



Rewarding Learning

ADVANCED

General Certificate of Education

2019

Centre Number

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Candidate Number

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Environmental Technology

Unit A2 1
Building and Managing a
Sustainable Future



AET11

[AET11]

FRIDAY 7 JUNE, MORNING

TIME

2 hours.

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 100.

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 Questions **6(a)** and **9**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

Total Marks	
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- 1 (a) A diagram illustrating the Waste Management Hierarchy is shown in Fig. 1.

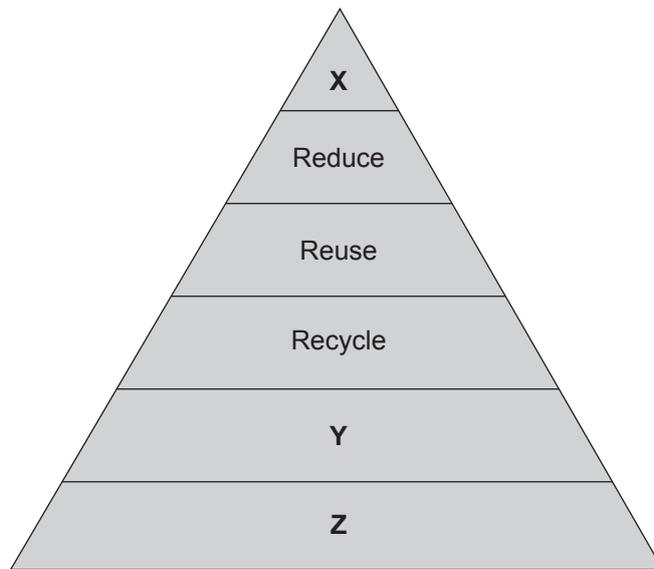


Fig. 1

© Crown Copyright. Adapted from DOENI waste-guidance-hierarchy-evidence-summary-2015.pdf
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Identify the waste management strategies **X**, **Y** and **Z** in Fig. 1.

X: _____ [1]

Y: _____ [1]

Z: _____ [1]

Examiner Only	
Marks	Remark

(c) Landfill Tax is a tax levied by central government through Her Majesty's Revenue and Customs (HMRC).

Discuss **one** way in which Landfill Tax supports the Northern Ireland Waste Management Strategy.

[2]

Examiner Only	
Marks	Remark

2 Anaerobic digestion is one method of extracting energy from waste.

(a) Explain how anaerobic digestion can be used in conjunction with CHP.

[2]

(b) With reference to anaerobic digestion, state the **term** used to mean:

(i) The time taken for the full degradation of material in an anaerobic digestion system:

[1]

(ii) The biological reactions occur in one holding tank and the biogas comes from this tank:

[1]

(iii) Feedstock containing up to 55% solid material:

[1]

(c) Hydrolysis and acetogenesis are two stages in anaerobic digestion. Explain what is occurring during each of these stages.

Hydrolysis: _____

[2]

Acetogenesis: _____

[2]

Examiner Only

Marks

Remark

3 Biohydrometallurgy is a method used to extract metals. It is an alternative to modern smelting methods.

(a) Name **one** organism used in biohydrometallurgy.

_____ [1]

(b) Explain what makes a site suitable for biohydrometallurgy.

_____ [2]

(c) Explain how sites, once identified, are prepared for effective and efficient use of biohydrometallurgy.

_____ [2]

Examiner Only	
Marks	Remark

4 Hydrogen is being developed as a transport fuel of the future. Hydrogen fuel cells use hydrogen to produce energy.

(a) List **four** common forms of hydrogen fuel cell.

1. _____ [1]

2. _____ [1]

3. _____ [1]

4. _____ [1]

(b) Describe **one** application of hydrogen fuel cells, other than in transport.

_____ [2]

Examiner Only

Marks

Remark

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- 5 (a) The 'U value' for a material is sometimes formally referred to as being the "overall heat transfer co-efficient of the material".

In a testing facility the U values of two different materials have been measured. Material **A** has a U value of $3.8 \text{ Wm}^{-2}\text{K}^{-1}$ and Material **B** has a U value of $2.4 \text{ Wm}^{-2}\text{K}^{-1}$. State which material is the better insulator.

_____ [1]

- (b) Outline **two** factors other than the U value which determine the rate of heat loss through a material.

