Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2016

Centre Number

Candidate Number

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	

Examiner Only	
Marks	Remark

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]

.

(ii) Outline **one** advantage and **one** disadvantage of carbon trading as a viable option for reducing global carbon emissions.

Advantage _____

_____

_____

Disadvantage _____

_____

_____ [2]

Examiner Only	
Marks	Remark

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]

(d) In October 2013 the UK government announced the construction of a new nuclear power station. The power station is scheduled to begin supplying electricity in 2023.

Discuss the use of nuclear power stations as a viable alternative to coal fired power stations. Your discussion should focus on **two** different factors.

[4]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

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.

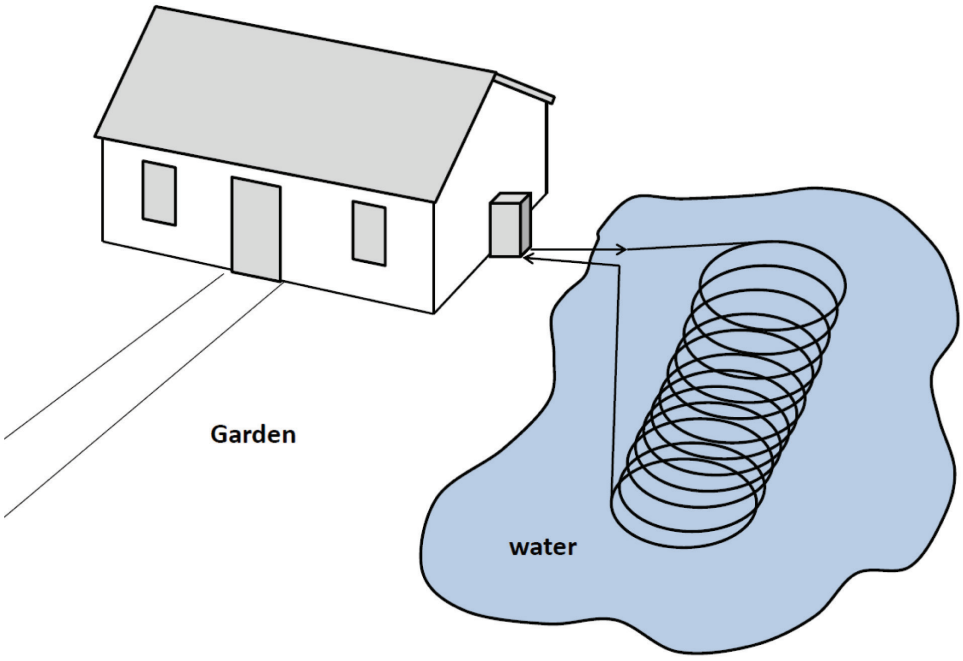


Fig. 2

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

_____ [1]

(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).

[5]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

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.

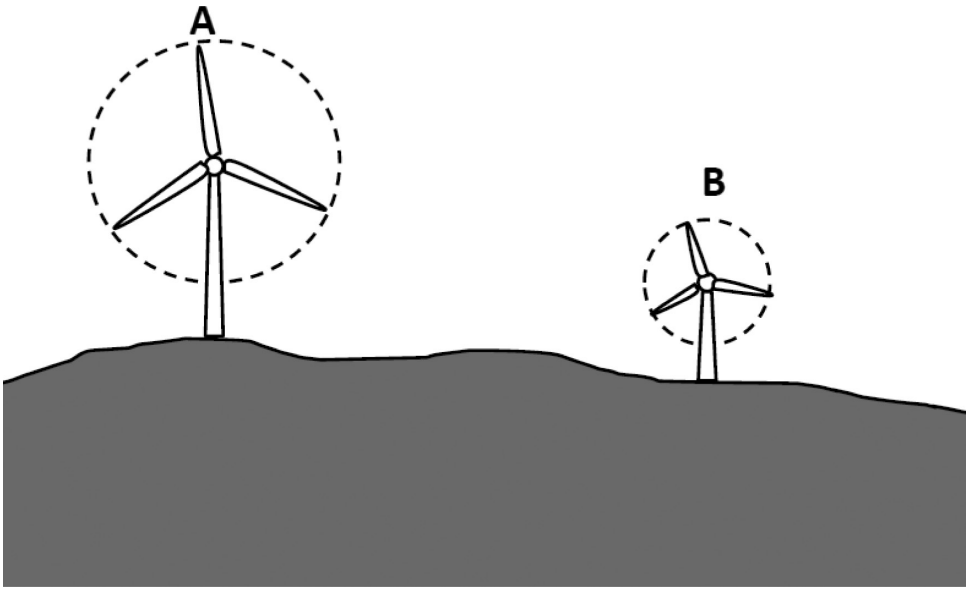


Fig. 3

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]

(c) Modern plastic manufacturing processes are moving towards the production of biodegradable plastics.

