



A-level GEOGRAPHY

Paper 1 Physical geography

Specimen Question Paper

Time allowed: 2 hours 30 minutes

Materials

For this paper you must have:

- a pencil
- a rubber
- a ruler.

You may use a calculator.

Instructions

- Answer **all** questions in Section A.
- Answer **either** Question 2 **or** Question 3 **or** Question 4 in Section B.
- Answer **either** Question 5 **or** Question 6 in Section C.

Information

- The total number of marks available for this paper is 120.

Advice


For the multiple-choice questions, completely fill in the circle alongside the appropriate answer.


CORRECT METHOD



WRONG METHODS



If you want to change your answer you must cross out your original answer as shown. 

If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown. 

Please write clearly, in block capitals, to allow character computer recognition.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature _____

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ANSWER IN THE SPACES PROVIDED**

Section A**Water and carbon cycles**

Answer **all** questions.

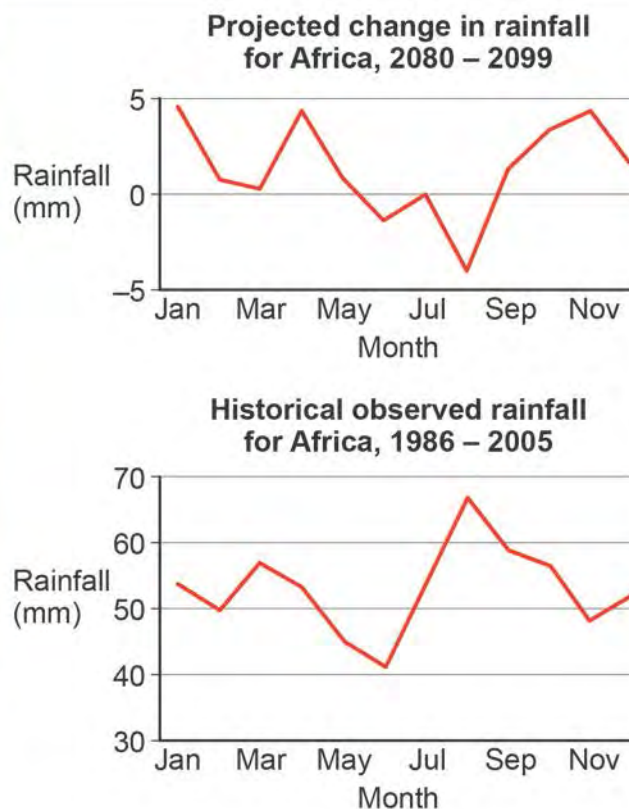
0 1 . **1** Explain the concept of dynamic equilibrium in relation to the water cycle.

[4 marks]

Question 1 continues on the next page

Figure 1 represents data from a climate model for Africa. The map shows how rainfall totals are expected to change in Africa by 2099 compared with 1986–2005 averages. The graphs show predictions for rainfall change by month between 2080 and 2099, compared with average rainfall taken from 1986–2005.

Figure 1



0 1 . 3

Using **Figure 2** and your own knowledge, assess the natural and human induced causes of the 2005 flood in Carlisle.

[6 marks]**Figure 2**

There were two separate aspects within this period of storm which affected the River Eden drainage basin around the city of Carlisle, England. Three rivers converge in the city, which has a population of approximately 72 000. There had been several weeks of above average rainfall for January. The January 2005 flood was a major event. Rainfall was very high for the period 6 to 8 January, during which two months' worth of rainfall was released in 24 hours. Some areas within the catchment received rainfall of up to 150 mm.

The upper parts of the catchment are dominated by the mountains of Skiddaw and the surrounding fells. The rocks here are hard and volcanic, soils are thin and the gradients of many tributaries are steep. In the lower reaches rivers flow through wide, shallow valleys.

The Eden channel itself has a steep gradient. The head of the catchment is around 690 m, falling rapidly to 160 m. The Eden's glaciated valley opens out and the channel gradient reflects this change: the River Eden steadily loses height at around 1.8 m per km on its journey to Carlisle. The valley floor is over 2.5 km wide in many places. This forms extensive areas of floodplain.

In terms of land use, the drainage basin is has a wide range of agricultural activity, both arable and pastoral farming. There are also golf courses and a small amount of managed forestry. As the River Eden reaches the coast, the area to the south is the heavily developed city of Carlisle. Much of the area is rural apart from this. 67% of the flooding resulted from rivers and watercourses. 25% of flooding was caused by surface water. 8% was due to flooding from sewerage and infrastructure

In Carlisle, the River Eden peaked at an estimated 1520 cumecs at the Sheepmount Gauging Station at 2.30 pm on 8 January. This flow has a return period in the order of 175–200 years (0.5%). The previous highest recorded flow on the River Eden at Carlisle was 1075 cumecs in 1987.

Question 1 continues on the next page

Assess the extent to which there are inter-relationships between processes in the water cycle and factors driving change in the carbon cycle.

[20 marks]

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Question 1 continues on the next page

[illegible]

END OF SECTION A

Section B

Answer **one** question.

Answer **either** Question 2 **or** Question 3 **or** Question 4.

Shade the circle below to indicate which optional question you have answered.