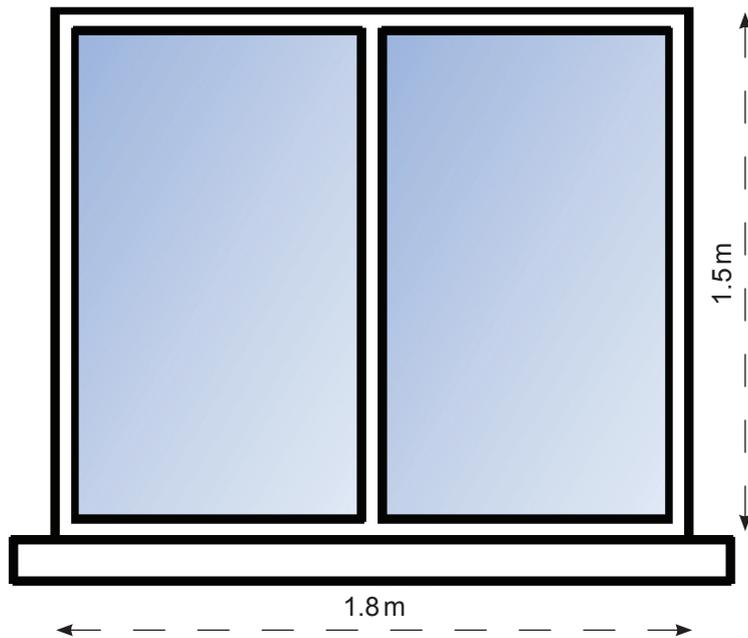
1. _____

2. _____

_____ [2]

Examiner Only	
Marks	Remark

(c) Fig. 2 below shows a window in a typical house.



Source: © Principal Examiner

Fig. 2

In Fig. 2 the window (including glass and frame) has an overall heat loss of 64.8 W.

Assuming that the temperature inside is 19°C and that the temperature outside is -1°C , calculate the overall U value of the window.

Show your working out in the space below.

Overall U value of window = _____

[4]

Examiner Only	
Marks	Remark

(d) Fig. 3 below shows the Zero Carbon Homes hierarchy.

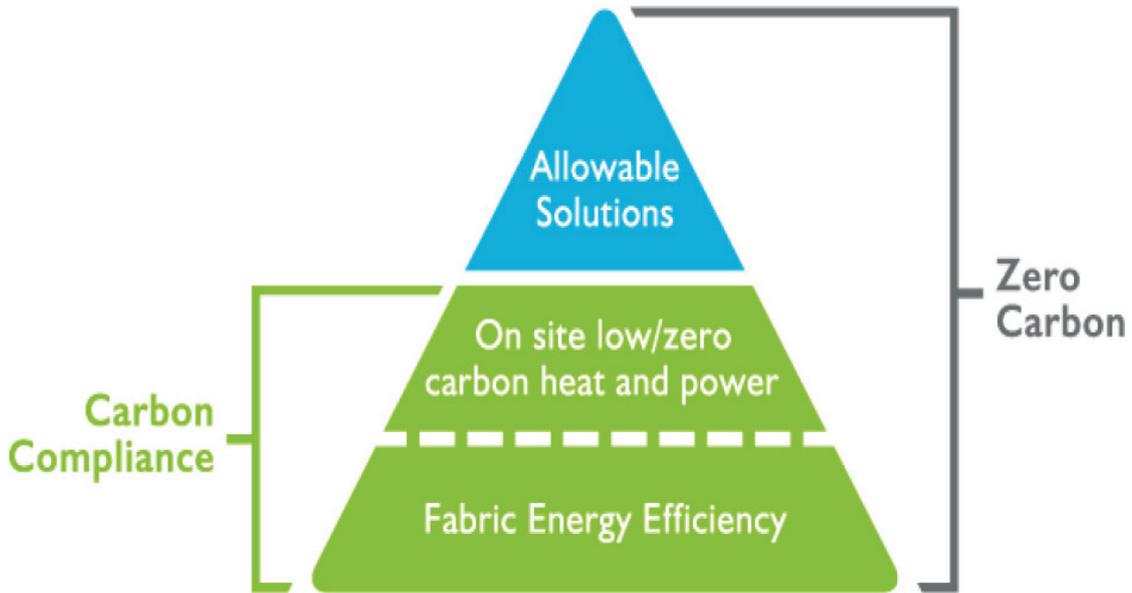


Fig. 3

Source: © Zero Carbon Hub.org

Outline **three** different measures which could be used to achieve the Fabric Energy Efficiency requirements of the Zero Carbon Homes hierarchy.

1. _____

 2. _____

 3. _____

- [3]

Examiner Only	
Marks	Remark

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Access to communication technologies

[2]

Examiner Only	
Marks	Remark

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