INVESTIGATION OF ICE MELTING CHEMICALS

SODIUM CHLORIDE CRYSTALS

vs

SODIUM CHLORIDE SOLUTIONS

Report 71-2

March 1971

VERMONT DEPARTMENT OF HIGHWAYS

J. T. Gray, Commissioner

R. H. Arnold, Chief Engineer

A. W. Lane, Materials Engineer

Report Prepared By

R. I. Frascoia
Research Specialist

Objective:

Experiments have proven that ice melting action caused by sodium chloride crystals, occurs after the crystals have dissolved into a solution by taking moisture from the atmosphere or the ice-snow surface being treated. Because lower temperature levels are normally accompanied by low humidity, dry sodium chloride crystals are often very slow in bringing about the desired melting action.

The object of our investigation was to determine whether or not sodium chloride solutions would prove more effective than dry sodium chloride crystals now being used for ice and snow removal.

Test Procedure:

Tests were conducted at various temperatures using sodium chloride applications of 10.5 and 21 grams vs. 21% sodium chloride solutions containing the equivalent amounts of sodium chloride. The maximum amount of sodium chloride which will remain soluble in water at $-6^{\circ}F$ is 23%.

The Sodium chloride was applied on 100 gram ice samples contained in 4 inch diameter metal pans. At specified time periods the amount of melted ice was determined by pouring the sodium chloride and melted ice into a beaker and weighing the amount recovered. The solution was then returned to the test sample to await the next test period.

Conclusion:

A comparison of effectiveness between a 21% sodium chloride solution and sodium chloride crystals indicates a temperature and time dependency.

The sodium chloride solution is more effective in the first one-half hour of application at nearly all temperature ranges. The same results were also found for periods of up to four hours when the temperatures did not rise above 15°F. When temperatures rise above 15°F for test periods of one hour or longer, sodium chloride crystals proved to be more effective in nearly all of the tests.

