

FOR OFFICIAL USE



National
Qualifications
2016

Mark

X726/75/01

Environmental Science

FRIDAY, 3 JUNE

9:00 AM – 11:00 AM



* X 7 2 6 7 5 0 1 *

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

Total marks — 80

Attempt ALL questions.

Questions 12 and 13 each contain a choice.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers and rough work is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting. Any rough work must be written in this booklet. You should score through your rough work when you have written your final copy.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



* X 7 2 6 7 5 0 1 0 1 *

Total marks — 80
Attempt ALL questions

1. Buzzards are birds of prey, commonly found throughout Scotland.



- (a) State the term used to describe the place where buzzards live. 1

- (b) Buzzards are part of the woodland ecosystem, which has several components. 2
Complete the table below to identify the terms and their definitions.

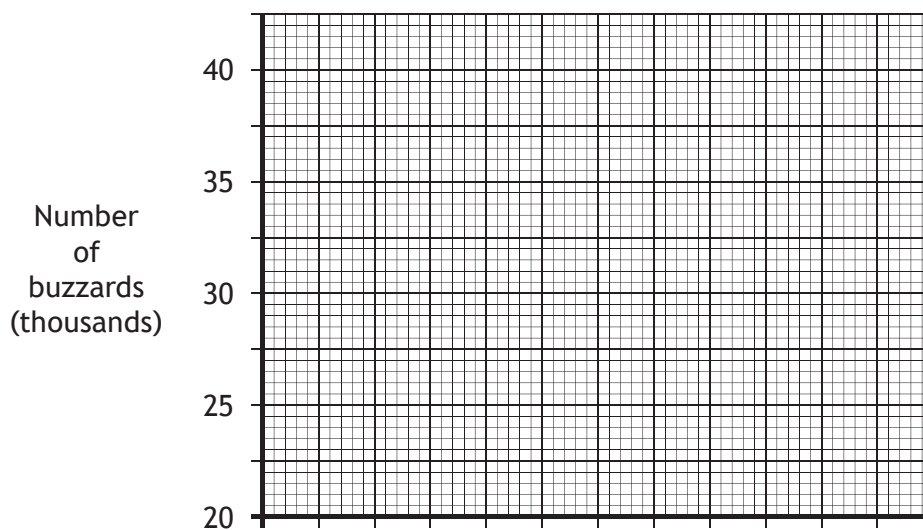
<i>Term</i>	<i>Definition</i>
Community	The sum of all the populations of plants, animals and micro-organisms living together in an ecosystem.
Species	
	The range of species which are present in a community.

1. (continued)

(c) The table below shows the changes in the number of nesting buzzards in the Caledonian Forest between 1997 and 2005.

Year	Number of buzzards (thousands)
1997	30.0
1999	30.5
2001	31.5
2003	32.5
2005	34.0

- (i) Using the information from the table, complete a line graph below by:
- 1 adding the scale and label to the horizontal (x) axis;
 - 2 completing the line graph to show the number of buzzards between 1997 and 2005.



2

(Additional graph paper, if required, can be found on *Page 31*)

- (ii) Use the data to predict the buzzard population in 2007.

1

_____ buzzards



2. A group of students used a 1 m² quadrat to measure the abundance of different plant species within the school grounds.



- (a) The students sampled a number of sites. To increase the reliability of the results, each site was sampled ten times.

Describe **one** other way the students could further increase the reliability of their results.

1

- (b) The students also gathered data on soil moisture.

