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91426



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NEW ZEALAND QUALIFICATIONS AUTHORITY
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SUPERVISOR'S USE ONLY

Level 3 Geography, 2017

91426 Demonstrate understanding of how interacting natural processes shape a New Zealand geographic environment

2.00 p.m. Wednesday 22 November 2017
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of how interacting natural processes shape a New Zealand geographic environment.	Demonstrate in-depth understanding of how interacting natural processes shape a New Zealand geographic environment.	Demonstrate comprehensive understanding of how interacting natural processes shape a New Zealand geographic environment.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt the question in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Excellence

TOTAL

08

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INSTRUCTIONS

Use page 3 to identify a **New Zealand geographic environment** that you have studied, and the **interacting natural processes** that shape it; and to plan your response to the question below.

Draw and explain map(s) and/or diagram(s) on page 4 to answer part (a).

Begin your written answer to part (b) on page 5, integrating comprehensive, supporting case study evidence about your New Zealand geographic environment and the interacting natural processes that shape it. You may include relevant map(s) and/or diagram(s) to support your answer as appropriate, and/or refer to the map(s) and/or diagram(s) that you have drawn and explained on page 4.

QUESTION

- (a) Draw map(s) and/or diagram(s) that explain how ONE natural process operates in your chosen New Zealand geographic environment.
- (b) Comprehensively analyse how the process you have drawn and explained in part (a), interacts with at least one other natural process, to shape a feature(s) in your chosen New Zealand geographic environment.

New Zealand geographic environment:

Muriwai Coastal Environment

Interacting natural processes that shape this environment:

Aeolian Erosion, ~~Act~~ Aeolian Deposition, Vegetation Growth, Wave Deposition.

PLANNING (OPTIONAL)

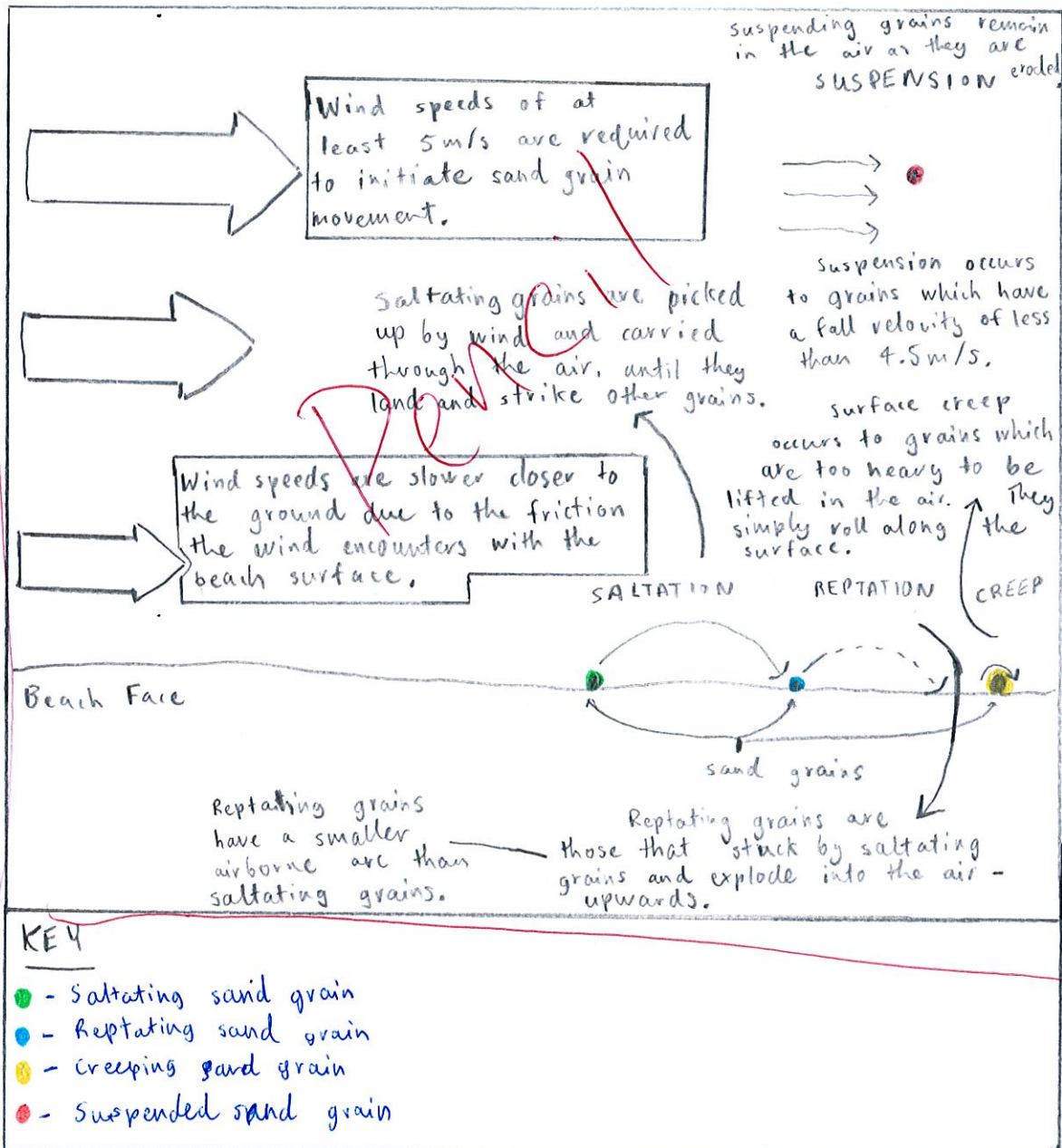
- Intro
- Aeolian Erosion
- Int. w/ Wave Deposition
- Int. w/ Vegetation growth and aeolian deposition
- Sand Dunes
- Summary

