



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2018

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

# Biology

Assessment Unit AS 2

*assessing*

Organisms and Biodiversity



[SBY21]

\*SBY21\*

**WEDNESDAY 30 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.

**You must answer the questions in the spaces provided.**

**Do not write outside the boxed area on each page or on blank pages.**

Complete in black ink only. **Do not write with a gel pen.**

Answer **all eight** questions.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Section A carries 60 marks. Section B carries 15 marks.

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

You are reminded of the need for good English and clear presentation in your answers.

Use accurate scientific terminology in all answers.

You should spend approximately **20 minutes** on Section B.

You are expected to answer Section B in continuous prose.

**Quality of written communication** will be assessed in Section B.

11582



\*28SBY2101\*

**BLANK PAGE**  
**DO NOT WRITE ON THIS PAGE**

11582



\*28SBY2102\*



## Section A

1 A variety of substances are required by living organisms in order to function.

Identify the substances described below:

- reduces surface tension in the moisture layer in the alveoli.

---

- directly converts fibrinogen to fibrin.

---

- waterproof component of the Casparian strip in the endodermis.

---

- an oxygen store in red muscle.

---

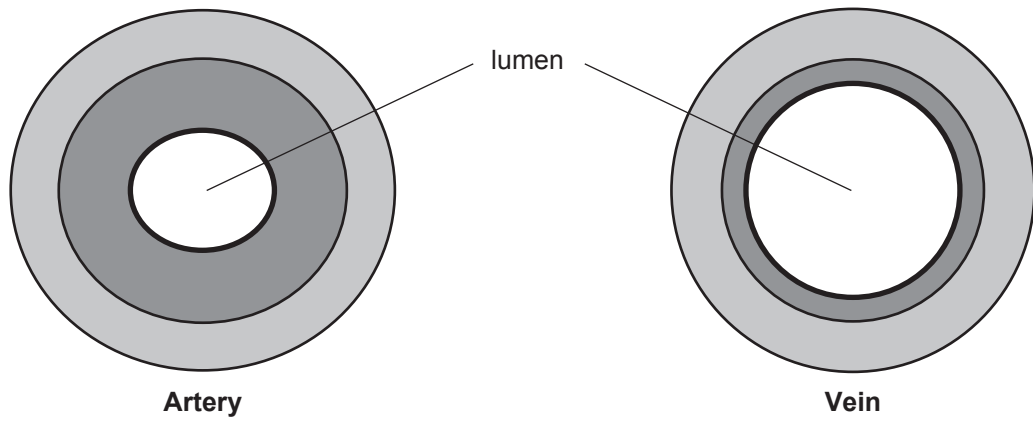
- carbohydrate transported by the phloem.

---

[5]



2 The diagram below represents sections through an artery and a vein.



(a) Describe and explain **two** structural differences shown between the artery and vein.

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

[2]



(b) (i) Distinguish between the terms ‘atherosclerosis’ and ‘atheroma’, and explain their effect on blood flow in the artery.

---

---

---

---

---

---

---

---

---

---

[3]

(ii) The blood vessels of the heart can be investigated to diagnose atherosclerosis by injecting radioactive dye and taking an X-ray.

Name this procedure and the blood vessels involved.

Test \_\_\_\_\_

Blood vessels \_\_\_\_\_

[2]

(c) Capillaries are involved in the production of tissue fluid.

State the difference in composition between tissue fluid and blood.

---

---

---

[1]

[Turn over



3 Fick's Law shows how three factors affect the rate of diffusion:

$$\text{diffusion rate} \propto \frac{\text{surface area} \times \text{difference in concentration}}{\text{thickness of membrane}}$$

(a) Compare and contrast **one** factor from Fick's Law as it relates to the gas exchange organs in plants and mammals. In your answer make reference to the structures involved.

