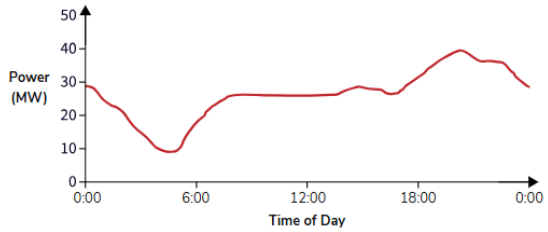
Energy Source

Energy Source – Question 1

The graph below shows average daily power use in the town.



Energy Sources

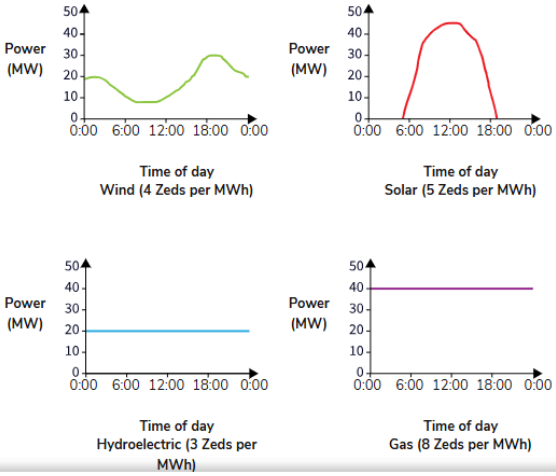
You are the mayor of a remote town in Zedland that generates its own electricity using a diesel-powered generator. The generator is now very old and you need to choose another power source.

The town considers four alternative sources for providing electricity to the town: wind turbines (wind), photovoltaic cells (solar), moving water (hydroelectric dam) and natural gas (a fossil fuel).

The graphs below show the average 24-hour power generation in megawatts (MW) expected from each source.

The graphs also show the cost in Zeds per megawatt hour (MWh) of energy produced.

What is one problem the town would face if there was not enough power?



Question Type	Open Response
Competency	Explain phenomena scientifically
Knowledge Type	Content Knowledge
Context	Local – Environmental Impacts & Climate Change
Environmental Competency	Make informed decisions to act based on evaluation of diverse sources
Difficulty	699 Level 5

Scoring

Full Credit

Identifies a problem the town would face from insufficient power. The problem must be explicitly linked to insufficient power.

- There will be more traffic accidents due to no traffic lights.
- No electric lighting will mean it could be dangerous at night.
- Hospital patients on life support might be at risk.
- Lack of heating/cooling could be a health risk to vulnerable people.

Restricted Use - À usage restreint

- Lack of communications technologies – people may not be able to contact emergency services if necessary.
- Refrigeration facilities fail, leading to food spoilage and possible food poisoning.
- People might not be able to charge electric vehicles, which would leave them without transportation.
- People might not be able to work.

Description:

To correctly answer this question, students must consider the consequences for a town of insufficient power and draw on their knowledge to describe a problem that the town would face.

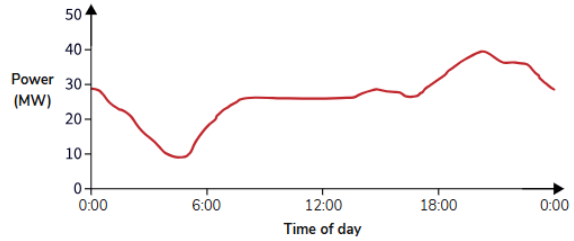
The question is of high cognitive demand (Proficiency Level 5) requiring students to draw on their scientific understanding of a familiar phenomenon and reason about cause and effect to explain a real-world impact of limited electricity availability.

A correct response requires student to describe at least one consequence of insufficient electricity, such as impacts on daily activities, services or infrastructure.

Students were not given credit if they provided a response referring to a consequence of insufficient power that is not a problem for the town (such as television not working) or states a problem without describing how it might result from insufficient power (such as people getting food poisoning).

Energy Source – Question 2

The graph below shows average daily power use in the town.



Which single alternative energy source could meet the town's daily power requirements at all times of the day?

- ○ wind
- ○ solar
- ○ hydroelectric
- ○ gas

Energy Sources

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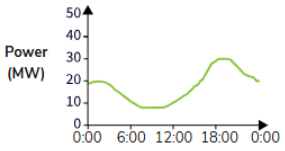
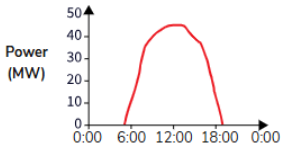
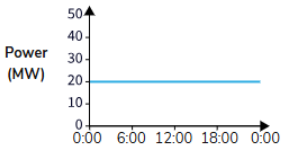
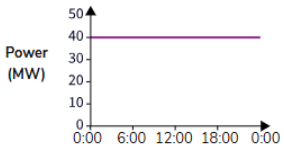








Question Type	Simple Multiple Choice
Competency	Construct and evaluate designs for scientific enquiry and interpret scientific data and evidence critically
Knowledge Type	Procedural Knowledge
Context	Local – Environmental Impacts & Climate Change
Environmental Competency	Make informed decisions to act based on evaluation of diverse sources
Difficulty	520 Level 3

Scoring

Full credit

The student selects:

“gas”

Description:

In this item, students must identify one energy source can supply sufficient power to meet the town's needs at all times of the day.

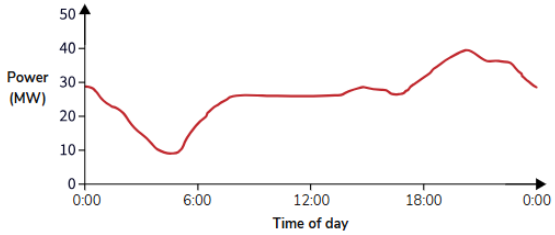
The question is of medium cognitive demand (Proficiency Level 3) and requires a valid interpretation of the graph showing the town's average daily power use and four additional graphs showing power generation from alternative energy sources.

Students must interpret and compare data across the graphs to determine which energy source consistently provides enough power to meet demand throughout the full 24-hour period.

Restricted Use - À usage restreint

Energy Source – Question 3

The graph below shows average daily power use in the town.



Consider a day of average power use (shown above) and the expected power generated by the alternative souces (shown to the right).

Which one of the following combinations would provide enough power for the town at the lowest price?

First Source Use all available power from first source | **Second source** Only use when first source is insufficient

- ○ wind | gas
- ○ hydroelectric | wind
- ○ wind | solar
- ○ hydroelectric | gas

What is one risk to the town of the combination you have chosen?

Energy Sources

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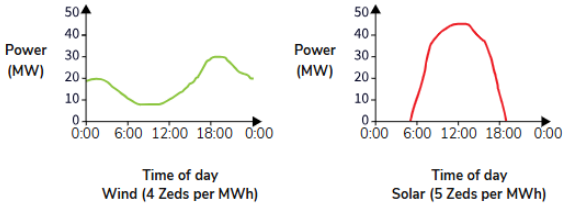
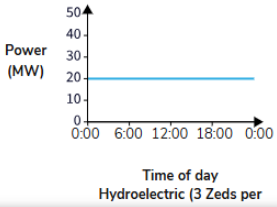
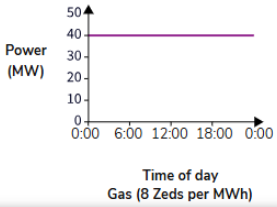






Question Type	Multiple Choice and Open Response
Competency	Research evaluate and use scientific information for decision making and action.
Knowledge System	Procedural Knowledge
Context	Local – Environmental Impacts & Climate Change
Environmental Competency	Make informed decisions to act based on evaluation of diverse sources
Difficulty	Code 1: 944 Level 6 Code 2: 1286 Level 6

Scoring

Full credit

The student selects:

'hydroelectric/wind'

AND identifies a plausible risk of using this chosen combination. The risk must be a direct consequence of the choice.

