

RAW AND PROCESSED DATA

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3 Table 1: Heart rate of *D. magna* in culture media (control) in 1 minute

	Specimen number									
	1	2	3	4	5	6	7	8	9	10
Number of heart beats in 1 min	152	185	175	158	176	173	161	169	148	157

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5 Table 2: Heart rate of *D. magna* in 0.05mol dm^{-3} ammonium sulfate solution in 1
6 minute

		Specimen number									
		1	2	3	4	5	6	7	8	9	10
Number of heart beats in 1 min	Before addition of test solution	174	163	157	182	170	153	144	172	164	180
	With 0.05 mol dm^{-3} test solution	214	201	173	197	204	181	179	193	186	212

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8 Table 3: Heart rate of *D. magna* in 0.1 mol dm^{-3} ammonium sulfate solution in 1
9 minute

		Specimen number									
		1	2	3	4	5	6	7	8	9	10
Number of heart beats in 1 min	Before addition of test solution	166	155	183	175	175	168	158	170	156	147
	With 0.10 mol dm^{-3} test solution	224	190	233	238	239	213	197	226	215	206

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12 Table 4: Heart rate of *D. magna* in 0.15 moldm⁻³ ammonium sulfate solution in 1
 13 minute

		Specimen number									
		1	2	3	4	5	6	7	8	9	10
Number of heart beats in 1 min	Before addition of test solution	178	182	162	175	169	173	149	171	167	154
	With 0.15 moldm ⁻³ test solution	289	281	245	270	261	253	219	275	273	232

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15 Table 5: Heart rate of *D. magna* in 0.2 moldm⁻³ ammonium sulfate solution in 1
 16 minute

		Specimen number									
		1	2	3	4	5	6	7	8	9	10
Number of heart beats in 1 min	Before addition of test solution	186	174	166	165	182	159	172	170	149	164
	With 0.20 moldm ⁻³ test solution	329	312	289	316	318	291	302	316	284	301

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18 Table 6: Heart rate of *D. magna* in 0.25 moldm⁻³ ammonium sulfate solution in 1
 19 minute

		Specimen number									
		1	2	3	4	5	6	7	8	9	10
Number of heart beats in 1 min	Before addition of test solution	178	182	162	175	169	165	170	156	177	176
	With 0.25 moldm ⁻³ test solution	310	314	298	283	311	300	318	282	289	273

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22 Table 7: Heart rate of *D. magna* in 0.30 moldm⁻³ ammonium sulfate solution in 1
 23 minute

		Specimen number									
		1	2	3	4	5	6	7	8	9	10
Number of heart beats in 1 min	Before addition of test solution	159	168	154	189	179	147	177	158	163	168
	With 0.30 moldm ⁻³ test solution	93 ¹	262	102 ²	148 ³	243	75 ⁴	266	122 ⁵	107 ⁶	110 ⁷

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25 The average heart rate of *D. magna* per minute exposed to each respective
 26 concentrations of ammonium sulfate solution was calculated as shown:

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$$\text{Average heart rate} = \frac{\sum \text{heart beat of all 10 specimens}}{10}$$

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31 Table 8: Average heart rate of *D. magna* per minute exposed to respective
 32 concentrations of ammonium sulfate solution

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<i>D. magna</i> in respective concentrations of ammonium sulfate solutions (moldm ⁻³)	Average heartbeat per min for all five specimens exposed to respective concentrations of ammonium sulfate solutions (b) (rounded off to the nearest whole number)	
	Before addition of ammonium sulfate solution	After addition of ammonium sulfate solution
0 (control)	166	N.A.
0.05	166	194
0.10	165	218
0.15	168	260
0.20	169	306
0.25	171	298
0.30	166	257*

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35 ***Only 3 values were used in calculating mean heartbeat for 0.30moldm⁻³ solutions**
 36 **as the heart beat of the other 7 specimens stopped before the 1 minute mark.**
 37 **Hence, they were not taken into consideration, as they would reflect a negative**
 38 **decrease in mean heart rate.**