Question **0 2** ☐

Question **0 3** ☐

Question **0 4** ☐

CORRECT METHOD ☒

WRONG METHODS



Question 2 Hot desert systems and landscapes

0 2 . **1** Outline the impact of temperature variation on weathering processes in hot deserts. **[4 marks]**

Question 2 continues on the next page

Figure 3a and Figure 3b show temperature data for the Sahara Desert and the Sonoran Desert.

Figure 3a

Summer average temperatures in the Sahara Desert 1955–2010

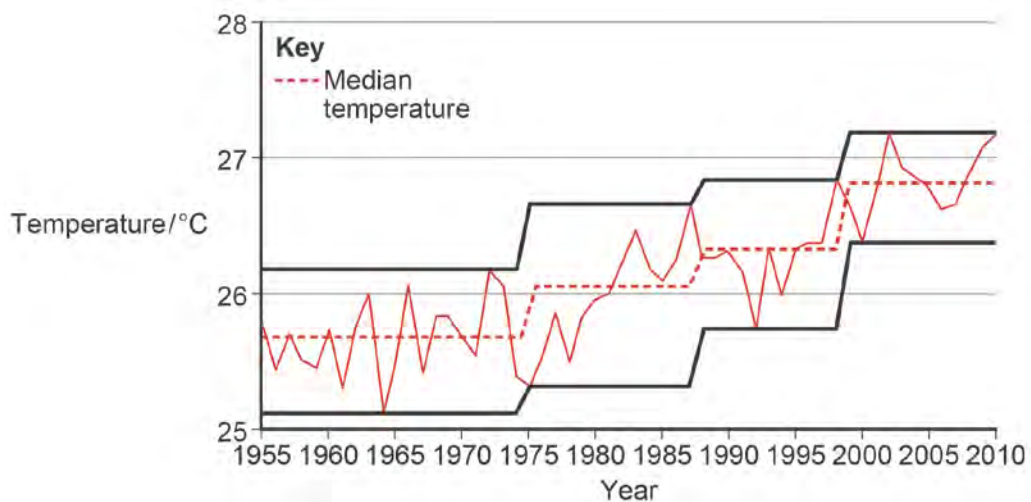
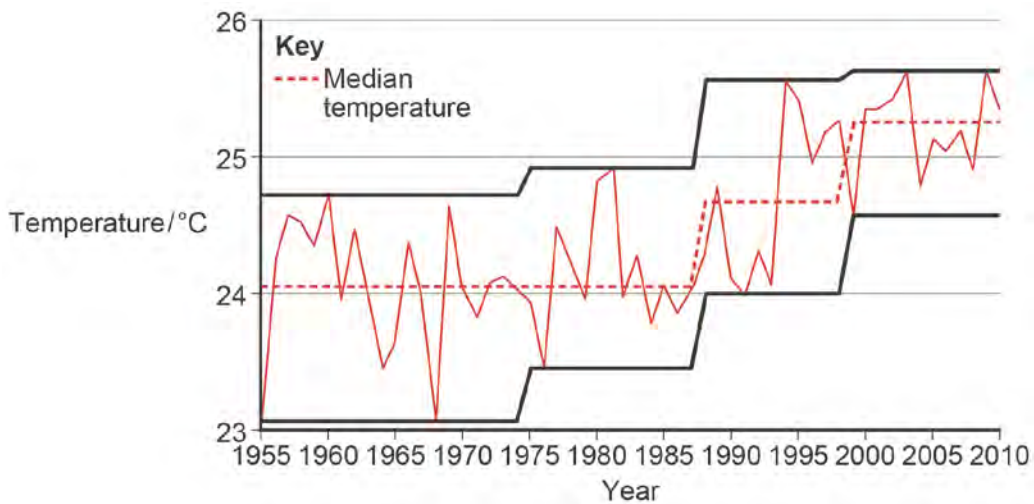


Figure 3b

Summer average temperatures in the Sonoran Desert 1955–2010



0 2 . 3

Using **Figure 4** and your own knowledge, assess the benefits of the shelterbelt system in combatting desertification.

[6 marks]

Figure 4

Surrounded by mountains and far from any sea or ocean, the region of Xinjiang Uygur in the north-west region of the People's Republic of China represents the largest stretch of drylands in China. Xinjiang territory stretches over 1 650 000 km² of which 49.5% are mountainous zones and 22.5% is desert. It is estimated that 400 million people are suffering from the impact of desertification and the effects of sand dust that can attack skin and lungs. Desertification in China is mainly caused by human induced factors and by extreme climatic conditions.

An oasis is an area with a plentiful supply of water in an otherwise arid environment. Vegetation growth will be adapted to the conditions in the oasis and will contain different species to the surrounding environment.

What is shelterbelt system in the Xinjiang Oasis?

- Around the perimeter of the oasis, shelterbelts made up of shrubs and grasses have been planted.
- Within the inner zone of the oasis, a forest belt of mature trees reinforces the function of the shelterbelt.
- Deep inside the oasis, a forest network has been planted in the interior, between the agricultural lands. This is composed four to six narrow rows of trees planted closely together.
- In general, the width of the shelterbelt should not be less than 200 m.