These can be:

- Unreliability of the sources
    - Wind is difficult to predict so it might not make up for the shortfall in hydroelectric power.
    - Peak wind power production might not coincide with peak energy consumption.
    - There would be no capacity to store energy if there was an increase in demand.
    - There may be not enough hydroelectric power during a drought when there is also no wind.
- Environmental risk
    - The dam may harm fish.
- Direct economic consequence
    - The town might not have the necessary infrastructure for hydroelectric power and/or wind power, leading to installation costs.

Partial credit

The student selects:

'hydroelectric/wind'

without an explanation or with an incorrect or insufficient explanation.

Description:

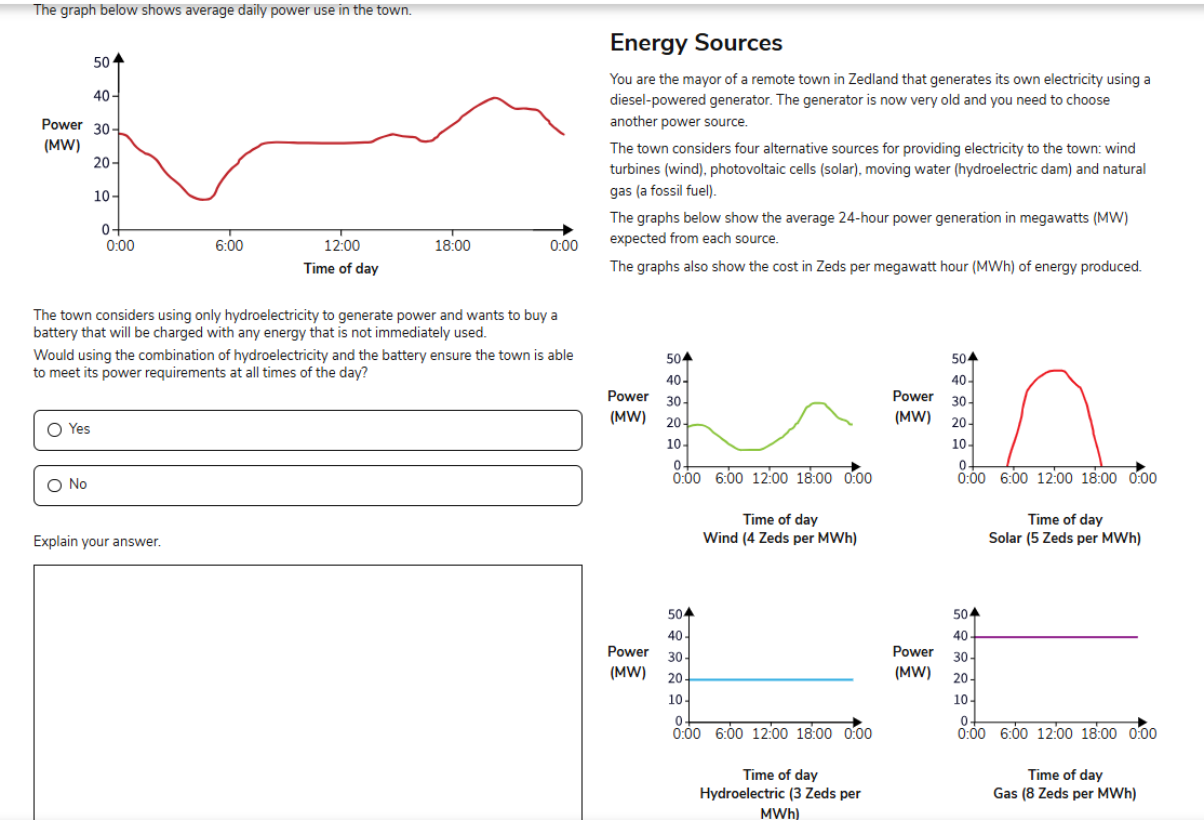
In this question, students must analyse and integrate information from five graphs to determine which combination of energy sources can most reliably and economically meet the town's electricity demand.

This question is of high cognitive demand (Proficiency Level 6) and requires students to draw on procedural knowledge of both science and economic considerations.

Students compare the graph of average daily power use with the power generation profiles of different energy sources to determine the best alternative energy sources, applying the condition that the second source is only used when the first is exhausted.

Students must reason about the variability and reliability of alternative power sources to identify a potential risk associated with their chosen combination. Successful students demonstrate an understanding of the limitations of alternative energy sources.

Energy Source – Question 4



Question Type	Multiple Choice and Open Response
Competency	Construct and evaluate designs for scientific enquiry and interpret scientific data and evidence critically
Knowledge System	Procedural Knowledge
Context	Local – Environmental Impacts & Climate Change
Environmental Competency	Make informed decisions to act based on evaluation of diverse sources
Difficulty	677 Level 5

Scoring

Full credit:

Explains that the amount of energy created when there is a hydroelectricity excess is not enough to compensate for the times when there is a deficit. Responses could include:

- The amount of energy that can be stored when there is excess hydroelectricity is not enough to cover the excess energy needed when the hydroelectricity is not producing the required amount.

Description:

In this question, students must evaluate if a combination of hydroelectric power and battery storage could meet the town's electricity demand at any time. The question is of medium to high cognitive demand (Proficiency Level 5) and requires students to interpret the graph showing the town's average daily power use and compare it with the constant power generation from hydroelectricity.

A correct response explains that the extra power made by hydro-electric generators is not enough to cover times when demand is higher than supply, meaning that the battery cannot store enough energy to make up the shortfall.

Energy Source – Question 5

The government adds a new tax, known as a carbon tax, on the amount of carbon dioxide emitted by generating power.

The carbon tax is **five zeds** for each tonne of carbon dioxide emitted.

The cost of which power source would increase the most through the addition of a carbon tax?

- ○ wind
- ○ solar
- ○ hydroelectric
- ○ gas

For which of the following reasons could a government consider introducing a carbon tax?
Select all correct answers.

- ☐ to ensure the town has a constant supply of power
- ☐ to increase the total amount of power that can be generated
- ☐ to generate funding for research into clean energy innovations
- ☐ to encourage the use of energy sources that cause less environmental damage

Energy Sources

You are the mayor of a remote town in Zedland that generates its own electricity using a diesel-powered generator. The generator is now very old and you need to choose another power source.

