

Section 1

Freezing Point Depression

Mass of Sodium: 4.0567 Lowest temperature: -1.59°C

Calorimetry Data

Time (sec)	Temperature (°C)
0.00	25.00
0.01	25.00
1.02	25.00
2.06	24.99
3.09	24.99
4.10	24.99
5.15	24.99
6.15	24.99
7.18	24.99
8.19	24.99
9.23	24.99
10.27	24.99
11.27	24.99
12.31	24.99
13.32	24.99
14.35	25.00
15.35	24.99
16.36	24.99
17.39	24.99
18.44	25.00
19.47	25.00
20.51	25.00
21.52	25.00
22.56	25.00
23.55	25.00
24.56	25.00
25.60	24.99
26.65	24.99
27.68	24.99
28.69	25.01
29.72	25.01
30.72	25.00
31.72	25.00
32.73	25.00
33.76	24.99
34.81	24.99
35.82	25.01
36.85	25.01
37.86	25.01
38.86	25.00
39.90	25.00
40.93	25.00
41.93	25.00
42.98	25.00
44.01	25.00
45.02	25.00
46.01	25.00
47.02	25.00

Time (sec)	Temperature (°C)
48.03	25.00
49.06	25.00
50.05	25.00
51.09	25.00
52.09	25.00
53.10	25.00
54.14	25.00
55.18	25.00
56.22	25.00
57.23	25.00
58.26	25.00
59.26	25.00
60.26	25.00
61.27	25.00
62.31	25.01
63.31	25.01
64.31	25.01
65.34	24.99
66.35	24.99
67.36	25.01
68.36	25.01
69.39	25.01
70.44	25.01
71.48	25.01
72.49	24.99
73.52	24.99
74.53	25.00
75.56	25.00
76.60	25.00
77.60	25.00
78.64	25.00
79.65	25.01
80.68	25.01
81.74	25.01
82.76	25.00
83.77	25.00
84.81	24.99
85.85	25.00
86.85	25.00
87.89	24.99
88.90	24.99
89.93	24.99
90.94	25.01
91.97	25.01
92.98	25.01
94.02	25.01
95.06	25.01
96.09	25.00
97.10	25.00
98.16	24.99
99.18	24.99
100.33	24.99

Time (sec)	Temperature (°C)
101.35	25.01
102.35	25.01
103.36	25.01
104.39	25.00
105.40	25.00
106.44	25.01
107.44	25.01
108.47	24.99
109.48	24.99
110.51	25.00
111.52	25.00
112.74	25.00
113.77	25.00
114.82	25.00
115.85	25.00
116.85	25.00
117.89	25.00
118.90	25.00
119.95	25.00
120.97	24.99
121.96	23.58
122.98	22.28
123.97	21.05
124.98	19.92
125.98	18.87
127.02	17.87
128.06	16.96
129.12	16.11
130.14	15.30
131.19	14.53
132.19	13.82
133.22	13.16
134.23	12.53
135.23	11.93
136.23	11.38
137.29	10.84
138.31	10.34
139.31	9.87
140.32	9.42
141.35	8.99
142.40	8.60
143.44	8.21
144.49	7.84
145.51	7.51
146.56	7.18
147.56	6.86
148.60	6.56
149.65	6.29
150.68	6.01
151.72	5.77
152.72	5.51
153.77	5.29

Time (sec)	Temperature (°C)
154.81	5.05
155.81	4.84
156.85	4.64
157.90	4.45
158.93	4.27
159.94	4.10
160.97	3.93
162.02	3.76
163.05	3.60
164.06	3.61
165.06	3.62
166.06	3.63
167.09	3.63
168.09	3.64
169.10	3.65
170.10	3.66
171.14	3.66
172.14	3.67
173.18	3.67
174.23	3.67
175.27	3.67
176.30	3.68
177.30	3.69
178.31	3.70
179.31	3.71
180.35	3.70
181.35	3.70
182.39	3.72
183.40	3.72
184.45	3.74
185.47	3.74
186.48	3.74
187.48	3.76
188.51	3.76
189.52	3.77
190.56	3.76
191.56	3.77
192.61	3.78
193.65	3.78
194.65	3.79
195.68	3.80
196.69	3.81
197.72	3.81
198.73	3.81
199.77	3.82
200.81	3.83
201.84	3.84
202.85	3.83
203.86	3.84
204.90	3.85
205.93	3.87
206.98	3.87