Ground wind speed is reduced by the presence of shrubs and grasses standing 50 cm to 60 cm high. In areas where sand accumulates, vegetation can reduce the development of dunes once the vegetation covers 40% of the surface.

The shelterbelt also acts as a biological drainage system that plays an important role in the Xinjiang oases. In Anjiahi, in the northern part of Xinjiang, the groundwater level of farmland has been lowered by between 20 cm and 70 cm. The tree network creates a microclimate. In some instances, the rate of water consumption for one kilogram of wheat or corn has decreased by between 15% and 22.8%.

[illegible]

Question 3 Coastal systems and landscapes

0 3 . **1** Explain the concept of the sediment cell.

[4 marks]

Question 3 continues on the next page

Figure 5 shows data relating to coastal flooding in Great Britain. The investigation is trying to determine whether any stretch of the coastline of Great Britain may be more or less susceptible to coastal flooding. The 96 most severe floods have been analysed.

The coastlines have been split into four broad categories: north west, north east, south west and south east.

This is the null hypothesis: there is no significant difference in the location of the worst floods to affect Great Britain.

Below is a partly completed Chi-squared test.

Figure 5					
	North west	North east	South west	South east	Total
O	22	16	38	20	96
E	24	24	24	24	96
O – E	–2	–8	14	–4	-
$\frac{(O - E)^2}{E}$	4	64		16	-
$\frac{(O - E)^2}{E}$	0.17		8.17	0.67	$\chi^2 =$

O – Observed frequencies
E – Expected frequencies

Figure 6		
Critical values for Chi-squared with 3 degrees of freedom.		
Degrees of freedom	Significance level	
	0.05	0.01
3	7.82	11.34

0	3
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2

 Complete **Figure 5** and interpret your Chi-square result using **Figure 6**.

[6 marks]

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Question 3 continues on the next page

- 0** **3** . **3** Using **Figure 7** and your own knowledge, assess the role of mass movement upon the development of this area of the Holderness coastal landscape.

[6 marks]

Figure 7



Holderness is overlaid with unconsolidated glacial deposits which lie on top of chalk. The landscape is dominated by deposits of till, boulder clays and glacial lake clays. The glacial deposits form a continuous lowland plain. Rainfall is below national average but the area is prone to heavy storms.

03 . 4

'No amount of coastal intervention by people can halt the natural processes which continue to present potentially serious risks to coastal communities now and even more so in the future.'

To what extent do you agree with this view?

[20 marks]

[illegible]

Question 4 Glacial systems and landscapes

0 4 . 1 Explain the development of warm based glaciers.

[4 marks]

Question 4 continues on the next page

Figure 8 shows the location of three US glaciers.

Figure 9 shows the change in their size (mass balance) between 1958 and 2005.

Figure 10 shows the cumulative impact of the annual change in mass balance within the three glaciers.