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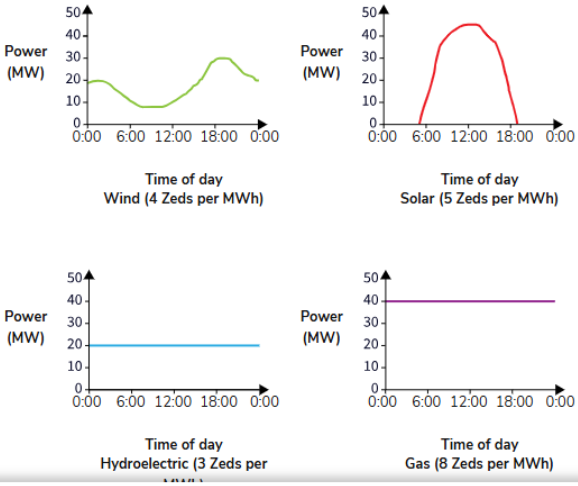


Question Type	Complex Multiple Choice
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Local – Environmental Impacts & Climate Change
Difficulty	Code 1: 423 Level 2 Code 2: 677 Level 5

Scoring

Full credit:

The student selects ‘gas’

AND

the student selects BOTH ‘to generate funding for research into clean energy innovations’ and ‘to encourage the use of energy sources that cause less environmental damage’.

Partial credit:

The student selects ‘gas’ but does not provide a correct response to explain the purpose of a government introduced carbon tax.

Description

This question assesses students' ability to interpret information about energy sources, carbon emissions, and government policy using both graphical and contextual information. Full credit responses demonstrate proficiency of medium to high cognitive demand (Proficiency Level 5) while partial credit responses demonstrate proficiency of medium cognitive demand (Proficiency Level 3).

Students must first identify the power source the cost of which would increase the most if a carbon tax were introduced. To answer correctly, students must recognise that the tax applies to carbon dioxide emissions and understand that natural gas, as a fossil fuel, produces carbon dioxide when generating electricity. In contrast, wind, solar, and hydroelectric power do not emit carbon dioxide during operation and therefore, the cost of electricity generated from these sources would not increase under a carbon tax.

Students then need to select valid reasons why a government might introduce a carbon tax. Correct responses require students to draw connections between government policy and environmental and economic outcomes to demonstrate an understanding of how policy can be used to influence environmental behaviour. Incorrect responses reflect misunderstandings of the purpose of a carbon tax by selecting outcomes related to energy infrastructure and capacity.

Black Soldier Fly

Black Soldier Fly – Question 1

Black soldier flies are sometimes considered beneficial because they prey on other insects, such as the housefly (*Musca domestica*).

Explain what will happen to a population of houseflies if the population of black soldier flies living in the same area increases.

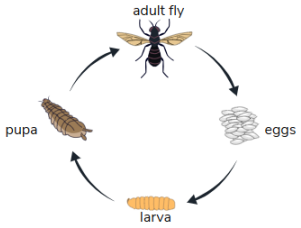
Black Soldier Fly

The black soldier fly (*Hermetia illucens*) is a common and fast-growing insect species.

It is native to South America but has spread to other continents, including North America, Europe, Africa and Asia.

The diagram shows the life cycle of the black soldier fly.

A female adult can lay up to 500 eggs at one time.



Question Type	Open Response
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Local – Health & Disease
Difficulty	458 Level 2

Scoring

Full Credit

Provides a response directly linked to the predator–prey relationship. Black soldier flies prey on houseflies, so the size of the population of houseflies will decrease as the black soldier fly population increases. Responses could include:

- As the population of black soldier flies increases, it can be assumed that the population of houseflies will decrease. This is because the black soldier flies are predators of species such as houseflies.
- If the population of the black soldier flies increases, this will lead to a sudden decline in the population of houseflies because black soldier flies feed on houseflies.
- The black soldier flies feed on houseflies, so if their population increases then the population of houseflies will decrease.

Description

This question requires students to recognise the predator–prey relationship between black soldier flies and houseflies and explain the expected impact of an increase in black soldier flies on the housefly population. A correct response draws on a basic understanding of population dynamics to link cause and effect, demonstrating the

ability to explain scientific phenomena of low to medium cognitive demand (Proficiency Level 2).

Black Soldier Fly – Question 2

The larval stage of the black soldier fly lasts for two weeks.
The larvae feed on decaying organic material, such as manure and rotting vegetation.
The larvae shed their outer body covering (exoskeleton) several times during this stage.
Why do the larvae shed their outer body covering?

- ○ They feed on larger pieces of food as they grow.
- ○ They grow rapidly and outgrow their body covering.
- ○ They are very active and their body covering becomes damaged.
- ○ They grow too large for their backbone to support them.

Black Soldier Fly

The black soldier fly (*Hermetia illucens*) is a common and fast-growing insect species.

It is native to South America but has spread to other continents, including North America, Europe, Africa and Asia.

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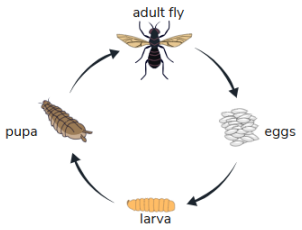
A female adult can lay up to 500 eggs at one time.



Question Type	Simple Multiple Choice
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Local – Environmental Impacts & Climate Change
Difficulty	398 Level 1a

Scoring

Full credit:

The student selects ‘They grow rapidly and outgrow their body covering.’

Description

This question assesses students’ understanding of insect growth and the function of an exoskeleton. It is a question of low cognitive demand that requires students to identify a scientific explanation of a simple phenomenon drawing on basic scientific knowledge. The correct response recognises that moulting occurs because the larvae outgrow their exoskeleton as they increase in size.

Incorrect options reflect common misconceptions, such as confusing growth with feeding behaviour, physical damage, or the presence of a backbone, which insects do not have.

Restricted Use - À usage restreint

Black Soldier Fly – Question 3

Black soldier fly larvae are rich in protein and can be used as a food source for other animals, including chickens.

Farmers breed the flies in compost systems. When the larvae are harvested, some larvae are deliberately left in the compost system.

Why are some larvae left in the compost system?

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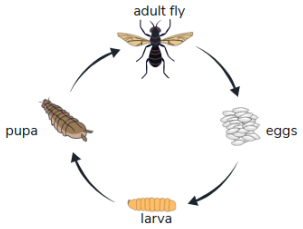


Question Type	Open Response
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Local – Natural Resources
Environmental Competency	Explain the impact of human interactions within Earth's systems
Difficulty	673 Level 5

Scoring

Full Credit

Provides a response that demonstrates understanding that some larvae must be left in the compost system so the life cycle of the black soldier fly can continue from these larvae. Responses could include:

- A few larvae are left so that they can grow into adult flies and provide more eggs, continuing to provide a food source for chickens.
- All larvae are not harvested for the food source because they want them to grow into black soldier flies so that they lay more eggs and thus more larvae are made in the future.

Description

This question assesses students' understanding of life cycles and sustainable biological systems. A correct response requires student to apply scientific knowledge and understanding to construct an explanation for a phenomenon of medium to high cognitive demand (Proficiency Level 5). To answer correctly, students must recognise that leaving some black soldier fly larvae in the compost system allows

them to continue developing into adult flies, which can reproduce and maintain the population.

The question requires students to apply their knowledge of reproduction and population sustainability to a real-world farming context.

