GEO.KS36 Energy Security: Changing Demand and Factors Affecting Supply

AQA 8035 · Calculators not allowed · about 30 minutes

Total Marks

Name: ________________________________ Date: ____ / ____ / ______

Answer ALL questions. Show all your working.

1 Define the term 'energy security' as it is used in discussions of national supply and demand.

(Total for Question 1 is 1 mark)

2 Give ONE reason why global energy consumption has risen in recent decades, with reference to population change.

(Total for Question 2 is 1 mark)

3 Describe TWO ways economic development in emerging economies increases energy demand, giving an example of each way.

(Total for Question 3 is 4 marks)

4 Suggest ONE reason why urbanisation increases energy demand in cities, referring to services and infrastructure.

(Total for Question 4 is 1 mark)

5 Define the term 'fossil fuel reserve' in the context of national energy supply.

(Total for Question 5 is 1 mark)

6 Explain TWO ways that the physical availability of fossil fuel reserves affects a country's energy security.

(Total for Question 6 is 4 marks)

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7 The table below gives hypothetical global energy consumption by source in 1990 and 2020, measured in exajoules (EJ), used to practise reading trends in demand.

Source	1990 (EJ)	2020 (EJ)
Coal	80	110
Oil	120	150
Natural gas	60	100
Nuclear	20	25
Renewables (wind, solar, hydro, bioenergy)	10	60

Using this table, answer the following.

(a) State which single energy source had the highest consumption in 1990. **(1)**

(b) Calculate the absolute increase in renewables consumption from 1990 to 2020. Show your working. **(2)**

....

(c) Describe the overall pattern shown by fossil fuels (coal, oil and natural gas) between 1990 and 2020. **(1)**

(Total for Question 7 is 4 marks)

8 Explain TWO ways that the cost of exploration and extraction can affect a country's energy supply choices.

(Total for Question 8 is 4 marks)

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9 Explain TWO ways environmental priorities around climate change can influence a country's energy supply decisions, referring to low-carbon sources.

(Total for Question 9 is 4 marks)

Mark scheme · GEO.KS36 Energy Security: Changing Demand and Factors Affecting Supply

Question 1

- **B1** a reliable and affordable supply of energy that meets a country's needs, oe
- **Answer: A reliable and affordable supply of energy that meets a country's needs.**

Question 2

- **B1** population growth has increased the number of people needing energy for homes, transport and industry, oe
- **Answer: Population growth has increased the number of people needing energy for homes, transport and industry.**

Question 3

- **B1** increased industrialisation raises demand for electricity and fuel, e.g. new factories in India need power, oe
- **B1** rising incomes lead to more car ownership and household appliances, e.g. more households in China buying refrigerators and cars, oe
- **B1** urbanisation increases demand for services and infrastructure that use energy, e.g. growing Nigerian cities need more electricity for transport and hospitals, oe
- **B1** expansion of commercial services and the digital economy increases electricity use, e.g. data centres and offices in Sao Paulo, oe
- **Answer: For example: increased industrialisation raises demand for electricity and fuel, such as new factories in India needing power; rising incomes lead to more car ownership and household appliances, for example more households in China buying refrigerators and cars. Urbanisation and growth of services also increase energy for transport, hospitals and offices.**

Question 4

- **B1** urbanisation concentrates people and services, increasing demand for electricity, heating, transport and water services in cities, oe
- **Answer: Urbanisation concentrates people and services, increasing demand for electricity, heating, transport and water services in cities.**

Question 5

- **B1** a deposit of coal, oil or natural gas that is known to exist and could be extracted commercially, oe
- **Answer: A deposit of coal, oil or natural gas that is known to exist and could be extracted commercially.**

Question 6

- **B1** having large domestic reserves reduces reliance on imports, so supply is more secure, oe
- **B1** linked detail, e.g. countries with big reserves can meet peaks in demand and avoid price shocks from global markets, oe
- **B1** lack of reserves increases dependence on foreign suppliers, increasing vulnerability to international price changes and political disruption, oe
- **B1** linked detail, e.g. import dependence may force a country to pay higher prices or accept risky supply routes, reducing energy security, oe
- **Answer: If a country has large domestic fossil fuel reserves it is less reliant on imports and better able to meet peaks in demand, avoiding price shocks; conversely, lacking reserves increases dependence on foreign suppliers, making the country vulnerable to international price changes and political disruption.**

Question 7

- (a) **B1** oil
- **(a) Answer: Oil.**
- (b) **M1** 60 - 10 seen, oe
- (b) **A1** 50 EJ cao
- **(b) Answer: 50 EJ.**
- (c) **B1** overall increase in use, with oil and gas rising and coal also increasing, oe
- **(c) Answer: Overall fossil fuel consumption increased between 1990 and 2020, with oil and natural gas showing substantial rises and coal also increasing.**

Question 8

- **B1** high exploration and extraction costs can make domestic fossil fuels uneconomic to produce, oe
- **B1** linked detail, e.g. expensive deep-sea or Arctic extraction may mean a country imports cheaper fuel instead, reducing domestic supply security, oe
- **B1** low costs or new technology that reduce costs can make previously uneconomic reserves viable, increasing domestic supply, oe
- **B1** linked detail, e.g. falling extraction costs from shale gas technology led some countries to increase domestic gas production, affecting their supply choices, oe
- **Answer: If exploration and extraction are expensive, domestic fossil fuels may be uneconomic and a country may import fuel instead; conversely, low costs or new extraction technology can make reserves viable so a country increases domestic production and relies less on imports.**

Question 9

- **B1** a commitment to reduce greenhouse gas emissions encourages investment in low-carbon sources such as renewables and nuclear, oe
- **B1** linked detail, e.g. subsidies, feed-in tariffs or contracts for difference can make renewables financially attractive, changing the supply mix, oe
- **B1** environmental regulations or carbon pricing can make fossil fuels more expensive to use, encouraging a shift away from coal and oil, oe
- **B1** linked detail, e.g. a carbon tax or emissions trading scheme increases operating costs for polluting power stations, accelerating replacement with low-carbon generation, oe
- **Answer: Environmental priorities, such as commitments to cut emissions, encourage investment in low-carbon sources through policy tools like subsidies for renewables; regulations and carbon pricing make fossil fuels more expensive to use, pushing the energy mix towards low-carbon generation.**