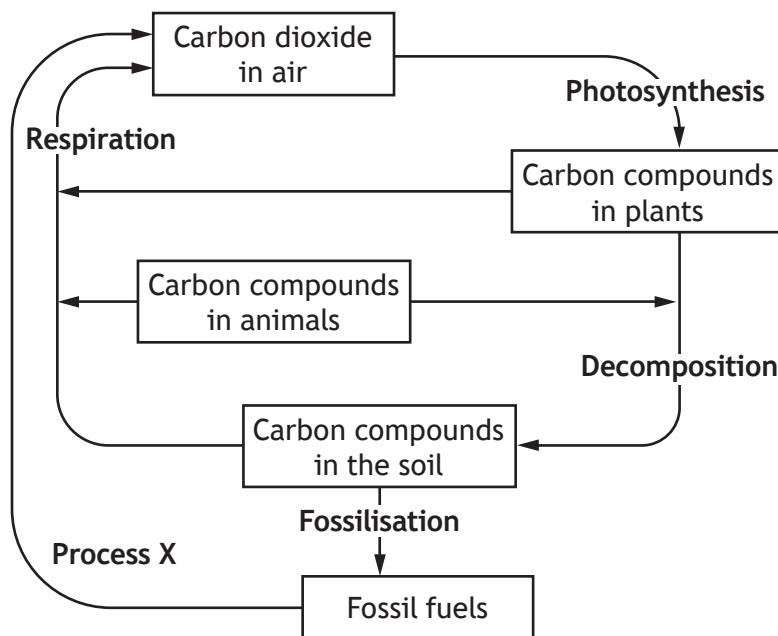
Describe a method to measure soil moisture.

2



* X 7 2 6 7 5 0 1 0 4 *

3. (a) The diagram below shows part of the carbon cycle.



(i) Complete the diagram by adding an arrow to represent the process of feeding. 1

(ii) Name Process X. 1

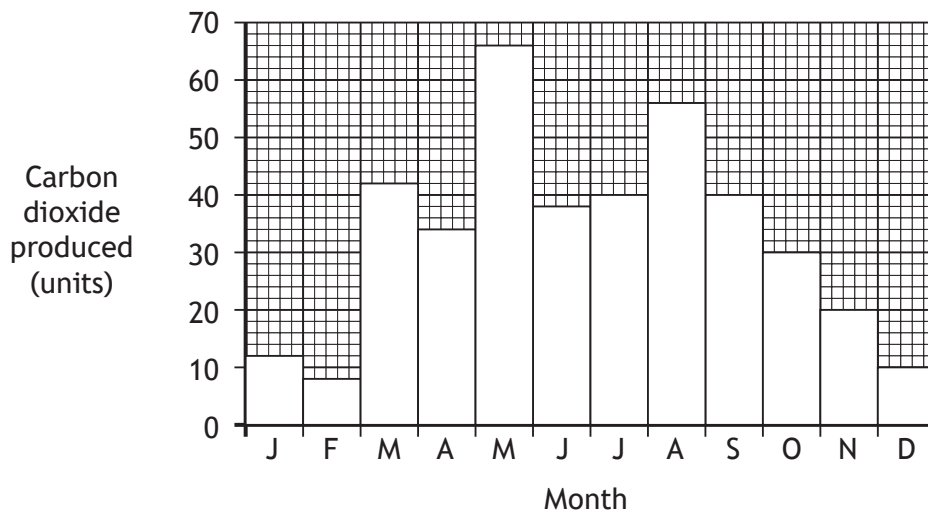
(b) Complete the word equation for the process of photosynthesis. 1



[Turn over

3. (continued)

(c) The graph below shows carbon dioxide produced from the decomposition of leaf litter in a Scottish woodland throughout the year.



(i) Calculate the average monthly carbon dioxide produced from the beginning of May to the end of August. 2

Show your working clearly.

Space for calculation

_____ units

(ii) Explain why there is a general decrease in the carbon dioxide produced from November to February. 2

4. Lichens are an indicator species that can be found growing on tree trunks in towns and rural areas. Many lichens are sensitive to pollutants in the air.

(a) State what is meant by an indicator species.

1

(b) The following table shows the approximate maximum levels of air pollution tolerated by some species of lichen.

<i>Lichen Species</i>	<i>Maximum level of air pollution tolerated ($\mu\text{g m}^{-3}$)</i>
Graphis elegans	50
Hypogymnia physodes	70
Lepraria incana	125
Parmelia sulcata	60
Ramalina fraxinea	35
Usnea subfloridana	40

(i) Select the lichen that is least tolerant to air pollution.