Restricted Use - À usage restreint

Lightning

Introduction

This unit comprises four questions focused on the concepts of light and sound waves in the context of lightning and thunder. The first question is a simple multiple-choice item designed to assess students' foundational understanding of the phenomenon.

Questions 2–4 require students to interact with a simulation that investigates the relationship between the speeds of light and sound. The simulation allows students to manipulate two variables: the power of a lightning strike and the distance between the lightning strike and an observer. Each combination of variables generates an output showing the time delay between seeing the lightning and hearing the thunder.

Students are provided with supporting information, including clear instructions on how to manipulate the variables within the simulation. Guidance is also provided on how to delete data from the output table, enabling students to re-run the simulation and collect additional data as they progress through the questions.

Lightning – Question 1

When lightning strikes, an observer immediately sees a flash of light. Thunder occurs at the same time, but the observer hears it a little later.

The time taken before an observer hears thunder depends on factors including the distance between the observer and the location of the lightning strike.

Which one of the following statements best explains why lightning is seen before thunder is heard?

- ○ The speed of light through air is faster than the speed of sound through air.
- ○ Light does not need to travel through the air to be seen, but sound does need to travel through the air to be heard.
- ○ Particles of light are not as heavy as particles of sound, so they are easier to detect.
- ○ Eyes detect light faster than ears detect sound.

Lightning

Lightning is a natural electrostatic discharge produced in Earth's atmosphere.

Thunder is the sound caused by the rapid heating of air that occurs during a lightning strike.

Question Type	Simple Multiple Choice
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Local – Natural Resources
Difficulty	435 Level 2

Scoring

Full credit:

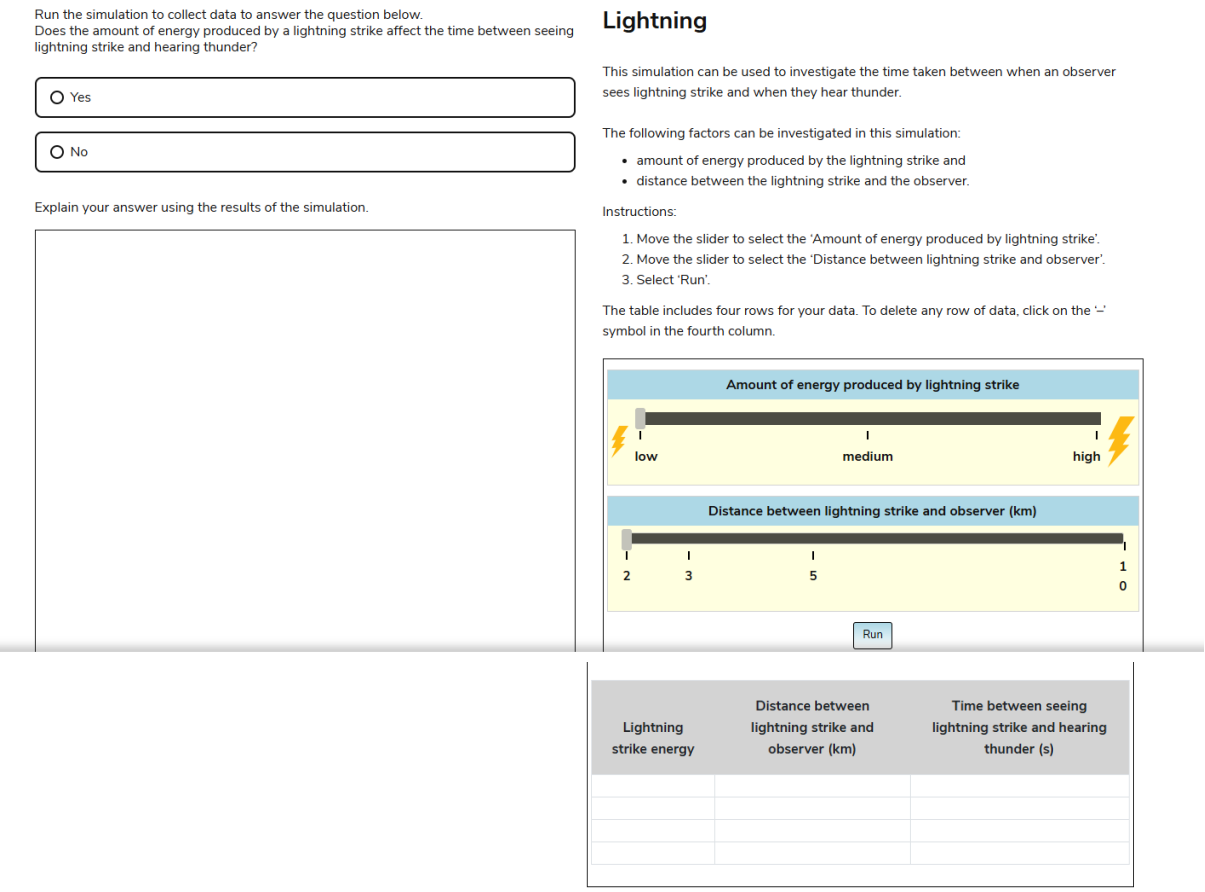
The student selects 'The speed of light through air is faster than the speed of sound through air.'

Description

This question assesses students' understanding of the different speeds at which light and sound travel. It is a question of medium to low cognitive demand (Proficiency Level 2) that requires students to apply their knowledge that light travels faster through air than sound and as a result, the flash of lightning is seen before the sound of thunder is heard.

The correct option requires students to identify an appropriate scientific explanation for this common scientific phenomenon using basic knowledge of wave behaviour to explain an everyday observation. Incorrect options reflect common misconceptions, such as attributing the delay to human sensory processing, the need for air to transmit light, or incorrect ideas about the physical properties of light and sound.

Lightning – Question 2



Question Type	Simple Multiple Choice and Open Response
Competency	Construct and evaluate designs for scientific enquiry and interpret scientific data and evidence critically
Knowledge System	Procedural knowledge
Context	Local – Natural Resources
Difficulty	586 Level 4

Scoring

Full Credit

The student uses the simulation to show that the amount of energy produced has no effect on the time it takes to hear the thunder. Responses could include:

- [No] It is always 5.9 s [*when the distance is 2 km*]
- [No] It is always 8.8 s [*when the distance is 3 km*]
- [No] It is always 14.7 s [*when the distance is 5 km*]
- [No] It is always 29.4 s [*when the distance is 10 km*]

