STUDENT TEST BOOKLET

READING SECTION (40 questions)

READING PASSAGE 1

You should spend about 20 minutes on **Questions 1-13**, which are based on Reading Passage 1 below.

The Silent Epidemic of the Ocean

Ocean acidification, often dubbed “climate change’s equally evil twin,” is a pervasive and insidious threat to marine ecosystems. It represents a significant alteration in the chemistry of the Earth’s oceans, driven by the absorption of anthropogenic carbon dioxide (CO_2) from the atmosphere. Since the dawn of the Industrial Revolution, human activities such as the combustion of fossil fuels and large-scale deforestation have led to a dramatic increase in atmospheric CO_2 levels. The ocean, acting as a vast carbon sink, has absorbed approximately one-third of these emissions. While this process has marginally mitigated the pace of global warming, it has come at a considerable cost: the progressive acidification of seawater.

The chemical process underpinning ocean acidification is straightforward. When CO_2 dissolves in seawater, it reacts with water to form carbonic acid (H_2CO_3). This weak acid then dissociates into hydrogen ions (H^+) and bicarbonate ions (HCO_3^-). The proliferation of hydrogen ions increases the acidity of the water, which is measured on the pH scale. It is crucial to note that the pH scale is logarithmic, meaning that a small change in value corresponds to a substantial change in acidity. Over the past two centuries, the average pH of ocean surface waters has decreased from approximately 8.2 to 8.1. This seemingly minor drop of 0.1 units represents a 30% increase in acidity, a rate of change unprecedented in the last 50 million years.

The consequences of this rapid chemical shift are particularly dire for marine organisms that rely on calcium carbonate to build their shells and skeletons. This group, known as marine calcifiers, includes a wide array of life forms, from microscopic coccolithophores to corals, crustaceans, and mollusks. These organisms construct their protective structures by combining calcium ions (Ca^{2+}) with carbonate ions (CO_3^{2-}) in the surrounding water. However, the surplus of hydrogen ions in more acidic seawater leads to a reduction in the availability of carbonate ions, as they readily bond with the excess hydrogen ions to form bicarbonate. This scarcity of carbonate ions forces marine calcifiers to expend more energy to build their shells, often resulting in thinner, weaker structures that are more vulnerable to dissolution and predation.

Coral reefs, the vibrant and biodiverse “rainforests of the sea,” are especially susceptible to the effects of ocean acidification. The reduced availability of carbonate ions hinders the growth of coral skeletons, a process vital for reef-building. This is compounded by the phenomenon of coral bleaching, which is exacerbated by rising sea temperatures. The combination of these stressors poses a severe threat to the integrity and resilience of coral reef ecosystems, which support a quarter of all marine species and provide coastal protection and livelihoods for millions of people worldwide.

Beyond the direct impact on calcifying organisms, ocean acidification has a cascading effect throughout the marine food web. Pteropods, or “sea butterflies,” are tiny, free-swimming snails that form a crucial part of the diet of many larger species, including fish, whales, and seabirds. These creatures have delicate shells made of aragonite, a form of calcium carbonate that is particularly soluble in acidic conditions. Studies have shown that pteropod shells can begin to dissolve in the levels of acidity projected for the end of this century, threatening their survival and, consequently, the stability of the entire food web.

Furthermore, research has revealed that the altered chemistry of the ocean can interfere with the sensory abilities of some marine animals. For instance, the ability of clownfish to detect predators and locate suitable habitats has been shown to be impaired in more acidic waters. These subtle yet significant behavioral changes can have profound implications for the survival and reproduction of affected species, with the potential to disrupt the delicate balance of marine ecosystems.

In conclusion, ocean acidification is a complex and multifaceted issue with far-reaching consequences for marine life and the health of our planet. Mitigating this global threat requires a concerted effort to reduce carbon emissions and transition to a more sustainable future. The silent epidemic of the ocean serves as a stark reminder of the interconnectedness of Earth’s systems and the urgent need for collective action to protect our marine heritage for generations to come.

Questions 1-6

Do the following statements agree with the information given in Reading Passage 1?

In boxes 1-6 on your answer sheet, write

TRUE if the statement agrees with the information **FALSE** if the statement contradicts the information **NOT GIVEN** if there is no information on this

1. Ocean acidification is a more serious threat to marine life than climate change.
2. The ocean has absorbed around 33% of the CO2 emissions produced by humans.
3. The pH of the ocean is expected to fall below 7 by the end of the century.
4. Marine calcifiers find it easier to build their shells in more acidic water.
5. Coral bleaching is caused solely by ocean acidification.
6. The shells of pteropods are particularly resistant to acidic conditions.

Questions 7-10

Choose the correct letter, **A, B, C** or **D**.

Write the correct letter in boxes 7-10 on your answer sheet.

1. What is the primary cause of ocean acidification? A. Volcanic activity B. Agricultural runoff C. The burning of fossil fuels D. The melting of polar ice caps

2. Which of the following is NOT a marine calcifier? A. Corals B. Oysters C. Jellyfish D. Pteropods

3. How does ocean acidification affect marine calcifiers? A. It makes it easier for them to build their shells. B. It has no effect on their ability to build shells. C. It forces them to expend more energy to build their shells. D. It causes them to grow larger shells.

4. What is the nickname given to coral reefs in the passage? A. The lungs of the ocean B. The rainforests of the sea C. The jewels of the ocean D. The gardens of the deep

Questions 11-13

Complete the summary below.

Choose **NO MORE THAN TWO WORDS** from the passage for each answer.

