



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2016

Centre Number

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Candidate Number

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Environmental Technology

Assessment Unit AS 1

assessing

The Earth's Capacity to Support
Human Activity



A1E11

[A1E11]

WEDNESDAY 25 MAY, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.
Answer **all** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 7.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	

Total Marks	
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1 (a) Name **one** fossil fuel found on Earth.

_____ [1]

(b) Fossil fuel consumption is increasing worldwide.

State **two** different manufacturing processes that rely on fossil fuels for their raw materials.

1. _____

2. _____
_____ [2]

(c) The Intergovernmental Panel on Climate Change (IPCC) has concluded that the combustion of fossil fuels, and subsequent increase in global carbon emissions, is linked to global warming and climate change.

(i) Describe **three** different pieces of scientific evidence that link the combustion of fossil fuels to global warming and climate change.

1. _____

2. _____

3. _____
_____ [3]

Examiner Only

Marks Remark

2 (a) Define the term 'biomass'.

_____ [1]

(b) Give an example of a crop that can be commercially grown to produce biomass.

_____ [1]

(c) **Fig. 1** shows the UK's largest power station. It is converting three of its six 660 MW electricity generating units to burn biomass. The remaining units will continue to use coal.



© Martin Bond / Science Photo Library

Fig. 1

(i) Identify **two** different advantages of replacing coal with biomass at this power station.

1. _____

2. _____

_____ [2]

(ii) Suggest **one** disadvantage of converting all six units to burn biomass instead of coal.

_____ [1]

Examiner Only	
Marks	Remark

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- 3 (a) Identify the **two** main sources of renewable microgeneration in microelectricity technologies.

1. _____

2. _____ [2]

- (b) Renewable sources are also used in conjunction with microheat technologies. One of these technologies is a ground source heat pump.

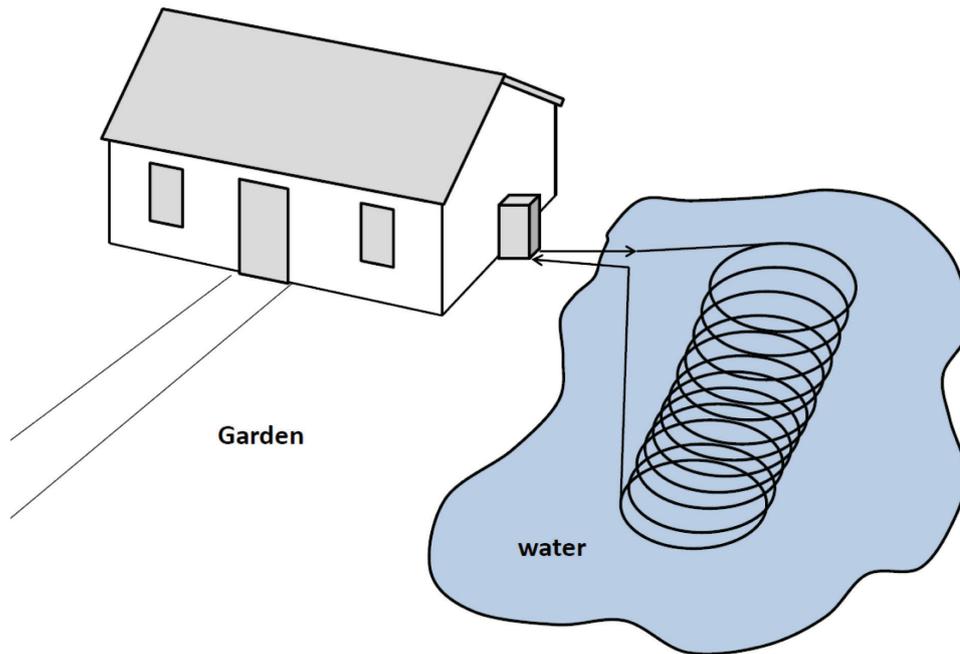


Fig. 2

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Identify the type of ground source heat pump shown in **Fig. 2** above.

