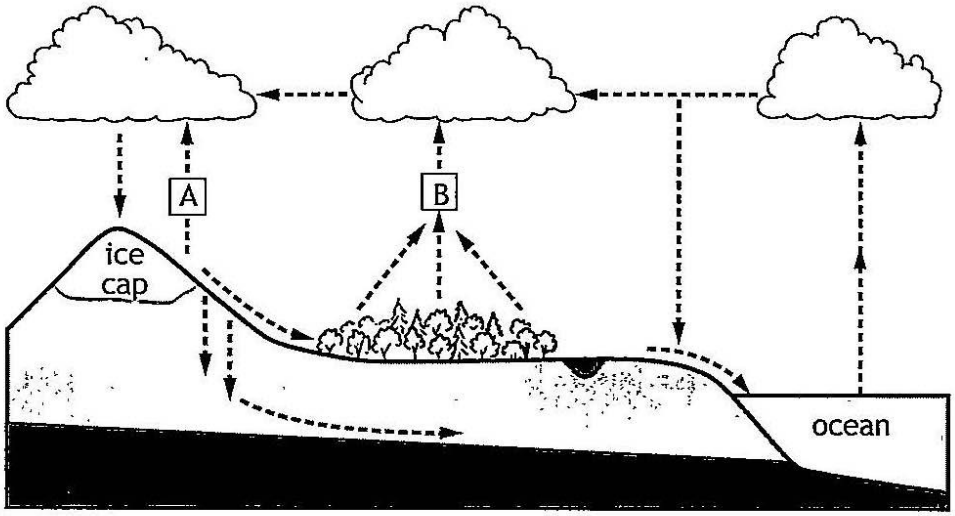
MARKS

Total marks — 100

Attempt ALL questions

Questions 10 and 11 each contain a choice

1. The model hydrological cycle below illustrates the storage and movement of water in its various states above, below and across the Earth's surface.



Model Hydrological Cycle

(a) (i) State a form of natural subterranean water storage. 1

Underground Spring

(ii) Name and describe the process occurring at either A or B. 2

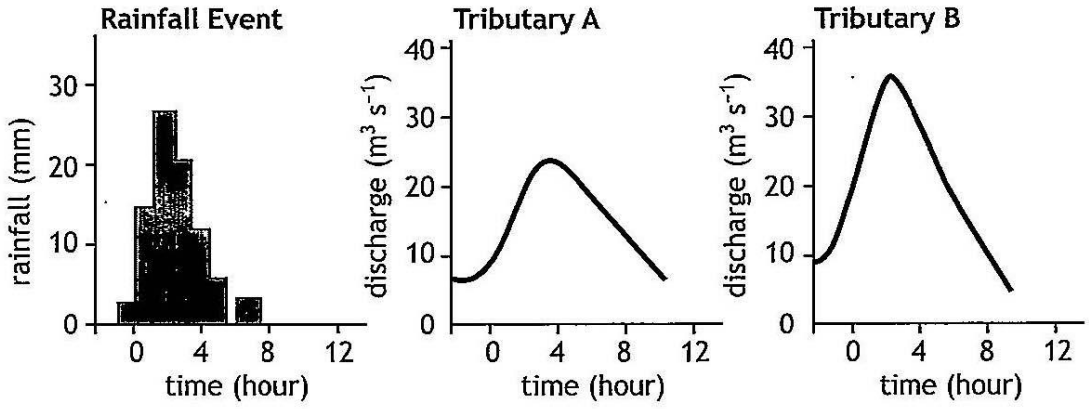
The water in forests is raised back into the atmosphere and returned into the hydrological cycle as it did not run off into the ocean due to rainfall

1. (continued) MARKS

(b) The measurement of river discharge can be recorded on a river hydrograph.

In the diagram below, the rainfall event graph shows the distribution of rainfall over a twelve hour period in a river catchment.

The hydrographs illustrate the discharge of two tributaries within the river catchment during the same rainfall event.



(i) Compare the discharge between the two tributaries during the rainfall event. 3

The amount of discharge in Tributary B was much higher than that of A in a shorter amount of time. The discharge in B also ended before the discharge in A, it also started at a higher level.

(ii) Explain how a change of land use may affect river discharge. 2

If there was a farm or trench around the river it would decrease the discharge. as it would be blocked by farm utensils or it would be trapped in the trench.

