Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Centre Number

Candidate Number

Environmental Technology

Assessment Unit AS 1
assessing
The Earth's Capacity to Support Human Activity

A1E11

[A1E11]
WEDNESDAY 17 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.
Complete in black ink only. **Do not write with a gel pen.**
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)** State the **main** non-renewable raw material used in the production of plastic.

_____ [1]

(b) BPE is an example of a recyclable plastic.

(i) What do the letters **BPE** stand for?

_____ [1]

(ii) Describe how BPE is manufactured.

_____

_____

_____

_____

_____

_____ [3]

(c) Describe **two** applications of biodegradable plastics.

1. _____

_____

_____

_____ [2]

2. _____

_____

_____

_____ [2]

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

2 **(a)** State the law of conservation of energy.

_____

_____

_____

_____ [2]

(b) Renewable energy sources can be used to generate electricity either directly or indirectly. Give **one** example of their use to generate electricity directly and **one** example of their use to generate electricity indirectly.

Direct use: _____

_____

Indirect use: _____

_____ [2]

(c) **Fig. 1** below shows a typical power generation and distribution system such as the National Grid.

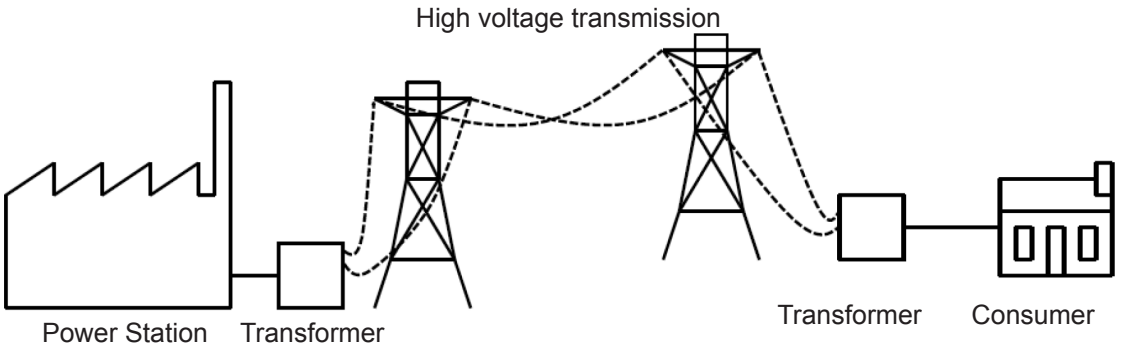

Fig. 1

With reference to **Fig. 1** describe how electricity is distributed through the National Grid.

[5]

(d) (i) Explain the concept of a **smart grid**.

[2]

(ii) Outline **one** way in which a smart grid can facilitate the efficient supply and distribution of electricity.

[1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 **(a)** State **three** issues which should be considered when calculating the amount of roof space required for a flat plate solar thermal collector.

1. _____

_____ [1]

2. _____

_____ [1]

3. _____

_____ [1]

(b) State **one** benefit to households of installing a flat plate solar collector.

_____

_____ [1]

(c) A family uses 6800 kWh of hot water per year. If they wish to install a solar thermal hot water system to meet at least 70% of their annual hot water needs, what area of flat plate solar panel would provide a practical solution?

(Assume 1 m^2 of flat plate collector provides 550 kWh of useful heat per year and that solar panels are supplied in 1 m^2 modules). Show your working out in the space below.

[3]

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

4 **(a)** **Fig. 2** below shows a typical horizontal axis wind turbine. Complete **Fig. 2** by labelling **X** and **Y**.