DEICER TEST DATA RESULTS

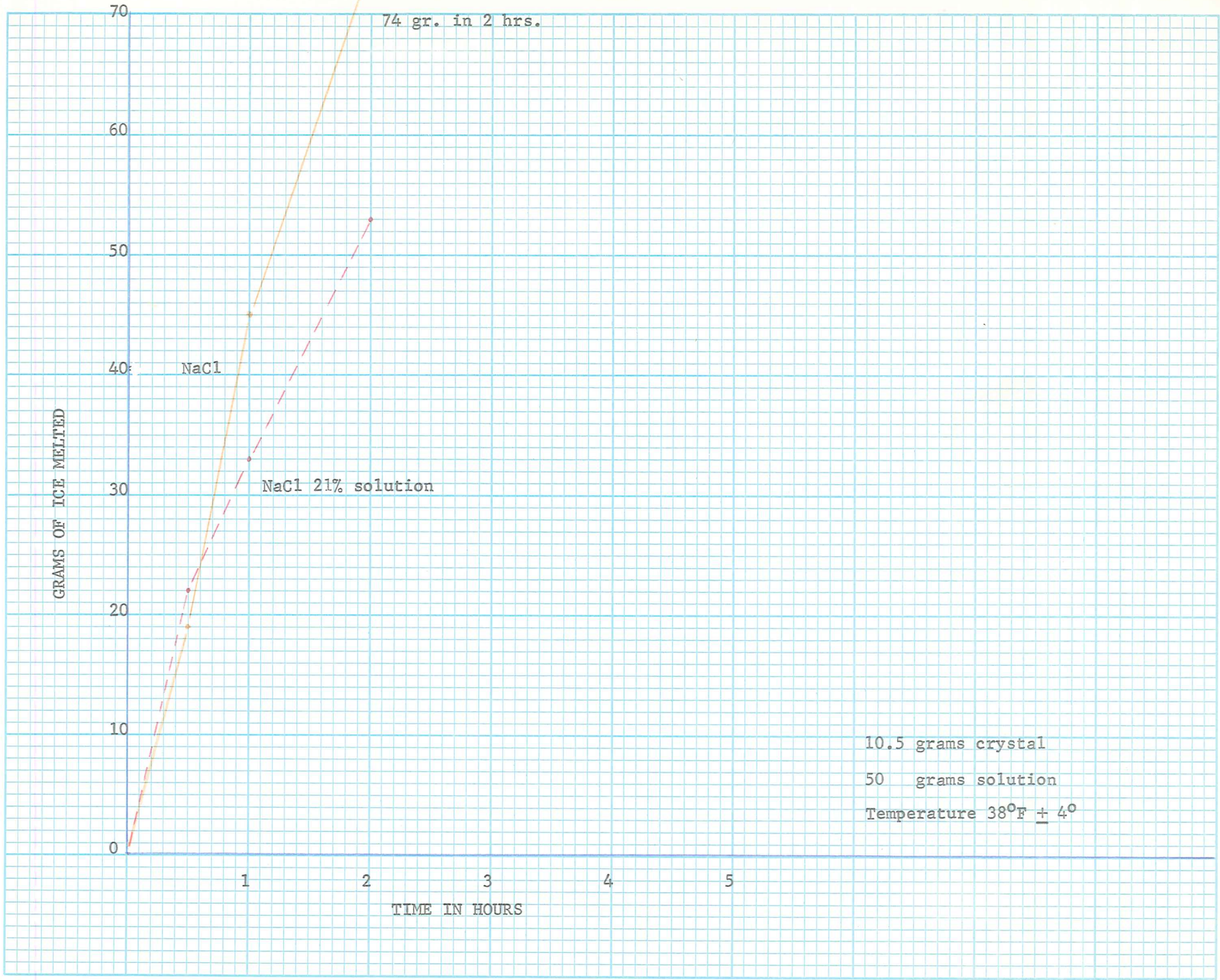
Deicer Quantity	Elapsed Time	Temperature	Grams Ice Melted 21% NaCl Solution	Grams Ice Melted NaCl Crystals
	½ hr.	-7°	0	0
21 Grams	1	-4°	2	0
NaCl Crystals	2	--	--	--
	3	+6°	6	4
100 Grams	4	+6°	9	12
NaCl Solution	5	+6°	10	19
	½ hr.	0°	5	0
21 Grams	1	0°	8	0
NaCl Crystals	2	0°	9	9
	3	+1°	12	19
100 Grams	4	+2°	13	23
NaCl Solution	5	+1°	18	37
	½ hr.	-3°	2	0
21 Grams	1	-2°	4	0
NaCl Crystals	2	0°	6	0
	3	+3°	7	4
100 Grams	4	+9°	10	18
NaCl Solution	5	11°	14	42
	½ hr.	15°	10	2
10.5 Grams	1	18°	17	21
NaCl Crystals	2	18°	26	30
	3	17°	29	48
50 Grams	4	18°	31	58
NaCl Solution	5	16°	34	65
	½ hr.	18°	9	11
10.5 Grams	1	18°	14	25
NaCl Crystals	2	19°	19	37
	3	20°	27	55
50 Grams	4	21°	32	64
NaCl Solution	5	21°	36	69
	½ hr.	20°	14	16
10.5 Grams	1	21°	21	33
NaCl Crystals	2	23°	30	53
	3	25°	40	70
50 Grams	4	26°	52	80
NaCl Solution	5	27°	61	--