MARKS

2. The pine marten (*Martes martes*) is an omnivorous cat-sized member of the weasel family. At different seasons, its diet includes fungi, berries, birds, eggs, beetles, carrion, and small mammals, including squirrels. It is an agile hunter, which hunts both in the trees and on the ground.

Although it was once commonly found in Britain, by the early 20th century the pine marten's range had been reduced to small populations in the pine forests of the north-west Scottish Highlands. Since 1950 it has expanded its range significantly, but it remains a rarely seen animal with an estimated population of only 4000 in 2012.

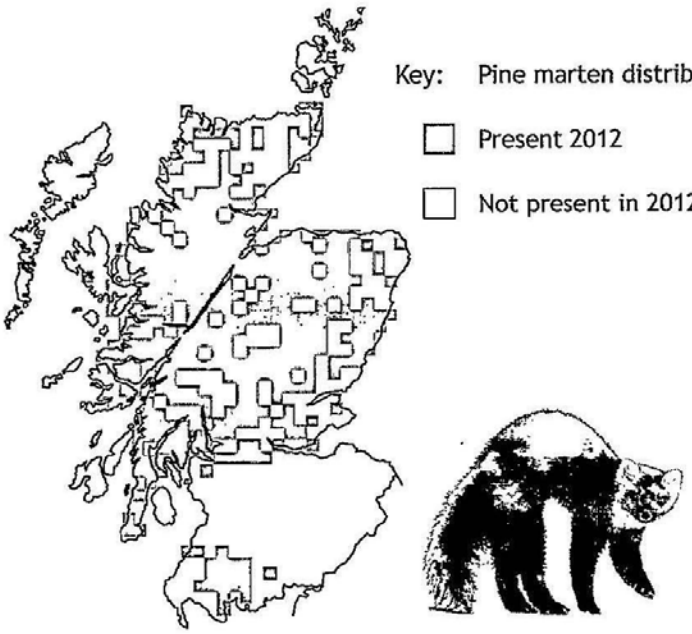
(a) Suggest **two** changes in the management of the countryside which have taken place since 1950 that would have helped the pine marten numbers to increase. 2

The decrease ~~the~~ in the use of chemical pesticides has meant that the insects it has eaten are not poisonous so they do not die. The decrease in deforestation means their habitats will not be destroyed and thus are less vulnerable to prey.

2. (continued) MARKS

(b) The diagram shows the distribution of the pine marten in Scotland as recorded in surveys carried out in 2012.

The squares on the map represent 10 km × 10 km areas (hectads) in which pine martens were surveyed and recorded as being present.



The distribution of the pine marten in 2012 was determined by walking along a forest track for 1 km and counting the number of scats (faeces) left by the pine martens. This was carried out in the largest forest in each hectad.

Earlier research suggested that if a breeding population of pine martens was present in an area, at least seven scats would be recorded for every 4 km of transect walked.

Discuss the validity of the technique used and how it might be improved. 3

It is relatively valid since they are using previous data to back up their findings but it could be improved by walking more than 1km in each forest as it would give more accurate results, they could also test more than 1 forest per hectad to get a better average. They could also survey more areas

2. (continued)

(c) The native red squirrel (*Sciurus vulgaris*) is under threat in Scotland from the introduced North American grey squirrel (*S. carolinensis*).

The table compares some features of the two species.

Squirrel species	*Mean mass* (g)	*Percentage of time spent foraging in trees* (%)
Red	300	67
Grey	550	14

(i) Calculate, as a simple whole number ratio, the mean mass of the red squirrel in relation to that of the grey squirrel. **1**

Space for calculation

red squirrel 6 : 11 grey squirrel

(ii) The expansion of the pine marten distribution has reached areas of the country where both red and grey squirrels are found.

With reference to data in the table above, suggest why it may be advantageous to the red squirrel that this predator is entering the area where both squirrel species are present. **2**

This is advantageous as the pine martin will kill off the grey Squirrell in the area so that there are less predators for the red Squirrell since there are already less pine martins than grey Squirrells. It also states that there are less grey Squirrels in those areas due to them not Spending as much time foraging in trees.

