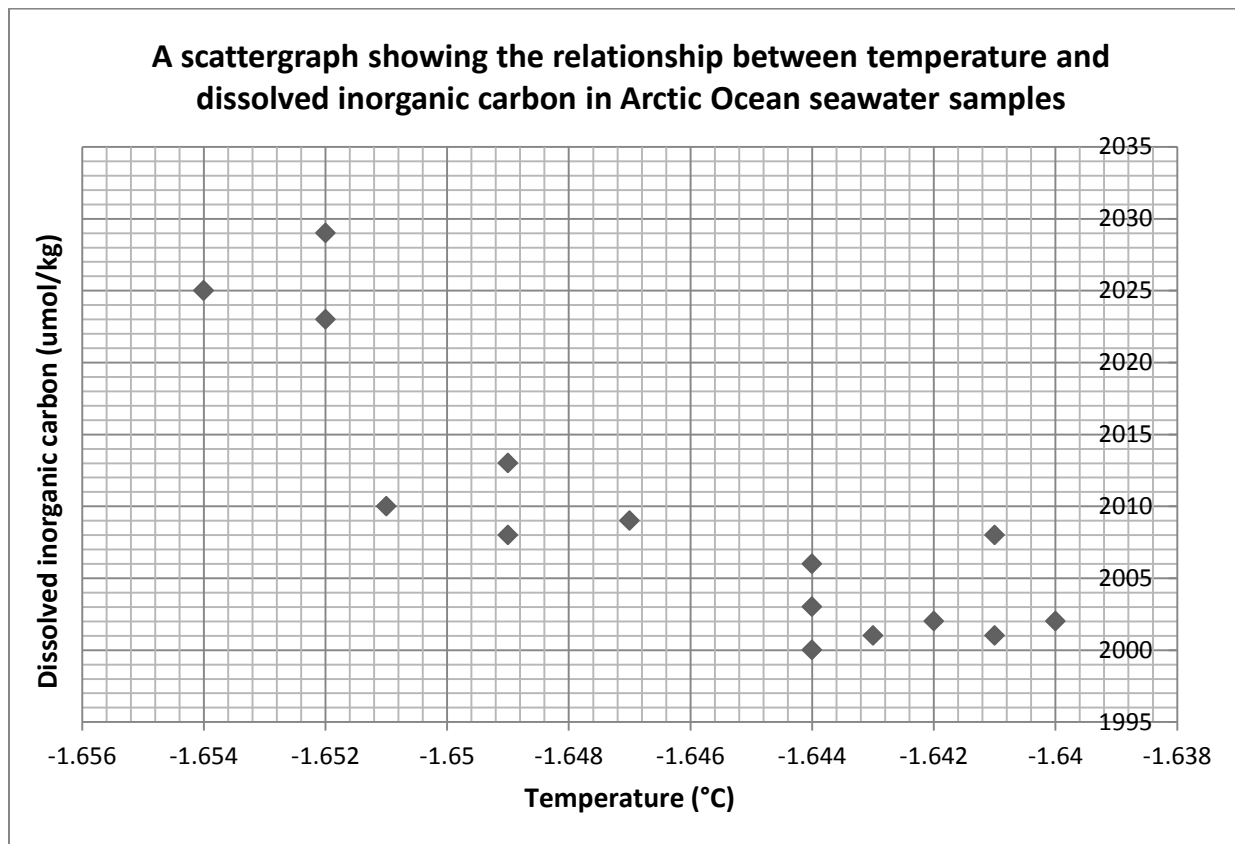


Ocean Acidification sample exam question

Answer **all** questions

- 1 (a) Study **Figure 1**, a scattergraph which shows the relationship between the temperature and dissolved carbon content of seawater samples collected in the Arctic Ocean.

**Figure 1**



- 1 (a) (i) Complete the scattergraph by adding the following data

Sample date	Temperature (°C)	Dissolved inorganic carbon (umol/kg)
04/04/10	-1.646	2007
10/04/10	-1.645	2010
16/04/10	-1.652	2018
22/04/10	-1.650	2024

(4 marks)

1 (a) (ii) Draw a best-fit line on the graph to show the trend between the two sets of data.  
(1 mark)

1 (a) (iii) Describe the relationship between the two sets of variables, as indicated by the scattergraph in **Figure 1**.

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(3 marks)

The next step when investigating the correlation between two variables is to use statistical testing to determine the validity and strength of the relationship.

1 (a) (iv) Write a hypothesis for this dataset that you could investigate through statistical testing.

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(2 marks)

**Question 1 continues on the next page**

1 (b) Study **Figure 2** below. This table sets out the preliminary workings for a Spearman's Rank Correlation Coefficient calculation.

**Figure 2**

Sample date	Temperature (°C)	Rank	Dissolved inorganic carbon (umol/kg)	Rank	<i>d</i>	<i>d</i> <sup>2</sup>
17/03/10	-1.644	7	2003	15	8	64
19/03/10	-1.644	7	2000	19	12	144
21/03/10	-1.644	7	2006	14	7	49
23/03/10	-1.643	5	2001	18.5	13.5	182.25
25/03/10	-1.641	2.5	2001	18.5	16	256
27/03/10	-1.640	1	2002	16.5	15.5	240.25
29/03/10	-1.641	2.5	2008	11.5	9	81
31/03/10	-1.642	4	2002	16.5	12.5	156.25
02/04/10	-1.647	11	2009	10	-1	1
04/04/10	-1.646	10	2007	13	3	9
06/04/10	-1.649	12.5	2013	7	-5.5	30.25
08/04/10	-1.649	12.5	2008	11.5	-1	1
10/04/10	-1.645	9	2010	8.5	-0.5	0.25
12/04/10	-1.651	15	2010	8.5	-6.5	42.25
14/04/10	-1.652	17	2023	5	-12	144
16/04/10	-1.652	17	2018	6	-11	121
18/04/10	-1.652	17	2029	1	-16	256
20/04/10	-1.654	19.5	2025	2.5	-17	289
22/04/10	-1.650	14	2024	4	-10	100
24/04/10	-1.654	19.5	2025	2.5	-17	289

1 (b) (i) Using the formula  $r = 1 - \frac{6\sum d^2}{n^3 - n}$  (where *n* = the number of samples) calculate the Spearman's Rank Correlation Coefficient for this data set. Show your workings in the box below and give your answer to two decimal places. (5 marks)

*r* = .....

1 (b) (ii) Explain how you would establish the significance of the correlation between water temperature and dissolved carbon content.

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*(4 marks)*

**Question 1 continues on the next page**

1 (b) (iii) Use your knowledge of the process of ocean acidification to explain the significance of a correlation between water temperature and dissolved carbon content in the Arctic Ocean.

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*(6 marks)*

*(Extra space)* .....

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**END OF QUESTION**

Total marks: 25