- [No] When you only change the amount of energy, the time remains the same

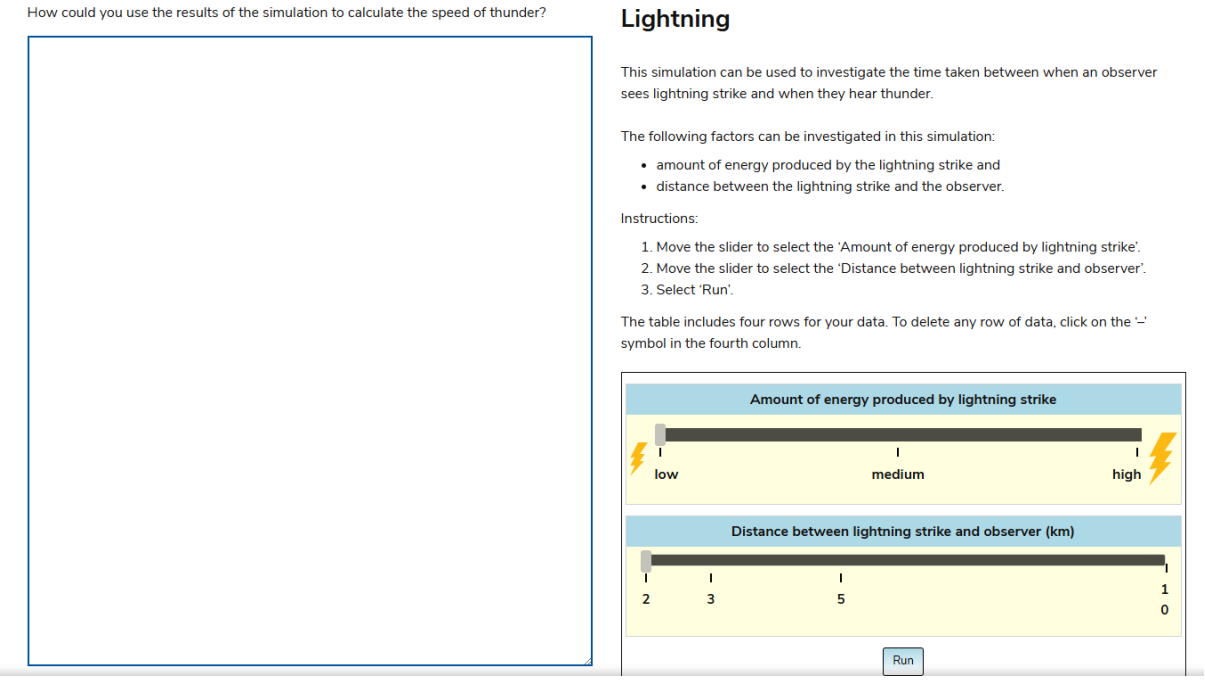
Description

This question assesses students' ability to interpret data generated from a simulation to investigate the relationship between lightning strike energy and the time delay between seeing lightning and hearing thunder. To respond correctly, students must recognise that changing the energy of the lightning strike does not affect the time delay, provided the distance between the lightning strike and the observer remains constant.

This question is of medium cognitive demand (Proficiency Level 4) requiring students to generate a table of data to identify that the time delay is determined by the distance the sound must travel and the relative speeds of light and sound, not by the amount of energy produced by the lightning strike. Students then use evidence from the simulation results to support their conclusion, noting that for a fixed distance, the recorded time remains the same regardless of whether the lightning strike energy is low, medium, or high.

This item requires students to apply procedural understanding by controlling variables, analysing patterns in the data, and drawing an evidence-based conclusion.

Lightning – Question 3



Question Type	Open Response
Competency	Construct and evaluate designs for scientific enquiry and interpret scientific data and evidence critically
Knowledge System	Procedural knowledge
Context	Local – Natural Resources
Difficulty	732 Level 6

Scoring

Full Credit

Explains that the speed of sound can be calculated by dividing the distance travelled by the sound of thunder by the time it takes the sound to travel that distance.

Divide the distance travelled by the thunder by the time it takes to hear it.

OR

Provides an answer calculated from the simulation:

- 339 m/s, 340 m/s, 341 m/s
- 339, 340, 341 [*the correct number without a unit indicates that the student has divided the distance by the time*]

Description

This question assesses students' ability to use data generated from the simulation to calculate the speed of sound (thunder). To respond correctly, students must

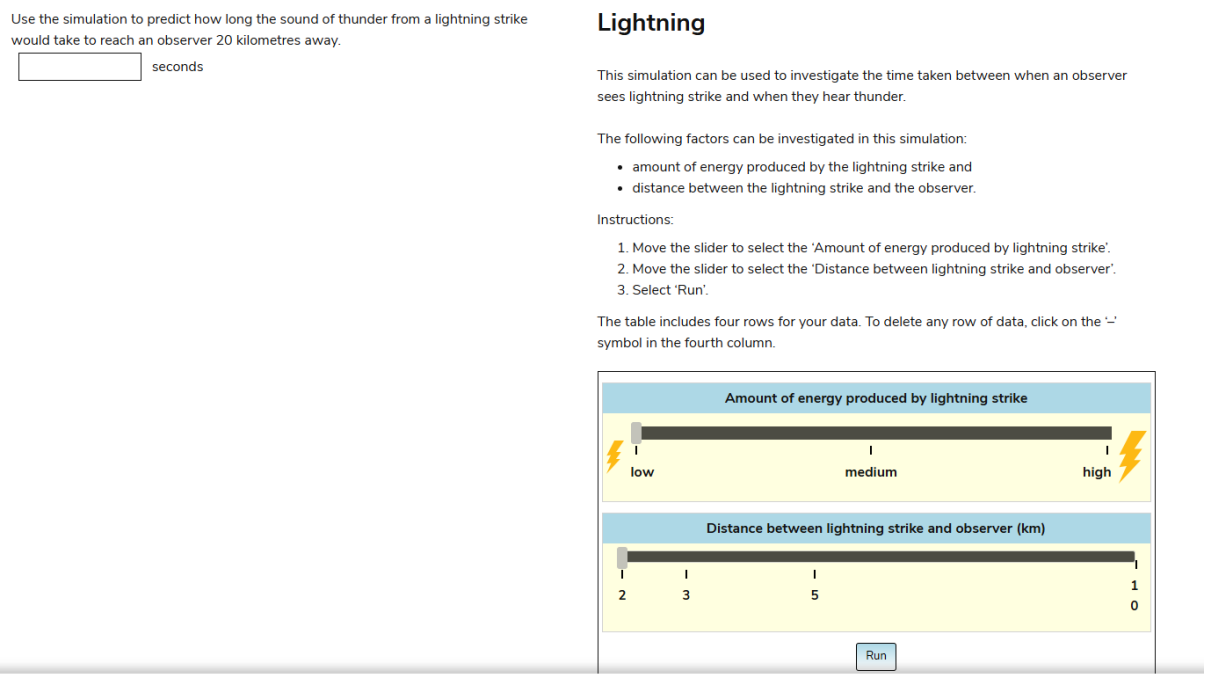
recognise that the speed of sound can be calculated by dividing the distance between the lightning strike and the observer by the time delay between seeing the lightning and hearing the thunder.

A correct response demonstrates that students can use the simulation to generate appropriate data, apply the formula (speed = distance ÷ time) or explain the method clearly.

This item requires students to implement procedural understanding of data handling and to complete a basic calculation. Incorrect or incomplete responses may indicate difficulties in selecting relevant variables, applying the correct relationship between distance, time, and speed, or clearly explaining how calculation could be determined using data from the simulation.

Restricted Use - À usage restreint

Lightning – Question 4



Question Type	Open Response
Competency	Construct and evaluate designs for scientific enquiry and interpret scientific data and evidence critically
Knowledge System	Content knowledge
Context	Local – Natural Resources
Difficulty	502 level 3

Scoring

Full Credit

Any answer from 58 seconds to 60 seconds. Responses could include:

- 58
- Fifty eight [*accept spelling errors*]
- About 58 seconds

Description

This question assesses students' ability to use data from a simulation to make a prediction beyond the values directly tested. To answer correctly, students must recognise that the speed of sound is constant under the conditions shown and apply the relationship between distance, speed, and time to estimate how long thunder would take to travel 20 kilometres.