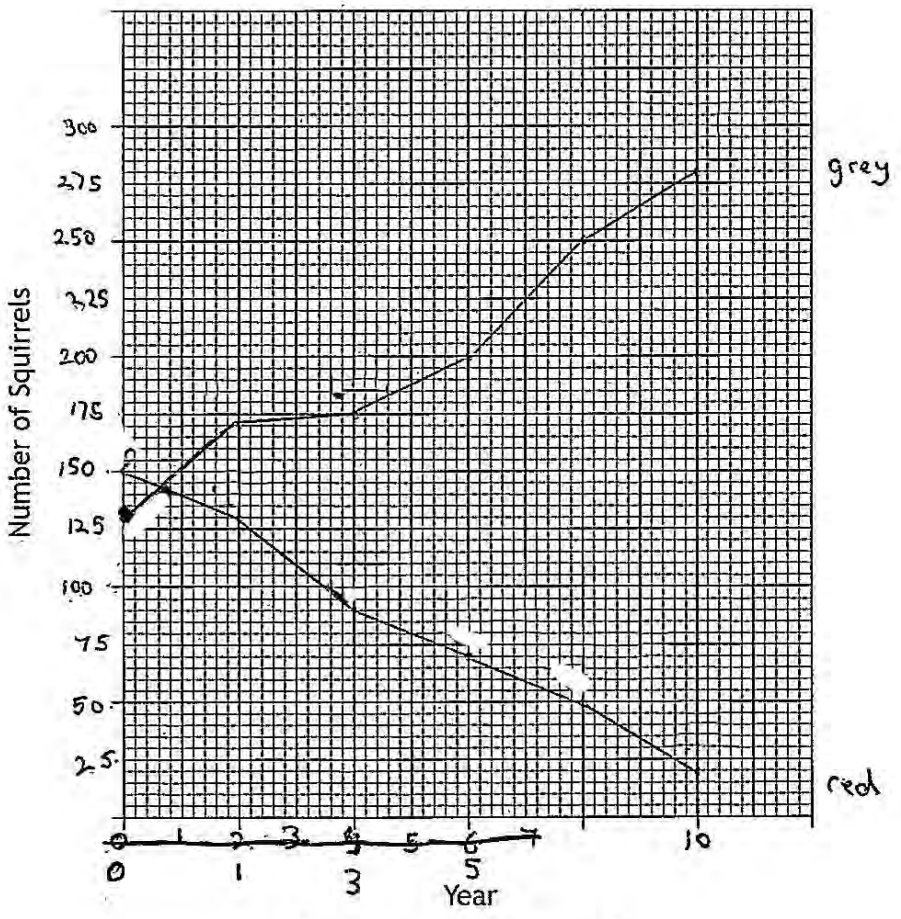
MARKS

2. (c) (continued)

(iii) The table below shows the populations of grey and red squirrels which were recorded in an area of woodland over a 10 year period.

Year	*Numbers of squirrels of each species*	
	Grey	*Red*
0	130	150
1	170	130
3	175	90
5	200	70
8	250	50
10	280	20

Draw a line graph to show the numbers of grey and red squirrels over the period of the study. 2



MARKS

3. Baryte is an abundant mineral that has many industrial uses.

(a) State **one** way in which baryte forms. 1

Pressure underground

(b) The table below shows Argentina's baryte production from 2003 to 2009.

Year	*Production* (tonnes)
2003	6934
2004	2762
2005	3355
2006	6276
2007	37 979
2008	3170
2009	4000

(i) Calculate the percentage change from 2006 to 2007. 1

Space for calculation

450%

(ii) Suggest a possible reason for the sharp increase in baryte production in 2007. 1

No - where else was producing it

MARKS

3. (continued)

(c) Explain how soil-forming processes can result in commercially viable deposits of baryte. 2

(d) Baryte is used in many industries, often in the form barium sulfate.

(i) State a reason for the use of barium sulfate as an additive in oil drilling. 1

It's not flammable therefore less dangerous

(ii) Barium sulfate is commonly used as a "barium meal" in biomedical imaging, to diagnose abnormalities within certain internal organs.

Explain why barium sulfate is suitable for use in biomedical imaging. 2

It is ~~usefule~~ suitable because it is digestable and it comes up well on the x-ray because it sticks to the walls of your organs.