- (a) Draw map(s) and/or diagram(s) that explain how ONE natural process operates in your chosen New Zealand geographic environment.

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Natural process: Aeolian Erosion

Diagram of the Operation of the Process that is Aeolian Erosion in the Muhiwai Coastal Environment



- (b) Comprehensively analyse how the process you have drawn and explained in part (a), interacts with at least one other natural process, to shape a feature(s) in your chosen New Zealand geographic environment.

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In your written answer:

- integrate comprehensive, supporting case study evidence about your chosen New Zealand geographic environment and the interacting natural processes that shape it
- refer to the map(s) and/or diagram(s) you have drawn on page 4, and/or integrate other relevant, detailed map(s) and/or diagram(s) as appropriate.

The Muriwai Coastal Environment is located on the west coast of the North Island, approximately 35km north west of the Auckland CBD. At the Muriwai Coastal Environment, the natural process of aeolian erosion, in interaction with the other natural processes of wave deposition, vegetation growth and aeolian deposition, operates to shape the feature that is the sand dunes. //

Aeolian erosion is the process which sees sand eroded off the face of Muriwai Beach; it is comprised of four sub-processes – saltation, reptation, creep and suspension. For any sand grains to be eroded by aeolian erosion, the wind speed along the beach must be at least 5m/s. This wind initially causes the sub-process of saltation, which sees sand grains carried into the air and moved from their original resting spot. Saltating grains are the subsequent cause of the sub-process reptation, as when saltating grains return to the beach face due to the force of gravity, they strike resting, heavier grains. As shown on the diagram on page 4, these resting, heavier grains then explode upwards and move through the air from their original resting spot. As also detailed on the diagram on page 4, saltating grains erode further through. //

the air than reptating grains, because saltating grains are lighter and moved by the stronger force of the wind, as opposed to reptating grains which are heavier and struck by the weaker force of a single saltating sand grain. //

