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Draw a cross through the box (☒) if you have NOT written in this booklet

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NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Science 2025

91922 Describe features of science that have contributed to the development of a science idea in a local context

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Describe features of science that have contributed to the development of a science idea in a local context.	Explain features of science that have contributed to the development of a science idea in a local context.	Examine features of science that have contributed to the development of a science idea in a local context.

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

Choose ONE science idea from the Resource Booklet to answer ALL parts of the task in this booklet.

Pull out Resource Booklet 91922R from the centre of 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 2–11 in the correct order and that none of these pages is blank.

Do not write in the margins (⋮⋮⋮⋮). This area will be cut off when the booklet is marked.

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

Excellence

TOTAL 08

Page 1

Make sure you have the paper Resource Booklet 91922R.

INSTRUCTIONS

This task is made up of three parts. You must answer ALL three parts.

Choose ONE science idea from the resource booklet to complete this assessment.

Science Idea Two: Reducing methane production by adding seaweed to cattle feed

Use information in the resource booklet for your chosen science idea to answer ALL parts of the task.

PART ONE

For part one, focus on **these two** features of science:

- the influence of social and cultural factors on science
- responding to needs and opportunities.

Using the information from your chosen science idea, discuss the following:

(a) How does the influence of social and cultural factors on science contribute to the development of the science idea?

Social and cultural factors heavily influence science and contribute to the idea of adding seaweed to cattle feed. In New Zealand cows play a massive role in our economy. Not only for the billions of dollars exported but because of the heavy beef and dairy product diet that many New Zealander's have. Cows not only supply millions in New Zealand with food, but they also supply many with jobs and work. Agriculture is a giant part of New Zealand's cultural identity. Which is how it influences this science idea. The mass amount of cows we have can't just be culled or lowered because they are such an important part of New Zealand's social and cultural identity. This means that we must look at alternative ways to solve the issue of cows producing too much methane. Many would be negatively affected if we tried to reduce the size of the dairy and beef industry so instead we must find an alternative solution which is how it contributes to the science idea. The social and cultural importance of the beef and dairy industry influences the science idea by forcing us to look at creative solutions.

(b) How does responding to needs and opportunities contribute to the development of the science idea?

Responding to needs and opportunities strongly contributes to the development of the science idea. Methane really negatively effects the climate as it is one of the greenhouse gases contributing to climate change. As cows produce up to 98kg of methane a year and New Zealand has around 10 million cattle there is a clear need to reduce methane production in cows. Responding to the need is the reason the science idea is developed. Without the need to reduce methane emissions in cows there would be no need to come up with the science idea. Scientists were given the opportunity to investigate and discovered Asparagopsis. Because of the need scientists were given the opportunity to investigate and through this discovered the effectiveness of Asparagopsis. This demonstrates perfectly how responding to needs and opportunities can contribute to the development of the science idea. In this case by responding to the need to reduce methane production and having the opportunity to investigate scientists were able to discover how Asparagopsis would reduce methane emissions in cows.

(c) Why are these features of science important to the development of the science idea?

Responding to needs and opportunities and the influence of social and cultural needs on science were both very important to develop the use of Asparagopsis to reduce cow's methane emissions. Responding to the need to reduce methane in cows and being given the opportunity to investigate is crucial in developing the use of Asparagopsis. This is because by being given the need to reduce methane, and the opportunity to investigate scientists were able to develop the use of Asparagopsis. Without the need and opportunity this never would've happened and the science idea wouldn't have been developed. Likewise for the influence of social and cultural needs on the development of using Asparagopsis. Because of the social and cultural importance of cows in New Zealand a solution had to be developed which didn't hinder the beef and dairy industry. The importance of this industry in New Zealand culturally and socially influenced how scientists went about developing the use of Asparagopsis as they had to find a solution which wouldn't harm cows. This shows why both of these features were incredibly important to develop the use of Asparagopsis because without them the science idea could negatively affect New Zealand's beef and dairy industry and through that New Zealand as many would be left without an income, or not even been developed in the first place.

(d) How do the two features of science **work together** to support the development of the science idea?

Social and cultural factors work with needs and opportunites to support the development of the science idea. The need to reduce methane production in cows came about because of the huge beef and dairy industry in New Zealand. This industry is a huge part of New Zealand's culture, with many working in agriculture and with cows. The scale of this industry has impacted the amount of cows we have in New Zealand which has impacted the total amount of methane cows in New Zealand produce. This has made it so we need to reduce the amount of methane production in New Zealand. So cultural and social factors have essentially created the needs and opportunuties. The need to reduce methane production and the opportunity to investiagte also impacts social and cultural factors. By needing to reduce methane production in New Zealand and being given the opportunity to investiagte this issue, scientists have needed the dairy and beef industry to be able to investigate how cows react to Asparagopsis. The need to develop a solution for cows needs cows to be able to investigate. Because cows are needed the beef and dairy industry can continue to grow as more cows are needed for research as well as producing beef and dairy products. Needs and opportunities have lead to scientists working with the beef and dairy industry to create a solution. Because the beef and dairy industry is impacted by this investiagtion scientists must work with them to create a solution. This also allows the beef and dairy industry to continue growing which contributes even more to the needs and opportunities to create a solution. The two features pingpong off eachother creating a loop which leads into more development of each. This development of each feature contributes heavily to the development of the use of Asparagopsis. With more and more research taking place, and the beef and dairy industry continuning to grow through the aid of this research, there is even more of a need to reduce methane. This means there is even more of a need to develop the use of Asparagopsis.