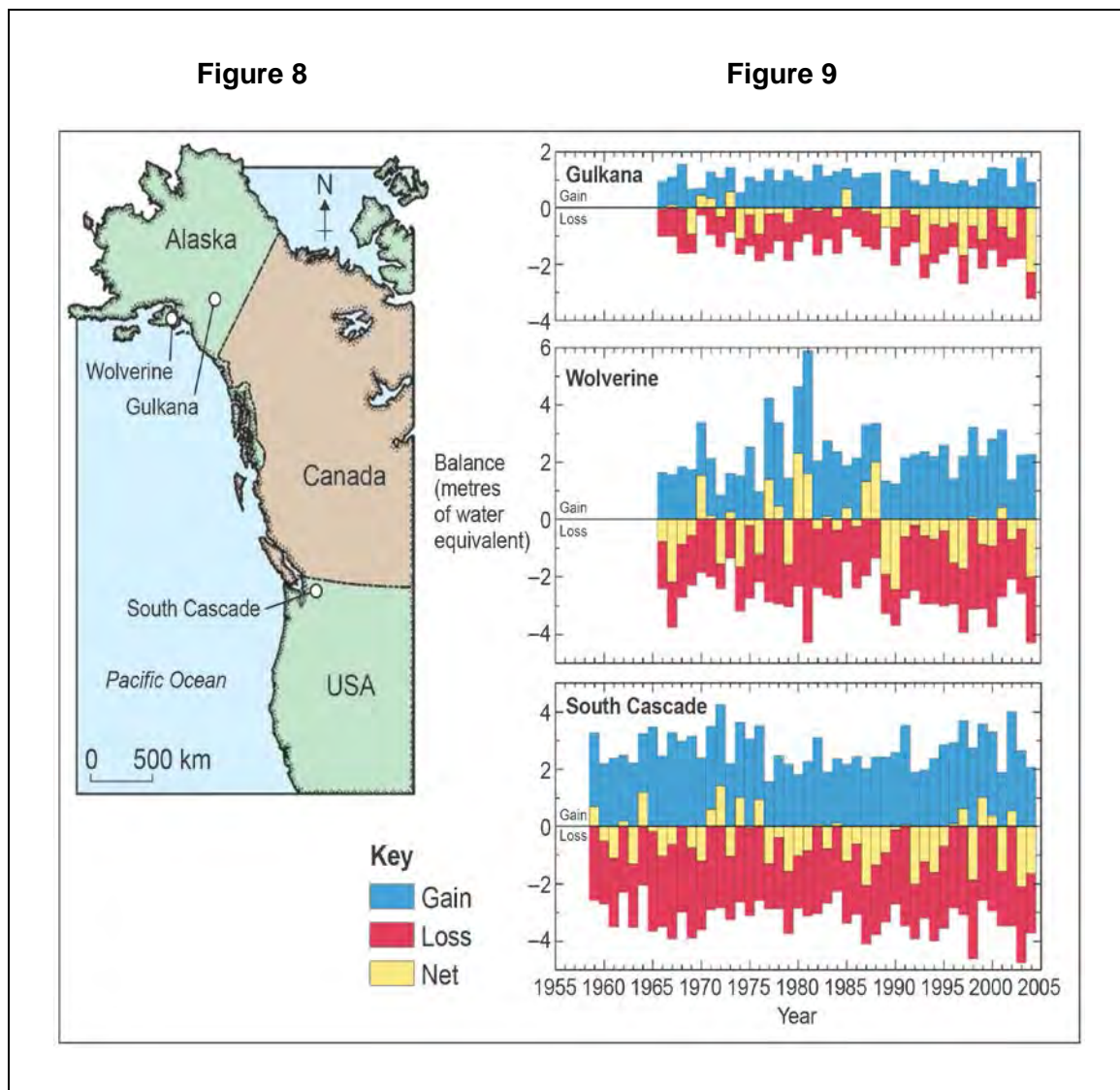
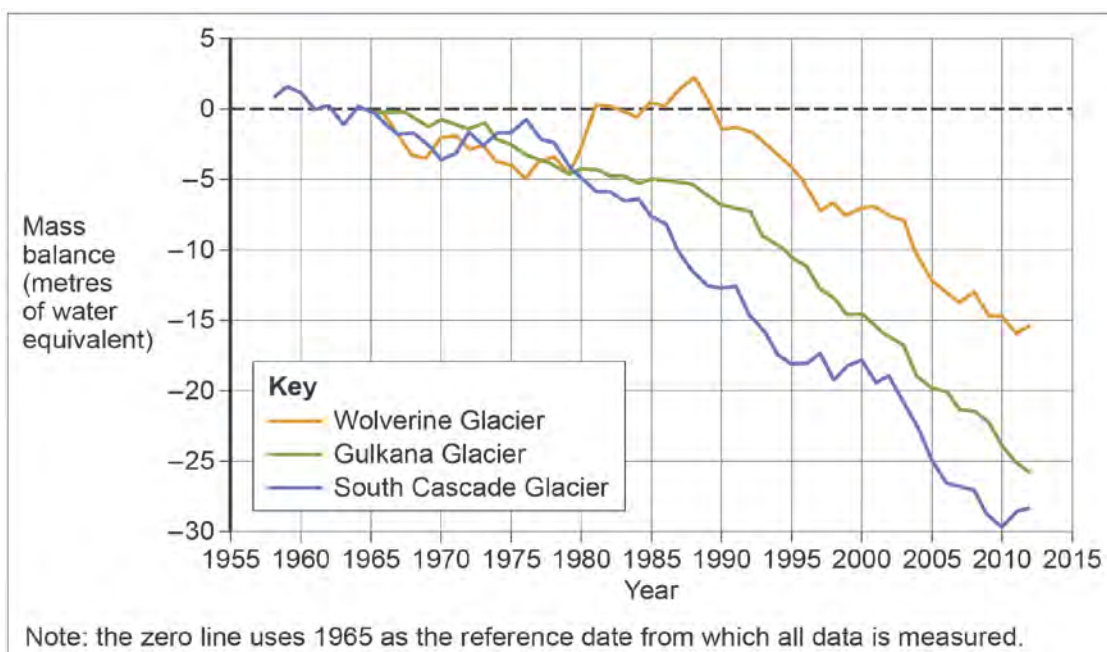