(i) Explain what is meant by the term 'biodegradable plastic'.

_____

_____ [1]

(ii) Two advantages of moving towards the manufacture of biodegradable plastics are:

- they can be manufactured using renewable raw materials
- they reduce environmental pollution.

Describe how each of the points above can be considered as an advantage.

_____

_____

_____

_____

_____

_____

_____

_____ [4]

Examiner Only	
Marks	Remark

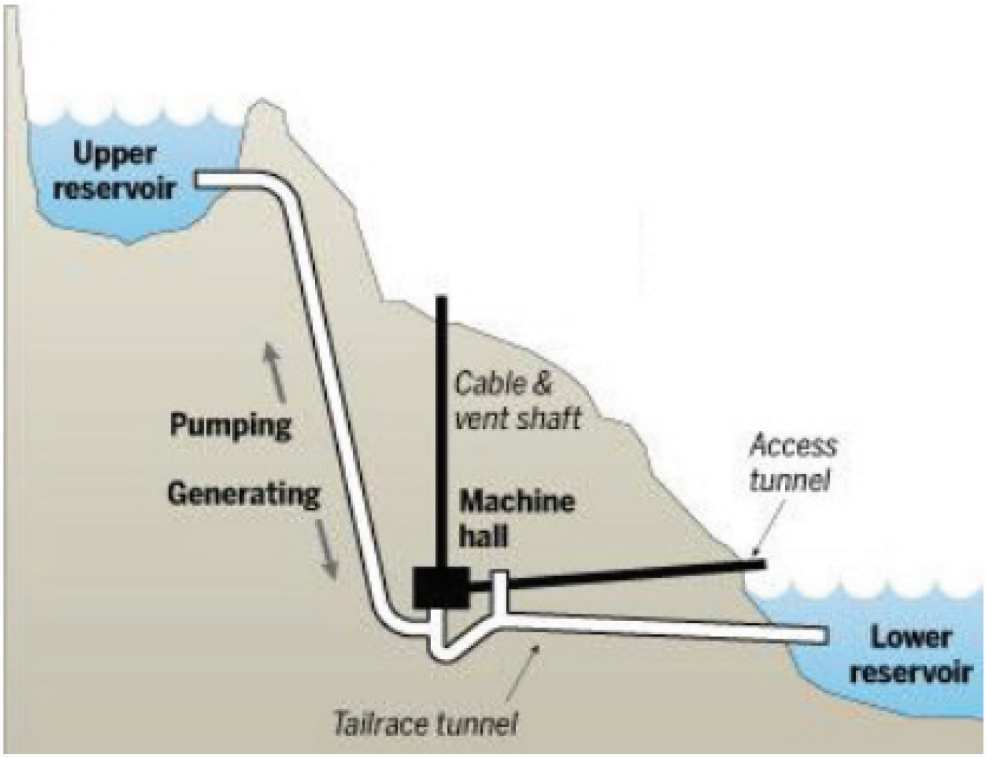
Examiner Only	
Marks	Remark

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 hydroelectic power station by Michael Kavanagh. Published by Financial Times - Business & Economy on 06 September 2013

Fig. 4

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

Examiner Only	
Marks	Remark

7 In its Statutory Consultation for the Renewables Obligation Order (Northern Ireland) 2014, the Department of Trade and Industry (DETI) stated that 'DETI is committed to increasing the deployment of renewable energy across Northern Ireland and we recognise the potential role and contribution that solar PV could make in helping to meet the target of 40% renewable electricity consumption by 2020.'

Discuss the main factors that should be taken into account when assessing the feasibility of generating electricity from solar PV for a typical Northern Ireland householder.

Your answer should make reference to:

- the amount of solar energy available for energy purposes
- how planning regulations impact on domestic solar PV panel installations
- the range of incentives available for installing solar PV panels.

The quality of written communication will be assessed in this question.

Examiner Only	
Marks	Remark

[15]

THIS IS THE END OF THE QUESTION PAPER

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