Write your answers in boxes 11-13 on your answer sheet.

The Impact of Ocean Acidification on Marine Life

Ocean acidification has a wide range of effects on marine organisms. For marine calcifiers, the reduced availability of 11 _______________ makes it difficult to build their shells and skeletons. Coral reefs, which are vital for marine biodiversity, are particularly vulnerable to the combined effects of ocean acidification and rising sea temperatures. The altered chemistry of the ocean can also interfere with the 12 _______________ of some marine animals, such as clownfish. The potential collapse of populations of organisms like pteropods, also known as 13 _______________, could have a devastating impact on the entire marine food web.

READING PASSAGE 2

You should spend about 20 minutes on **Questions 14-26**, which are based on Reading Passage 2 below.

Investigating the Invisible Invader: The Science of Studying Ocean Acidification

A. The study of ocean acidification is a relatively new and rapidly evolving field of scientific inquiry. For decades, the primary focus of climate change research was on the atmospheric and terrestrial impacts of rising CO2 levels. The ocean, with its immense volume and perceived resilience, was largely overlooked. It was not until the early 2000s that the scientific community began to fully appreciate the profound chemical changes occurring beneath the waves. Today, a multidisciplinary army of scientists, including chemists, biologists, ecologists, and oceanographers, is working to understand the intricate and far-reaching consequences of this invisible invader.

B. At the forefront of ocean acidification research are the sophisticated monitoring systems that provide the raw data for analysis. A global network of buoys, floats, and research vessels is equipped with an array of sensors that continuously measure key parameters such as pH, temperature, salinity, and dissolved CO2. These in-situ measurements are complemented by satellite observations, which provide a broader, more holistic view of ocean chemistry. By combining these different data streams, scientists can create detailed maps of ocean acidity and track its changes over time. This information is crucial for identifying hotspots of acidification and predicting future trends.

C. Laboratory experiments play a vital role in elucidating the specific effects of ocean acidification on marine organisms. In controlled environments, scientists can manipulate the chemistry of seawater to simulate the conditions expected in the coming decades. By exposing various species, from phytoplankton to fish, to these altered conditions, researchers can observe their physiological and behavioral responses. These experiments have provided invaluable insights into the mechanisms by which ocean acidification affects processes such as calcification, growth, reproduction, and survival. However, it is important to acknowledge the limitations of laboratory studies, as they cannot fully replicate the complexity of natural ecosystems.

D. To bridge the gap between the laboratory and the real world, scientists are increasingly turning to field studies in naturally acidified environments. Volcanic seeps, where CO2 naturally bubbles up from the seafloor, create gradients of acidity that serve as natural laboratories. By studying the communities of organisms that live along these gradients, researchers can gain a deeper understanding of how marine ecosystems might adapt to future acidification. These "windows into the future" have revealed that while some species are able to tolerate more acidic conditions, others are severely impacted, leading to a decline in biodiversity and a shift in the overall structure of the ecosystem.

E. The geological record provides another crucial line of evidence for understanding the long-term consequences of ocean acidification. By analyzing the chemical composition of marine sediments and fossils, scientists can reconstruct past changes in ocean chemistry and their corresponding impacts on marine life. One of the most significant events in Earth's history, the Paleocene-Eocene Thermal Maximum (PETM), which occurred around 56 million years ago, was characterized by a massive release of carbon into the atmosphere and a subsequent period of intense ocean acidification. The fossil record from this period reveals a major extinction event in the deep sea, offering a sobering glimpse into the potential consequences of our current trajectory.

F. The ultimate goal of ocean acidification research is to inform policy and management decisions aimed at mitigating its effects. By providing a robust scientific basis for understanding the problem, researchers can help to shape effective strategies for reducing carbon emissions and protecting vulnerable marine ecosystems. This includes identifying and protecting "refugia," areas that may be naturally more resilient to acidification, and developing new approaches to aquaculture and fisheries management that can help to build the resilience of these industries to the challenges ahead. The science of ocean acidification is not merely an academic pursuit; it is a vital tool in the fight to preserve the health and productivity of our oceans for future generations.

Questions 14-19

Reading Passage 2 has six paragraphs, **A-F**.

Which paragraph contains the following information?

Write the correct letter, **A-F**, in boxes 14-19 on your answer sheet.

1. A description of how past events can inform our understanding of the current situation
2. The use of technology to track changes in ocean chemistry
3. The importance of scientific research in guiding practical solutions
4. The study of marine life in environments with naturally high CO2 levels
5. The relatively recent emergence of ocean acidification as a major area of research
6. The benefits and drawbacks of conducting experiments in a controlled setting

Questions 20-23

Choose the correct letter, **A, B, C** or **D**.

Write the correct letter in boxes 20-23 on your answer sheet.

1. What is the main purpose of the monitoring systems described in paragraph B? A. To reduce the acidity of the ocean B. To provide data for scientific analysis C. To develop new species of marine organisms D. To remove CO2 from the atmosphere

2. What is a key advantage of studying volcanic seeps? A. They are easy to access. B. They provide a controlled environment for experiments. C. They offer insights into how ecosystems might adapt to future acidification. D. They are not affected by ocean acidification.

3. What was the Paleocene-Eocene Thermal Maximum (PETM)? A. A period of intense volcanic activity B. A major extinction event in the deep sea C. A time of rapid global cooling D. A period of high biodiversity

4. According to the author, what is the ultimate goal of ocean acidification research? A. To publish academic papers B. To secure funding for future projects C. To inform policy and management decisions D. To create new tourist attractions

Questions 24-26

Complete the sentences below.

