel produces heat?

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(1)

(ii) Explain how the heat released from a nuclear fuel is used to generate electricity in power stations.

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(2)

(iii) Some people have suggested that more nuclear power stations should be built in the UK.

Give **two** reasons to support this suggestion.

1

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2

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(2)

(iv) Nuclear power stations create dangerous waste.

Why is the waste from a nuclear power station dangerous?

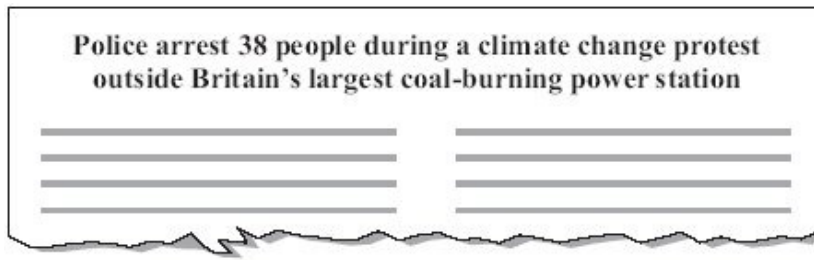
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(1)



(c) A headline from a newspaper article is shown below.



Explain the possible link between *climate change* and *coal-burning power stations*.

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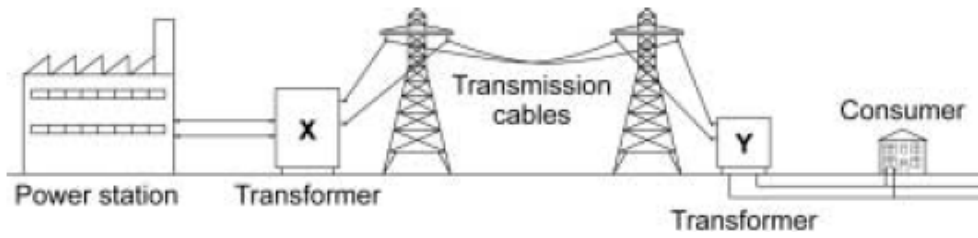
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(2)
(Total 9 marks)



Q8. The diagram shows the National Grid system.



Transformers **X** and **Y** are an essential part of the National Grid system.

Explain why.

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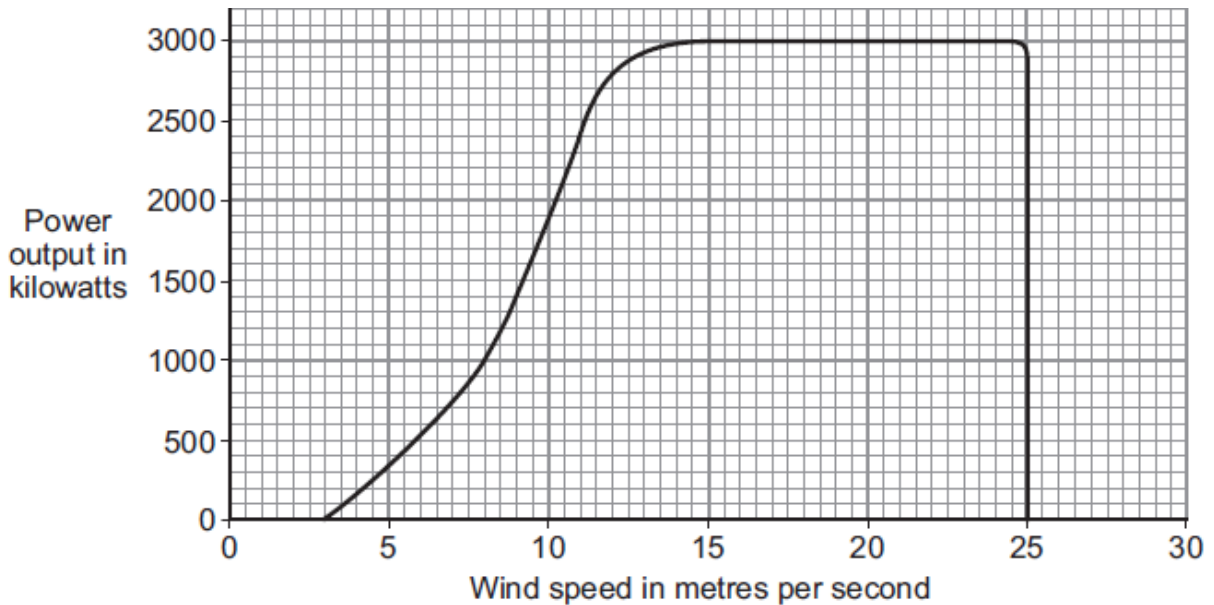
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(Total 4 marks)



Q9. The world's biggest offshore wind farm, built off the Kent coast, started generating electricity in September 2010.

