Results 1 = 6/6 marks

3. Results

3.1 Replicate 1

Figure 3.0 shows the averages and standard deviations for the absorbance readings of the solution as the ethanol concentration increased.

Ethanol concentration (%)	**Absorbance Reading**	
	Average	Standard Deviation
0	0.52	0.05
10	0.60	0.03
20	0.57	0.02
30	0.62	0.01
40	0.55	0.06
50	0.54	0.02

Figure 3.0

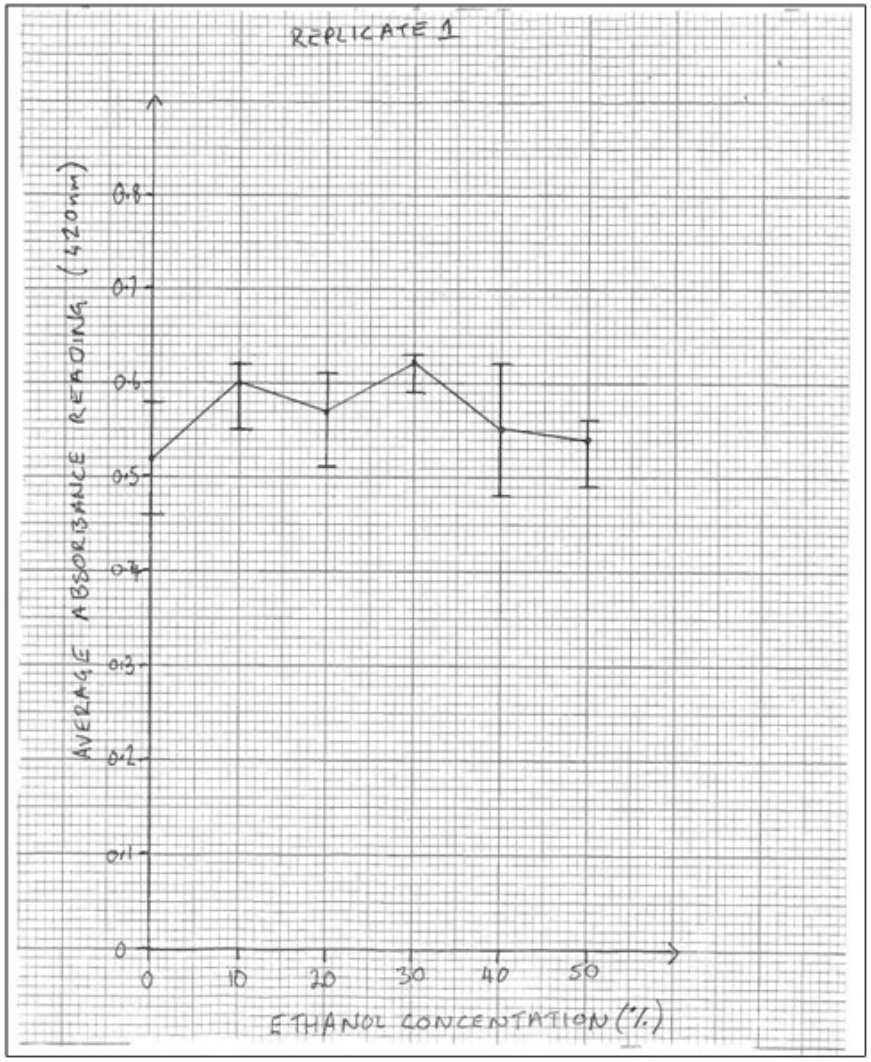
As the ethanol concentration increased from 0 - 50% the absorbance readings fluctuate with no significant trend. There is no visible correlation between ethanol concentration and amylase activity.

Average standard deviation value: 0.0334

Calculation :

Sample calculation for standard deviations is found in the appendix.

Figure 3.1 shows how the absorbance values vary as the ethanol concentration was increased throughout replicate 1.