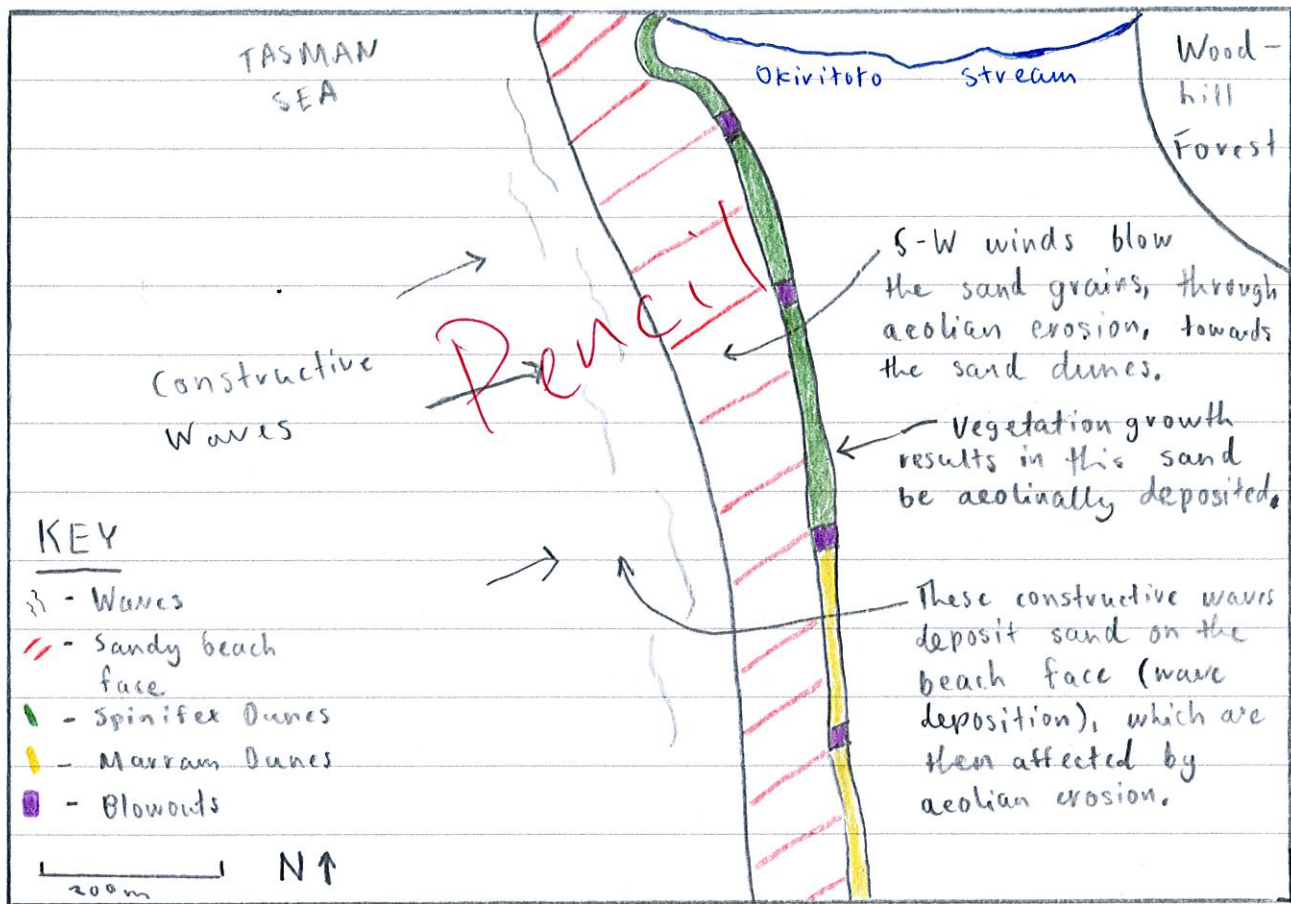
Aeolian erosion also operates through the sub-process of creep (surface creep). Creep occurs to grains which are too heavy to be blown into the air by the wind. These grains subsequently erode by rolling along the surface of the beach face (not becoming airborne). The fourth sub-process which is detailed on the diagram on page 4 is that of suspension. When grains that have a small mass, specifically a fall velocity of less than 4.5 m/s, are struck by the wind, they erode through the air and remain in the air. These 'suspended' grains travel further than any other grains that are either saltating, reptating or creeping, due to their lighter weight and their ability to travel without being impeded by the surface of the beach face. //

This process of aeolian erosion just described can only shape the sand dunes of the MCE through interacting with the other natural process that is wave deposition. Wave deposition is the process which sees sand deposited on the face of Muriwai Beach, which is required for aeolian erosion to occur. Wave deposition can only occur at Muriwai when 'constructive' waves are striking the //

beach face. ~~Constructive~~ Waves are considered to be constructive at Muriwai Beach when they have an energy of less than $100,000 \text{ J/m}^2$, and have a steepness ratio of less than 0.025. These such waves are constructive, ~~because~~ ^{due to} their low energy and relative flatness, because they crash onto the beach face with a 'spilling' motion. This 'spilling' motion causes waves to have a strong swash, but a weak backwash. The strong swash of these waves picks up sand from the shoreline, carries it up the beach face, and deposits it on the upper reaches of the beach face; ~~its~~ ^{the} weak backwash means that these waves can not drag the sand back down the beach when they recede, and subsequently the sand remains deposited on the beach. //