1

(ii) The level of air pollution in one area was found to be $65 \mu\text{g m}^{-3}$.
Select **all** the species of lichen which would be found growing in the area.

1

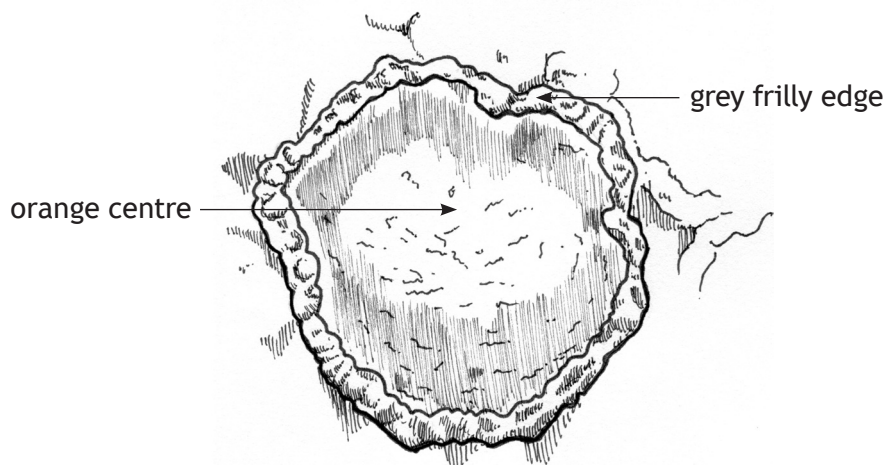
[Turn over



4. (continued)

- (c) A field sketch of a lichen, which is loosely attached to a tree trunk by root-like strands, is shown below.

Field sketch of lichen fruiting body



- (i) Using the paired statement key below, identify the lichen.

1

1. Lichen cannot be removed from tree bark Lichen can be removed without damaging tree bark	Go to 2 Go to 5
2. Lichen made up of fine powder/tiny balls Lichen not just made up of fine powder	<i>Lepraria incana</i> Go to 3
3. Grey with lobed edges Green or grey without lobed edges	<i>Diploicia canescens</i> Go to 4
4. Yellow-green to green with disc shaped fruits Grey-green with dome shaped fruits	<i>Lecidella elaeochroma</i> <i>Buellia punctata</i>
5. Leafy lichens attached to bark by root-like strands Bushy or hair-like lichens	Go to 6 Go to 7
6. Edges of fruits orange Edge of fruits grey	<i>Degelia plumbea</i> <i>Pannaria rubiginosa</i>
7. Lichen orange Lichen green or grey	<i>Teloschistes flavicans</i> Go to 8
8. Lichen shaped like a string of sausages Lichen not shaped like a string of sausages	<i>Usnea articulata</i> <i>Usnea florida</i>

Lichen _____



* X 7 2 6 7 5 0 1 0 8 *

4. (c) (continued)

- (ii) Give **one** similarity and **one** difference between *Usnea articulata* and *Teloschistes flavicans*.

2

Similarity _____

Difference _____

- (iii) Suggest why identification of lichens based on colour may not be very reliable.

1

[Turn over



* X 7 2 6 7 5 0 1 0 9 *

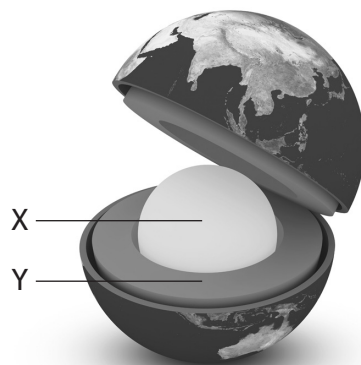
[BLANK PAGE]

DO NOT WRITE ON THIS PAGE



* X 7 2 6 7 5 0 1 1 0 *

5. (a) The structure of the Earth can be illustrated using a model.



Complete the table below by naming the parts of the Earth's structure identified in the diagram.