¹ Heart beat stopped after 21s

² Heart beat stopped after 39s

³ Heart beat stopped after 32s

⁴ Heart beat stopped after 16s

⁵ Heart beat stopped after 27s

⁶ Heart beat stopped after 35s

⁷ Heart beat stopped after 16s

39 Calculation for average heart rate of 10 specimens after exposure to 0.05M
 40 ammonium sulfate solution:

$$41 \quad \text{Average heart rate} = \frac{214 + 201 + 173 + 197 + 204 + 181 + 179 + 193 + 186 + 212}{10}$$

$$42 \quad = 194$$

43 Calculation for average heart rate of 10 specimens after exposure to 0.3M ammonium
 44 sulfate solution:

$$45 \quad \text{Average heart rate} = \frac{262+243+266}{3}$$

$$46 \quad = 257$$

48 The overall percentage change in the heart rate of *D. magna* in the respective
 49 concentrations of ammonium sulfate solutions is calculated as shown:

$$50 \quad \text{Percentage change in heart rate of } D. magna$$

$$51 \quad = \frac{\text{mean heartbeat after exposure to test solution} - \text{mean heartbeat before exposure to solution}}{\text{mean heartbeat before exposure to test solution}} \times 100\%$$

53 Calculation of percentage change in heart rate for specimens exposed to 0.05M
 54 solution:

$$55 \quad \frac{194 - 166}{166} \times 100 = 16.7\%$$

56 Table 9: Overall percentage change in heart rate of *D. magna* in different
 57 concentrations of test solution

		Concentration of Ammonium Sulfate stock solution (mol dm ⁻³)					
		0.05	0.10	0.15	0.20	0.25	0.30
Daphnia heart rate (beats per minute)	Before addition of test solution	166	165	168	169	171	166
	After addition of test solution	194	218	260	306	298	257
	Percentage change(%) (to 1 d.p.)	+ 16.7	+ 32.1	+ 54.8	+ 81.1	+ 74.3	+ 54.8*

58 * Selective data used in calculating percentage change

59 For calculation of percentage change in heart rate per minute for *D. magna* in 0.30M
 60 solution, only 3 out of 10 set of raw data values were used in the calculation of mean
 61 heart beats in 1 minute. This is because there were inconsistency in the other 7 values

62 observed. It was observed that the heart beat of the other 7 specimens stopped before
63 the stipulated 1 minute observation time. If these values were taken into consideration
64 in calculating the mean percentage change in heart rate, it would register an overall
65 negative increase in percentage change in the heart beat of *D. magna* in 1 minute, which
66 is an inaccurate reflection of the results for that specific concentration as the 3 of the
67 10 specimens did show an increase in heart rate. However, it has to be taken into
68 consideration that there is a possibility of the other 7 readings being more accurate
69 reflections of the actual affect of ammonium sulfate at 0.30M concentration on *D.*
70 *magna*. Hence, analysis of data was only focused on concentrations up till 0.25M and
71 the data collected for 0.30M concentration was classified as anomaly.

72 Bioassay of *D. magna* on concentrations above 0.30M (i.e. 0.35M and 0.40M solution)
73 were done and experimental observations showed that upon addition of the respective
74 concentrations of ammonium sulfate solution, *D. magna* specimens showed an
75 extremely rapid increase in heartbeat initially. However, the heart beat of the *D. magna*
76 specimens stopped before the stipulated 1 minute observation time. Hence, the results
77 from those concentrations were not reflected.

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Table 10: Effect of various concentrations of ammonium sulfate solution concentration on heart rate of *D. magna*

		Before/after addition of test solution	Heart beats per minute (bpm)										Average heart rate	Percentage Change (%) (to 1 d.p.)	
			<i>Daphnia specimen no.</i>												
			1	2	3	4	5	6	7	8	9	10			
Concentration of ammonium sulfate test solution (mol dm ⁻³)	0.05	Before	174	163	157	182	170	153	144	172	164	180	166	+ 16.7	
		After	214	201	173	197	204	181	179	193	186	212	194		
	0.10	Before	166	155	183	175	175	168	158	170	156	147	165	+ 32.1	
		After	224	190	233	238	239	213	197	226	215	206	218		
	0.15	Before	178	182	162	175	169	173	149	171	167	154	168	+ 54.8	
		After	289	281	245	270	261	253	219	275	273	232	260		
	0.20	Before	186	174	166	165	182	159	172	170	149	164	169	+ 81.1	
		After	329	312	289	316	318	291	302	316	284	301	306		
	0.25	Before	178	182	162	175	169	165	170	156	177	176	171	+ 74.3	
		After	310	314	298	283	311	300	318	282	289	273	298		
	0.30	Before	159	168	154	189	179	147	177	158	163	168	166	+ 54.8	
		After	93	262	102	148	243	75	266	122	107	110	257		
	Control setup			152	185	175	158	176	173	161	169	148	157	166	N.A.