MARKS

4. Carpets and carpet tiles consist of an upper layer of "pile" attached to a backing. The pile can be made from either natural or synthetic fibres and usually consists of twisted tufts which are often heat-treated to maintain their structure. The backing is primarily made of latex.

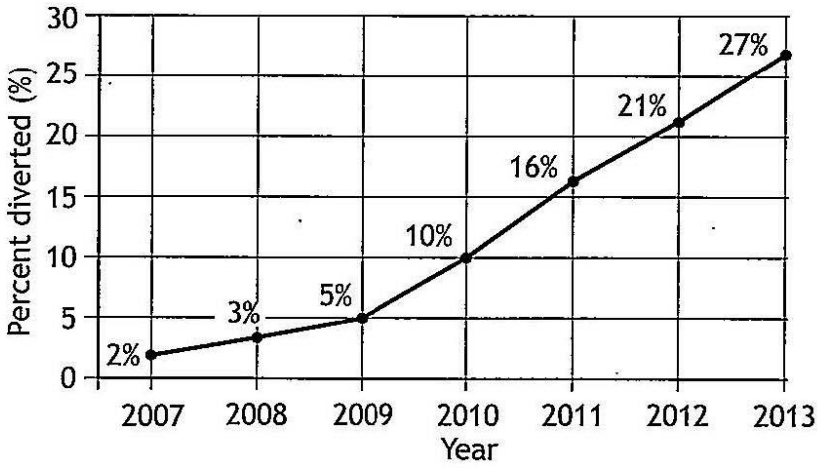
Once a carpet is no longer needed there are a number of options:

- **Reuse:** carpet tiles are cleaned and reused.
- **Recycle:** components of the carpet are separated for recycling.
- **Energy recovery:** carpets are shredded, mixed with other materials and used as secondary fuel for industry, or burned as a fuel to create electricity.
- **Disposal:** mainly to landfill.

(a) State **two** factors which would be considered in the life cycle analysis of a product such as a carpet. 2

The material it is made from
How valuable those materials are

(b) The graph below shows the total percentage of carpets being diverted away from landfill in the UK from 2007 to 2013.



107 000 tonnes of carpets were diverted away from landfill in 2013. The remainder was sent to landfill.

Calculate, to the nearest tonne, the mass of carpets deposited in landfill in 2013. 1

Space for calculation.

310,000 tonnes

MARKS

4. (continued)

(c) Suggest **two** disadvantages of energy recovery compared to recycling. 2

It would release harmful fumes into the atmosphere

It's a waste of materials

(d) In addition to selling carpets, some manufacturers use a "closed-loop approach" to their business. They lease out carpet tiles which are then collected back, cleaned and reused. This is called a circular economic model.

A linear economic model is one where manufacturers take resources, make goods out of them and sell these. The majority of these goods end up in landfill.

(i) Suggest **two** environmental benefits that the circular economic model has over a traditional linear economic model. 2

A circular economic model means less waste ends up in landfills which means less pollution.

~~It wouldn't~~

Less materials are used if the same ones are re-used which cuts down on waste.

(ii) Suggest **two** reasons why manufacturers may be resistant to using the closed loop approach. 2

It is more expensive to lease them out and clean them for re-use.

It takes longer so less goods are sold

MARKS

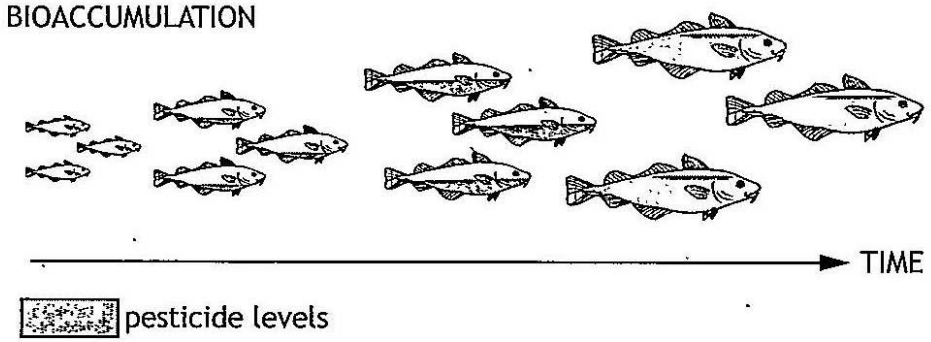
5. (a) A persistent pesticide is one which is not easily broken down in the environment.