2

<i>Letter</i>	<i>Part of Earth's structure</i>
X	
Y	

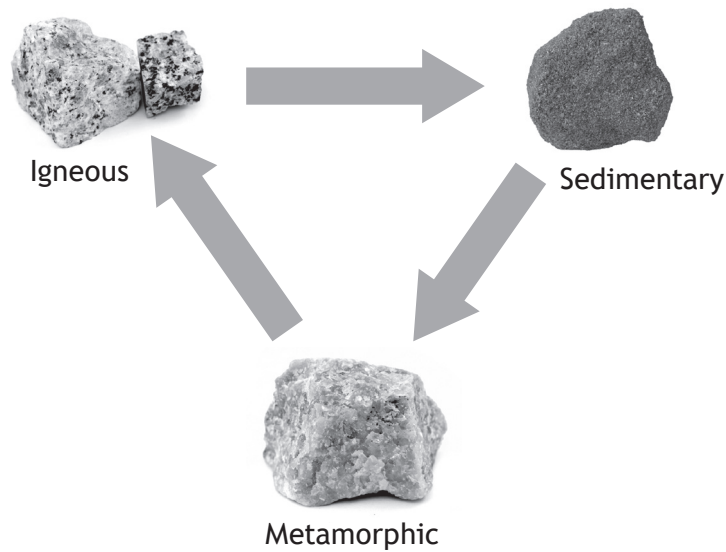
[Turn over



* X 7 2 6 7 5 0 1 1 1 *

5. (continued)

(b) The following diagram shows part of the rock cycle.



(i) Decide if each of the following statements is *True* or *False*.

If the statement is *False*, write the correct word(s) in the correction box to replace the word(s) in **bold** in the statement.

3

<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>
Igneous rocks are formed by the process of magma melting .			
The rock cycle is part of one of the Earth's systems called the biosphere .			
Metamorphic rocks are formed through exposure to heat and/or pressure .			

5. (b) (continued)

(ii) Rocks undergo the process of weathering and erosion.

Describe the processes of weathering and erosion of rocks.

2

(c) Name an ore mineral from which a metal may be economically extracted.

1

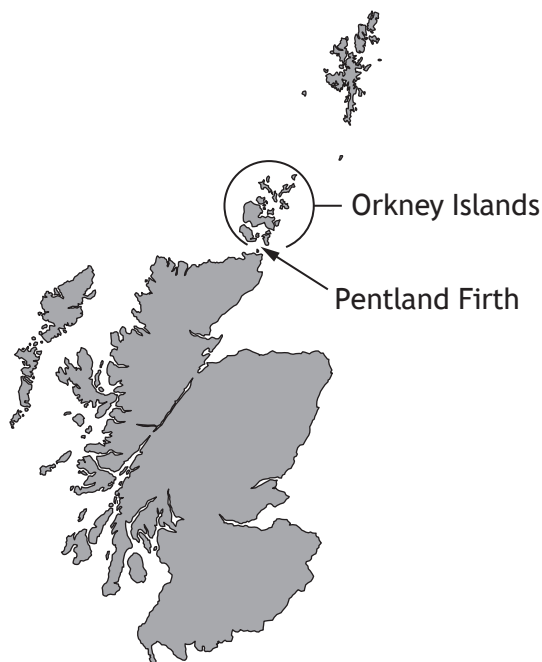
[Turn over



* X 7 2 6 7 5 0 1 1 3 *

6.

Scotland's Tidal Energy



A £4 billion project to build a number of tidal power stations around the Orkney Islands and the Pentland Firth is expected to generate the same amount of power as a nuclear power station. This is 1.2 gigawatts (GW) of renewable energy, enough to power up to 750 000 homes.

These areas features narrow sea channels and are suited to take advantage of the powerful Atlantic waves and some of the world's strongest tidal streams.

This development is one of the world's first commercial tidal power schemes that combines the use of two different tidal power generation systems. One will incorporate twin underwater "propellers" attached to a column which is anchored to the seabed. The other is a large underwater turbine bolted to the seabed.

To further increase power generation from the sea, it is estimated that a combination of tidal and wave power from the area could produce up to 60GW of power. This would represent 10 times Scotland's annual electricity usage.