Compare \_\_\_\_\_

\_\_\_\_\_

Contrast \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]





**BLANK PAGE**

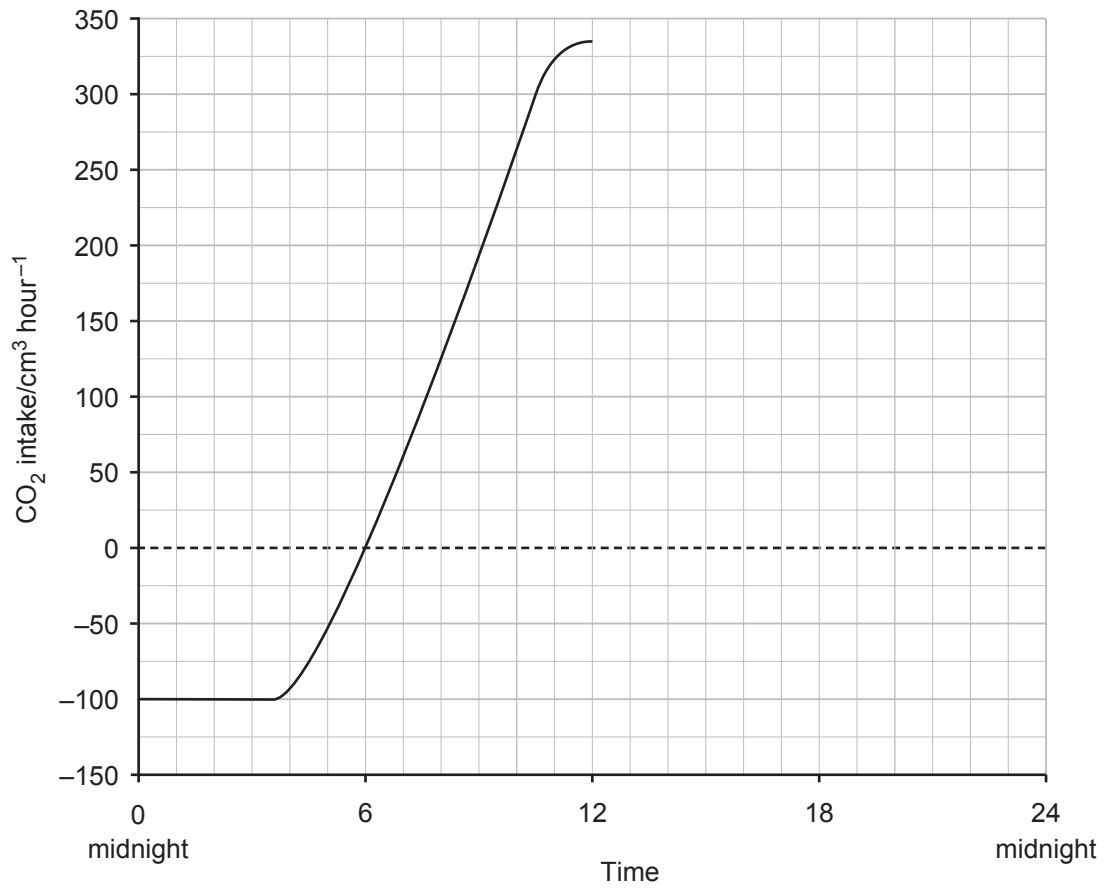
**DO NOT WRITE ON THIS PAGE**

**(Questions continue overleaf)**

**[Turn over**



(b) Below is a partially drawn graph showing the net carbon dioxide intake by a plant over the first 12 hours of a 24-hour period.





(i) Complete the graph to show the expected carbon dioxide intake for 12–24 hours. [2]

(ii) Describe and explain the carbon dioxide intake shown for 0–12 hours.

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

(iii) Shade on the graph the area which represents a net gain in glucose.

Explain your answer.

---

---

---

---

[Turn over



- 4 Biodiversity can be measured using Simpson's Index. An investigation was carried out to assess the biodiversity of plant species in three fields. Five 1m<sup>2</sup> quadrats were used in each field and the mean numbers of plants of five species were calculated. The results of the investigation and the calculated Simpson's Index for two of the fields are shown in the table below.