This item is of medium cognitive demand (Proficiency Level 3) and requires students to integrate conceptual understanding of sound propagation with procedural skills in data interpretation and prediction. A correct response demonstrates that students

can extrapolate from the simulation results by either calculating the speed of thunder using existing distance–time data or identifying a consistent pattern in the data and extending it to a greater distance. Students are expected to use proportional reasoning or the formula, time = distance ÷ speed, to justify their prediction.

Restricted Use - À usage restreint

Main Study Items

Fast Fashion

Fast Fashion – Question 1

Which of the following actions can be taken to reduce the negative environmental impacts of producing cotton textiles?

Select all correct answers.

- ☐ Use water more efficiently.
- ☐ Reduce the quality of the cotton textiles produced.
- ☐ Increase the number of staff that cotton farms employ.
- ☐ Use pesticides that are harmful only to the pest species being targeted.
- ☐ Dispose of chemical waste in areas far away from the sites involved in cotton production.

Fast Fashion

Many people are concerned about the global environmental impacts of the manufacture and disposal of clothing.

Cotton fibres come from the outer layer of the cotton plant's seeds. Compared to synthetic fibres, cotton fibres need less processing and biodegrade more easily.

The production of cotton textiles requires a lot of water, fertilisers, pesticides and other harmful chemicals. To try to solve these issues, sustainable cotton production methods are being developed.

Question Type	Complex Multiple Choice
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Global – Environmental Impacts & Climate Change
Environmental Competency	Explain the impact of human interactions within Earth's systems
Difficulty	727 Level 6

Scoring

The student selects:

'Use water more efficiently' and 'Use pesticides that are harmful only to the pest species being targeted.'

Description

To answer this question, students must choose all the actions in the list that help reduce the environmental harm caused by making cotton textiles.

The question is a complex multiple-choice item where students must choose all the correct answers from the list. They only get credit if they select every correct option and avoid all incorrect ones. This means students must evaluate each option to see if it is a scientifically accurate way to reduce the impact of producing cotton textiles, not just select a single correct answer. As a result, the task places a higher cognitive load on students (Proficiency Level 6).

A correct response demonstrates that students understand using water more efficiently would lead to less demand for the abstraction of water and that using narrow spectrum pesticides, as compared to a broad-spectrum pesticide, would lead to fewer insect species being harmed.

Restricted Use - À usage restreint

Fast Fashion – Question 2

For a crop to be certified as organic, it cannot be grown with synthetic fertilisers or pesticides. Genetically modified crops of cotton are also not classified as organic.

One researcher claimed that, 'Organic cotton production is more sustainable than non-organic cotton production because organic cotton crops use less water'.

Which one of the following statements supports the researcher's claim?

- ○ Genetically modified cotton crops use less water than non-genetically modified organic cotton crops.
- ○ Because natural fertilisers are used when growing organic cotton, the soil holds water for a longer time.
- ○ Cotton plants used in organic farming need the same amount of water as other organic crops.
- ○ Cotton uses a lot of water to grow.

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Question Type	Simple Multiple Choice
Competency	Research evaluate and use scientific information for decision making and action
Knowledge System	Epistemic knowledge
Context	Global – Environmental Impacts & Climate Change
Environmental Competency	Make informed decisions to act based on evaluation of diverse sources
Difficulty	624 Level 4

Scoring

The student selects "Because natural fertilisers are used when growing organic cotton, the soil holds water for a long time."

Description

To successfully complete the question, students must evaluate pieces of evidence to identify the statement that supports an environmental claim about the sustainability of organic cotton production.

The question requires medium cognitive load (Proficiency Level 4) to compare the statements to the claim.

The first option is merely a restatement of the scientist's claim and does not provide any evidence to support the claim. The second option is the correct option and provides both evidence supporting the claim and a mechanism for how organic crops

use less water. The third option provides a comparison of water use between different organic crops but does not inform on the relative use of water by organic and non-organic crops. The fourth option is a statement about the amount of water that is required to grow cotton and does not provide any evidence regarding the relative use of water between types of cotton.

Fast Fashion – Question 3

Consider the three quotes, extracted from different sources. The sources argue that certified organic cotton should be used to reduce the negative environmental impacts of farming cotton.

Source identifier	Source	Quote
A	Website for an online shop selling organic cotton	'Certified organic cotton production uses less water, energy and fuel. Its production also reduces the carbon footprint and the amount of chemical pollution released into the environment.'
B	Website article from a business journalist reporting on a non-profit conference	'Because organic cotton is not genetically modified, more plants will be needed to get the same amount of cotton fibre. This means more land and water must be used to grow the organic cotton.'
C	An international agriculture journal article that was reviewed by agricultural scientists	'There was no significant difference found between the yields of organic and non-organic cotton in each year tested. In 2004, the organic cotton yield was 1459 kg/ha and the non-organic cotton yield was 1400 kg/ha.'

Which source is most reliable?

Fast Fashion

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The production of cotton textiles requires a lot of water, fertilisers, pesticides and other harmful chemicals. To try to solve these issues, sustainable cotton production methods are being developed.

Why is the source you have selected more trustworthy than the others?
Select all correct answers.

- ☐ It has been reviewed by other experts.
- ☐ It compares the results of a scientific study over time.
- ☐ There is a definition in the quote.
- ☐ It is well written.
- ☐ The author is an expert in analysing trends in data.

Question Type	Complex Multiple Choice
Competency	Research evaluate and use scientific information for decision making and action
Knowledge System	Epistemic knowledge
Context	Global – Environmental Impacts & Climate Change
Environmental Competency	Make informed decisions to act based on evaluation of diverse sources
Difficulty	Code 1: 441 Level 2 Code 2: 726 Level 6

Scoring

Full Credit

From the drop-down menu, the student s elects 'C' 'An international agricultural journal article that was reviewed by agricultural scientists.' AND selects 'It has been reviewed by other experts', 'It compares the results of a scientific study over time' and 'The author is an expert in analysing trends in data.'

Restricted Use - À usage restreint

Partial Credit

Using the drop-down menu, selects ‘C’ ‘An international agricultural journal article that was reviewed by agricultural scientists.’

Description

In the first part of the question, the student must evaluate three sources of information using the descriptions to identify the source that is most reliable. Students who successfully complete this task receive one mark. Making a single comparison of this kind requires medium to low cognitive load (Proficiency Level 2).

In the second part of the question, the students must identify all factors that lead to the selection being more trustworthy than the other sources.

The question is a complex multiple-choice item where students must choose all the correct answers from the list. Students only get credit if they select every correct option and avoid all incorrect ones. This means they must evaluate each option to see if it is a scientifically accurate way to reduce the impact of producing cotton textiles, not just select one correct answer. As a result, the task places a higher cognitive load on students (Proficiency Level 6). Full credit is awarded to students who respond correctly to both parts of this question.

The correct options in the second part describe factors that increase the reliability of the information in the article. Specifically, that the work of the article authors was reviewed by other relevant scientists (first option), the study included data from more than one year (second option) and that the data was analysed by an expert in quantitative analysis (fifth option) .