Results 1 = 6/6 marks

3.2 Replicate 2

Figure 3.2 shows how increasing the alcohol concentration affects the absorbance of the solution

Ethanol concentration (%)	Absorbance Readings	
	Average	Standard Deviation
0	0.65	0.07
10	0.63	0.04
20	0.64	0.07
30	0.59	0.04
40	0.57	0.05
50	0.61	0.05

Figure 3.2

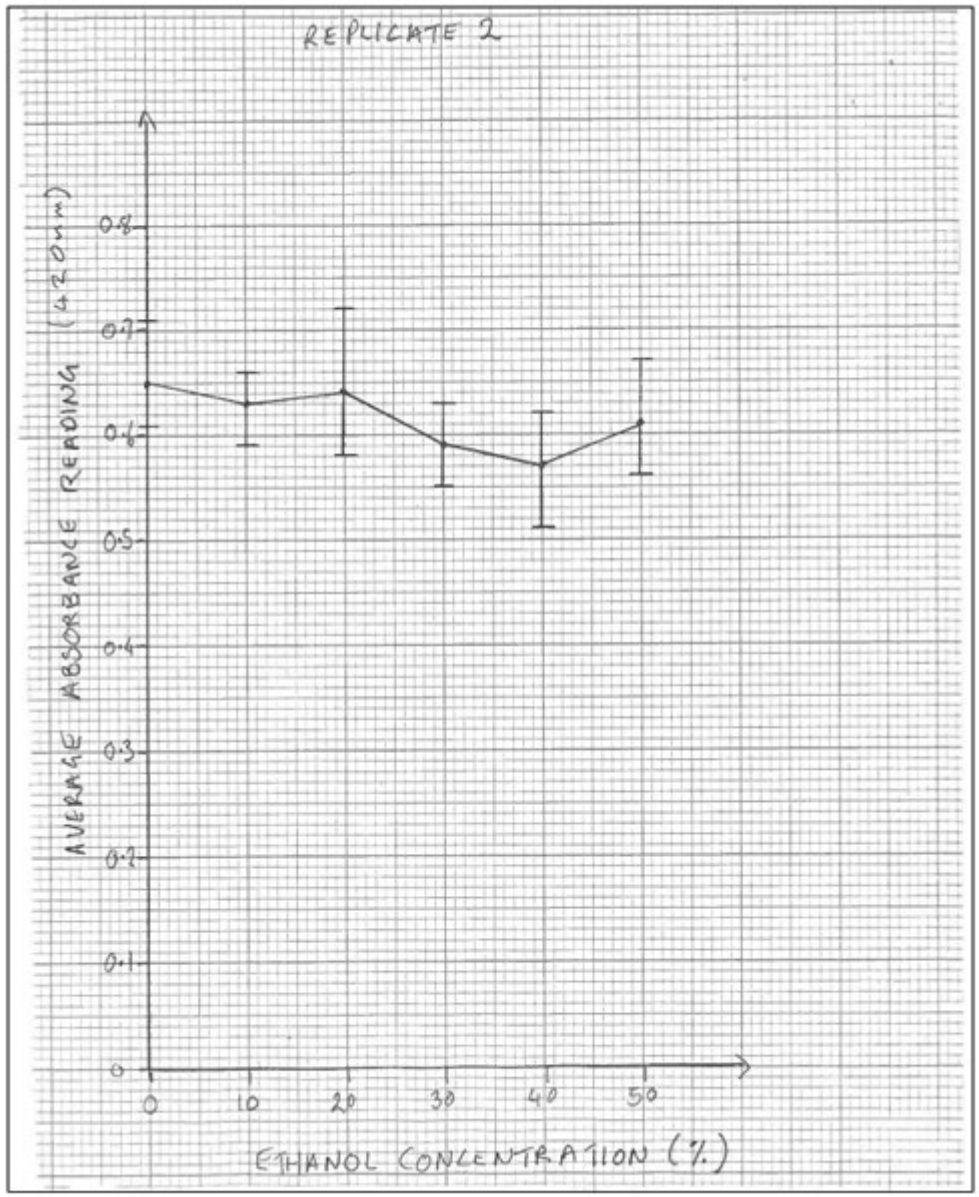
Again as the ethanol concentration increased from 0 - 50% the absorbance readings fluctuated throughout representing no correlation between ethanol concentration and absorbance readings.