Plant species	Mean number of plants		
	Field A	Field B	Field C
common daisy	2	8	2
dandelion	1	13	1
meadow buttercup	2	9	5
white clover	8	11	15
rye grass	21	12	5
<b>Simpson's Index</b>	<b>0.43</b>	<b>0.19</b>	

The formula for calculating Simpson's Index is:

$$D = \frac{\sum n_i(n_i - 1)}{N(N - 1)}$$

where N = the total number of all organisms

$n_i$  = the number of organisms of each individual species

- (a) (i) Using the values given and the formula above, calculate the Simpson's Index for **Field C**.

(Show your working.)

\_\_\_\_\_ [2]



(ii) Identify the field with the highest biodiversity.

[1]

\_\_\_\_\_

(iii) Although **Field A** and **Field B** each contains all five species investigated, they are not considered equally diverse. Explain why.

[2]

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(b) Suggest **two** possible sources of error in this investigation.

1. \_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_

[2]

[Turn over



**Field B** is grazed by cattle. It contains the largest number of dandelions, a species which has several adaptations that help it survive in this habitat. One of these is flattened leaves that grow close to the ground.

- (c) State the term used to describe an external structural adaptation and suggest how the adaptation described above helps the dandelion survive in this habitat.

---

---

---

---

---

---

---

---

[2]





**BLANK PAGE**

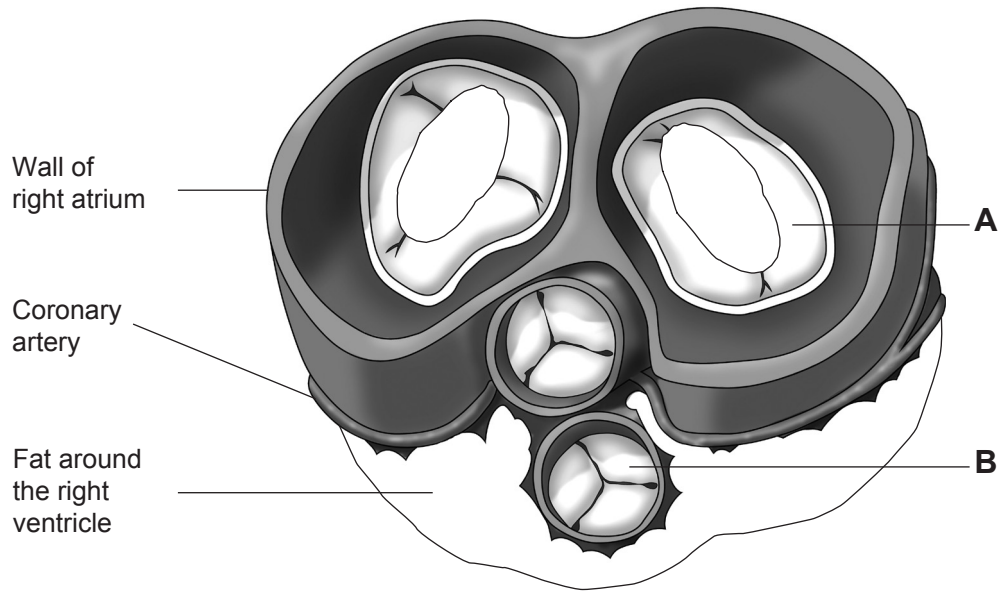
**DO NOT WRITE ON THIS PAGE**

**(Questions continue overleaf)**

**[Turn over**



- 5 When a mammalian heart is sectioned in a particular plane, all four valves can be observed as shown below.



© Monica Schroeder / Science Photo Library

- (a) (i) Identify the parts labelled **A** and **B**.

**A** \_\_\_\_\_

**B** \_\_\_\_\_

[2]

- (ii) Describe the state of the valves shown above and suggest which stage of the cardiac cycle is represented.

---



---



---



---



---



---

[2]





(b) Valves help to maintain one-way flow of blood through the heart. With reference to the structures and pressure changes involved, describe how blood leaves a ventricle.