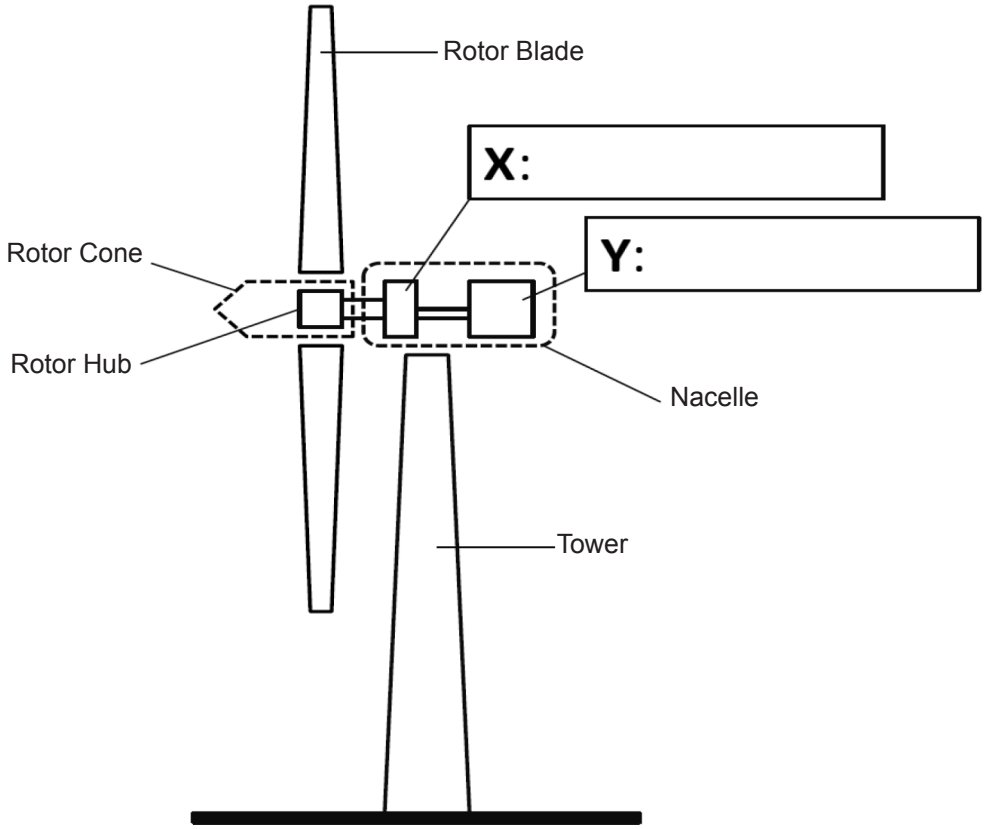

Fig. 2

[2]

(b) If the turbine in **Fig. 2** has a rotor diameter of 6.0 m calculate the rotor swept area for the turbine. Show your working out in the space below.

[3]

Examiner Only	
Marks	Remark

(c) Calculate the wind speed required to produce a maximum theoretical energy of 15680 joules from 640 kg of air. Show your working out in the space below.

[3]

(d) **Fig. 3** below shows a typical wind turbine power curve. Explain the significance of the annotated points **A** and **B** shown on the graph.

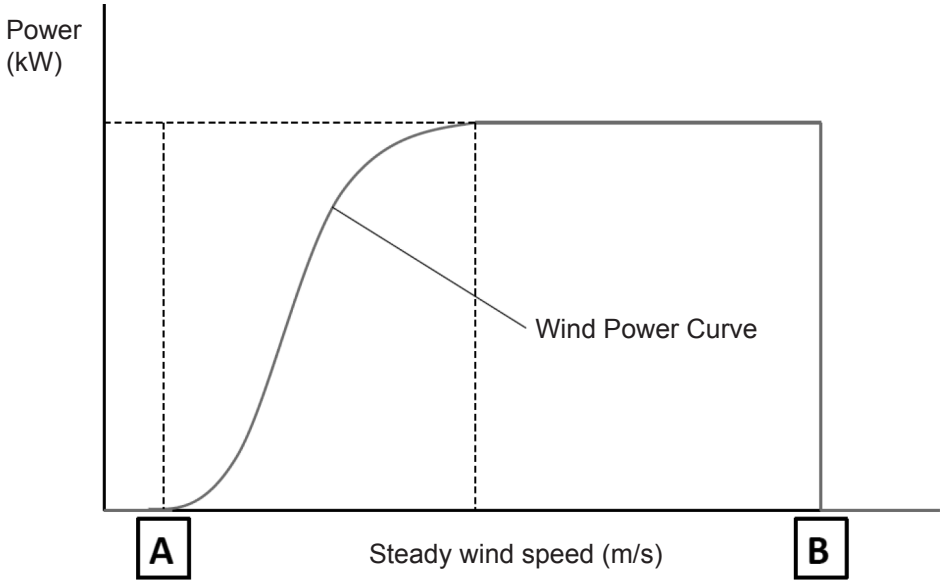

Fig. 3

A _____

_____ [2]

B _____

_____ [2]

Examiner Only	
Marks	Remark

5 **Fig. 4** below shows a schematic diagram of a PV cell.