PART TWO

For part two, focus on **these two** features of science:

- linking new evidence to existing models, theories, and ideas
- the influence of the development and use of technology on science.

Using the information from your chosen science idea, discuss the following:

(a) How does linking new evidence to existing models, theories, and ideas add to the science idea?

By linking new evidence to existing models, theories, and ideas usage of Asparagopsis to reduce methane emissions in cows can be furthered developed. Through research scientists discovered that the key compound in Asparagopsis which reduced methane is bromoform ($CHBr_3$). Through this discovery scientists were able to trial using bromoform supplements to reduce methane in cows. They then discovered through this that just using whole Asparagopsis was much more effective. The scientists discovered through new evidence that whole seaweed reduced emissions better which lead to them needing to find a way to produce more Asparagopsis. So by discovering that bromoform was the main compound that stopped producing methane scientists were able to try use it as a supplement and then learn through this that whole Asparagopsis worked better. They learned through new evidence how the plant was effective and were then able to discover the best way to use it. This also added to the science idea by helping scientists to figure out they needed to grow more Asparagopsis.

(b) How does the influence of the development and use of technology add to the science idea?

The development of the seaweed growing facility which uses aerated tanks strongly adds to the science idea. CH4 Global set up a seaweed growing facility to grow Asparagopsis. Through this they are using aerated tanks which provide the optimal conditions to grow seaweed by addding air into the water. The development and use of these tanks helps scientists to grow more Asparagopsis to use in cattle feed to reduce methane emissions. By using these special aerated tanks scientists are able to grow as much seaweed as possible in the best and fastest way possible which strongly contributes to reducing methane emissions in cows. By having more of the seaweed quickly more farmers are able to use the cattle feed for their cows and help reduce methane emissions. The technology helps fasten the pace at which seaweed can be used in the cattle feed.

(c) Why are these two features of science significant to the development of the science idea?

Both the development and the usage of aerated tanks, and the discovery of bromoform being the key compound in Asparagopsis are very important to the science idea. By discovering new evidence that bromoform is the key compound is Asparagopsis scientists were able to trial using supplements and were then able to discover that whole seaweed works best which allowed them to further develop the science idea. This is incredibly important because by linking this new evidence to what they already knew the scientists were able to investigate the best way to reduce methane emissions within cows. Without this new evidence scientists wouldn't have been able to investiagete the best way to give bromoform to cows meaning the science idea wouldn't work as best as it could. The development and usage of the aerated tanks was absolutley key in developing the use of Asparagopsis. This is because the development and use of these aerated tanks allowed scientists to grow Asparagopsis much more quickly and get the solution out to farmers in a more efficent and better way.

(d) How do these two features of science **work together** to develop the science idea?

The development and usage of the aerated tanks and the discovery of bromoform being the key compound in Asparagopsis which reduced methane emissions both worked together to develop the science idea. Through the discovery of bromofrom being the key compound in Asparagopsis, scientists were then able to discover that whole Asparagopsis worked best. This new development lead into needing a way to grow Asparagopsis as efficently as possible. Which is how the linking of new evidence to past ideas contributed to the development and usage of new technology. The need to grow Asparagopsis in a quick way lead to the development of the aerated tanks which keep the seaweed at optimal growing conditions. The development of these tanks also helps contribute to finding new evidence and linking to past theories, models and ideas. By finding a way to grow Asparagopsis efficently scientists can further research how different conditions effect the growth of Asparagopsis and then begin to further develop the technology to better grow Asparagopsis. These two features work in a loop by finding new evidence which leads to further development of technology which leads into finding new evidence which leads into further development of technology and so on. By working together the features strongly contribute to the development of using Asparagopsis to reduce methane emissions by finding out more and more about Asparagopsis, the best way to grow it and how different conditions impact its effectiveness.

PART THREE

For part three, focus on **these two** features of science:

- the influence of the development and use of technology on science
- responding to needs and opportunities.

How do these two features of science **support each other** in the development of the science idea?

The development and use of technology and responding to needs and opportunites heavily support each other in the development of reducing methane production in cows. Needs and opportunites are created such as the need to reduce methane proudction in cows and the opportunity to investigate this and find a solution. Technology is then developed to aid in finding a solution such as the development and usage of aerated tanks to grow seaweed effiecently at optimal conditions. Through the development of technology new needs arise such as the need to make the tanks sustainable and cost effective. This then leads into further development of the tanks. Through this more needs and opportunites arise like the need to develop more tanks in a wide scale way to grow more seaweed for the millions of cows in NZ. Each feature helps contribute to the other which leads to the development of the use of Asparagopsis. Technology is developed, and needs arise, which creatures further development, and more needs arise which creates further development, thus creating a loop in which each feature lends to the development of the other. Each feature supports the other to develop. This continued support of each feature leads to strong and intuitive development of the use of Asparagopsis as a way to reduce methane in cows. By further developing the technology this science idea becomes extremely developed.

Excellence

Subject: Science

Standard: 91922

Total score: 08

Part	Grade score	Marker commentary
One	E8	The response explains how social and cultural factors affect the science idea by adding seaweed to cattle feed. The economic and cultural importance of livestock to New Zealand drives the need for alternative solutions to climate change to be found.
Two		The response links the discovery that seaweed is more effective than bromoform (linking new evidence to existing ideas) to the use of technology in growing the seaweed effectively, which allows more efficient further research on the seaweed.
Three		The response explains the importance of the use of technology on the development of the science idea in Part Two and responding to the needs and opportunities in Part One. The response then discusses the link between the two features of science in Part Three. The response discusses the need to reduce methane production by cows driving the development of technology so that seaweed can be produced effectively.