This process of wave deposition interacts with aeolian erosion in the shaping of the sand dunes, as it provides the actual sand on the beach that the wind can erode. The average wind direction at the Muriwai Coastal Environment is South-West, and this sees the process of ~~and~~ aeolian erosion result in the sand deposited on the beach by constructive waves, blown in ~~to~~ a north-easterly direction towards the sand dunes. The sand dunes are on the eastern border of the Muriwai Beach face. ~~The diagram on the next map on~~ the next page illustrates this interaction between the processes of aeolian erosion and wave deposition. 4

Map of Muriwai Beach Showing How the Interaction of Wave Deposition and Aeolian Erosion Shapes the Sand Dunes



As this sand is eroded towards the sand dunes, by the south-west winds, as shown on the map above, they come into interaction with the process of vegetation growth. ~~Two~~ The two major types of vegetation that grow on the eastern border of the Muriwai Beach face are Spinifex Grass (in the north) and Marram Grass (in the south). Both these vegetation types have tiny, hair-like cuticles on their grass strands, ~~which~~ When eroding sand grains ~~particles~~ make contact with this vegetation, these cuticles trap the sand, stopping its erosion, and effectively causing the sand to become deposited on

E8

Extra space if required.

Write the question number(s) if applicable.

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the vegetation. This is evidence of a three-way interaction ^{between} ~~with~~ the processes of aeolian erosion, vegetation growth and aeolian deposition (the sand becoming deposited on the grass is aeolian deposition).

The shaping of the sand dunes occurs when the two vegetation types (spinifex grass and marram grass) grow out of the sand that is deposited on them. When spinifex grass becomes deposited with sand, it ~~gr~~ sends runners out to the ~~sand~~ side, where the plant is not covered by sand, in order for the grass to receive sunlight and photosynthesise. In turn, this grass that has grown outwards becomes covered by more eroded and then deposited sand (again due to the sticky cuticles on the grass), and the process of growing outwards repeats. ~~This results in spinifex dunes being flat and~~ Marram grass on the other hand, undergoes the same interaction of processes however in an upwards fashion. This is because, when covered with eroded and then deposited sand, Marram grass goes upwards out of the sand in order to receive sunlight and photosynthesise, as opposed to outwards. Like with spinifex, this now uncovered grass becomes covered with sand again and the upwards growth repeats.

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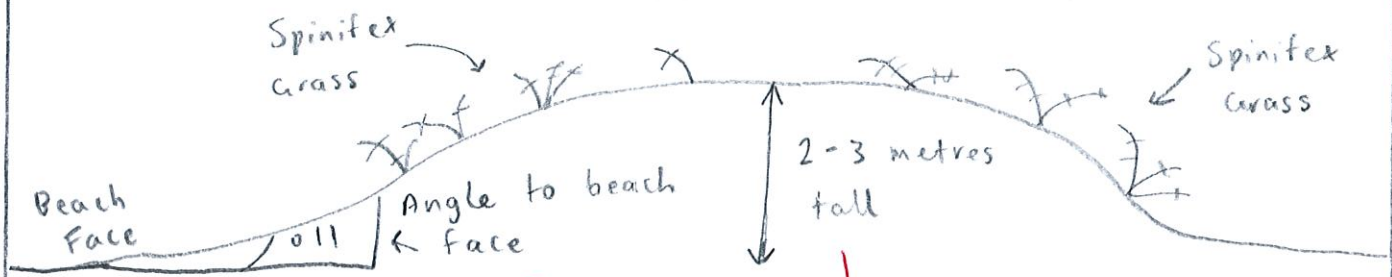
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This results in the shaping of the sand ^{sandy} dunes at the Muriwai Coastal Environment - spinifex dunes on Muriwai Beach are typically between 2-3 metres high, and of 11° angle to the beach face, due to the outwards vegetation growth; while marram sand dunes at Muriwai Beach are typically 7-8 metres high, and of 21° angle to the beach face, due to the upwards growth of marram grass. //