Average standard deviation: 0.0512

Calculation:

See sample calculation carried out for replicate 1.

Figure 3.3 shows graphically how the absorbance values vary as the ethanol concentration is increased in replicate 2.



Results 1 = 6/6 marks

3.3 Average across replicate 1 and 2

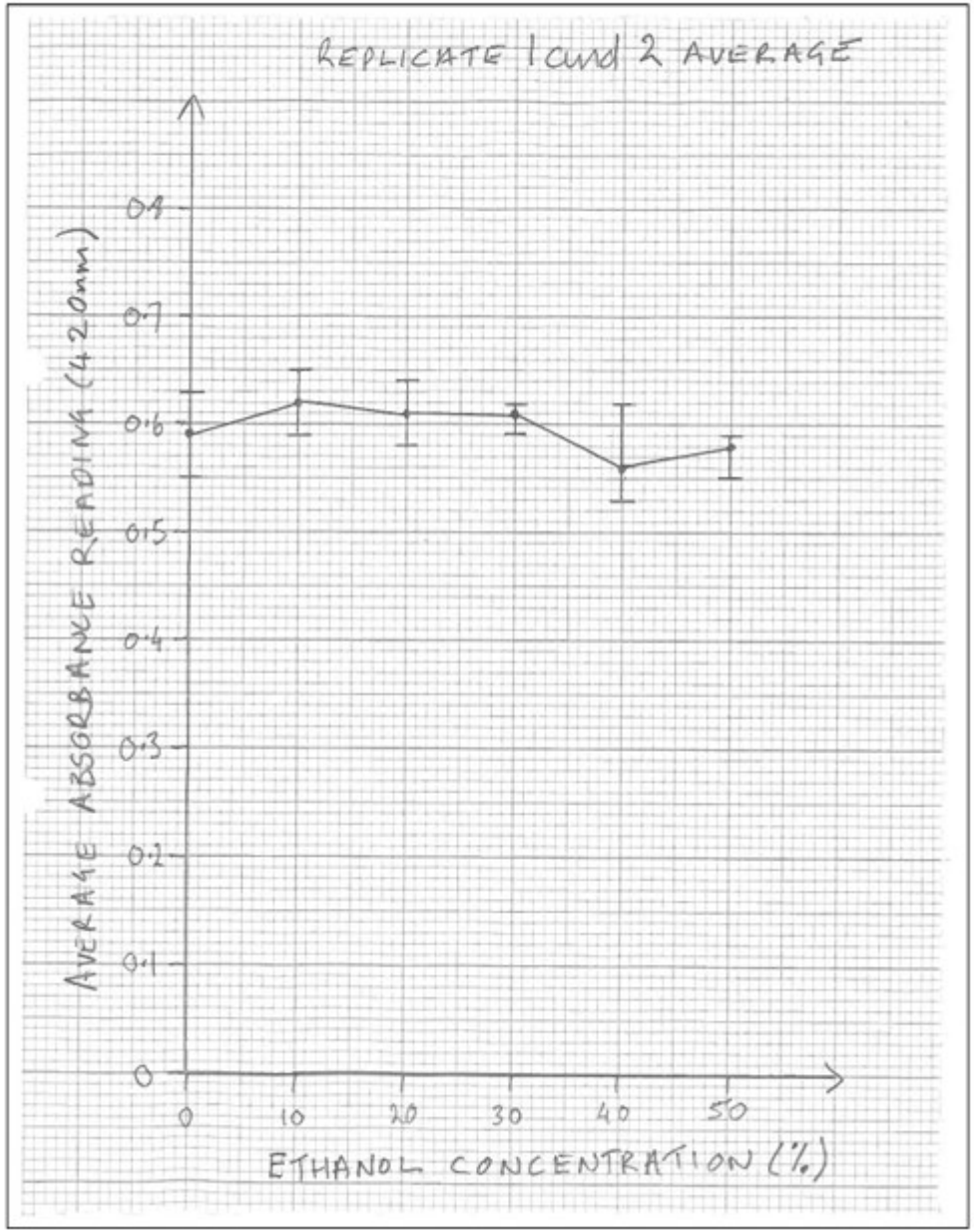
Figure 3.4 combines the results from replicate 1 and 2 creating overall absorbance readings across both replicates