---



---



---



---



---



---



---



---



---



---

[3]

(c) A heart condition called hypertrophic cardiomyopathy (HCM) is characterised by thickened muscle in the ventricle wall, reducing the space inside the ventricle. Sufferers may experience dizziness, fainting or tiredness.

Suggest an explanation for these symptoms.

---



---



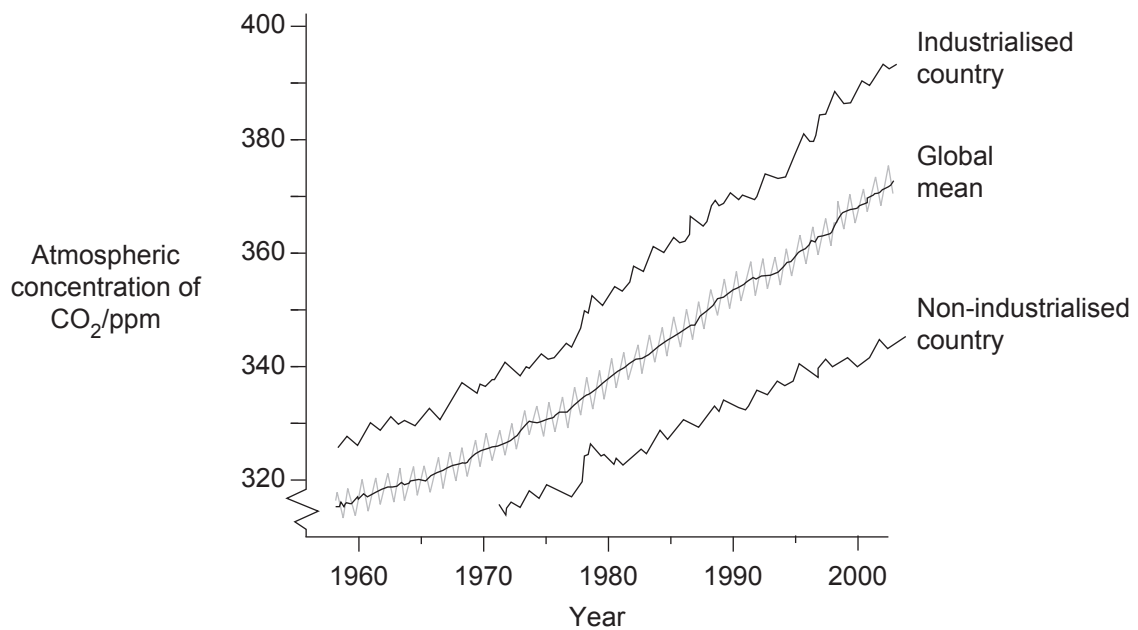
---

[1]

[Turn over



6 In recent decades, global temperatures have been steadily increasing, a change which has been linked to rising global CO<sub>2</sub> levels. The graph below shows trends in atmospheric CO<sub>2</sub> concentrations in different parts of the world and the global mean.



© NOAA / Science Photo Library

(a) It has been claimed that human activity is responsible for the change in atmospheric CO<sub>2</sub> concentrations. From the data, provide **one** piece of evidence to support this claim and **one** to reject it.

Support \_\_\_\_\_

---



---



---

Reject \_\_\_\_\_

---



---



---

[2]





(b) The speckled wood butterfly (*Pararge aegeria*) is commonly found in woodland in southern parts of Britain. It was first classified by Carl Linnaeus in 1758 into the group of related genera called *Nymphalidae*. The species shows variation in body size and colour, with those in the northern parts of the ecological range tending to be larger and darker bodied.

(i) Complete the table which shows the classification of the speckled wood butterfly.

Kingdom	
	Arthropoda
Class	Insecta
	Lepidoptera
Family	
Genus	
Species	

[3]

(ii) When Linnaeus classified *P. aegeria*, kingdom was the highest taxonomic rank. In 1990 an updated classification system was introduced by Carl Woese, to include the rank of domain.

State the domain for *P. aegeria*.