Time (sec)	Temperature (°C)
208.03	3.86
209.06	3.88
210.06	3.89
211.09	3.88
212.11	3.90
213.14	3.90
214.18	3.90
215.23	3.91
216.28	3.93
217.31	3.92
218.32	3.93
219.35	3.94
220.36	3.94
221.40	3.95
222.43	3.95
223.43	3.95
224.48	3.98
225.52	3.98
226.56	3.99
227.56	3.99
228.61	4.00
229.63	3.99
230.65	4.00
231.69	4.00
232.72	4.01
233.73	4.03
234.76	4.03
235.76	4.04
236.77	4.04
237.82	4.05
238.85	4.04
239.89	4.06
240.89	4.06
241.90	4.06
242.93	4.08
244.10	4.08
245.10	4.10
246.14	4.09
247.18	4.09
248.23	4.10
249.26	4.10
250.26	4.13
251.27	4.13
252.31	4.12
253.38	4.14
254.39	4.13
255.44	4.14
256.48	4.15
257.52	4.15
258.52	4.16
259.56	4.17
260.67	4.18

Time (sec)	Temperature (°C)
261.68	4.18
262.73	4.19
263.77	4.20
264.77	4.20
265.77	4.20
266.81	4.22
267.80	4.22
268.85	4.22
269.86	4.23
270.86	4.24
271.87	4.23
272.89	4.24
273.89	4.25
274.89	4.26
275.93	4.26
276.96	4.27
277.97	4.28
278.97	4.28
279.99	4.29
281.02	4.30
282.03	4.31
283.06	4.31
284.06	4.30
285.09	4.31
286.11	4.33
287.13	4.34
288.13	4.33
289.14	4.34
290.15	4.34
291.15	4.35
292.18	4.35
293.22	4.36
294.23	4.36
295.27	4.37
296.28	4.38
297.30	4.39
298.32	4.40
299.35	4.40
300.35	4.41
301.40	4.42
302.40	4.41
303.43	4.43
304.47	4.42
305.48	4.44
306.48	4.44
307.52	4.45
308.57	4.45
309.57	4.45
310.60	4.45
311.60	4.47
312.60	4.47
313.64	4.49

Time (sec)	Temperature (°C)
314.72	4.48
315.73	4.31
316.73	4.16
317.76	4.00
318.77	3.85
319.81	3.70
320.82	3.57
321.84	3.42
322.84	3.30
323.85	3.18
324.85	3.06
325.86	2.94
326.89	2.83
327.93	2.74
328.94	2.62
329.97	2.53
330.98	2.43
332.02	2.35
333.06	2.27
334.10	2.19
335.14	2.10
336.15	2.03
337.18	1.96
338.19	1.89
339.22	1.82
340.22	1.75
341.23	1.69
342.23	1.63
343.27	1.57
344.28	1.50
345.31	1.46
346.35	1.40
347.39	1.34
348.43	1.30
349.44	1.27
350.47	1.21
351.52	1.18
352.52	1.13
353.55	1.09
354.56	1.04
355.60	1.01
356.61	0.98
357.64	0.94
358.65	0.91
359.68	0.88
360.69	0.84
361.73	0.81
362.76	0.79
363.77	0.76
364.81	0.74
365.84	0.69
366.86	0.69