Concentration of ethanol (%)	Average absorbance across replicate 1 and 2	
	Overall average	Standard deviation
0	0.59	0.04
10	0.62	0.03
20	0.61	0.03
30	0.61	0.01
40	0.56	0.04
50	0.58	0.02

Figure 3.4

Figure 3.4 shows no visible trend corresponding between the absorbance values and concentration of ethanol used.

Figure 3.5 shows the average absorbance readings graphically from figure 3.4.



Results 1 = 6/6 marks

6. Appendix

6.1 Replicate 1

Ethanol concentration (%)	Absorbance Reading					
	Repeat				Average	Standard deviation
	1	2	3	4		
0%	0.49	0.46	0.54	0.58	0.52	0.05
10%	0.59	0.62	0.62	0.55	0.60	0.03
20%	0.57	0.59	0.51	0.61	0.57	0.02
30%	0.59	0.62	0.63	0.63	0.62	0.01
40%	0.62	0.51	0.48	0.58	0.55	0.06
50%	0.54	0.55	0.49	0.56	0.54	0.02

Figure 6.0

6.2 Replicate 2

Ethanol concentration (%)	Absorbance Readings					
	Repeat				Average	Standard deviation
	1	2	3	4		
0	0.61	0.65	0.71	0.62	0.65	0.066
10	0.59	0.67	0.65	0.61	0.63	0.037
20	0.58	0.59	0.72	0.66	0.64	0.066
30	0.63	0.62	0.55	0.56	0.59	0.041
40	0.62	0.57	0.58	0.51	0.57	0.050
so	0.56	0.62	0.67	0.59	0.61	0.047

Figure 6.1

Results (6 marks)		
(a) Data is relevant to the aim(s).	1/1	
(b) Raw data is recorded and within the limits of accuracy of measurement.	1/1	The raw data is provided in the appendix. The data is within the limits of accuracy of the measuring instrument.
(c) Results presented appropriately.	1/1	The tables and line graphs are appropriate for the data.
(d) Overall results calculated and presented.	1/1	Overall average values have been calculated and presented as a graph (figure 3.5) and supported by an appropriate table (figure 3.4).
(e) Presentation of tables and graphs is correct and accurate. ♦ Tables are of sufficient quality - headings/units and correct mean/average values.	1/1	The table headings are clear and the units are correct. Units are not required for absorbance readings. The mean values are calculated correctly. All three tables (figures 3.0, 3.2 & 3.4) could have been combined to present the data.
♦ Graphs are of sufficient quality - scales/labels/units/clarity and accuracy of plotting.	1/1	Scales, labels and units are correct. The mean values are plotted accurately. The range bars are not considered at this point.
		6/6

Results 2 = 5/6 marks

Results

Investigation - Final Results Table

Temperature (°C)	Average Cirral Beating Rate (bpm)
5	11
10	13
15	21
20	22
25	31

It can be observed from the investigation results that as temperature is increased, the average cirral beating rate also increases due to less dissolved oxygen in the water and the barnacle requiring more due to an increase in activity of enzymes and metabolism.