(i) Explain how a persistent pesticide might enter a marine ecosystem. 2

If a pesticide is used and then the rain washes it into the ocean then the fish in the area will ingest it and their prey will eat them and also the pesticide inside them

(ii) The diagram below shows one way in which a persistent pesticide builds up in a marine fish species in the Arctic.

In the diagram, the axis labelled TIME refers to the growth of individual fish.



Explain, with reference to the diagram, the process of bioaccumulation. 2

As the fish grows it eats more fish that have ingested the pesticide therefore as it grows it can consume larger fish with a larger amount of pesticide within.

MARKS

5. (a) (continued)

(iii) Suggest how the following actions by farmers would help to reduce the effect of bioaccumulation. 2

1. Conversion to organic farming

This means chemical free pesticides would not be used and therefore would not make it to the marine life instantly cutting down on bioaccumulation

2. Use of biodegradable pesticides

This means the pesticides will seep into the earth instead of resting on top so that rainfall can not wash it away.

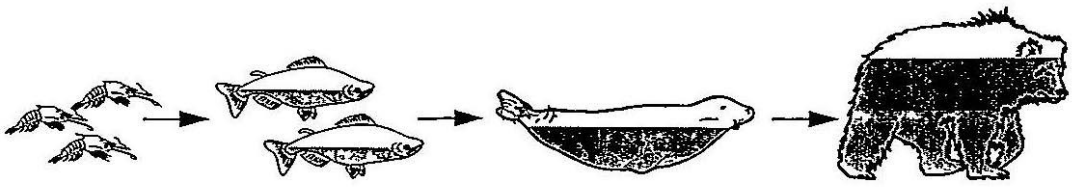
(b) State why the total biomass of organisms usually decreases at each successive trophic level in a food chain. 1

The organism above is larger and energy is used to move, eat and sleep therefore less energy will be carried up the trophic levels. and thats why there are less of the upper trophic level species

MARKS

5. (continued)

(c) The diagram below shows the way in which persistent pesticides build up in an Arctic food chain.



BIOMAGNIFICATION

pesticide levels

(i) Explain the process by which low levels of a persistent pesticide in marine waters can result in the death of large carnivores. 2

low levels of persistant pesticide in marine waters can kill large carnivores because as it moves up the food chain the pesticide builds up in each species to dangerous levels so when a large carnivore eats something it is also ingesting all the pesticides in its prey and the animals that its prey has consumed.

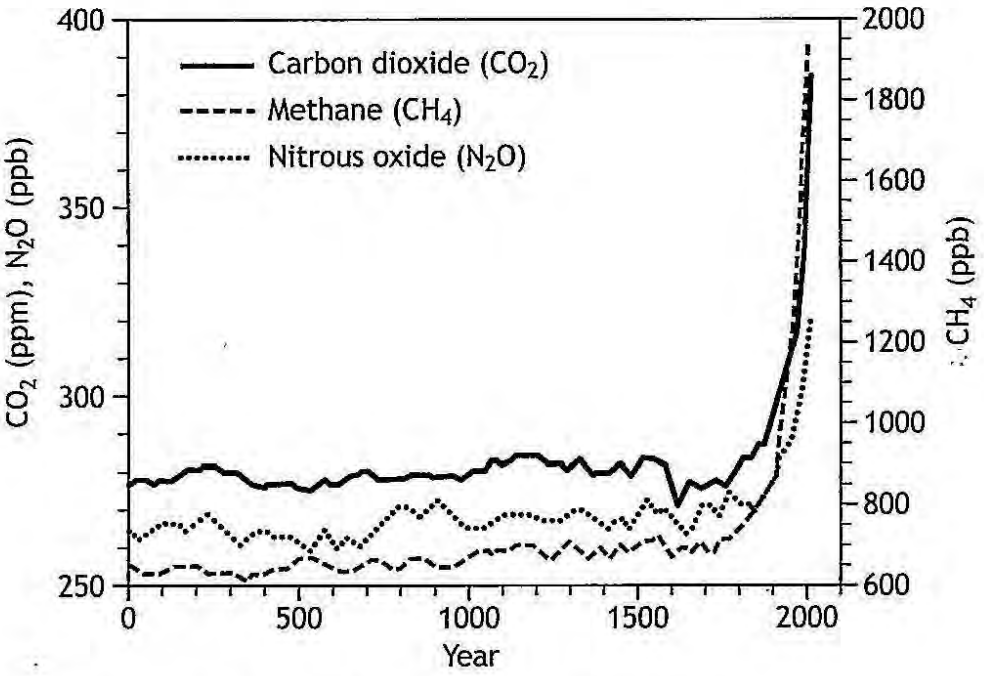
(ii) The food chain above contains both ectotherms and endotherms.