Figure 10

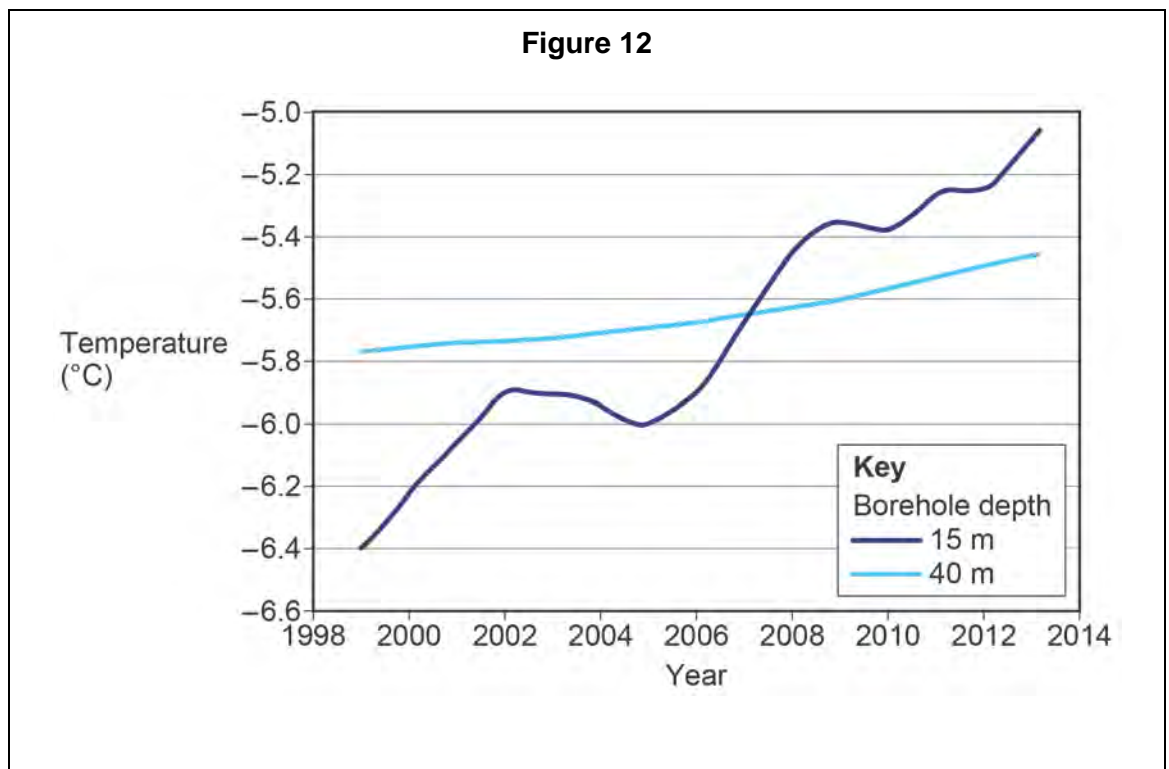
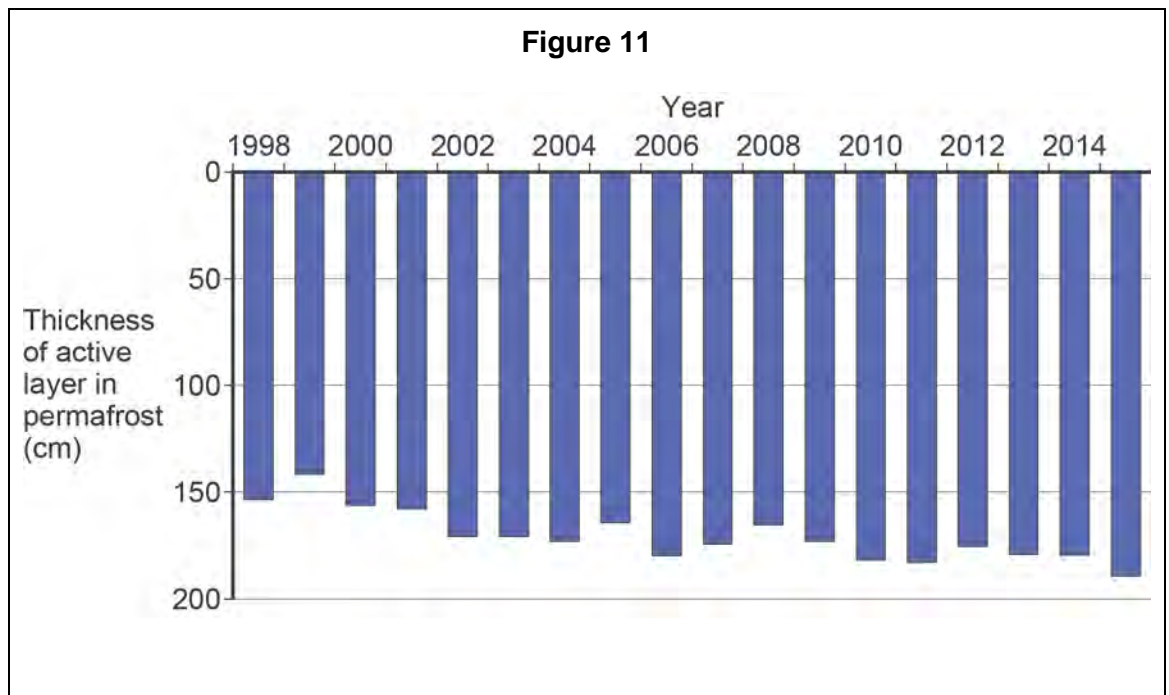


0 4 . 2 Using **Figures 8, 9** and **10**, compare the differences between the glaciers.

[6 marks]

Question 4 continues on the next page

Figure 11 and **Figure 12** show information about the active layer and ground temperature in Svalbard, which is within the Arctic Circle. **Figure 13** provides further information about the island of Svalbard.



04 . **4** Assess the relative importance of water and ice in the development of landscapes of glacial deposition.

[20 marks]

[illegible]

Section C

Answer **one** question.

Answer **either** Question 5 **or** Question 6.

Shade the circle below to indicate which optional question you have answered.

Question **0 5** ☐

Question **0 6** ☐

CORRECT METHOD ☒

WRONG METHODS



Question 5 Hazards

0 5 . **1** In the context of natural hazards, what is meant by the term fatalism?