Independent Replicate - Final Results Table

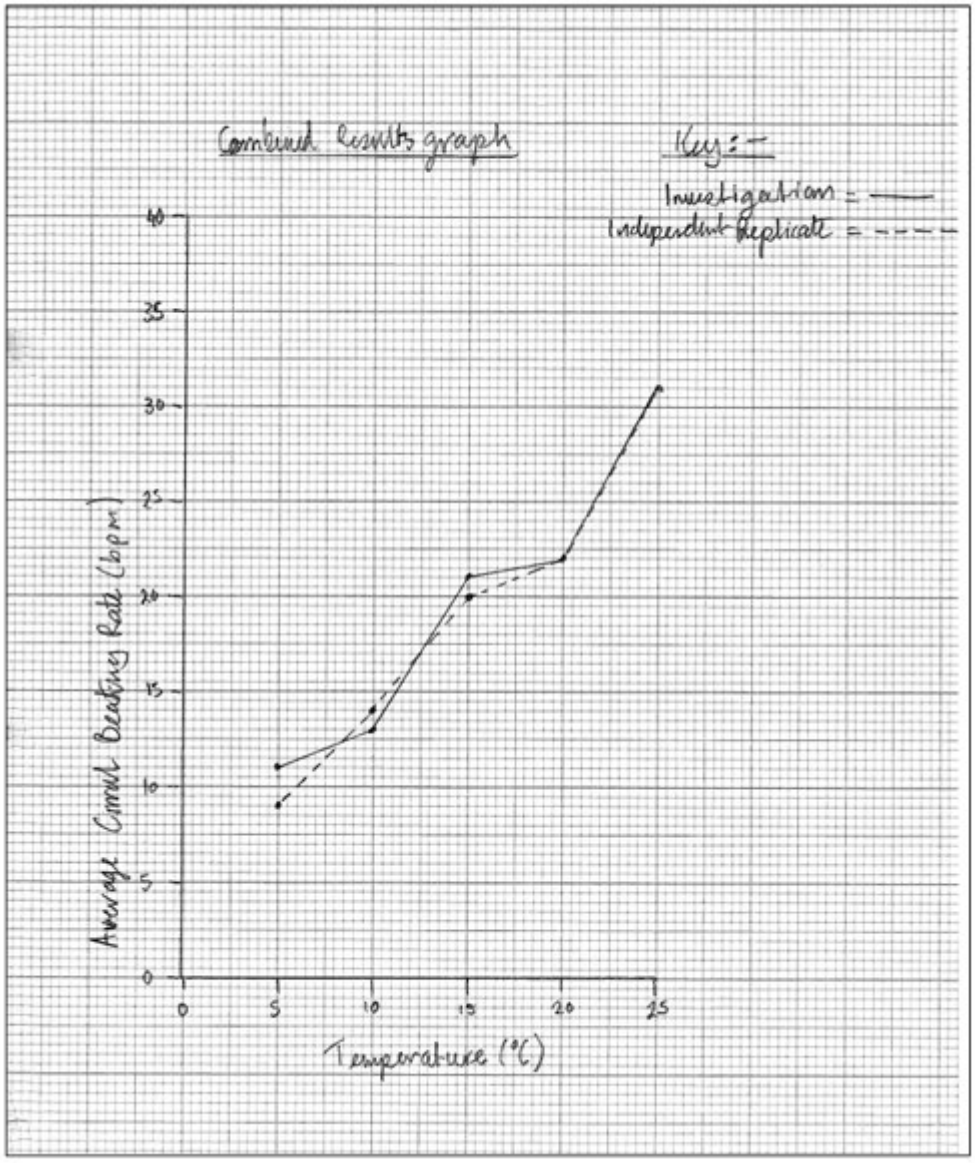
Temperature (°C)	Average Cirral Beating Rate (bpm)
5	9
10	14
15	20
20	22
25	31

It can be seen that the independent replicate shows the same results as the investigation. As the temperature of the barnacles' environment is increased from 5°C to 25°C, cirral beating rate also increases.