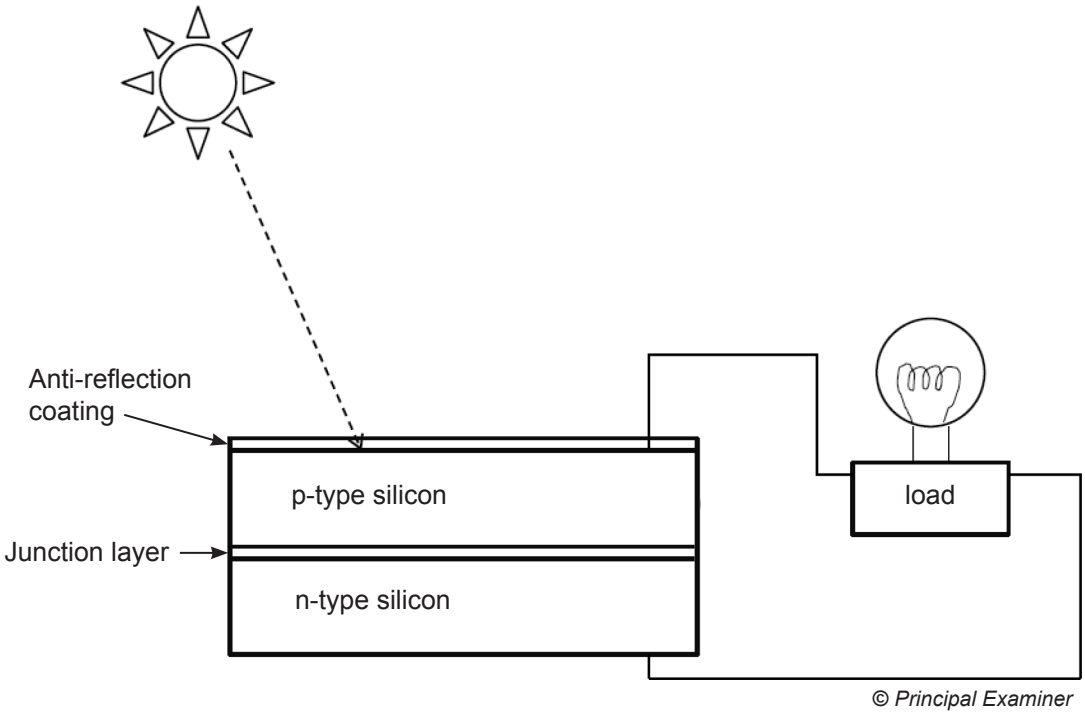

Fig. 4

(a) **(i)** Explain the purpose of the anti-reflection coating.

_____

_____ [2]

(ii) Explain the operation of the PV cell.

_____

_____

_____

_____

_____

_____ [3]

(b) Outline **two** ways in which automated solar tracking can maximise the energy output from solar collectors.

1. _____

_____ [1]

2. _____

_____ [1]

(c) State **one** advantage and **one** disadvantage of monocrystalline PV modules.

Advantage: _____

_____ [1]

Disadvantage: _____

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** Define what is meant by the term **biomass**.

_____

_____ [1]

(b) State the main process used to obtain energy from biomass.

_____ [1]

(c) Woodchip is a form of biomass that can be commercially produced. Explain the effect of moisture content on **one** property of woodchip fuels.

_____

_____

_____

_____ [2]

(d) Certain types of biomass can undergo **anaerobic digestion**. Describe the process of anaerobic digestion.

_____

_____

_____

_____ [2]

(e) Name the main product of anaerobic digestion and state its use.

Product: _____ [1]

Use: _____ [1]

(f) Outline **three** advantages of using commercial anaerobic digesters.

Examiner Only

Marks	Remark

[3]

7 Present the case for global action on fossil fuel conservation and the need for a move towards renewable energy sources.

Ensure that you make reference to the following points in your discussion:

- The role of fossil fuels in modern society;
- Fossil fuel lifespan, location of reserves and accessibility;
- National and international environmental targets aimed at reducing greenhouse gas emissions.

The quality of written communication is assessed in your answer.

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

[15]

THIS IS THE END OF THE QUESTION PAPER