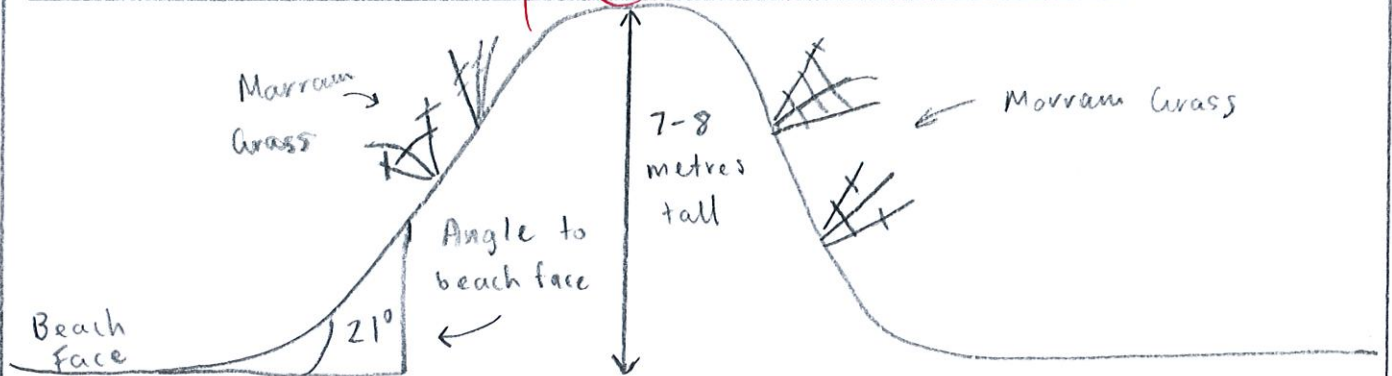
In summary, the process of aeolian erosion shapes the sand dunes at Muriwai Beach, through interactions with the other natural processes of wave deposition, vegetation growth and aeolian deposition. ~~The~~ Wave deposition sees sand deposited on the beach, which is then blown towards the spinifex and ~~vegetati~~ marram vegetation at the eastern boundary of the Muriwai Beach face by aeolian erosion. This eroded sand then experiences aeolian deposition as it comes into contact with the process of vegetation growth. The two different types of grass vegetation then grow out of this sand deposited on them in two different ways, resulting in the shaping of the sand dunes in two different ways. Spinifex sand dunes are flatter and more parabolic in shape, while marram dunes are taller and steeper. These shapings of the sand dunes are shown in // the diagram on the right. //

Diagram showing the Shape of the Sand Dunes on Muriwai Beach

Spinifex Grass Sand Dune looking South to North



Marram Grass Sand Dune looking South to North



Subject:		Geography	Standard:	91426	Total score:	E8
Q	Grade score	Annotation				
Interaction of processes to shape a feature(s)	E8	<p>Setting: Muriwai Coastal Environment (MCE)</p> <p>The diagram on page 4, 8 and back page show the selected natural environment. Annotations provide specific supporting case study evidence and analysis of how processes operate differently within an environment to shape a feature(s). The diagrams add to the answer and are directly relevant to the question explaining how processes shape features within the MCE which helped the candidate to meet the requirements for Excellence.</p> <p>Comprehensive analysis of how and why three processes (Aeolian, Wave and Vegetation growth) interact to shape the feature (dunes). Insight is demonstrated in the reasoning for the dunes being varying shapes and sizes depending on the combination of how the processes interact.</p> <p>Reasons for feature formation included sufficient process analysis, with evidence of a technical understanding of Aeolian processes (saltation, reptation, creep and suspension), wave processes (constructive depositional waves) and vegetation growth and type influencing sand dune shape. This demonstrates that the candidate clearly comprehends how processes operate together.</p> <p>Comprehensive, relevant specific supporting case study evidence is integrated throughout, which supports both the candidate's written response and diagrams.</p> <p>The candidate gained Excellence due to their clear understanding of the requirements of this question, and focus on processes throughout. Their answer was well planned and executed, comprehensively explaining the first process before moving onto the second and third. Geographic insight was demonstrated in their response structure, the choice of correct terminology used in their explanation of processes, and the comprehensive understanding of interactions between processes shown throughout the answer.</p>				