Use the information in the passage above to answer the following questions.

(a) Give **two** reasons for investing in this project.

2

Reason 1 _____

Reason 2 _____



* X 7 2 6 7 5 0 1 1 4 *

6. (continued)

- (b) Describe **one** way in which this area is suited for generating power from tidal power stations.

1

- (c) Calculate Scotland's annual electricity usage.

1

Space for calculation

- (d) Describe **two** differences between the two tidal power generation systems.

2

1 _____

2 _____

[Turn over



* X 7 2 6 7 5 0 1 1 5 *

7. The company responsible for building the new road bridge crossing over the Firth of Forth re-use and recycle waste materials where possible.

(a) Name **one** national policy relating to waste management.

1

(b) The table below shows the management of waste materials and the mass produced at the construction site during one month.

<i>Waste management strategy</i>	<i>Mass of waste (tonnes)</i>
Re-used on site	5.00
Recycled off-site	14.89
Sent to landfill	2.28

(i) Calculate the percentage of waste that is re-used at the construction site.

2

Show your working clearly.

Space for calculation

_____ %

(ii) Suggest a material from the construction site that could be recycled.

1



7. (continued)

- (c) As a result of the company's re-use and recycle activities, it is estimated that 22 journeys were **not** made between the construction site and the landfill site.

Describe **one** benefit to the construction company and **one** benefit to the environment of reducing the number of journeys to the landfill site.

2

Construction company

The Environment

[Turn over



* X 7 2 6 7 5 0 1 1 7 *

8. Service industries within Scotland contribute to the volume of waste produced in Scotland as shown in the table.

<i>Service industry</i>	<i>Volume of waste (tonnes)</i>
Motoring	23 000
Retail (shops)	105 000
Wholesale	54 000
Education	85 000
Human health activities	55 000

- (a) Calculate the simplest whole number ratio of volume of waste produced from retail compared to that of education. 1

Space for calculation

Retail _____ : _____ Education

- (b) Suggest a reason for retail producing the highest volume of waste and describe how this could be reduced. 2



* X 7 2 6 7 5 0 1 1 8 *

9. The Borders Railway linking Edinburgh to Tweedbank in the Scottish Borders opened in 2015. It is the largest new railway to be built in the UK for over 100 years.

(a) Suggest **one** environmental impact of the railway construction.

1

(b) The railway tracks, along the 50 km route, are made of steel.

Underline the correct options.

1

Steel is a

- A renewable resource
- B non-renewable resource
- C physical resource
- D biological resource.