\_\_\_\_\_

[1]

(iii) How could it be determined that butterflies of different body colours are the same species?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

[1]

[Turn over



In the last 40 years, *P. aegeria* has significantly increased both its abundance and its ecological range in Britain. This is thought to be due to climate change, allowing the species to survive in more northerly habitats.

(c) Suggest **two** ways in which the increased ecological range of *P. aegeria* could impact on other species.

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]





**BLANK PAGE**

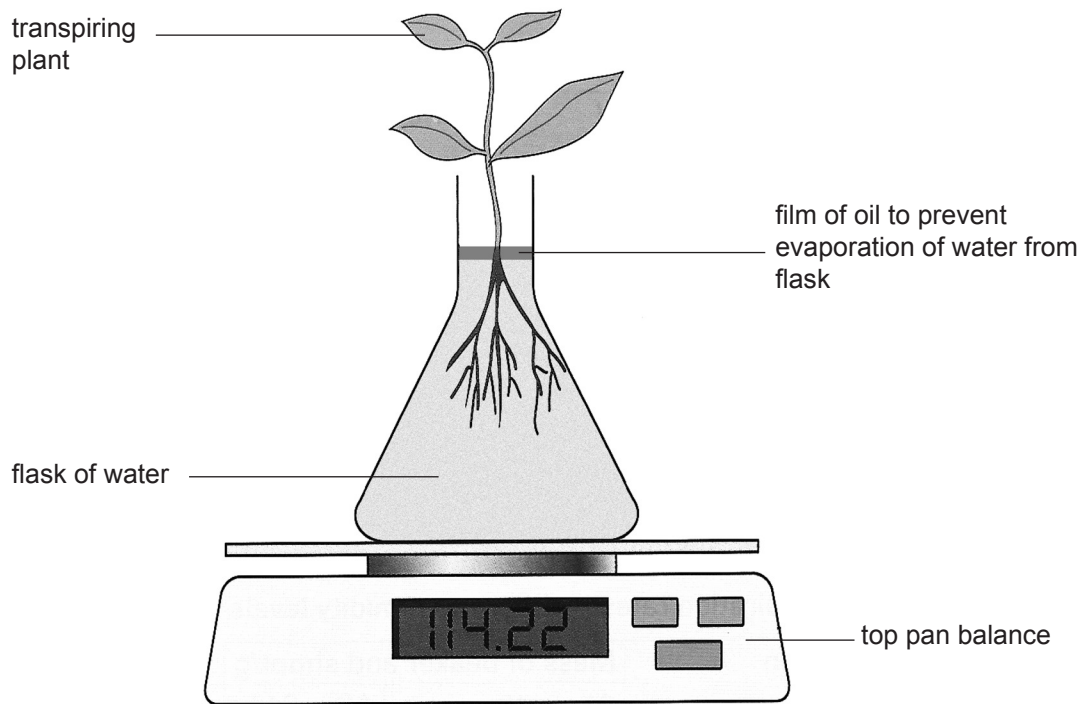
**DO NOT WRITE ON THIS PAGE**

**(Questions continue overleaf)**

**[Turn over**

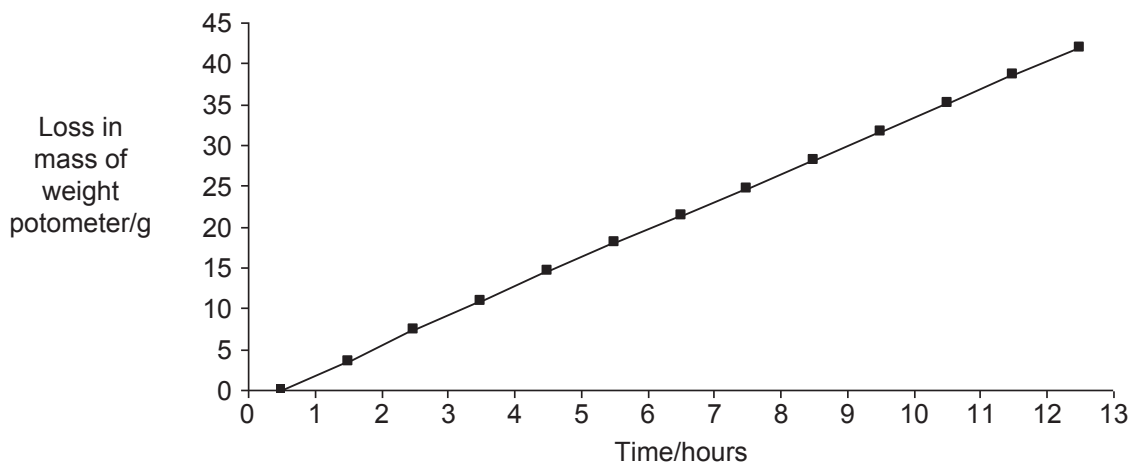


7 Transpiration can be measured using a weight potometer as shown below.



© Principal Examiner

A weight potometer was set up in a laboratory and the loss of mass was recorded at intervals over 12 hours in bright light, as shown below.



(a) (i) Describe and explain the trend shown.

---

---

---

---

---

---

---

---

---

---

---

[3]

(ii) Identify the evidence from the graph which suggests that the environmental conditions in the laboratory remained constant during the investigation.

---

---

---

[1]

(b) (i) On the graph, sketch the results you would expect if the investigation was carried out with this plant in a laboratory where the temperature was 5°C lower.

[1]

(ii) Explain your answer.

---

---

---

---

---

---

---

---

---

---

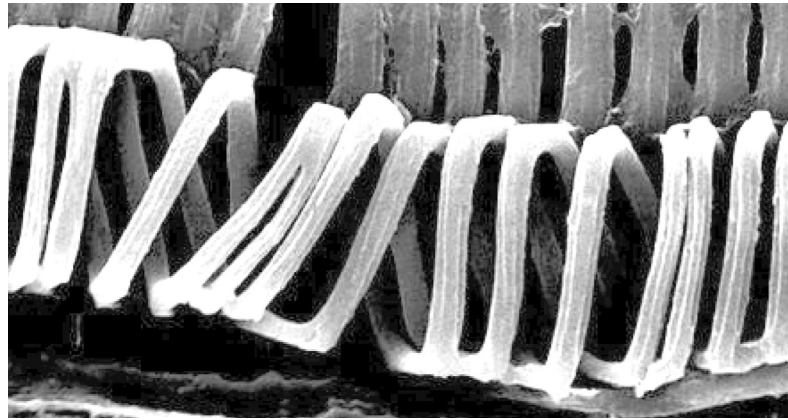
---

[2]

[Turn over



The image below is a scanning electron micrograph (SEM) of xylem from a sweetgum plant. Transpiration involves the movement of water through this tissue. This movement of water creates strong forces within the xylem.