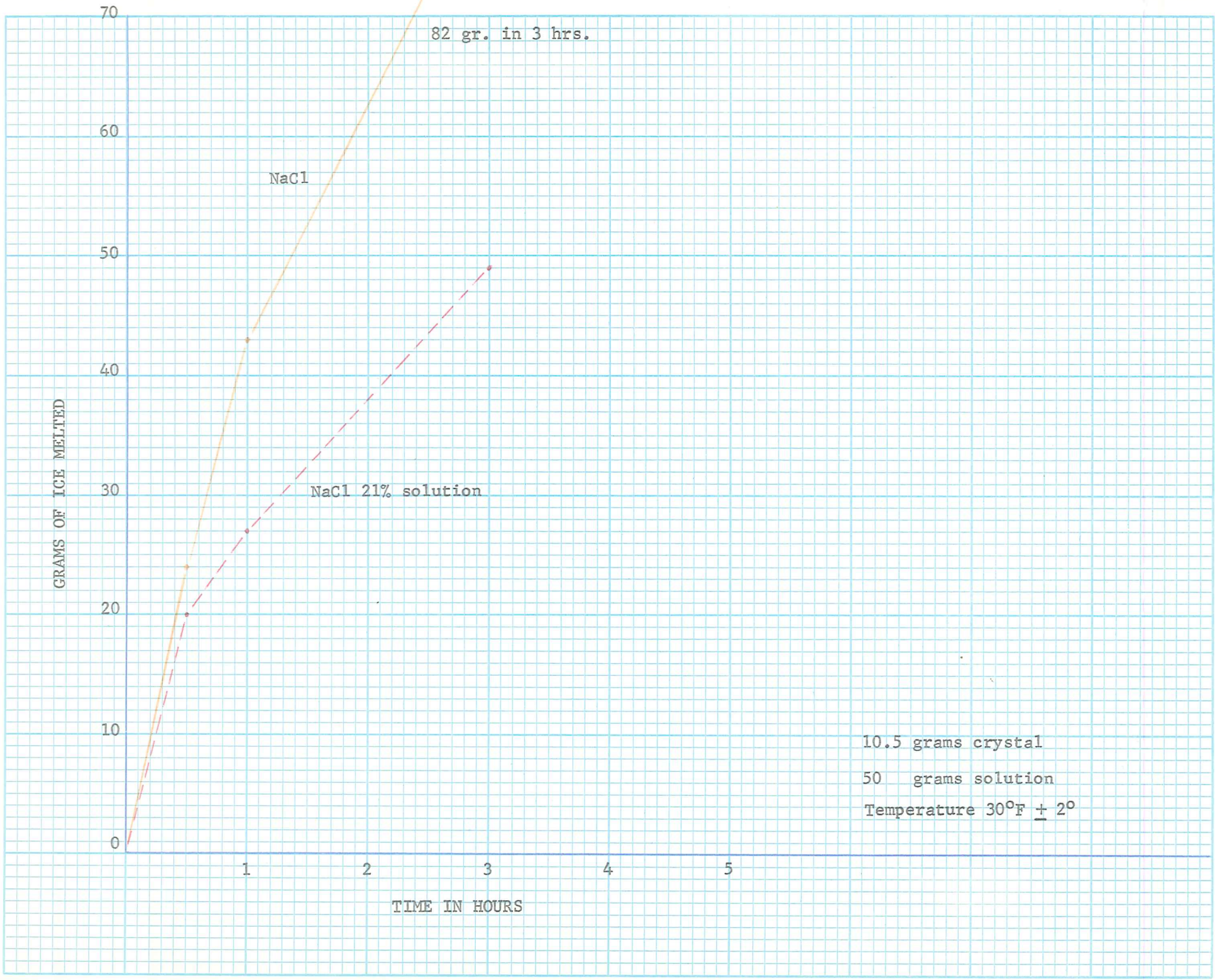
Deicer Quantity	Elapsed Time	Temperature	Grams Ice Melted 21% NaCl Solution	Grams Ice Melted NaCl Crystals
	½ hr.	14°	5	3
10.5 Grams	1	17°	10	13
NaCl Crystals	2	21°	19	31
	3	32°	42	64
50 Grams	4	33°	56	86
NaCl Solution	5	32°	66	--
	½ hr.	19°	16	8
10.5 Grams	1	21°	22	20
NaCl Crystals	2	25°	30	42
	3	26°	36	56
50 Grams	4	31°	48	69
NaCl Solution				
10.5 Grams	½ hr.	28°	20	24
NaCl Crystals	1	29°	27	43
	2	--	--	--
50 Grams	3	32°	49	82
NaCl Solution				
10.5 Grams				
NaCl Crystals	½ hr.	34°	22	19
	1	39°	33	45
50 Grams	2	44°	53	74
NaCl Solution				