Time (sec)	Temperature (°C)
367.89	0.66
368.90	0.63
369.94	0.61
370.94	0.60
371.98	0.56
372.98	0.55
374.02	0.52
375.02	0.52
376.06	0.50
377.06	0.48
378.06	0.46
379.09	0.44
380.10	0.42
381.15	0.42
382.15	0.39
383.17	0.38
384.18	0.37
385.19	0.35
386.22	0.35
387.23	0.33
388.23	0.32
389.26	0.30
390.27	0.31
391.32	0.29
392.37	0.28
393.39	0.27
394.40	0.27
395.40	0.24
396.44	0.24
397.48	0.22
398.49	0.23
399.51	0.21
400.52	0.21
401.56	0.20
402.56	0.19
403.60	0.19
404.61	0.17
405.64	0.16
406.65	0.16
407.69	0.16
408.72	0.16
409.73	0.16
410.76	0.15
411.77	0.13
412.81	0.14
413.81	0.13
414.85	0.13
415.90	0.13
416.94	0.11
417.98	0.11
418.98	0.12
420.01	0.10

Time (sec)	Temperature (°C)
421.01	0.10
422.02	0.10
423.02	0.10
424.07	0.08
425.10	0.08
426.15	0.08
427.19	0.08
428.22	0.09
429.23	0.07
430.26	0.07
431.27	0.07
432.31	0.06
433.34	0.06
434.34	0.06
435.36	0.06
436.39	0.06
437.39	0.05
438.43	0.05
439.43	0.06
440.44	0.06
441.48	0.05
442.51	0.05
443.52	0.05
444.56	0.04
445.60	0.04
446.64	0.04
447.69	0.04
448.72	0.03
449.73	0.04
450.73	0.04
451.73	0.03
452.76	0.03
453.76	0.03
454.78	0.04
455.81	0.03
456.84	0.03
457.89	0.03
458.90	0.02
459.93	0.03
460.93	0.02
461.97	0.03
462.98	0.02
464.01	0.02
465.06	0.02
466.11	0.03
467.14	0.01
468.15	0.02
469.18	0.03
470.18	0.02
471.23	0.02
472.26	0.01
473.31	0.02

Time (sec)	Temperature (°C)
474.36	0.02
475.38	0.02
476.38	0.02
477.42	0.00
478.43	0.02
479.43	0.02
480.47	0.01
481.53	0.00
482.56	0.01
483.56	0.02
484.60	0.01
485.60	0.00
486.64	0.00
487.65	0.02
488.68	0.02
489.69	0.00
490.74	0.01
491.77	0.01
492.80	0.00
493.81	-0.00
494.81	0.00
495.84	-0.00
496.85	0.00
497.89	0.00
498.89	0.01
499.89	0.00
500.94	0.00
501.98	0.00
502.56	-0.06
502.98	-0.11
504.02	-0.17
505.06	-0.20
506.10	-0.26
507.14	-0.32
508.19	-0.36
509.21	-0.41
510.23	-0.44
511.25	-0.48
512.27	-0.52
513.32	-0.56
514.35	-0.61
515.39	-0.64
516.40	-0.66
517.47	-0.70
518.47	-0.73
519.52	-0.77
520.56	-0.81
521.56	-0.83
522.59	-0.86
523.60	-0.88
524.60	-0.91
525.60	-0.94

Time (sec)	Temperature (°C)
526.64	-0.95
527.65	-0.98
528.68	-0.99
529.69	-1.01
530.75	-1.05
531.76	-1.05
532.76	-1.07
533.76	-1.09
534.77	-1.11
535.81	-1.13
536.86	-1.15
537.89	-1.16
538.90	-1.17
539.93	-1.20
540.92	-1.21
541.94	-1.21
542.99	-1.24
544.01	-1.26
545.02	-1.26
546.06	-1.27
547.09	-1.29
548.10	-1.29
549.10	-1.31
550.15	-1.32
551.17	-1.32
552.19	-1.34
553.18	-1.35
554.23	-1.35
555.26	-1.37
556.26	-1.37
557.30	-1.37
558.31	-1.39
559.35	-1.39
560.39	-1.40
561.40	-1.41
562.43	-1.41
563.42	-1.42
564.47	-1.42
565.49	-1.42
566.48	-1.43
567.52	-1.45
568.55	-1.46
569.55	-1.44
570.61	-1.45
571.64	-1.46
572.64	-1.46
573.68	-1.46
574.68	-1.47
575.68	-1.48
576.68	-1.47
577.72	-1.49
578.76	-1.49