[1 mark]

- A** Local people take the view that whatever they do death will be imminent as a result of factors beyond their control. They often leave the area as a result. ☐
- B** This is a view that outcomes of future hazards are beyond the power of people to control. Individuals, families and communities take little action to mitigate against hazards. ☐
- C** Local governments realise that the area is vulnerable to a particular hazard. They take decisive action in order to avoid fatalities for the local people. ☐
- D** People choose to live in areas vulnerable to natural hazards in the belief that the benefits outweigh the risks. They understand that they are risking their lives with these choices. ☐

0 5 . **2** What is risk sharing as a human response to a hazard?

[1 mark]

- A** Government or private companies offer insurance against the impact of the hazard. It requires large numbers to purchase the insurance compared to those impacted following the event. ☐
- B** Families share the risk of the hazard by supporting each other throughout the event. By continuing with their daily business they risk their lives in support of each other. ☐
- C** Local people pay extra money for additional services which may be required in the event that the hazard strikes. This is a type of mitigation. ☐
- D** Community members understand the risks and agree to live together despite these risks. There is an element of community cohesion arising out of this approach. ☐

0 5 . **3** How do tropical storms lead to storm surges?

[1 mark]

- A** The storm conditions lead to the formation of tsunami waves which are extremely large in size. These can be over 20 metres in size and inundate the coast where they strike. ☐
- B** When a cyclone strikes a large water body it creates very large waves which have the power to destroy the coastline and all properties in these areas. ☐
- C** The intense high pressure weather systems associated with storms cause very strong winds. When this is combined with a large fetch, very large waves are created. ☐
- D** The very high wind speeds are associated with warmer water and low pressure. These factors generate higher than average tides and large waves. ☐

Question 5 continues on the next page

0 5 . **4** How does an earthquake lead to liquefaction?

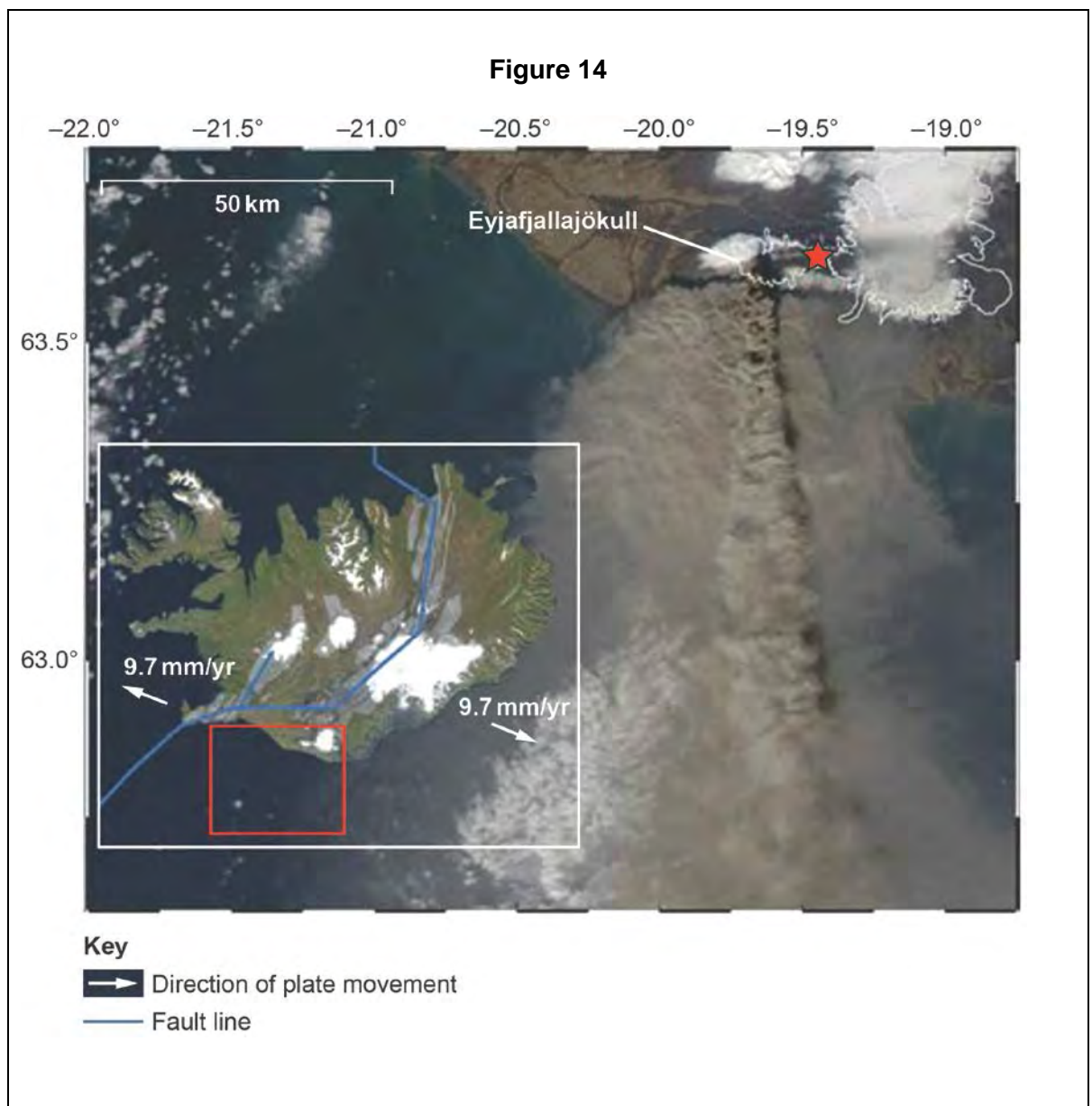
[1 mark]