Explain why food webs involving mainly ectotherms contain longer food chains than those involving mainly endotherms. 2

Ectotherms can release some of the pesticides so it does not poison as much of the food chain allowing there to be more predators as it takes longer for them to die due to the low levels of pesticide.

MARKS

6. (a) The graph below shows greenhouse gas concentrations in the atmosphere up to the year 2000. Concentration units are parts per million (ppm) or parts per billion (ppb), indicating the number of molecules of the greenhouse gas per million or billion molecules of air.



(i) Describe the general trend shown on the graph. 1

In the years between 1500 and 2000, carbon dioxide, Methane and Nitrous oxide all dramatically increased very rapidly

(ii) Suggest **two** possible causes for this change. 2

The introduction of cars meaning more harmful fumes such as Carbon dioxide

The increase in population of the earth meaning more methane is released

(b) In 2013, the Intergovernmental Panel on Climate Change (IPCC) said that "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century."

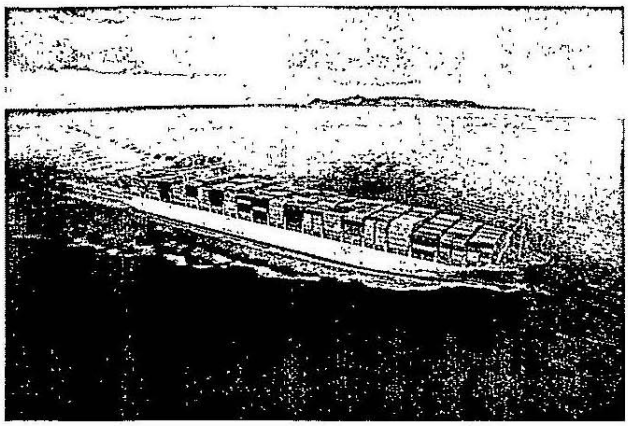
Explain why the IPCC cannot say for certain that human influences are the dominant cause of climate change. 1

Because animals also release methane.

MARKS

6. (continued)

(c)



CO_2 emissions from shipping have increased by more than 90% since 1990 and are currently responsible for 3% of global CO_2 emissions. One proposal to reduce emissions is slow steaming, which involves reducing the speed of the ship by 10%.

(i) Suggest a reason why shipping companies may choose not to use slow steaming. 1

They would have to spend more on fuel and wages if people are working longer

(ii) The Energy Efficiency Design Index is a new set of design standards which will encourage the construction of ships that are more energy efficient.

Suggest a reason why the new design standards may not have an immediate effect in reducing greenhouse gas emissions. 1

Because it will release a large amount of emissions to build the ships.

MARKS

6. (continued)

(d) The growth in international shipping has led to enlargement of ports and extensions to existing dockside facilities.

State **two** reasons why such developments require environmental assessment. 2

So they can see how many more emissions are being released.