Time (sec)	Temperature (°C)
579.81	-1.49
580.85	-1.50
581.86	-1.50
582.89	-1.50
583.93	-1.51
584.93	-1.51
585.94	-1.51
586.98	-1.52
587.98	-1.51
588.99	-1.51
590.02	-1.53
591.05	-1.53
592.06	-1.52
593.10	-1.54
594.14	-1.52
595.15	-1.54
596.18	-1.53
597.22	-1.54
598.27	-1.54
599.31	-1.53
600.31	-1.54
601.34	-1.54
602.35	-1.54
603.39	-1.54
604.43	-1.54
605.44	-1.54
606.44	-1.55
607.48	-1.54
608.52	-1.56
609.51	-1.56
610.56	-1.55
611.56	-1.55
612.56	-1.55
613.60	-1.57
614.65	-1.55
615.65	-1.56
616.69	-1.55
617.72	-1.57
618.73	-1.57
619.76	-1.57
620.77	-1.57
621.83	-1.56
622.85	-1.56
623.85	-1.57
624.89	-1.56
625.90	-1.57
626.93	-1.56
627.98	-1.57
629.02	-1.56
630.03	-1.56
631.05	-1.57
632.06	-1.57

Time (sec)	Temperature (°C)
633.07	-1.57
634.10	-1.56
635.14	-1.58
636.19	-1.57
637.22	-1.56
638.24	-1.57
639.26	-1.57
640.31	-1.58
641.35	-1.58
642.35	-1.58
643.39	-1.56
644.43	-1.56
645.47	-1.57
646.48	-1.58
647.48	-1.58
648.52	-1.58
649.57	-1.58
650.59	-1.58
651.60	-1.58
652.63	-1.57
653.65	-1.57
654.68	-1.57
655.69	-1.59
656.72	-1.57
657.73	-1.58
658.76	-1.57
659.77	-1.58
660.81	-1.57
661.82	-1.57
662.84	-1.57
663.89	-1.57
664.90	-1.57
665.93	-1.57
666.94	-1.58
667.97	-1.58
668.98	-1.59

Calorimetry Data

Time (sec)	Temperature (°C)
0.00	-1.57
0.56	-1.58
1.61	-1.57
2.61	-1.57
3.61	-1.57
4.64	-1.58
5.69	-1.57
6.69	-1.57
7.73	-1.57
8.76	-1.58
9.78	-1.58
10.80	-1.57
11.81	-1.58
12.85	-1.58
13.85	-1.58
14.89	-1.58
15.92	-1.58
16.93	-1.58
17.97	-1.58
18.98	-1.57
20.01	-1.58
21.02	-1.58
22.05	-1.58
23.06	-1.58

Calorimetry Data

Time (sec)	Temperature (°C)
0.00	-1.58
0.45	-1.58
1.50	-1.57

Boiling Point Elevation

Mass of Sodium Chloride: 4.0867 Boiling temp of pure water: 100.18°C Boiling temp of solution:
100.90°C

Calorimetry Data

Time (sec)	Temperature (°C)
0.00	25.01
0.20	25.01
1.20	25.00
2.45	25.00
3.46	25.68
4.45	26.85
5.46	28.04
6.49	29.23
7.50	30.33
8.52	31.45
9.54	32.53
10.58	33.65
11.61	34.74
12.65	35.84
13.65	36.92
14.66	37.98
15.70	39.09
16.71	40.15
17.71	41.21
18.73	42.29
19.74	43.37
20.74	44.42
21.75	45.49
22.78	46.57
23.79	47.64
24.84	48.76
25.86	49.83
26.90	50.92
27.90	51.98
28.95	53.09
29.95	54.15
30.99	55.23
31.99	56.30
32.99	57.34
34.03	58.43
35.04	59.51
36.07	60.59
37.08	61.65
38.11	62.74
39.12	63.79
40.17	64.89
41.21	65.97
42.21	67.04
43.24	68.12
44.28	69.21
45.32	70.30
46.32	71.33
47.37	72.44