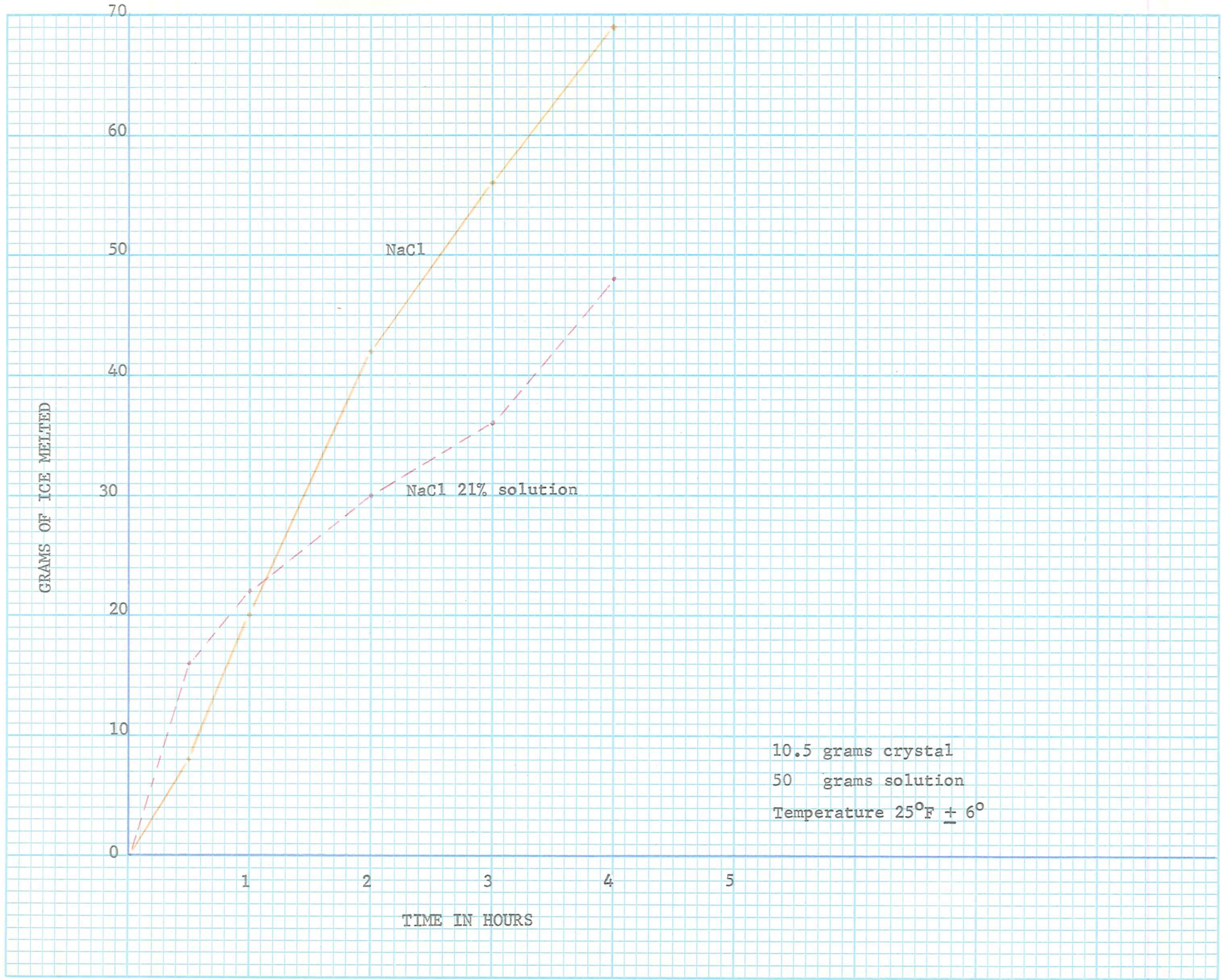
GRAMS OF ICE