Choose **NO MORE THAN THREE WORDS** from the passage for each answer.

Write your answers in boxes 24-26 on your answer sheet.

1. The study of ocean acidification involves a _______________ army of scientists from various disciplines.
2. Laboratory experiments have provided invaluable insights into the _______________ by which ocean acidification affects marine life.
3. The fossil record from the PETM offers a _______________ into the potential consequences of our current path.

READING PASSAGE 3

You should spend about 20 minutes on **Questions 27-40**, which are based on Reading Passage 3 below.

Navigating the Future: Charting a Course Against Ocean Acidification

The specter of ocean acidification looms large over the future of our planet's marine ecosystems. Having established the causes and consequences of this profound chemical imbalance, the global community now faces the critical task of formulating and implementing effective solutions. The challenge is monumental, demanding a multifaceted approach that combines aggressive mitigation of the root cause with innovative strategies for adaptation. While the path forward is fraught with difficulty, a combination of technological innovation, ecosystem stewardship, and international cooperation offers a beacon of hope in the fight to preserve our oceans.

The cornerstone of any meaningful strategy to combat ocean acidification is the drastic reduction of carbon dioxide emissions. This is the only solution that addresses the fundamental driver of the problem. The Paris Agreement, a landmark international accord, represents a global commitment to this goal, aiming to limit global warming by transitioning away from fossil fuels towards renewable energy sources such as solar, wind, and geothermal power. Beyond international policy, individual and corporate actions, including reducing energy consumption, adopting sustainable practices, and investing in green technologies, play a crucial role in this collective effort. However, the inertia of the global energy system and the long lifespan of CO_2 in the atmosphere mean that even with immediate and substantial emission cuts, the ocean will continue to acidify for some time.

Given the slow-moving nature of climate mitigation, there is growing interest in geoengineering techniques designed to actively counteract acidification. One such proposal involves "ocean alkalinization," where large quantities of alkaline substances, such as olivine or limestone, are added to the ocean to increase its buffering capacity and raise its pH. Another concept is ocean fertilization, which aims to stimulate large-scale phytoplankton blooms to draw down atmospheric CO_2. While these approaches are theoretically promising, they are also fraught with uncertainty and potential unintended consequences. The ecological risks of altering ocean chemistry on a massive scale are poorly understood, and there are significant logistical and financial hurdles to overcome. Consequently, most scientists view geoengineering as a potential last resort, not a substitute for emissions reduction.

In parallel with mitigation efforts, strategies for adaptation are essential to help marine ecosystems and the human communities that depend on them cope with the inevitable changes. A key approach is to bolster the resilience of marine ecosystems by reducing other stressors, such as overfishing, pollution, and habitat destruction. The establishment of Marine Protected Areas (MPAs) can provide safe havens for marine life, allowing ecosystems to recover and better withstand the pressures of acidification. For the aquaculture and fishing industries, adaptation may involve selectively breeding species that are more tolerant of acidic conditions or shifting to the cultivation of species, like seagrass and certain types of algae, that may actually benefit from higher CO_2 levels.

A particularly promising avenue for both mitigation and adaptation lies in the concept of "blue carbon." This refers to the carbon sequestered in coastal and marine ecosystems, primarily mangroves, seagrass meadows, and salt marshes. These ecosystems are incredibly efficient at capturing and storing carbon, locking it away in their biomass and the sediment below. Protecting and restoring these vital habitats not only helps to mitigate climate change by removing CO_2 from the atmosphere but also provides a local buffer against acidification. The photosynthesis carried out by these plants absorbs dissolved CO_2 from the water, creating a localized area of higher pH that can serve as a refuge for vulnerable organisms.

The journey to a healthier ocean is a long and arduous one. The scale of the challenge is unprecedented, and there is no single, easy solution. It requires a sustained and coordinated global effort, underpinned by robust scientific research and a shared sense of responsibility. While the future of our oceans remains uncertain, the growing awareness of the threat of acidification and the burgeoning portfolio of potential solutions provide a glimmer of hope. By charting a course that integrates ambitious emissions reductions with proactive adaptation and ecosystem restoration, we can navigate the turbulent waters ahead and work towards a future where both humanity and marine life can thrive.

Questions 27-32

Do the following statements agree with the claims of the writer in Reading Passage 3?

In boxes 27-32 on your answer sheet, write

YES if the statement agrees with the claims of the writer **NO** if the statement contradicts the claims of the writer **NOT GIVEN** if it is impossible to say what the writer thinks about this

1. The writer believes that ocean acidification is the most significant environmental problem of our time.
2. Reducing carbon emissions is the only strategy that tackles the root cause of ocean acidification.
3. The writer is confident that geoengineering will be a safe and effective solution.
4. The resilience of marine ecosystems can be improved by reducing other environmental pressures.
5. The writer suggests that the fishing industry is doomed to collapse due to ocean acidification.
6. Protecting “blue carbon” ecosystems offers benefits for both climate change mitigation and adaptation.

Questions 33-36

Choose the correct letter, **A, B, C** or **D**.

Write the correct letter in boxes 33-36 on your answer sheet.