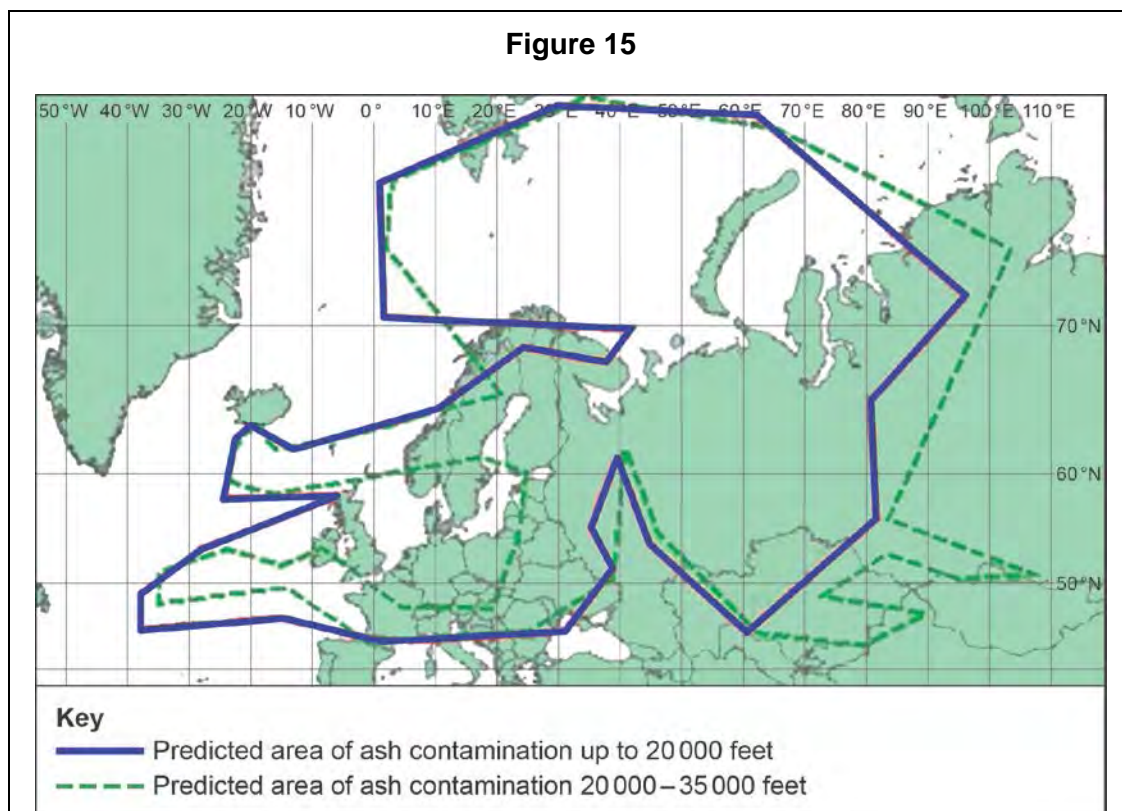
- A** The vibration breaks the sediment particles into smaller pieces and mixes this with soil and vegetation to break down the structure of the subsurface sediments. ☐
- B** The shaking cause the sediments to compress and, where there is a mixing with ground water sands and clays turn to liquid for the duration of the shaking. ☐
- C** Loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking. This acts like a fluid for the duration of the vibration. ☐
- D** The violent shaking causes friction which melts ice. The melt water mixes with soil and sediments to generate a thick mudflow. These liquefied sediments flow downslope. ☐

Question 5 continues on the next page

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ANSWER IN THE SPACES PROVIDED**

Figure 14 and **Figure 15** show information about an ash cloud following the eruption of an Icelandic volcano in 2010.





0 5 . 5 Using **Figure 14** and **Figure 15**, assess the scale of the eruption.

[6 marks]

Question 5 continues on the next page

To what extent do you agree that seismic events will always generate more widespread and severe impacts than volcanic events?

[9 marks]

[illegible]

0	5	.	7
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Assess the importance of factors in globalisation in supporting the response to major seismic hazards.