(a) The graph shows how wind speed affects the power output from one of the wind turbines.



In one 4-hour period, the wind turbine transfers 5600 kilowatt-hours of electrical energy.

Use the equation in the box and the data in the graph to calculate the average wind speed during this 4-hour period.

energy transferred = power × time

Show clearly how you work out your answer.

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Average wind speed = m/s

(3)

(b) The wind turbines are linked to the National Grid by underwater cables.

(i) What is the National Grid?

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(1)



(ii) How is the National Grid designed to reduce energy losses during transmission?

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(1)

(c) Read this extract from a newspaper.

Power crisis as island basks in sunshine

The population of a small island off the coast of Scotland decided to generate all their electricity from water and wind. However, they did not predict having a long period of warm, dry weather. A combination of low water levels and hardly any wind has drastically reduced the output from the hydroelectric power station and wind turbines.

Explain **one** way in which the islanders could try to ensure that a similar power crisis does **not** happen in the future.

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(2)

(Total 7 marks)

Q10. Over the next 15 years, some of the older nuclear power stations will be closed down, and the process of *decommissioning* will start. In the same period, several countries plan to build a number of new nuclear power stations.

(a) (i) What does it mean to *decommission* a nuclear power station?

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(1)

(ii) How does *decommissioning* affect the overall cost of electricity generated using nuclear fuels?

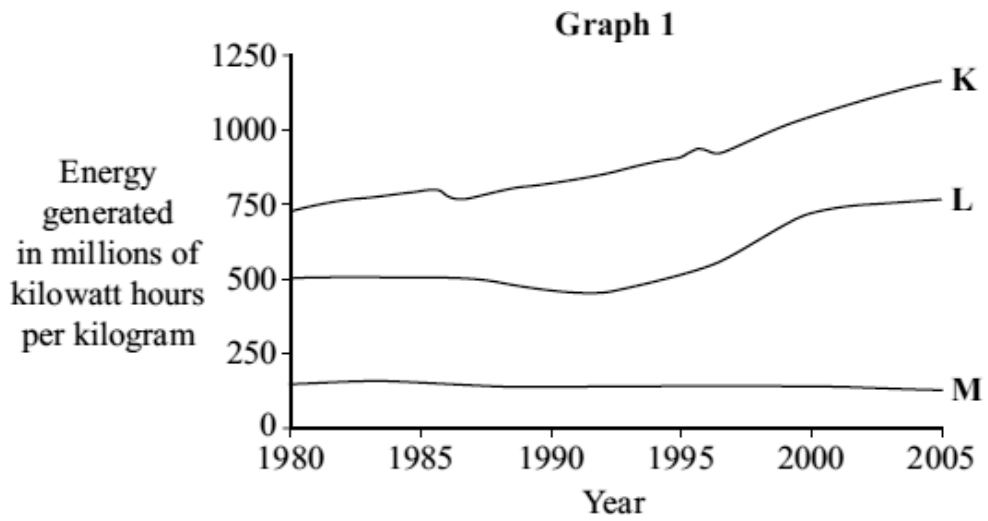
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(1)



- (b) Uranium is a fuel used in nuclear power stations to generate electricity.

Graph 1 compares how the electricity generated from one kilogram of nuclear fuel changed between 1980 and 2005 in three different types of nuclear power station.



- (i) Compare the efficiency of the three types of power station, **K**, **L** and **M**, between 1980 and 2005.

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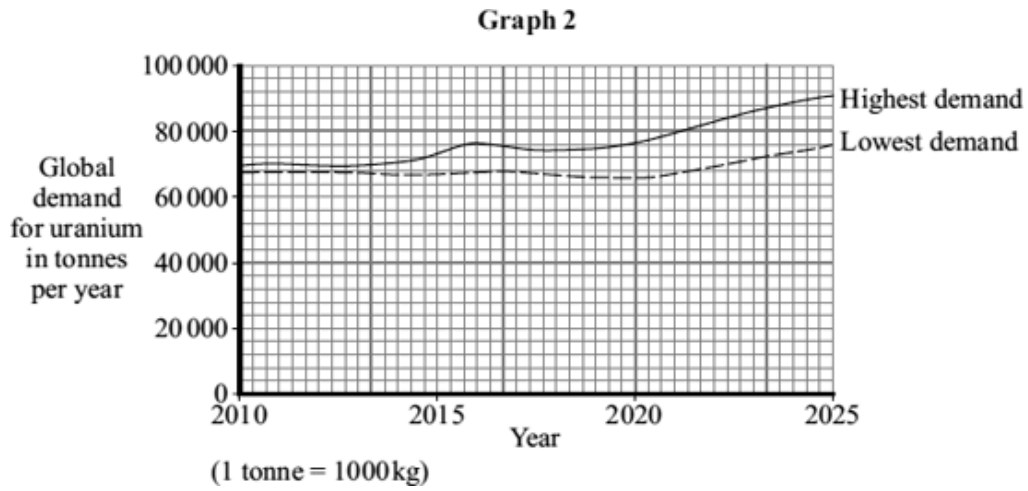
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(2)



Graph 2 shows two different predictions for the global growth in uranium demand over the next 15 years.