1. What is the main focus of the Paris Agreement? A. To promote geoengineering techniques B. To establish more Marine Protected Areas C. To limit global warming by reducing emissions D. To fund research into ocean alkalinization
2. What is a major concern associated with geoengineering techniques? A. Their high cost B. Their potential for unintended ecological consequences C. The lack of international support D. Their ineffectiveness in reducing acidity
3. What is “blue carbon”? A. A type of renewable energy B. A species of algae that thrives in acidic water C. Carbon that is sequestered in coastal and marine ecosystems D. A new type of fishing vessel
4. What is the overall tone of the passage? A. Hopelessly pessimistic B. Cautiously optimistic C. Completely neutral D. Overly enthusiastic

Questions 37-40

Complete the notes below.

Choose **NO MORE THAN TWO WORDS** from the passage for each answer.

Write your answers in boxes 37-40 on your answer sheet.

Strategies to Combat Ocean Acidification

- **Mitigation:**
    - The primary strategy is the reduction of **37. carbon emissions**.
    - Geoengineering is considered a **38. last resort** due to the risks involved.
- **Adaptation:**
    - Increase ecosystem resilience by reducing stressors like **39. overfishing** and pollution.
    - Protect and restore “blue carbon” habitats, which can provide a **40. local buffer** against acidification.

LISTENING SECTION (40 questions)

SECTION 1 Questions 1-10

Complete the form below.

Write **ONE WORD AND/OR A NUMBER** for each answer.

University of Oceanview Course Enrollment Form

Course: Introduction to Ocean Acidification **Course Code:** 1 _______________
Student Name: Sarah Jenkins

Contact Information:

- **Email:** s.jenkins@email.com
- **Phone:** 2 _______________

Reason for Enrollment:

- Wants to learn more about the impact of climate change on the 3 _______________
- Considering a career in marine conservation.

Course Details:

- **Lecturer:** Dr. Evelyn Reed
- **Day:** 4 _______________
- **Time:** 2:00 PM - 4:00 PM
- **Location:** Building 5, Room 6 _______________

Required Materials:

- Textbook: “The Acidic Ocean” by Dr. Reed
- Lab coat (available at the university 7 _______________)

Assessment:

- Mid-term exam (8 _______________)
- Final project (40%)
- Weekly quizzes (20%)

Additional Notes:

- The first lecture will be on the 9 _______________ of September.
- Students should bring a notebook and a 10 _______________ to the first class.

SECTION 2 Questions 11-20

Questions 11-15

Choose the correct letter, **A, B** or **C**.

1. The main purpose of the Seaview Marine Conservation Centre is to A. entertain tourists. B. protect and rehabilitate marine life. C. conduct scientific research.

2. What is the biggest threat to the coral reef at Seaview? A. Overfishing B. Pollution C. Ocean acidification

3. The ‘Coral Guardians’ program allows visitors to A. adopt a coral. B. go diving in the reef. C. work as a volunteer at the centre.

4. The centre’s sea turtle rehabilitation program has been running for A. five years. B. ten years. C. fifteen years.

5. What is the main food source for the sea turtles at the centre? A. Fish B. Seaweed C. Jellyfish

Questions 16-20

Which feature is associated with each of the following areas of the Seaview Marine Conservation Centre?

Choose **FIVE** answers from the box and write the correct letter, **A-G**, next to questions 16-20.

Areas of the Centre

1. The Reef Tank ________________
2. The Turtle Sanctuary ________________
3. The Mangrove Forest ________________
4. The Discovery Lab ________________
5. The Ocean Theatre ________________

Features

A. Interactive displays B. Daily feeding shows C. A 3D documentary D. A breeding program for endangered species E. A unique underwater viewing tunnel F. A special exhibition on plastic pollution G. A guided tour with a marine biologist

SECTION 3 Questions 21-30

Choose the correct letter, **A, B** or **C**.

1. What is the main topic of the students' research project? A. The impact of ocean acidification on coral reefs B. The effect of ocean acidification on the behavior of clownfish C. The role of seagrass in mitigating ocean acidification
2. What was the most surprising finding from their experiment? A. The clownfish were not affected by the acidic water. B. The clownfish became more aggressive in the acidic water. C. The clownfish had difficulty finding their way back to their anemone.
3. What was the main limitation of their study? A. The small sample size B. The short duration of the experiment C. The lack of a control group
4. Dr. Evans suggests that for their next experiment, the students should A. use a different species of fish. B. increase the level of acidity in the water. C. focus on the long-term effects of acidification.
5. What is the students' hypothesis for their next experiment? A. That clownfish can adapt to more acidic conditions over time. B. That the offspring of clownfish exposed to acidic water will be more tolerant. C. That the anemones will also be affected by the acidic water.
6. How do the students plan to measure the clownfish's tolerance? A. By observing their behavior B. By measuring their growth rate C. By analyzing their DNA
7. What is the main challenge the students anticipate for their next experiment? A. Obtaining the necessary equipment B. Finding a suitable location C. Keeping the fish alive for a long period of time
8. Dr. Evans recommends that the students read a paper by A. Dr. Williams. B. Dr. Chen. C. Dr. Garcia.
9. What is the main focus of the recommended paper? A. The genetic basis of tolerance to ocean acidification B. The impact of ocean acidification on the entire coral reef ecosystem C. The use of new technologies to study ocean acidification

10. What will the students do next? A. Write up their research proposal B. Start their next experiment C. Present their findings at a conference

SECTION 4 Questions 31-40

Complete the notes below.

Write **ONE WORD ONLY** for each answer.

The Economic Impacts of Ocean Acidification

Introduction

- Ocean acidification is not just an environmental problem, but also a significant **31. economic** one.
- The livelihoods of millions of people are at risk.