[Turn over

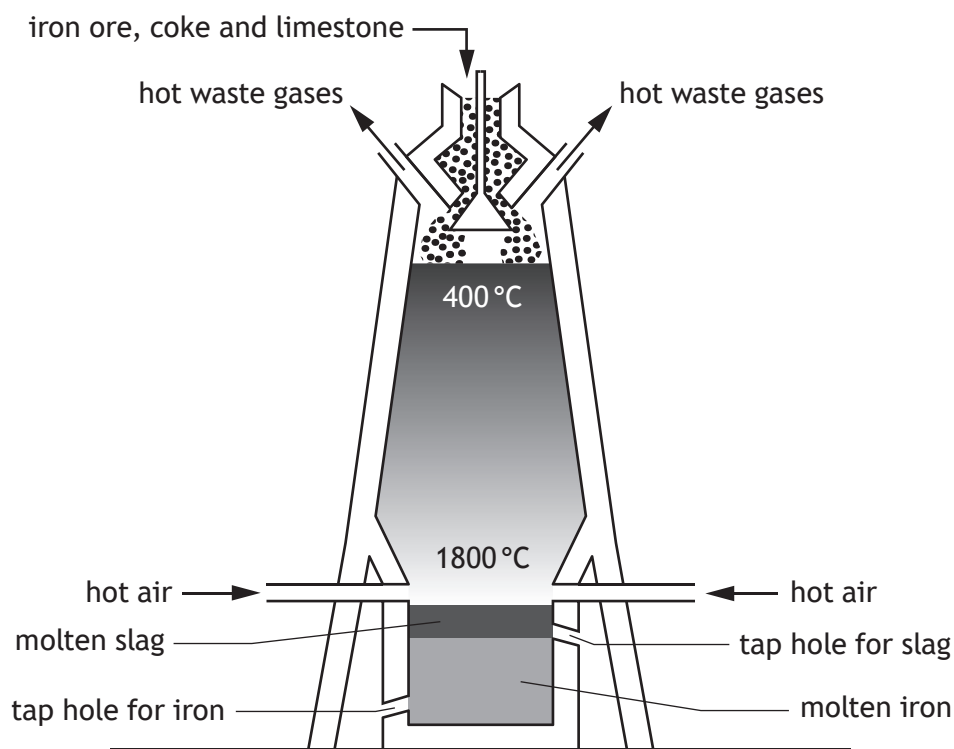


* X 7 2 6 7 5 0 1 1 9 *

9. (continued)

- (c) A mixture of iron ore, coke and limestone is heated to produce molten iron, from which steel is made.

The diagram below shows the industrial equipment that is required to produce the molten iron.



- (i) Name the piece of industrial equipment that is required to produce the molten iron. 1
- _____
- (ii) Name a waste gas given off during the production of iron. 1
- _____
- (iii) State the purpose of adding limestone during the production of iron. 1
- _____
- _____
- (d) Suggest another use of iron other than for making steel railway tracks. 1
- _____
- _____

9. (continued)

- (e) Some people believe that the provision of a rail link between Edinburgh and the Scottish Borders will help reduce global warming.

Indicate whether you agree, disagree or neither agree nor disagree with this statement by ticking (✓) the appropriate box.

Give a reason for your choice.

1

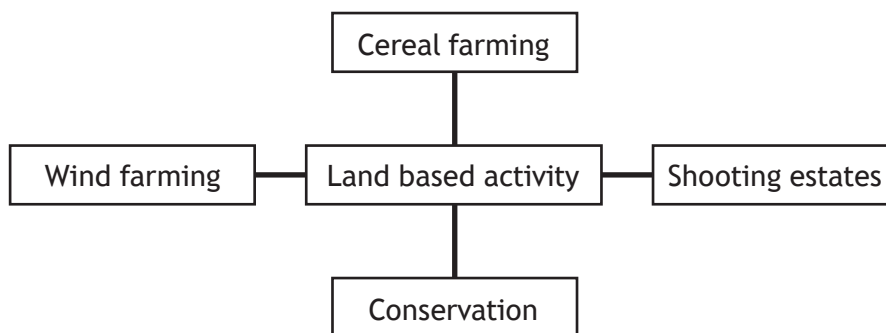
	Tick (✓)
Agree	
Disagree	
Neither agree nor disagree	

Reason _____

[Turn over



10. Land based activities provide Scotland with a variety of valuable resources. The diagram below shows some of the land-based activities in the Scottish Highlands.



- (a) Organic farming is another example of a land-based activity. Give **one** advantage and **one** disadvantage of this type of farming.

2

Advantage _____

Disadvantage _____

- (b) Name **one** economically important crop, other than cereals, produced in Scotland.

1



10. (continued)

- (c) Choose **two** of the land-based activities from the diagram and explain how they may be in conflict within an environment of national importance.