- (ii) Suggest reasons why it is **not** possible to predict accurately how much uranium will be needed in 2025.

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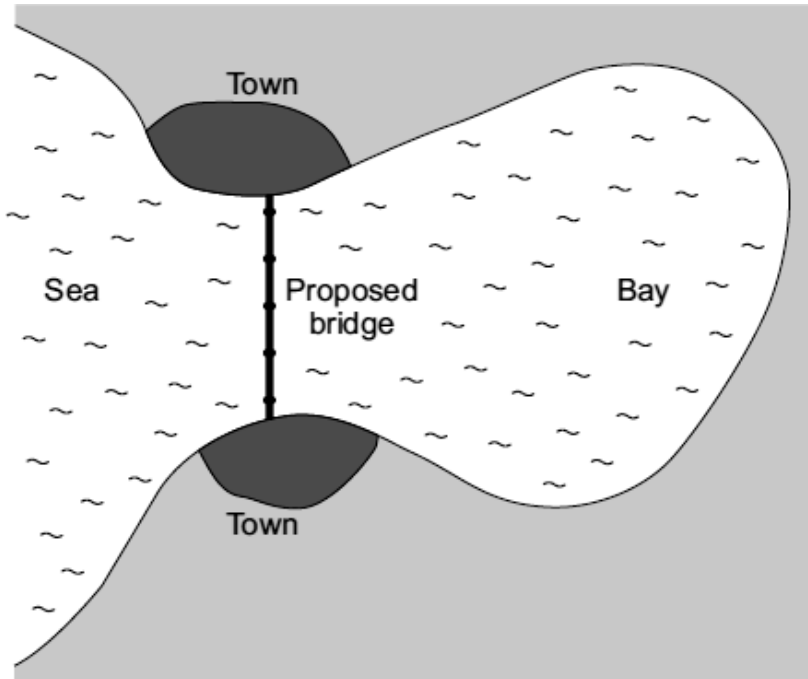
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(2)
(Total 6 marks)



Q11. The map shows the positions of two towns on either side of a very large coastal bay in England. The map also shows where a bridge may be built to link the towns. The road journey from one town to the other is about 60 kilometres at present.



(a) It is estimated that building turbines and generators inside the legs of the bridge would produce enough electricity for both towns. In addition, enough electricity would be generated to run electric buses over the bridge between the two towns.

(i) If the bridge is built, what form of renewable energy will be used to generate the electricity?

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(1)

(ii) Most people living in the area are in favour of the proposed bridge.

Suggest **three** reasons why people would be in favour of building the bridge and the associated electricity generating scheme.

Reason 1

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Reason 2

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Reason 3

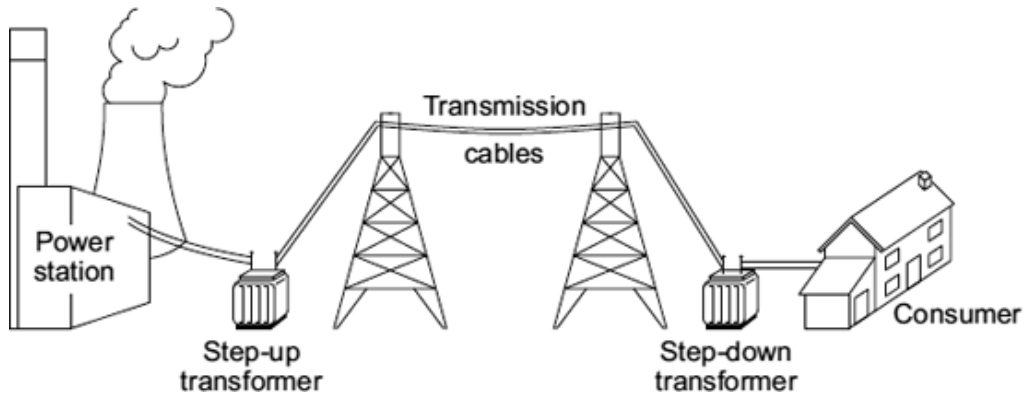
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(3)



- (b) Even with the proposed bridge, the two towns will need to stay connected to the National Grid.

The diagram shows part of the National Grid.



- (i) Give **one** reason why the towns need to stay connected to the National Grid.

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(1)

- (ii) Explain how the step-up transformer increases the efficiency of the National Grid.

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(2)

(Total 7 marks)