_____ [1]

Examiner Only	
Marks	Remark

- (c) The heat pump shown in **Fig. 2** has a Coefficient of Performance of 2.8. The heat pump produces 16.8 MJ of heat in one hour. State clearly the formula for the Coefficient of Performance of a heat pump **and** calculate the amount of energy it will use in one hour.

Formula:

Calculation: (You are encouraged to show your working out in the space below).

Examiner Only	
Marks	Remark

[5]

- 4 (a) **Table 1** below gives some specification details for a popular commercially available wind turbine.

Table 1

Rated Energy Output	5.2 kW (@ steady wind speed of 11 m/s)
Rotor Diameter	5.6 m

For a rotor diameter of this size and with a wind speed of 11 m/s the maximum available rated energy in the wind is 16.4 kW. Identify **two** reasons which explain why there is an energy shortfall between the maximum energy available in the wind and the actual rated energy output of the turbine.

1. _____

2. _____

_____ [2]

- (b) John is considering building a wind turbine to provide power to his home. Describe **two** ways in which the performance of his turbine could be influenced by each of the following factors:

1. Blade length: _____

2. Strength of materials: _____

3. Siting requirements: _____

_____ [6]

Examiner Only	
Marks	Remark

- (c) Fig. 3 below shows two possible turbine installations (A and B), each with a different hub height.

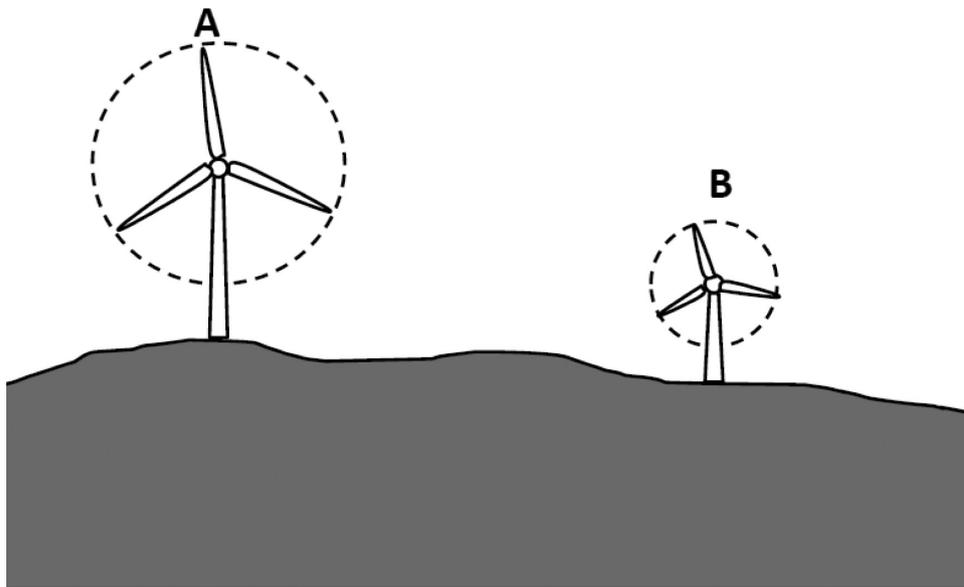


Fig. 3

© Principal Examiner

Outline **two** critical factors that must be taken into account when determining the hub height for a wind turbine installation.

1. _____

 2. _____

- [2]

- (d) (i) Define the term 'wind survival speed'.

_____ [1]

- (ii) Wind turbines are designed with a range of power control systems. Name **one** power control system used in wind turbines.

_____ [1]

Examiner Only	
Marks	Remark

- 5 (a) (i) State the name of the process required to convert crude oil into the feedstocks required for plastic manufacture.

_____ [2]

- (ii) State the trend in the global production of plastic each year.