Impact on Fisheries

- The global fishing industry is worth billions of dollars.
- Ocean acidification threatens the survival of many commercially important species, especially **32. shellfish**.
- The decline of pteropods, a key food source for many fish, could lead to a collapse of some **33. populations**.
- The aquaculture industry is also highly vulnerable.

Impact on Tourism

- Coral reefs are a major draw for tourists in many parts of the world.
- The degradation of coral reefs due to ocean acidification could lead to a significant loss of **34. revenue** for the tourism industry.
- This will have a particularly severe impact on small island nations that are heavily dependent on tourism.

Impact on Coastal Protection

- Healthy coral reefs act as natural barriers, protecting coastlines from storms and **35. erosion**.
- The loss of coral reefs will increase the vulnerability of coastal communities to the impacts of climate change.

- The cost of replacing this natural protection with artificial structures would be enormous.

The Cost of Inaction

- The economic costs of ocean acidification are difficult to predict with certainty, but they are likely to be substantial.
- A recent study estimated that the global cost of inaction could be as high as **36. one** trillion dollars per year by 2100.
- This does not include the non-market values of marine ecosystems, such as their cultural and **37. aesthetic** importance.

The Way Forward

- The most effective way to address the economic impacts of ocean acidification is to reduce carbon emissions.
- We also need to invest in adaptation strategies to help coastal communities build **38. resilience**.
- This includes promoting sustainable fishing practices and protecting and restoring marine habitats.
- The transition to a sustainable "blue economy" can create new opportunities for economic growth and **39. development**.
- This requires a global effort based on science, cooperation, and a shared sense of **40. responsibility**.

WRITING SECTION

WRITING TASK 1

You should spend about 20 minutes on this task.

The line graph below shows the changes in atmospheric CO2 and ocean pH from 1850 to 2020, with projections to 2100.

Summarise the information by selecting and reporting the main features, and make comparisons where relevant.

Write at least 150 words.

(A line graph would be inserted here showing two lines: one for atmospheric CO2, starting low and rising sharply, and another for ocean pH, starting high and decreasing steadily. The x-axis would show the years from 1850 to 2100, and the y-axis would have two scales, one for CO2 concentration in parts per million (ppm) and one for pH.)

WRITING TASK 2

You should spend about 40 minutes on this task.

Write about the following topic:

Ocean acidification is a major threat to marine ecosystems. What are the main causes of this problem? What are some possible solutions?

Give reasons for your answer and include any relevant examples from your own knowledge or experience.

Write at least 250 words.

SPEAKING SECTION

PART 1

- Let's talk about the ocean. Do you like to go to the beach?
- What do you enjoy doing when you're at the seaside?
- Have you ever been on a boat trip?
- Are you concerned about the health of the oceans? Why or why not?
- Do you think it's important to learn about marine life?

PART 2

Describe a time you learned about an environmental problem.

You should say:

- what the problem was
- when and where you learned about it
- what you learned

and explain how you felt about this problem.

PART 3

- What are the most serious environmental problems facing the world today?
- Do you think that individuals can do anything to help solve these problems?
- What role should governments play in protecting the environment?
- Do you think that technology can help us to solve environmental problems?
- Are you optimistic or pessimistic about the future of our planet?

GRAMMAR SECTION (20 questions)

Questions 1-5: Error Correction

Identify the error in each sentence and correct it.

1. The increase in atmospheric CO2 have led to a decrease in the pH of the ocean.
2. Marine organisms, such as corals and shellfish, is particularly vulnerable to the effects of ocean acidification.
3. The scientist, which is a leading expert in the field, will be giving a lecture on ocean acidification tomorrow.
4. The government has implemented a number of policies to reducing carbon emissions.
5. If I would have known about the problem, I would have done something to help.

Questions 6-10: Sentence Transformation

Complete the second sentence so that it has a similar meaning to the first sentence, using the word given. Do not change the word given. You must use between two and five words, including the word given.

1. The ocean is absorbing a large amount of CO2. (BEING) A large amount of CO2 ________________ by the ocean.

2. It is difficult for marine organisms to build their shells in acidic water. (FINDS) Marine organisms ________________ to build their shells in acidic water.

3. The government should do more to protect the oceans. (OUGHT) The government ________________ more to protect the oceans.
4. The last time I went to the beach was a year ago. (BEEN) I ________________ to the beach for a year.
5. “I am very concerned about the future of our planet,” she said. (THAT) She said ________________ very concerned about the future of our planet.

Questions 11-15: Fill in the Blanks

Complete the sentences with the correct form of the verb in brackets, or with an appropriate article or preposition.

1. Ocean acidification ________________ (cause) by the absorption of CO2 from the atmosphere.
2. The pH of the ocean ________________ (decrease) steadily for the past 200 years.
3. I am very interested ________________ learning more about marine biology.
4. We need to find a solution ________________ the problem of plastic pollution.
5. ________________ scientist who discovered the problem was awarded the Nobel Prize.

Questions 16-20: Word Formation

Use the word in capitals to form a word that fits in the gap.

1. The ________________ of the coral reefs is a major concern for scientists. (DESTROY)
2. We need to find more ________________ sources of energy. (SUSTAIN)
3. The ________________ of the oceans is essential for the health of our planet. (PROTECT)
4. Ocean acidification is a ________________ threat to marine life. (SERIOUSLY)
5. The government needs to take ________________ action to address this problem. (DECIDE)

LISTENING SCRIPTS

SECTION 1

(Sound of a phone ringing)

Administrator: Good morning, University of Oceanview, Admissions Office. How can I help you?