[9 marks]

[illegible]

Question 5 continues on the next page

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Question 6 Ecosystems under stress**0 6** . **1** What is plagioclimax?**[1 mark]**

- A** Local differences in climate cause a modification to the natural development of vegetation in an area. The vegetation is prevented from reaching its natural equilibrium by these local variations. ☐
- B** The vegetation has reached a state of equilibrium when human activity causes intended or unintended changes, preventing the natural climax vegetation from developing. A new equilibrium emerges. ☐
- C** Human activity such as tree planting or farming is designed to help the natural vegetation to reach its climatic climax state. This takes many years of intervention to regenerate the natural state. ☐
- D** When vegetation moves through a series of developmental stages from mosses and lichens to a full grown forest. It reaches maturity without the involvement of human activity. ☐

0 6 . **2** Why are some food webs more complex than others?**[1 mark]**

- A** As energy is lost at each trophic level, it is more likely that a complex food web will have a small number of trophic levels. Where climate allows an abundance of decomposers, food webs will be less complex. ☐
- B** When there are more autotroph species than heterotrophs, the web becomes more complex. This is because the autotrophs have a wide range of species to feed off. ☐
- C** When species are highly adapted to a community, there is likely to be a very simple food web. This is because the species are highly adapted to eating only one species. ☐
- D** This occurs in a biome with a broad range of autotrophs and heterotrophs. Where net primary productivity is high, the range of the species will offer a more varied diet for inhabitants in the web. ☐

Question 6 continues on the next page

0 6 . **3** Which is an expected ecological response to climate change?

[1 mark]

- A** If the region experiences warming and rainfall declines expect to see an increase in the growth of a range of tree species. Semi-arid conditions will always attract increased tree growth. ☐
- B** Plants will adapt to the new environment. New species will colonise the area which are more suited to the conditions. ☐
- C** In the places which experience increased precipitation, the extra groundwater will bring nutrients to the surface, increasing soil fertility and promoting extra density of plant growth. ☐
- D** Places which experience cooling will see increases in cloud cover and higher rates of precipitation. The higher rainfall will leach nutrients and cause the soil to lose fertility. Only trees with deeper roots will grow. ☐

0 6 . **4** Which are the realistic implications of declining biodiversity?

[1 mark]

- A** This will present opportunities for new species to evolve and fill the niches left by the species which have been wiped out. This will be part of a new dynamic equilibrium. ☐
- B** As autotroph species die out, so too do those species which depend upon the primary producer. This will cause knock on effects throughout the ecosystem. This may reduce net primary productivity. ☐
- C** If biodiversity declines, this will allow single, well adapted, plant species to dominate an area. A new food chain will emerge which may also lead to an influx of new herbivores, restoring the balance and range of species. ☐
- D** Declining biodiversity causes soil erosion as plants die out and leave soil bare in natural environments. The soil will be washed away rendering it infertile for subsequent colonisation. This will further exacerbate the problem. ☐

Question 6 continues on the next page

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Figure 16 shows the temperature and precipitation associated with different world biomes.

Figure 17 shows information about productivity in various ecosystem types.

Figure 16

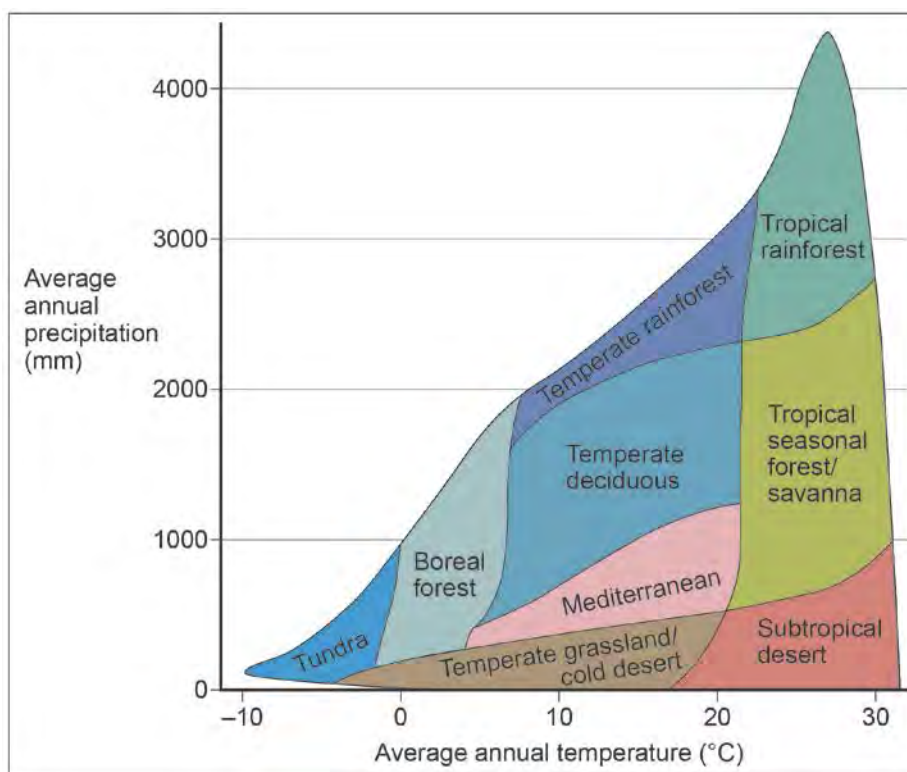


Figure 17

Biome	Area	Mean net primary productivity	Mean biomass
	(10^6 km^2)	($\text{g/m}^2/\text{yr}$)	(kg/m^2)
Tropical rainforest	17	2 200	45
Temperate deciduous forest	7	1 200	30
Savanna	15	900	4
Tundra	8	140	0.6
Subtropical desert	18	90	0.7

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END OF QUESTIONS

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