Time (sec)	Temperature (°C)
48.40	73.52
49.40	74.56
50.45	75.67
51.49	76.74
52.49	77.78
53.50	78.84
54.54	79.94
55.57	81.01
56.61	82.10
57.66	83.19
58.70	84.26
59.70	85.32
60.75	86.40
61.78	87.48
62.79	88.53
63.82	89.61
64.81	90.62
65.84	91.70
66.87	92.78
67.91	93.86
68.95	94.92
69.95	95.98
70.95	97.01
71.98	98.08
73.03	99.16
74.05	100.18
75.10	100.18
76.11	100.16
77.11	100.15
78.15	100.14
79.20	100.12
80.20	100.10
81.21	100.09
82.23	100.07
83.23	100.07
84.24	100.05
85.24	100.04
86.28	100.02
87.32	100.00
88.32	99.98
89.38	99.97
90.41	99.95
91.41	99.94
92.46	99.93
93.46	99.92
94.49	99.88
95.53	99.87
96.54	99.86
97.57	99.85
98.58	99.83
99.62	99.82
100.62	99.80

Time (sec)	Temperature (°C)
101.66	99.79
102.70	99.76
103.70	99.75
104.70	99.73
105.73	99.72
106.78	99.70
107.78	99.70
108.82	99.66
109.87	99.65
110.91	99.64
111.95	99.63
112.99	99.62
114.03	99.60
115.03	99.59
116.03	99.56
117.07	99.54
118.08	99.54
119.12	99.51
120.12	99.49
121.16	99.49
122.16	99.48
123.19	99.45
124.20	99.45
125.24	99.42
126.24	99.41
127.28	99.39
128.29	99.39
129.33	99.35
130.36	99.34
131.40	99.33
132.46	99.31
133.50	99.31
134.53	99.29
135.53	99.27
136.57	99.25
137.58	99.24
138.61	99.22
139.66	99.20
140.70	99.19
141.74	99.18
142.78	99.16
143.79	99.15
144.82	99.13
145.83	99.12
146.87	99.11
147.87	99.08
148.87	99.08
149.90	99.05
150.91	99.04
151.91	99.02
152.91	99.02
153.97	98.99

Time (sec)	Temperature (°C)
154.98	98.97
155.99	98.97
156.98	98.94
158.03	98.94

Calorimetry Data

Time (sec)	Temperature (°C)
0.00	93.80
0.99	93.79
2.02	93.77
3.03	94.43
4.07	95.66
5.11	96.91
6.15	98.10
7.15	99.21
8.20	100.18
9.24	100.90
10.27	100.89
11.33	100.87
12.38	100.85
13.40	100.83
14.44	100.83
15.44	100.81
16.45	100.78
17.49	100.77
18.52	100.76
19.57	100.74
20.57	100.73
21.58	100.70
22.61	100.70
23.65	100.67
24.65	100.66
25.66	100.65
26.70	100.63
27.73	100.61
28.74	100.59
29.74	100.58
30.74	100.56
31.74	100.54
32.78	100.53
33.82	100.52
34.82	100.51
35.86	100.49
36.86	100.47
37.90	100.45
38.94	100.44
39.95	100.41
40.98	100.41
41.99	100.39
43.03	100.37
44.04	100.36
45.07	100.34
46.11	100.32
47.15	100.31
48.20	100.30

Time (sec)	Temperature (°C)
49.23	100.27
50.24	100.27
51.27	100.24
52.28	100.23
53.32	100.20
54.32	100.20
55.35	100.19
56.36	100.17
57.40	100.15
58.44	100.13
59.45	100.11
60.74	100.10
61.77	100.08
62.77	100.06