Sarah: Hello, my name is Sarah Jenkins. I'd like to enroll in a course.

Administrator: Certainly, Sarah. Which course are you interested in?

Sarah: It's the "Introduction to Ocean Acidification" course.

Administrator: Ah, yes. A very popular choice. Do you have the course code?

Sarah: I'm not sure. I think it's OC101. Is that right?

Administrator: Let me check. Yes, that's it. **OC101**. And your name is Sarah Jenkins. Can I take your contact details?

Sarah: Of course. My email is s.jenkins@email.com and my phone number is **07700 900 852**.

Administrator: Great. And can I ask why you're interested in this course?

Sarah: I want to learn more about the impact of climate change on the **ocean**. I'm also considering a career in marine conservation, so I thought this would be a good introduction.

Administrator: That's wonderful. The course is taught by Dr. Evelyn Reed, one of our leading experts. It's on **Thursday** afternoons, from 2:00 PM to 4:00 PM.

Sarah: Perfect. And where is it held?

Administrator: It's in Building 5, Room **203**.

Sarah: Okay. Are there any required materials?

Administrator: Yes, you'll need the textbook, "The Acidic Ocean," which is written by Dr. Reed herself. You'll also need a lab coat for the practical sessions. You can get one at the university **bookstore**.

Sarah: Right. And how is the course assessed?

Administrator: There's a mid-term exam, which is worth **40%** of the final grade. Then there's a final project, which is also 40%, and the remaining 20% is from weekly quizzes.

Sarah: That sounds fair. Is there anything else I need to know?

Administrator: The first lecture is on the **15th** of September. And for the first class, please bring a notebook and a **pen**.

Sarah: Great. Thank you for your help.

Administrator: You're very welcome. We look forward to seeing you in September.

SECTION 2

Good morning everyone, and welcome to the Seaview Marine Conservation Centre. My name is David, and I'll be your guide for today's tour. Our mission here at Seaview is to **protect and rehabilitate marine life**, and to educate the public about the importance of ocean conservation. We face many challenges in our work, but one of the most significant is the growing problem of ocean acidification. As you'll see during your visit, this invisible threat is having a profound impact on the marine ecosystems we strive to protect, particularly our precious coral reef.

Our first stop is the Reef Tank, which is home to over 200 species of coral and 1,000 species of fish. It's a vibrant and bustling ecosystem, but it's also incredibly fragile. Ocean acidification is making it harder for our corals to build their skeletons, and we're already seeing the effects of this. To help combat this, we've launched our 'Coral Guardians' program, which allows you to **adopt a coral** and contribute to our restoration efforts. You can find out more about this at the information desk.

Next, we'll head to the Turtle Sanctuary. We've been rescuing and rehabilitating sea turtles for **fifteen years**, and we're very proud of the work we do here. Many of the turtles that come to us are suffering from injuries caused by plastic pollution, but we're also seeing an increasing number of cases related to the changing ocean chemistry. The main food source for many of our turtles is **jellyfish**, but the decline in water quality is affecting their availability.

Now, let's take a look at the map of the centre. As you can see, we have a number of different exhibits. The Reef Tank, which we've just seen, features a unique **underwater**

viewing tunnel that gives you a 360-degree view of the reef. The Turtle Sanctuary has daily **feeding shows**, which are very popular with our younger visitors. The Mangrove Forest is home to our breeding program for endangered seahorses. The Discovery Lab is where you'll find our **interactive displays** and our special exhibition on plastic pollution. And finally, the Ocean Theatre is where you can see our award-winning **3D documentary** about the wonders of the deep sea.

We'll be visiting all of these areas on our tour today. If you have any questions, please don't hesitate to ask. Now, if you'll follow me, we'll make our way to the Turtle Sanctuary.

SECTION 3

Dr. Evans: Hi, come in. You must be Maria and Ben. Thanks for coming in to discuss your research project.

Maria: Thanks for seeing us, Dr. Evans.

Ben: We're really excited to get your feedback.

Dr. Evans: So, I've read your proposal, and I think it's a very interesting project. You're planning to investigate the effect of ocean acidification on the behavior of clownfish. Is that right?

Maria: Yes, that's the plan. We've already done a preliminary experiment, and the results were quite surprising.

Dr. Evans: Tell me about it.

Ben: Well, we set up two tanks, one with normal seawater and one with more acidic water. We then introduced a clownfish to each tank and observed their behavior. We expected the clownfish in the acidic water to be less active, but we didn't see any significant difference.

Maria: But what we did find was that the clownfish in the acidic water had **difficulty finding their way back to their anemone**. They seemed to get lost, which was really unexpected.

Dr. Evans: That is interesting. And what do you think is the main limitation of your study?

Ben: I think it's the **short duration of the experiment**. We only observed the fish for a few hours, so we don't know what the long-term effects might be.

Dr. Evans: I agree. For your next experiment, you should definitely focus on the **long-term effects of acidification**. You could also consider looking at the impact on their offspring.

Maria: That's a great idea. Our hypothesis for our next experiment is that the offspring of clownfish exposed to acidic water will be more tolerant. We think there might be some kind of genetic adaptation.

Dr. Evans: An excellent hypothesis. And how do you plan to measure their tolerance?

Ben: We're going to **observe their behavior**, just like in the first experiment. We'll look at things like their activity levels, their ability to find food, and their response to predators.

Dr. Evans: Good. And what do you anticipate will be the main challenge?