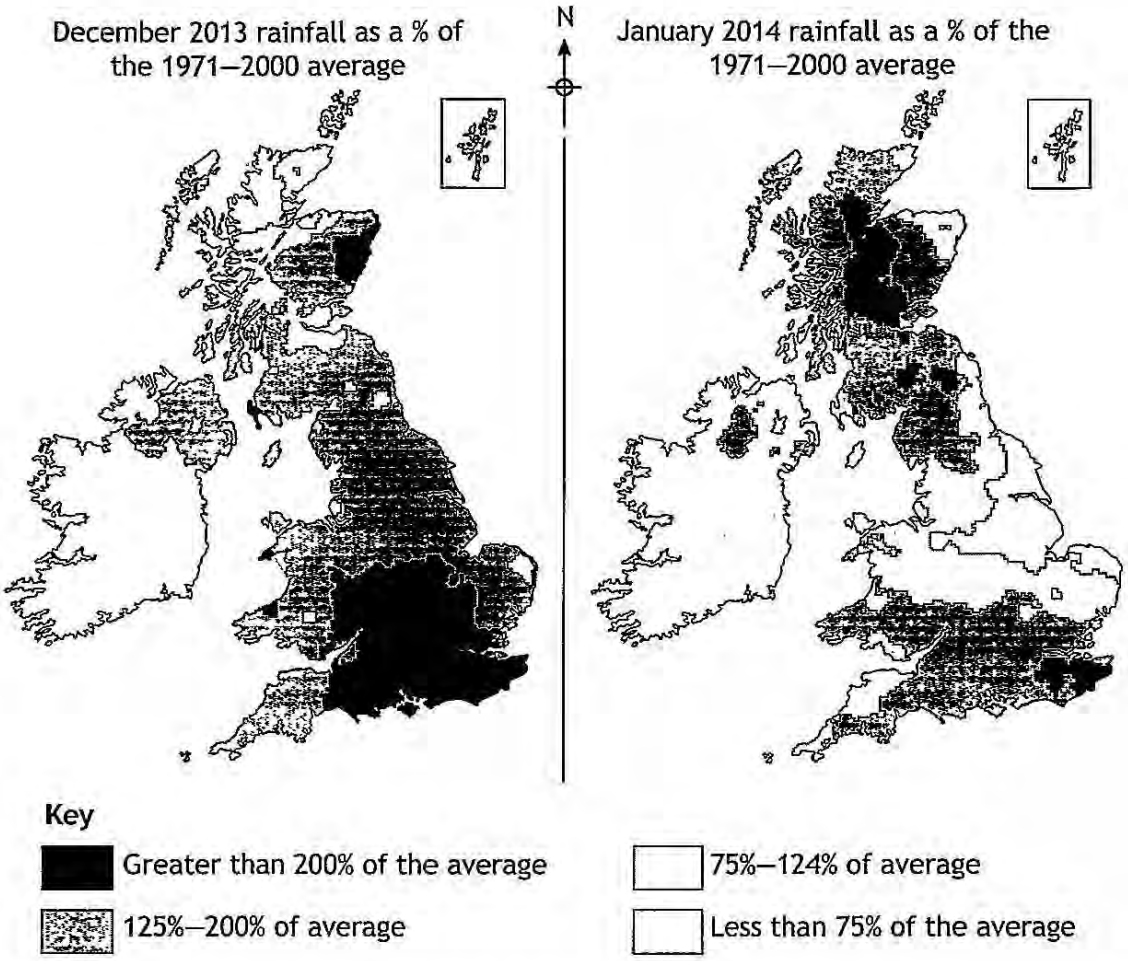
To see if it is safe to have that many ships in a place where animal habitats may be so the habitat and animals are undisturbed

[Turn over

MARKS

7. The winter of 2013–14 was the wettest on record in parts of the UK. It also brought flooding to large parts of the south of England.

The images below show rainfall in the UK across two months in the winter of 2013–14.



(a) Identify **two** changes in rainfall distribution shown in the diagrams. 2

It greatly increases in the north in January 2014 to more than 200% of the average since it was less than 75% in December 2013 The entire midbelt goes back to normal rainfall in January from being 125%-200% above average in December.

MARKS | D W N

7. (continued)

(b) The extreme weather conditions experienced during the winter of 2013–14 resulted in much debate around anthropogenic and natural climate variability.

(i) Explain why climate variability might have accounted for the higher than average rainfall levels in parts of Britain in January 2014. 2

The melting ice caps due to high temperatures means that more water is in the air allowing for higher levels of rainfall

(ii) Describe how a named natural factor contributes to climate variability. 2

Condensation means more water vapour is released into the air and causes it to be colder.

(c) South West England experienced flooding during the winter of 2013–14.

Suggest how flooding might impact on the structure and composition of brown earth soils. 2

The large amount of water will wash the soil away and seep down making it clumpy instead of more like a powder.

MARKS D W N

8. The EU Common Agricultural Policy (CAP) was created in 1962 in order to provide affordable food for citizens and a fair return for farmers. Initially it did this by providing a guaranteed minimum price for specific agricultural products — this was called market support.