Offshore Wind Turbine Farm

Offshore Wind Turbine Farm – Question 1

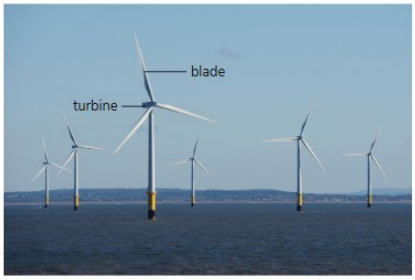
Explain one way in which the environment benefits when electricity is generated using wind instead of fossil fuels.

Offshore Wind Turbine Farm

A coastal town is considering constructing an offshore wind turbine farm to generate electricty.

Wind causes the blades on a wind turbine to turn, which generates electricity. The electricity is added to the electricity network onshore.

Some people in the town are in favour of the project. Other people are concerned that the project will have a negative impact on the local environment.



An offshore wind turbine farm

Question Type	Open Response
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Global – Environmental Impacts & Climate Change
Environmental Competency	Explain the impact of human interactions within Earth's systems
Difficulty	667 Level 5

Scoring

Full Credit

The student must provide a description of an environmental benefit of using wind turbines instead of burning fossil fuels to generate electricity.

Examples of responses include:

- CO_2 is not released during the generation of electricity.
- No carbon dioxide is released. [*true during power generation although CO_2 could be released at other stages, e.g. transport and construction*]
- Burning fossil fuels releases more CO_2 than wind.
- Less CO_2 [minimum response]

Description

To successfully complete the question, students are required to draw on their scientific knowledge to provide and explain one way in which the use of renewable energies instead of fossil fuels benefits the environment.

Restricted Use - À usage restreint

This question is of moderate to high cognitive demand (Proficiency Level 5) requiring students to identify and construct a scientific explanation of a familiar phenomenon.

A correct response provides an explanation that wind energy produces electricity without burning fossil fuels, which reduces carbon dioxide emissions and air pollution. This demonstrates an understanding that renewable energy sources helps mitigate climate change and reduces the release of pollutants that can harm ecosystems and human health.

Restricted Use - À usage restreint

Offshore Wind Turbine Farm – Question 2

Describe one negative impact that the wind farm could have on the local environment.

Offshore Wind Turbine Farm

A coastal town is considering constructing an offshore wind turbine farm to generate electricty.

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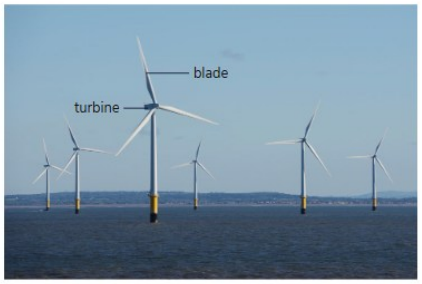


An offshore wind turbine farm

Question Type	Open Response
Competency	Explain phenomena scientifically
Knowledge System	Content knowledge
Context	Local – Environmental Impacts & Climate Change
Environmental Competency	Explain the impact of human interactions within Earth's systems
Difficulty	605 Level 4

Scoring

Full Credit

The student must describe one negative impact that a wind farm could have on the local environment. Responses could include:

- The local sea floor, flora and/or fauna may be harmed during the construction phase.
- Birds might fly into the blades.
- Wind farms could interfere with the movement of wildlife (e.g. fish, whales, dolphins).
- Wildlife may not like the noise or vibration of the blades.
- There would be permanent alteration of the aquatic environment.
- Water currents/waves might be altered.
- Animals will suffer

Restricted Use - À usage restreint

Description

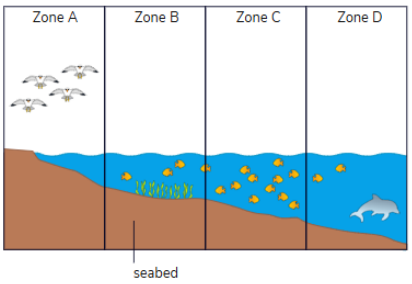
To successfully complete the question, the student must draw on their knowledge to provide and explain one way in which the installation of wind turbines in a marine environment could damage the immediate environment.

Offshore Wind Turbine Farm – Question 3

The town decides to go ahead with constructing the offshore wind turbine farm.

Wind turbines have to be anchored to the seabed. The deeper the seabed the more expensive it is to install the turbines.

The wind farm will be built in one of the zones shown in the diagram.



Consider this information about the zones:

- Zone A is visited by large numbers of seabirds every day.
- Zone B supports green algae, a critical source of food for many marine organisms.
- Zones B and C support shoals of common fish species.
- Zone D is deep enough to allow large marine animals to swim through it.

In which zone should the wind turbines be installed as the best compromise between the financial cost and environmental impact?

- ○ Zone A
- ○ Zone B
- ○ Zone C
- ○ Zone D

Explain your choice.

Offshore Wind Turbine Farm

A coastal town is considering constructing an offshore wind turbine farm to generate electricty.

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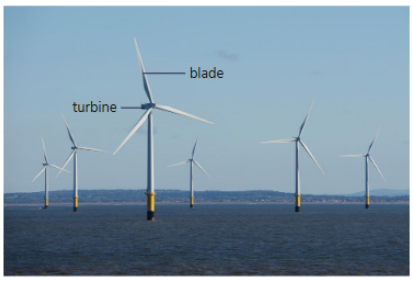


An offshore wind turbine farm

Question Type	Open Response
Competency	Research evaluate and use scientific information for decision making and action
Knowledge System	Procedural knowledge
Context	Local – Environmental Impacts & Climate Change
Environmental Competency	Make informed decisions to act based on evaluation of diverse sources
Difficulty	Code 1: 559 Level 4 Code 2: 625 Level 4 Code 3: 762 level 6

Scoring

Student must select ‘Zone C’

Full Credit

Three marks: The student also explains the elements of the compromise that must be made by referring to both financial cost and environmental considerations. Responses could include

- [Zone C] Building here will be a more expensive option because it is away from the shore in deeper water. However, the fish in this area can move to other habitats whereas this is not as easy for the wildlife in other zones which makes the cost worthwhile.
- [Zone C] This is not the cheapest area to build it but it will reduce the impact on the environment since this area is not critical for the survival of any species.
- [Zone C] Is in deeper water but the animals in Zone C are also in Zone B, so they can move to another habitat unlike the wildlife/plants in other areas.

Partial Credit

Two marks: the student considers one aspect of the compromise by referring to either the financial cost or an environmental consideration. Responses could include:

- [Zone C] Because the animals in this zone can be found in other zones, so they have somewhere to go when the turbines are built. [*does not refer to financial cost considerations*]
- [Zone C] The fish will be able to move to Zone B, whereas the plant/aquatic life in Zones other than C are unable to move to other areas so turbines should not be built in them.
- [Zone C] Because this will be cheaper than building in deeper water. [*does not refer to environmental impact*]
- [Zone C] There are no birds, but it is quite deep. *['quite deep' refers to increased cost; 'no birds' does not fully explain the environmental considerations of building in Zone C*]
- [Zone C] Some fish might become extinct
- [Zone C] because this is not the deepest. [*implied consideration of cost*]
- [Zone C] The fish are small enough to swim around it.

