3.8 Energy Resources and Electricity Generation: Test Pack

Total Marks

EDEXCEL 4PH1 · Calculator allowed · about 15 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State one example of non-renewable energy resources named on the Edexcel 4PH1 specification, in the context of national electricity generation.

(Total for Question 1 is 1 mark)

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2 State one practical limitation of relying on tidal power for a country's electricity generation, referring to timing or geography.

(Total for Question 2 is 1 mark)

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3 Describe briefly how nuclear fuel in a nuclear power station supplies energy to boil water and drive a turbine, naming the primary physical process inside the reactor.

(Total for Question 3 is 2 marks)

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4 Describe one environmental advantage and one environmental disadvantage of building a large hydroelectric dam compared with a coal-fired power station, in terms of emissions and habitat change.

(Total for Question 4 is 2 marks)

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5 A country plans to add 150 MW of extra generating capacity. Explain one reason why building a natural gas plant might be chosen over building an equivalent total area of solar farms, considering reliability and space requirements.

(Total for Question 5 is 3 marks)

6 For an illustrative generation trial, the total energy input is 875 MJ and the useful electrical output is 322 MJ. All remaining input energy is transferred to the surroundings. Determine the wasted energy and the percentage efficiency. Show the efficiency calculation and give both results to 1 decimal place.

(Total for Question 6 is 3 marks)

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Mark scheme · 3.8 Energy Resources and Electricity Generation: Test Pack

Question 1

any one valid non-renewable resource named, e.g. coal, oil, natural gas, uranium/nuclear fuel **B1**

Answer: Any one of: coal, oil, natural gas, nuclear fuel

Question 2

states a limitation such as: tidal power is location dependent and only works where tidal ranges are large, or it produces power only at certain times following tidal cycles **B1**

Answer: It is location dependent and only produces power at certain times of the tidal cycle

Question 3

names nuclear fission as the process where heavy nuclei split and release energy **B1**

states that the released energy heats water to make steam which drives a turbine **B1**

Answer: Nuclear fission releases energy when heavy nuclei split; this energy heats water to make steam which turns a turbine to drive a generator

Question 4

advantage: hydroelectric dams produce little or no CO_2 during operation compared with coal which emits CO_2 **B1**

disadvantage: dams flood large areas and disrupt ecosystems and human settlements, whereas coal does not cause large-scale flooding **B1**

Answer: Advantage: hydroelectric produces little CO_2 in operation compared with coal. Disadvantage: dams flood and disrupt habitats and communities on a large scale, unlike coal plants which have different local impacts

Question 5

states that gas plants can provide continuous, on-demand power and are dispatchable **B1**

explains that solar output is intermittent and requires much more land area for the same capacity **B1**

connects these points to the choice: gas ensures stable supply with smaller footprint, while solar may need storage or backup and large land area **B1**

Answer: Gas provides on-demand, reliable power and requires less land area than the equivalent solar arrays, so it may be chosen to guarantee supply without needing large storage or backup

Question 6

wasted energy = 875 - 322 = 553.0 MJ to 1 decimal place **B1**

uses efficiency = useful output / total input x 100 with 322 / 875 x 100 **M1**

efficiency = 36.8% to 1 decimal place **A1**

Answer: Wasted energy = total input - useful output = 875 - 322 = 553.0 MJ. Efficiency = useful output / total input x 100 = 322 / 875 x 100 = 36.8%.

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