7.2 Energy sources: uses and management

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS energy mix • energy security • fossil fuel • renewable energy • nuclear power • energy efficiency

Objective

Build the skills to answer exam questions on **energy** : renewable and non-renewable sources, a country's **energy mix** , **energy security** , and the choice between energy sources.

You must be able to:

- distinguish renewable from non-renewable energy sources, with examples
- calculate from energy-mix data and explain why countries use different sources
- evaluate named energy sources, including nuclear and renewables
- discuss how a country can improve energy security and cut emissions

1 Key knowledge and worked examples

Energy

type	examples	notes
non-renewable	coal, oil, natural gas, nuclear (uranium)	fossil fuels still give about 80% of the world's primary energy; they release CO_2
renewable	solar, wind, hydroelectric (HEP), geothermal, tidal, biomass	low emissions when running; some depend on the weather

Choice of energy sources depends on: resources the country has (coal seams, rivers, sun, wind); cost and technology; politics and trade; public opinion; climate targets; reliability.

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Energy security is reliable access to enough affordable energy. It is lower when a country imports most of its energy from a few suppliers, or when supply can be cut by conflict or price shocks.

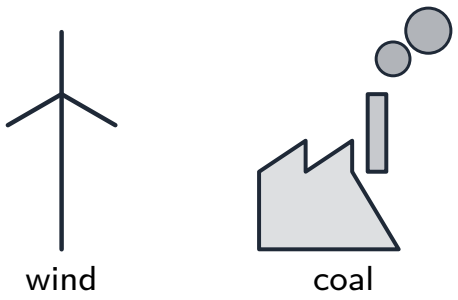
source	for	against
solar	no fuel cost; falling price; good in sunny places	only in daylight; needs storage; land or roof area
wind	cheap electricity; low emissions	variable; noise and visual impact; bird deaths
nuclear	very low CO_2; steady output	high cost; long build; radioactive waste; accident risk
coal	cheap where local; steady output	most CO_2 per unit; air pollution

Ways to reduce energy demand: insulation, efficient appliances, public transport, smart grids.

Answer shapes: name the source, a fact about it, and its effect on emissions, cost or security.

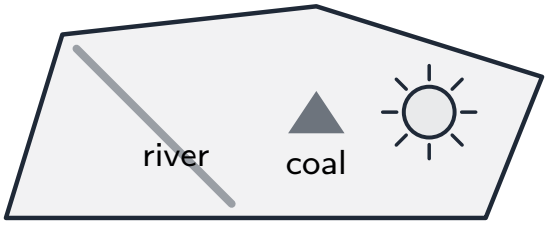
2 Practice

2.1 Distinguish between renewable and non-renewable energy sources, giving **one** example of each. [2]



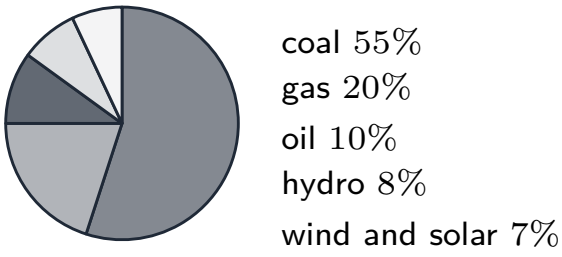
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2.2 Explain **three** factors that affect the energy sources a country chooses. [3]



3 Exam-style questions

3.1 The pie chart shows the primary energy mix of a country that uses 2 000 PJ a year: coal 55%, natural gas 20%, oil 10%, hydroelectric 8%, wind and solar 7%.

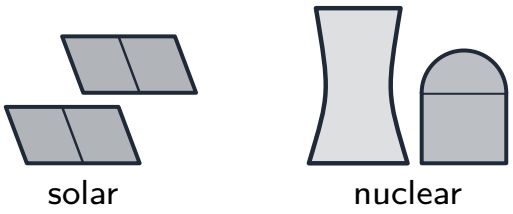


(a) Calculate the energy from renewable sources. [2]

(b) Suggest **two** reasons why the country depends on coal. [2]

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3.2 A country wants to cut emissions from electricity.



(a) Outline **one** advantage and **one** disadvantage of solar power. [2]

(b) Evaluate nuclear power as a way to reduce greenhouse gas emissions. [3]

3.3 A country imports 70% of its energy as oil and gas from two suppliers.



Discuss how the country could improve its energy security while also cutting emissions. [6]

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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

renewable: replaced naturally as fast as it is used, e.g. wind, solar, HEP; non-renewable: a finite stock that is used up much faster than it forms, e.g. coal, oil, gas

2.2

any three, explained: natural resources available (e.g. coal reserves, rivers for HEP, strong sun); cost and access to technology; politics and energy security, e.g. avoiding imports from unstable suppliers; climate targets and public opinion, e.g. opposition to nuclear

3.1

(a) renewables $= 8\% + 7\% = 15\%$; $0.15 \times 2000 =$ **300** PJ

(b) any two: large coal reserves of its own; coal power is cheap and steady; existing power stations and mining jobs; less money for new technology

3.2

(a) advantage: no fuel cost / very low emissions / falling price; disadvantage: no output at night or in cloud, so storage is needed / uses land

(b) strength: very low CO_2 per unit, steady output day and night; limitation: high cost and 10+ years to build; radioactive waste and accident risk; public opposition; judgement: helpful where it is accepted, but slow, so renewables are faster for quick cuts

3.3

award up to [6]: low security: depends on few suppliers; supply and price can be cut by conflict or politics; build domestic renewables (wind, solar, HEP), which need no imported fuel; improve efficiency (insulation, transport), so less energy is needed; storage, grid links and a mix of sources to deal with variable output; limits: high early cost; land and materials; transition time; jobs in old industries; conclusion: diversification plus efficiency improves both goals, with justification

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