_____ [1]

- (iii) Name **two** toxic gases that may be released during the incineration of plastics.

1. _____

2. _____ [2]

- (b) Many plastics are photodegradable.

- (i) Describe how a plastic can be modified during the manufacturing process to make it photodegradable.

_____ [2]

- (ii) Identify a piece of laboratory apparatus that could be used to measure the tensile strength of photodegradable plastics.

_____ [1]

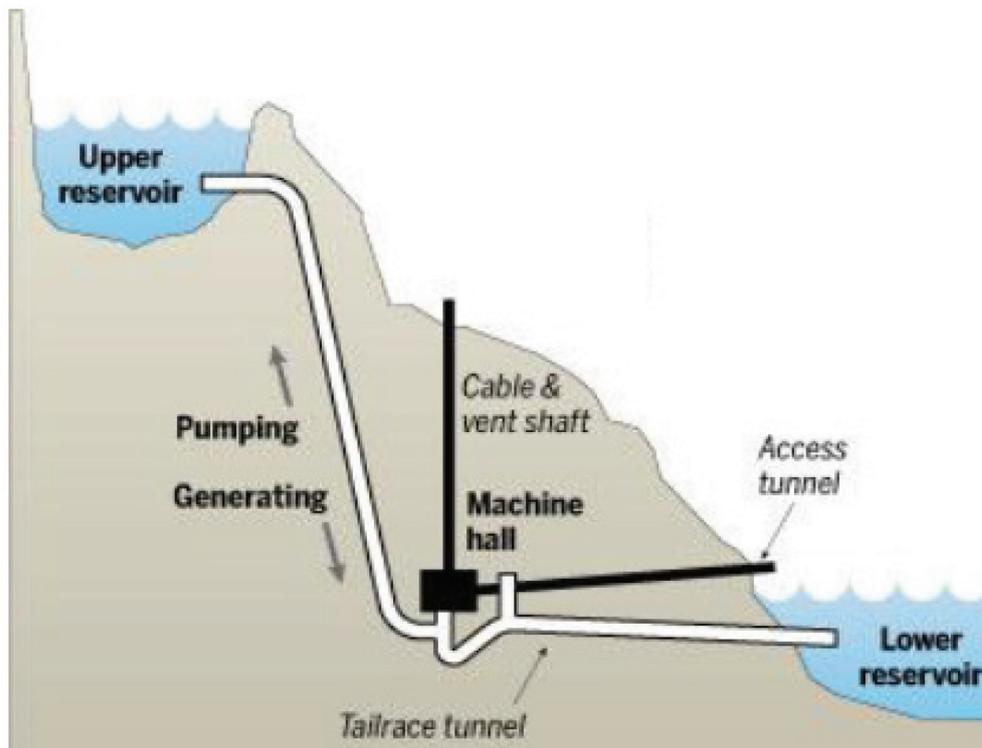
Examiner Only

Marks Remark

- 6 (a) Renewable energy sources have the potential to deliver a significant proportion of our energy needs in the future. State **one** main reason why energy storage facilities are needed in order for us to make optimum use of renewable energy sources such as wind, solar, wave and tidal.

_____ [1]

- (b) Fig. 4 below shows a schematic diagram of an energy storage facility.



© Greenlight for Welsh hydroelectric power station by Michael Kavanagh.
Published by Financial Times - Business & Economy on 06 September 2013

Fig. 4

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Marks	Remark

Name the type of energy storage facility shown in **Fig. 4** and describe how the system operates.

(i) Type of facility: _____ [1]

(ii) Description: _____

_____ [4]

(c) State **three** factors that would make a potential location both beneficial as well as cost effective for the type of energy storage facility shown in **Fig. 4**.

1. _____

2. _____

3. _____

_____ [3]

(d) Name **one** other type of energy storage facility.

_____ [1]

Examiner Only	
Marks	Remark

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