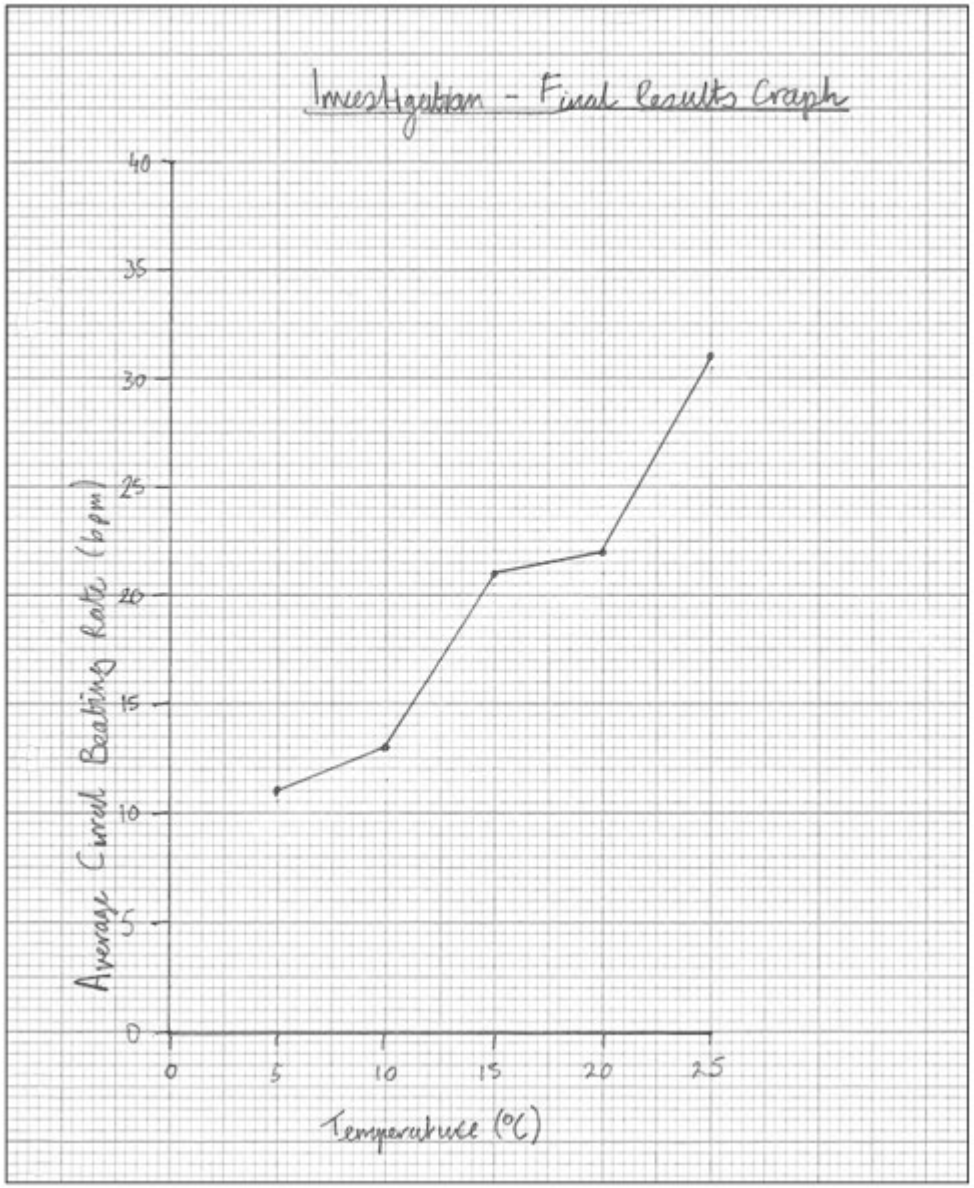
Combined Results Table

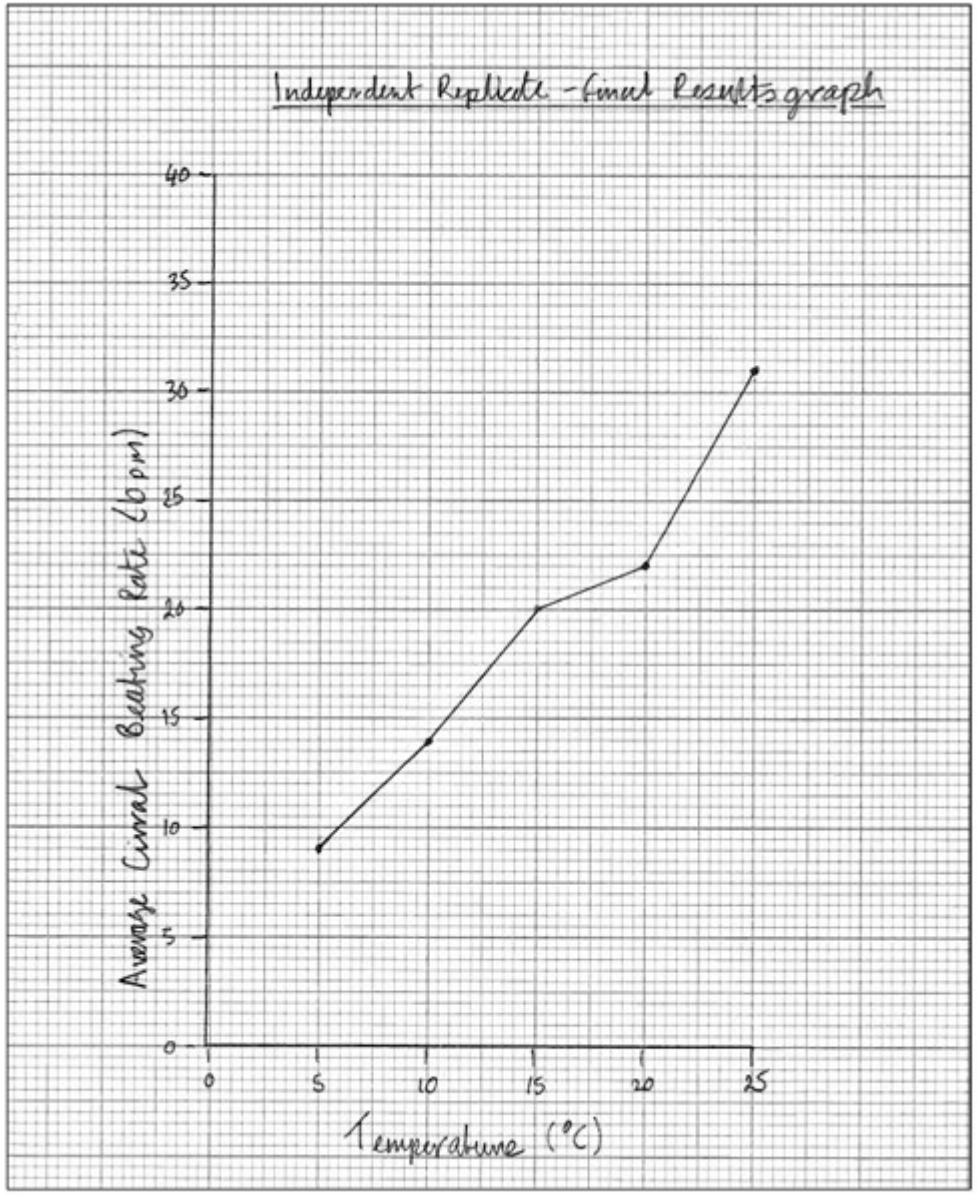
Temperature (°C)	Average Cirral Beating Rate (bpm)		
	Investigation	Independent Replicate	Overall
5	11	9	10
10	13	14	14
15	21	20	21
20	22	22	22
25	31	31	31

It can be observed that results obtained from both the investigation and the independent replicate are concordant with each other. Both results show that as temperature is increased from 5°C to 25°C, cirral beating rate also increases.



