Year 11 Science: A science idea in Aotearoa: carbon dioxide and a more acidic ocean

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Your turn: an exam-style question

Use this lesson as your resource. Focus on two features: responding to needs and opportunities, and repeatable, checkable data.

1. Give one example of a need or an opportunity that helped start the Baring Head record. (Achieved)

2. Give one way the Baring Head team made their data repeatable and checkable. (Achieved)

3. Why was repeatable, checkable data significant for this idea? (Merit)

4. How did needs and opportunities and repeatable data work together to develop the idea? (Excellence)

Fix the mistake

5. Correct this statement: "The pH only fell from 8.09 to 8.06, so the ocean has hardly changed."

6. Correct this statement: "The ocean is becoming acidic, so its pH is now below 7."

7. Correct this statement: "Baring Head proves that the ocean is acidifying."

8. Correct this statement: "Existing models: Dr Currie used her earlier pH readings."

Answer key (for parents and tutors)

1. Give one example of a need or an opportunity that helped start the Baring Head record. (Achieved)
   Opportunity: Keeling wanted a Southern Hemisphere record to match Mauna Loa, and New Zealand scientists took up that chance (the need was to find out whether rising CO_2 was global).
2. Give one way the Baring Head team made their data repeatable and checkable. (Achieved)
   They kept only readings from steady southerly winds, and checked the analyser against reference gases so readings from different years can be compared.
3. Why was repeatable, checkable data significant for this idea? (Merit)
   CO_2 rises by only about 1.3 to 2.4 ppm a year, so without identical, checked methods over fifty years the trend could not be told apart from measurement error, and other stations could not compare their numbers with it.
4. How did needs and opportunities and repeatable data work together to develop the idea? (Excellence)
   The need for a southern record gave the reason to build a station and keep it running; that commitment made it possible to collect consistent data for decades; the long, repeatable record then showed a speeding-up rise, which created a new need, to find out where the CO_2 goes, and so led to measuring the ocean at Munida. Each feature fed the other.
5. Correct this statement: "The pH only fell from 8.09 to 8.06, so the ocean has hardly changed."
   pH is a log scale, so that small drop is an 8.6% rise in hydrogen ions over 23 years, which is a real change for shell-building animals.
6. Correct this statement: "The ocean is becoming acidic, so its pH is now below 7."
   Seawater is still basic, around pH 8.06; acidification means the pH is falling towards 7, not that it has passed it.
7. Correct this statement: "Baring Head proves that the ocean is acidifying."
   Baring Head measures CO_2 in the air; the ocean evidence comes from sampling the sea, such as the Munida Transect, and evidence supports an idea rather than proving it.
8. Correct this statement: "Existing models: Dr Currie used her earlier pH readings."
   An existing model is an accepted idea, here that dissolved CO_2 forms carbonic acid; earlier readings from the same study are part of the data, not a model.