© P. Dayanandan / Science Photo Library

(c) (i) Explain how strong forces arise within the xylem and describe how it is adapted to withstand these forces.

---

---

---

---

---

---

---

[2]



(ii) Identify evidence from the SEM that this is a young xylem vessel. Explain the advantage of the feature identified.

---

---

---

---

---

[2]



## Section B

*Quality of written communication will be assessed in this section.*

- 8 Farming can have a negative impact on biodiversity. In the last 30 years, farmers in Northern Ireland have been encouraged to adopt a range of practices to help promote biodiversity on their land. In addition to these agricultural practices, several other initiatives have been introduced to conserve habitats and promote biodiversity, such as Areas of Special Scientific Interest (ASSI).

Describe and explain how agricultural practices can have a **negative** impact on biodiversity and name **two** other initiatives that have been introduced to conserve habitats and promote biodiversity in Northern Ireland. [15]

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---







Large rectangular area with horizontal lines for writing.

11582

[Turn over



\*28SBY2125\*

11582



\*28SBY2126\*





A large rectangular area with a black border, containing 20 horizontal lines for writing.

11582



\*28SBY2127\*

---

**THIS IS THE END OF THE QUESTION PAPER**

---

**DO NOT WRITE ON THIS PAGE**

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

<b>Total Marks</b>	
--------------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for.  
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

11582/4



\*28SBY2128\*