Maria: I think it will be **keeping the fish alive for a long period of time**. It's not easy to maintain a stable environment in a laboratory setting.

Dr. Evans: You're right, it's a big challenge. I recommend you read a paper by **Dr. Garcia**. She's done a lot of work in this area, and her paper on the genetic basis of tolerance to ocean acidification is particularly relevant.

Ben: Thank you, we'll definitely look that up.

Dr. Evans: So, what are your next steps?

Maria: We're going to **write up our research proposal** and submit it for ethics approval. Then we can start setting up the experiment.

Dr. Evans: Excellent. I look forward to seeing your results. Keep me updated on your progress.

SECTION 4

Good morning, everyone. In today's lecture, we're going to be discussing the economic impacts of ocean acidification. While we often think of ocean acidification as an environmental problem, it's also a significant **economic** one. The livelihoods of millions of people around the world are directly or indirectly dependent on the health of our oceans, and the changes we’re seeing in ocean chemistry pose a serious threat to their prosperity.

Let’s start with the fishing industry. The global fishing industry is a multi-billion dollar enterprise, and it’s a vital source of food and income for countless coastal communities. Ocean acidification threatens the survival of many commercially important species, particularly **shellfish** like oysters, clams, and mussels. These organisms are the foundation of many fisheries, and their decline could have a devastating impact on the industry. Furthermore, the decline of pteropods, a key food source for many fish, could lead to a collapse of some **populations**, with far-reaching consequences for the entire marine food web.

The tourism industry is also highly vulnerable to the effects of ocean acidification. Coral reefs, with their stunning beauty and biodiversity, are a major draw for tourists in many parts of the world. The degradation of these reefs due to ocean acidification and coral bleaching could lead to a significant loss of **revenue** for the tourism industry. This will have a particularly severe impact on small island nations that are heavily dependent on tourism for their economic survival.

Another often-overlooked economic impact of ocean acidification is its effect on coastal protection. Healthy coral reefs act as natural barriers, protecting coastlines from storms and **erosion**. As these reefs degrade, coastal communities will become more vulnerable to the impacts of climate change, such as sea-level rise and more frequent and intense storms. The cost of replacing this natural protection with artificial structures, such as seawalls, would be enormous.

The economic costs of inaction are difficult to predict with certainty, but they are likely to be substantial. A recent study estimated that the global cost of inaction could be as high as **one** trillion dollars per year by 2100. And this figure doesn’t even include the non-market values of marine ecosystems, such as their cultural and **aesthetic** importance.

So, what can we do? The most effective way to address the economic impacts of ocean acidification is to reduce carbon emissions. But we also need to invest in adaptation strategies to help coastal communities build **resilience**. This includes promoting sustainable fishing practices, protecting and restoring marine habitats, and developing new technologies for monitoring and mitigating the effects of acidification. The transition to a sustainable “blue economy” can create new opportunities for economic growth and **development**, but it requires a global effort based on science, cooperation, and a shared sense of **responsibility**.

ANSWER KEY

READING SECTION

1. NOT GIVEN
2. TRUE
3. FALSE
4. FALSE
5. FALSE
6. FALSE
7. C
8. C
9. C
10. B
11. carbonate ions
12. sensory abilities
13. sea butterflies
14. E
15. B
16. F
17. D
18. A
19. C
20. B
21. C
22. B
23. C

24. multidisciplinary
25. mechanisms
26. sobering glimpse
27. NOT GIVEN
28. YES
29. NO
30. YES
31. NO
32. YES
33. C
34. B
35. C
36. B
37. carbon emissions
38. last resort
39. overfishing
40. local buffer

LISTENING SECTION

1. OC101
2. 07700900852
3. ocean
4. Thursday
5. 203
6. bookstore
7. 40%
8. 15th
9. pen
10. B

11. C
12. A
13. C
14. B
15. E
16. B
17. D
18. A
19. C
20. B
21. C
22. B
23. C
24. B
25. A
26. C
27. C
28. A
29. A
30. economic
31. shellfish
32. populations
33. revenue
34. erosion
35. one
36. aesthetic
37. resilience
38. development
39. responsibility

GRAMMAR SECTION

1. have -> has
2. is -> are
3. which -> who
4. to reducing -> to reduce
5. would have known -> had known
6. is being absorbed
7. finds it difficult
8. ought to do
9. have not been
10. that she was
11. is caused
12. has been decreasing
13. in
14. to
15. The
16. destruction
17. sustainable
18. protection
19. serious
20. decisive

TUTOR GUIDE

MODEL ANSWER FOR WRITING TASK 1

The line graph illustrates the relationship between atmospheric CO2 concentrations and ocean pH levels from 1850 to 2020, with projections extending to 2100. Overall, the graph indicates a clear inverse correlation between the two variables, with rising CO2 levels corresponding to a decrease in ocean pH.

From 1850 to around 1950, atmospheric CO2 levels remained relatively stable at approximately 280 ppm, while ocean pH hovered around 8.15. However, the latter half of the 20th century saw a dramatic increase in CO2 concentration, which climbed to over 400 ppm by 2020. During this same period, ocean pH began a steady decline, falling to just below 8.1.

The projections for the remainder of the 21st century show these trends continuing at an accelerated rate. By 2100, atmospheric CO2 is expected to reach approximately 950 ppm, while ocean pH is projected to fall to around 7.7. This represents a significant increase in ocean acidity over a relatively short period of time.