(a) The CAP supports agriculture within the EU.

Describe **two** ways in which CAP achieves this. 2

It sets a limit on how much crops can be harvested.

They give grants to farmers

(b) Explain why EU policy aims to improve the sustainability of food production. 2

So that more organic food can be produced. It will cut down on the amount of emissions from factories making food

(c) Early versions of CAP encouraged increased food production which indirectly impacted on other aspects of the environment.

Explain an environmental impact of increased food production. 2

The farm vehicles would release harmful gases into the atmosphere which would contribute to climate change.

MARKS

8. (continued)

(d) Non-food crops represent a viable alternative for many European farmers.

Describe the use of a named non-food crop. **2**

Cotton could be farmed to make clothes

(e) Suggest a non-agricultural land use into which farmers can diversify. **1**

Wind farms to create energy.

MARKS

9. Since 2014 the British Geological Survey and the Department for Energy and Climate Change have worked together to estimate the volume of shale gas in the British Isles.

(a) (i) Describe briefly the formation of shale gas. 2

When shale oil is burned shale gas is released.

(ii) Describe a method of shale gas extraction. 2

They would mine down a hole such as mining for oil then when they got to the gas a tube would be dropped down the drill to extract the gas.

(b) The development of shale gas extraction is proving to be controversial in many countries.

(i) Suggest a reason why a national government may be in favour of developing shale gas extraction within their country. 1

If they develop it they can sell it to other countries

(ii) Suggest **two** reasons why some local people may object to the extraction of shale gas in their area. 2

It causes visual and noise pollution

It's dangerous and may cause damage.

MARKS

9. (continued)

(c) In 2014, six UK conservation organisations launched the report "Are We Fit to Frack?" which suggested setting up zones in which no shale gas extraction would be permitted.

Outline the role of a named land designation in conserving the UK's geological heritage. 2

MARKS

For questions 10 and 11 choose to answer **either** A or B. Write your answers on the following pages. Diagrams may be used where appropriate.

10.A The introduction of non-native species causes ecological concern globally. A large number of non-native species, such as the grey squirrel, have been introduced to the UK, both deliberately and accidentally.

Discuss the impacts of non-native species, using a named example other than the grey squirrel, under the following headings:

(a) Impacts on local biodiversity

(b) Minimisation of these impacts **10**

OR

B A 2010 report compiled for the Cairngorms National Park Authority identified twenty-three nationally extinct species that have the potential to live in Scotland again. However, species reintroduction has been a controversial subject in recent years.

Discuss the re-introduction of nationally extinct species, using named example(s), under the following headings:

(a) Arguments in favour of re-introduction

(b) Arguments against re-introduction **10**

11.A In 2013 Scotland produced approximately 20 million tonnes of waste. This came from both domestic and industrial sources. In recent years the Scottish Government has introduced legislation to manage this waste.

Discuss the benefits and challenges of a piece of waste management legislation you have studied. **10**

OR

B The Scottish Government is using climate change and renewable energy policies to minimise greenhouse gas emissions in line with international targets.

Discuss the benefits and challenges of a national policy or relevant piece of legislation relating to climate change or renewable energy which you have studied. **10**

10 B) The wolf has been discussed in being re-introduced into Scotland ~~as~~; people are for this because it would help cut down in the overpopulation of deer which are feeding on farm-crops causing farmers to lose money. However people are against it because they think that the wolf will also negatively effect the population of other species such as rabbits and that they would be a danger to ~~people~~ humans. The beaver has also been considered for re-introduction but people have said that their dams would cause river problems and therefore destroy the habitats of species down river. They have also said that it would be damaging for forest animals as when they cut down trees for their dams it will in fact cause the loss of habitats. However the people for it have said that it will help deal with the over population of fish in some rivers.

11 A) Benefits that would occur from implementing waste management include, the reduction the harmful gases being released into the environment and the amount of waste sent to landfill would be reduced as reduce, re-use, recycle would be implemented, meaning more products would be recycled from old ones which would reduce the cost of disposing it elsewhere. It would be hard however as companies and factories would have to change the resources they used or how they went about making products so that it is more environmentally friendly this could make production more expensive meaning the final product more expensive and it could mean that production would take longer.