2

Activity 1 _____

Activity 2 _____

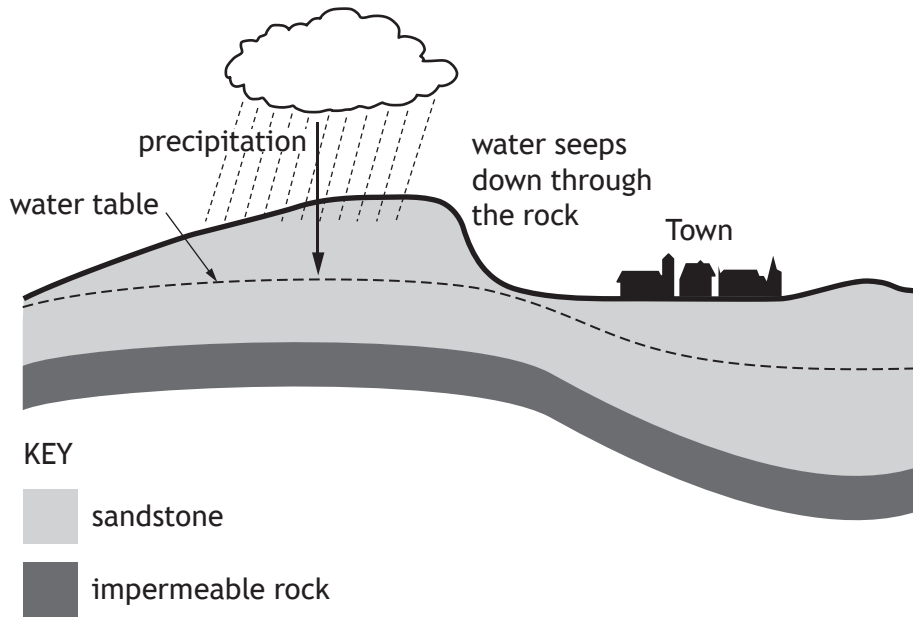
Conflict _____

[Turn over



* X 7 2 6 7 5 0 1 2 3 *

11. Consider the diagram below.



(a) (i) State what is meant by the term *groundwater*. 1

(ii) Explain how groundwater can be extracted for use as a water supply. 1

(b) The town is expected to double in size in the future. Explain how this could affect the water table. 2



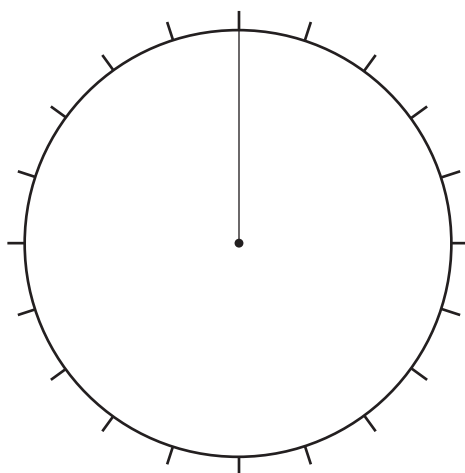
11. (continued)

(c) The table below shows domestic use of water in a More Economically Developed Country (MEDC).

<i>Use</i>	<i>Percentage of water used (%)</i>
Flushing toilet	32
Bath and shower	18
Washing machine and dishwasher	15
Drinking	5
Other	30

(i) Use the data in the table to complete the pie chart,
Label each section and amount clearly.

2



(An additional pie chart, if required, can be found on *Page 31*)

(ii) (A) Suggest a difference in the percentage of domestic water used in a Less Economically Developed Country (LEDC) compared to an MEDC.

1

(B) Give a reason for your answer.

1



Write your answers to questions 12 and 13 on the following pages. Diagrams may be used where appropriate.

12. (a) Energy produced from wind power contributes to Scotland's economy.

Describe the effects that wind farms have on:

- (i) landscape
- (ii) wildlife.

7

OR

(b) Limestone is an important resource for the construction industry.

Describe the

- (i) formation,
- (ii) extraction, and
- (iii) processing of limestone.

7

13. (a) National organisations are responsible for developing legislation that relates to the protection and sustainability of the environment.

Name **two** national organisations which have this responsibility and describe ways in which the implementation of the relevant legislation protects the environment.

7

OR

(b) Freshwater loch ecosystems can be damaged by human activity.

Identify and describe how this may occur and suggest conservation measures which could be taken to minimise this damage.