Results 2 = 5/6 marks





Results 2 = 5/6 marks

Raw Data:-

Investigation:-

Cirral Beating Rate at 5°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	Mean
1	11	14	13	13
2	8	10	8	9
3	11	10	6	9
4	12	9	12	11
5	9	7	11	9
6	15	10	13	13
7	12	12	10	11
Overall Average (bpm)				11

Cirral Beating Rate at 10°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	Mean
1	10	13	13	12
2	16	14	14	15
3	11	14	12	12
4	15	13	15	14
5	13	15	14	14
6	10	8	11	10
7	14	16	15	15
Overall Average (bpm)				13

Cirral Beating Rate at 15°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	Mean
1	21	24	19	21
2	21	21	25	22
3	22	22	19	21
4	23	19	17	20
5	21	24	20	22
6	19	23	20	21
7	23	25	19	22
Overall Average (bpm)				21

Cirral Beating Rate at 20°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	Mean
1	22	21	20	21
2	30	26	29	28
3	21	24	24	22
4	18	21	19	19
5	20	20	17	19
6	23	19	24	22
7	27	24	26	26
Overall Average (bpm)				22

Cirral Beating Rate at 25°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	Mean
1	33	31	32	32
2	28	29	34	30
3	39	41	39	40
4	27	24	29	27
5	26	31	28	28
6	32	28	34	31
7	29	32	27	29
Overall Average (bpm)				31

Independent Replicate:-

Cirral Beating Rate at 5°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	Mean
1	10	7	8	8
2	13	10	12	12
3	7	7	9	8
4	12	9	11	11
5	10	10	8	9
6	9	7	12	9
7	8	11	6	8
Overall Average (bpm)				9

Results 2 = 5/6 marks

Cirral Beating Rate at 10°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	mean
1	11	17	14	14
2	11	10	11	11
3	16	18	13	16
4	19	19	17	18
5	15	16	14	15
6	12	15	14	14
7	11	13	13	12
Overall Average (bpm)				14

Cirral Beating Rate at 15°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	mean
1	22	23	18	21
2	23	21	20	21
3	21	19	21	20
4	24	20	22	22
5	19	19	20	19
6	18	18	18	18
7	22	19	21	21
Overall Average (bpm)				20

Cirral Beating Rate at 20°C

Barnacle No.	Cirral Beating Rate (bpm)			
	1	2	3	mean
1	22	24	19	18
2	26	21	22	23
3	23	20	21	21
4	25	24	26	25
5	24	19	21	21
6	23	20	18	20
7	24	24	21	22
Overall Average (bpm)				22

Results (6 marks)

(a) Data is relevant to the aim(s).	1/1	
(b) Raw data is recorded and within the limits of accuracy of measurement.	1/1	The raw data is provided in the appendix and is as described in the procedures.
(c) Results presented appropriately.	1/1	Tables and line graphs are appropriate for the data.
(d) Overall results calculated and presented.	0/1	Although the overall results have been calculated by combining the two data sets and presented in a table, these have not been presented as a single line graph. The 'combined results graph' still treats the replicates separately.
(e) Presentation of tables and graphs is correct and accurate.		
♦ Tables are of sufficient quality - headings/units and correct mean/average values.	1/1	The table headings are clear and the units are correct. Mean values have been calculated correctly.
♦ Graphs are of sufficient quality - scales/labels/units/clarity and accuracy of plotting.	1/1	Scales, labels and units are correct. The plotting is clear and accurate.

5/6