One mark: Selects [Zone C] without an explanation or with an incorrect explanation. Responses could include:

- [Zone C] It is far enough offshore that they won't bother anyone.
- [Zone C] The turbines should be built on land.

Description

To successfully complete the task presented in this question, the student must evaluate a series of contextual data presented in diagrammatic and text forms to determine the best location for wind turbines and provide a supporting explanation that considers both economic and environmental factors.

The task is of high cognitive demand in that it requires evaluation of both diagrammatic and textual information to identify that the solution must involve a compromise between environmental and economic factors. They must also be able to provide a written justification for their choice of solution.

Students receive two marks if they select the zone representing the best compromise between environmental and economic factors but only describe one of those factors in their justification.

Students receive one mark if they select the zone representing the best compromise between environmental and economic factors but do not provide a justification for their choice.

Restricted Use - À usage restreint

Loss of Biodiversity

Loss of Biodiversity – Question 1

Which one of the following statements is supported by the data in the graph?

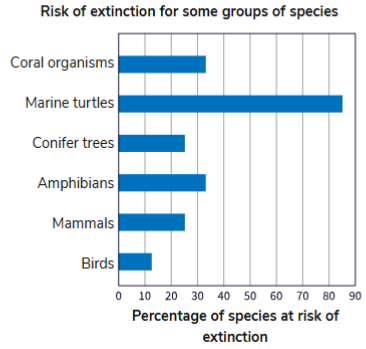
- ○ The percentage of species at risk of extinction is equal for conifer trees and for birds.
- ○ The percentage of species at risk of extinction is lower for mammals than for the other groups of species.
- ○ The percentage of species at risk of extinction is higher for amphibians than for the other groups of species.
- ○ The percentage of species at risk of extinction is higher for marine turtles than for the other groups of species.

Loss of Biodiversity

'Biodiversity' refers to the variety of plants, animals and other organisms in a particular location or throughout the world.

Coral reefs are believed to have the highest biodiversity of any ecosystem. They are stony structures built by coral organisms and algae in shallow tropical waters. They provide habitat for many species of marine animals.

Loss of biodiversity is widespread throughout the world. The graph shows the percentage of groups of species that are currently at risk of becoming extinct in the wild.



Question Type	Simple Multiple Choice
Competency	Construct and evaluate designs for scientific enquiry and interpret scientific data and evidence critically
Knowledge System	Content knowledge
Context	Local – Environmental Impacts & Climate Change
Environmental Competency	Explain the impact of human interactions within Earth's systems
Difficulty	Code 1: 388 Level 1a

Scoring

Full credit:

The student selects 'The percentage of species at risk of extinction is higher for marine turtles than for the other groups of species.'

Description

This item is of very low cognitive demand (Proficiency Level 1a), requiring students to directly read and interpret a simple bar graph. Students identify which statement is supported by the data by comparing the bars representing the percentage of species at risk of extinction for different groups. This item evaluates basic data reading with a correct response relying on accurately extracting and comparing explicit values shown in the graph, while incorrect responses typically result from misreading or overlooking the relative sizes of the bars.

Loss of Biodiversity – Question 2

Policymakers need reliable information to determine what action is needed to prevent further biodiversity loss.

Below are four descriptions of sources of information on biodiversity loss.

Which source of information would be the most reliable?

- ○ It was written by a scientist who specialises in astronomy.
- ○ It referred to sources that were reviewed by scientists who are experts on the subject.
- ○ It was written by an environmentalist who volunteers with a conservation organisation.
- ○ It was published on a tourism website advertising a holiday to see endangered species.

Loss of Biodiversity

'Biodiversity' refers to the variety of plants, animals and other organisms in a particular location or throughout the world.

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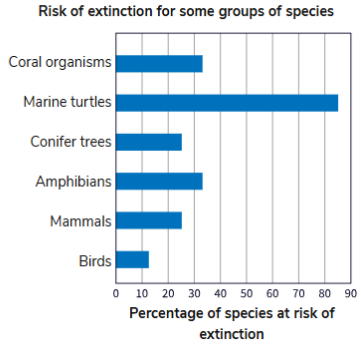

Question Type	Simple Multiple Choice
Competency	Research evaluate and use scientific information for decision making and action
Knowledge System	Epistemic knowledge
Context	Local – Environmental Impacts & Climate Change
Difficulty	Code 1: 454 Level 2

Scoring

Full credit:

The student selects 'It referred to sources that were reviewed by scientists who are experts on the subject.'

Description

This item is of low to moderate cognitive demand (Proficiency Level 2) and requires students to identify the most reliable source of scientific information in a familiar context. Students are provided with several descriptions of information sources and must recognise that reliability is linked to expert review and subject-matter expertise. A correct response involves selecting the source that refers to information reviewed by scientists who are experts in biodiversity, demonstrating an understanding that scientific credibility depends on appropriate expertise and peer support. Incorrect responses result from selection of a source that lacks scientific expertise in the relevant field or sources with potential bias or non-scientific aims.

Restricted Use - À usage restreint

Loss of Biodiversity – Question 3

The news headline below suggests that our use of marine resources is causing biodiversity loss.

Human overuse of marine resources has reached unprecedented levels

Does the information in the graph provide evidence to support the claim in the headline?

- ○ Yes
- ○ No

Explain your answer.

Loss of Biodiversity

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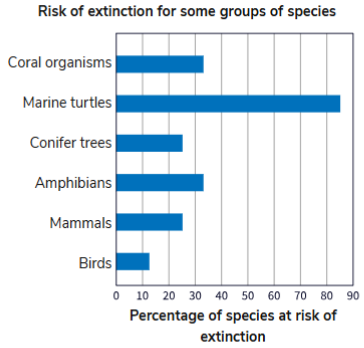

Question Type	Open Response
Competency	Research evaluate and use scientific information for decision making and action
Knowledge System	Epistemic knowledge
Context	Environmental Impacts & Climate Change
Environmental Competency	Explain the impact of human interactions within Earth's systems
Difficulty	665 Level 5

Scoring

Full Credit:

The student selects 'No' and explains that the graph contains no information about how humans are consuming marine resources.

- [No] The graph does not contain information about human impact.
- [No] Human overuse of resources is not shown in the graph.
- [No] The graph is about risk of extinction for some animal groups; it is not about how humans are using marine resources.
- [No] The graph does not link the extinction risk to how humans are overusing marine resources.

Description

This item is of high cognitive demand (Proficiency Level 5) and requires students to critically evaluate whether the evidence provided supports a real world claim. Students must go beyond reading values in the graph and instead use epistemic knowledge about what counts as evidence for a claim, specifically, recognising when the available data are insufficient or irrelevant to the claim being made. To respond correctly, students must analyse the graph to determine that it does not provide evidence for the headline, as it contains no information about human consumption/overuse of marine resources, nor does it link extinction risk to human activity. An incorrect response treats the graph as if it does provide evidence about human overuse, for example, by pointing to high extinction risk for a marine group (such as marine turtles) and assuming this must be caused by human overuse, even though the graph does not show any measure of consumption, overuse, or causal mechanism.

Restricted Use - À usage restreint