7



* X 7 2 6 7 5 0 1 2 6 *



MARKS DO NOT
WRITE IN
THIS
MARGIN

SPACE FOR ANSWERS

--



* X 7 2 6 7 5 0 1 2 7 *



MARKS DO NOT
WRITE IN
THIS
MARGIN

SPACE FOR ANSWERS

--



* X 7 2 6 7 5 0 1 2 8 *



MARKS DO NOT
WRITE IN
THIS
MARGIN

SPACE FOR ANSWERS

--



* X 7 2 6 7 5 0 1 2 9 *

MARKS DO NOT
WRITE IN
THIS
MARGIN

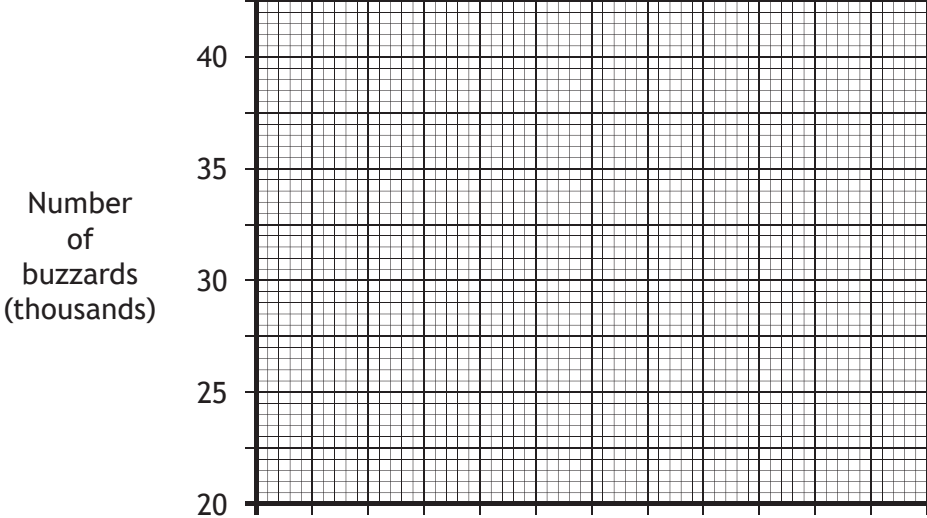
SPACE FOR ANSWERS

[END OF QUESTION PAPER]

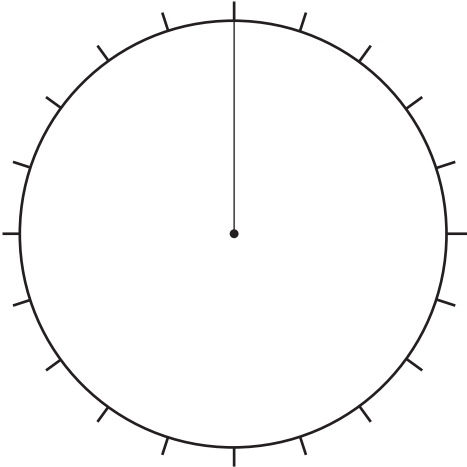


* X 7 2 6 7 5 0 1 3 0 *

Additional graph paper for Question 1 (c) (i)



Additional pie chart for Question 11 (c) (i)



MARKS

DO NOT
WRITE IN
THIS
MARGIN

ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK



* X 7 2 6 7 5 0 1 3 2 *

MARKS

DO NOT
WRITE IN
THIS
MARGIN

ADDITIONAL SPACE FOR ANSWERS AND ROUGH WORK



* X 7 2 6 7 5 0 1 3 3 *

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE



* X 7 2 6 7 5 0 1 3 4 *

[BLANK PAGE]

DO NOT WRITE ON THIS PAGE



* X 7 2 6 7 5 0 1 3 5 *

ACKNOWLEDGEMENTS

Question 1 - aaltair/shutterstock.com

Question 2 – Image is taken from <http://www.discoverypark.ie/ecology-field-study/>.

SQA has made every effort to trace the owners of copyright materials reproduced in this question paper, and seek permissions. We will be happy to incorporate any missing acknowledgements. Please contact Janine.Anderson@sqa.org.uk.

Question 5(a) - baur/shutterstock.com

Question 5(b) – Tyler Boyes/shutterstock.com
Siim Sepp/shutterstock.com
Tyler Boyes/shutterstock.com



* X 7 2 6 7 5 0 1 3 6 *