In conclusion, the data presented in the graph highlights the profound impact of rising atmospheric CO2 on the chemistry of the ocean. The projected changes suggest that ocean acidification is a serious and escalating problem that will have significant consequences for marine ecosystems.

MODEL ESSAY FOR WRITING TASK 2 (BAND 9 LEVEL)

Ocean acidification, a direct consequence of anthropogenic carbon emissions, poses a grave and escalating threat to the delicate equilibrium of marine ecosystems. This essay will explore the principal causes of this phenomenon and delineate some of the most viable solutions to mitigate its impact. The primary driver of ocean acidification is the absorption of excess carbon dioxide from the atmosphere by the world's oceans. The combustion of fossil fuels for energy, industrial processes, and transportation, coupled with widespread deforestation, has led to an unprecedented increase in atmospheric CO2 concentrations. The ocean, acting as a vast carbon sink, absorbs a significant portion of these emissions, triggering a chemical reaction that lowers the pH of the seawater and reduces the availability of carbonate ions. This has profound implications for a wide range of marine organisms, particularly those that rely on calcium carbonate to build their shells and skeletons, such as corals, crustaceans, and mollusks.

Addressing this complex challenge necessitates a multifaceted approach that combines aggressive mitigation of the root cause with proactive adaptation strategies. The most critical and effective solution is a rapid and decisive global transition away from fossil fuels towards renewable energy sources. International agreements, such as the Paris Agreement, provide a framework for this transition, but their success hinges on the unwavering commitment of all nations to implement and strengthen their emission reduction targets. In addition to large-scale policy changes, individual and corporate actions, such as reducing energy consumption, adopting sustainable practices, and investing in green technologies, are indispensable components of the collective effort.

Furthermore, bolstering the resilience of marine ecosystems is a crucial complementary strategy. This can be achieved by reducing other anthropogenic stressors, such as overfishing, pollution, and habitat destruction. The establishment and effective management of Marine Protected Areas can provide vital refuges for marine life, allowing ecosystems to recover and better withstand the pressures of acidification. Moreover, the protection and restoration of "blue carbon" ecosystems, such as mangroves, seagrass meadows, and salt marshes, offer a powerful nature-based solution. These habitats are not only incredibly efficient at sequestering carbon but also create localized areas of higher pH, providing a buffer against the corrosive effects of acidification.

In conclusion, while the challenge of ocean acidification is daunting, it is not insurmountable. A concerted and sustained global effort to reduce carbon emissions, coupled with a commitment to protecting and restoring the resilience of our marine ecosystems, offers a viable path forward. By embracing a future powered by clean energy and guided by a deep respect for the intricate web of life that sustains us, we can hope to preserve the health and vitality of our oceans for generations to come.

SPEAKING PART 2 SAMPLE RESPONSE

I remember first learning about the problem of ocean acidification during a university lecture in my first year of studying marine biology. The professor, a passionate and knowledgeable woman, dedicated an entire lecture to what she called "the other CO2 problem." Before that, I had always associated rising CO2 levels with global warming, but I had never considered the direct impact it was having on the chemistry of the ocean.

During the lecture, she explained the chemical process in a way that was easy to understand, using diagrams and animations to illustrate how CO2 dissolves in seawater to form carbonic acid. She showed us images of pteropod shells dissolving in acidic water and explained the devastating impact this was having on the marine food web. She also talked about the effect on coral reefs, showing us before-and-after pictures of vibrant, colorful reefs that had been reduced to barren, white skeletons.

I was shocked and deeply saddened by what I learned that day. It felt like a silent and invisible threat that was slowly but surely destroying the underwater world I was so passionate about. I felt a sense of anger and frustration that this was happening and that so few people seemed to be aware of it. That lecture was a turning point for me. It solidified my desire to pursue a career in marine conservation and to dedicate my life to protecting the oceans. It made me realize that the problems facing our planet are complex and interconnected, and that we all have a role to play in finding solutions.

KEY VOCABULARY LIST

1. **Acidification:** The process of becoming more acidic.
2. **Anthropogenic:** Caused or produced by humans.
3. **Bicarbonate:** A salt of carbonic acid.
4. **Biodiversity:** The variety of life in the world or in a particular habitat or ecosystem.
5. **Calcification:** The process of depositing calcium carbonate.
6. **Carbonate:** A salt of carbonic acid.
7. **Crustacean:** An arthropod of the large, mainly aquatic group Crustacea, such as a crab, lobster, shrimp, or barnacle.
8. **Deforestation:** The clearing of trees, transforming a forest into cleared land.
9. **Ecosystem:** A biological community of interacting organisms and their physical environment.
10. **Geoengineering:** The deliberate large-scale manipulation of an environmental process that affects the Earth's climate, in an attempt to counteract the effects of global warming.
11. **Mitigation:** The action of reducing the severity, seriousness, or painfulness of something.
12. **Mollusk:** An invertebrate of a large phylum that includes snails, slugs, mussels, and octopuses.
13. **pH scale:** A scale used to specify the acidity or basicity of an aqueous solution.
14. **Phytoplankton:** Microscopic marine algae.
15. **Pteropod:** A small, free-swimming pelagic snail.
16. **Resilience:** The capacity to recover quickly from difficulties; toughness.
17. **Sequestration:** The action of taking legal possession of assets until a debt has been paid or other claims have been met.

18. **Stressor:** Something that causes a state of strain or tension.
19. **Susceptible:** Likely or liable to be influenced or harmed by a particular thing.
20. **Vulnerable:** Exposed to the possibility of being attacked or harmed, either physically or emotionally.