MELTED

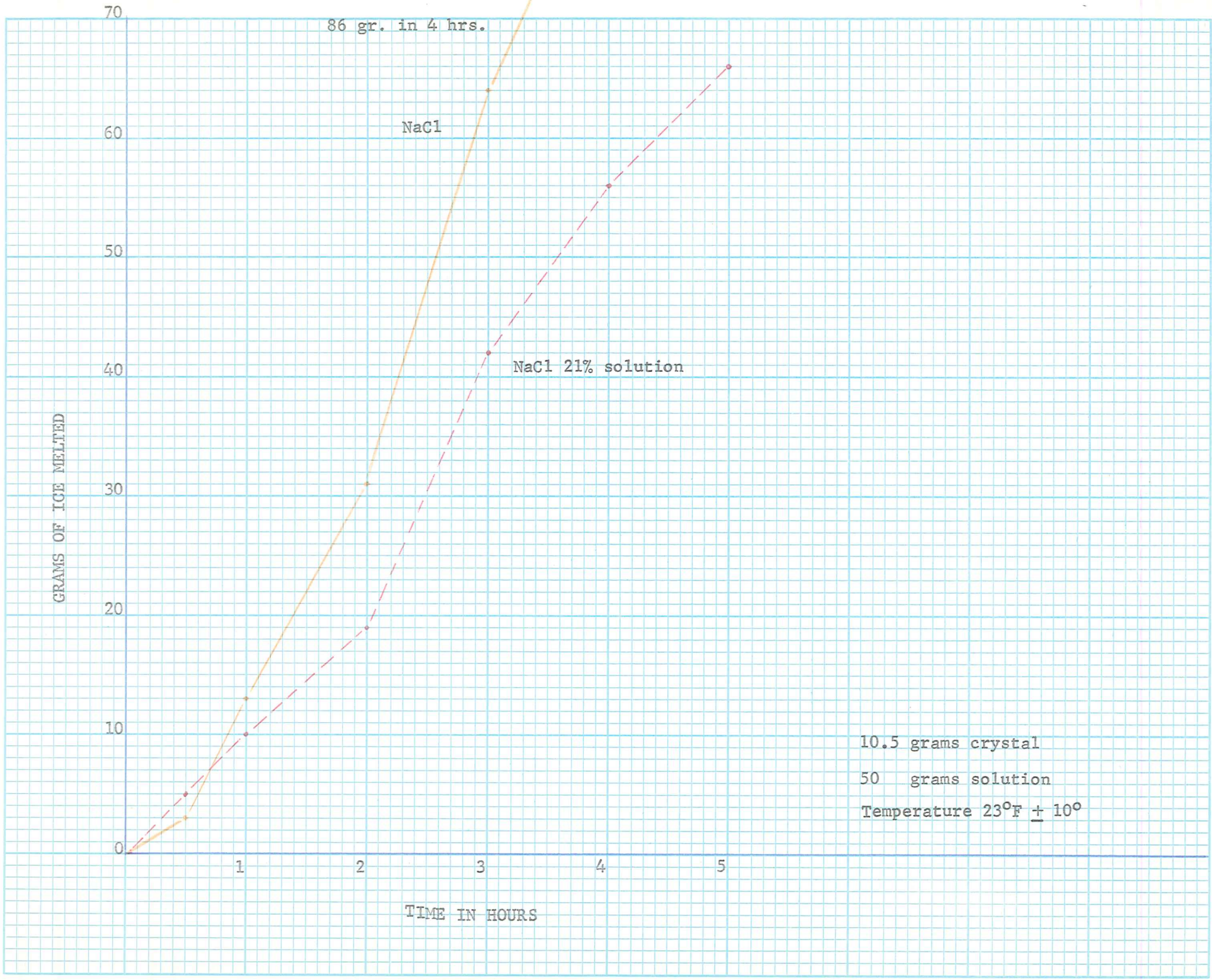
Vs

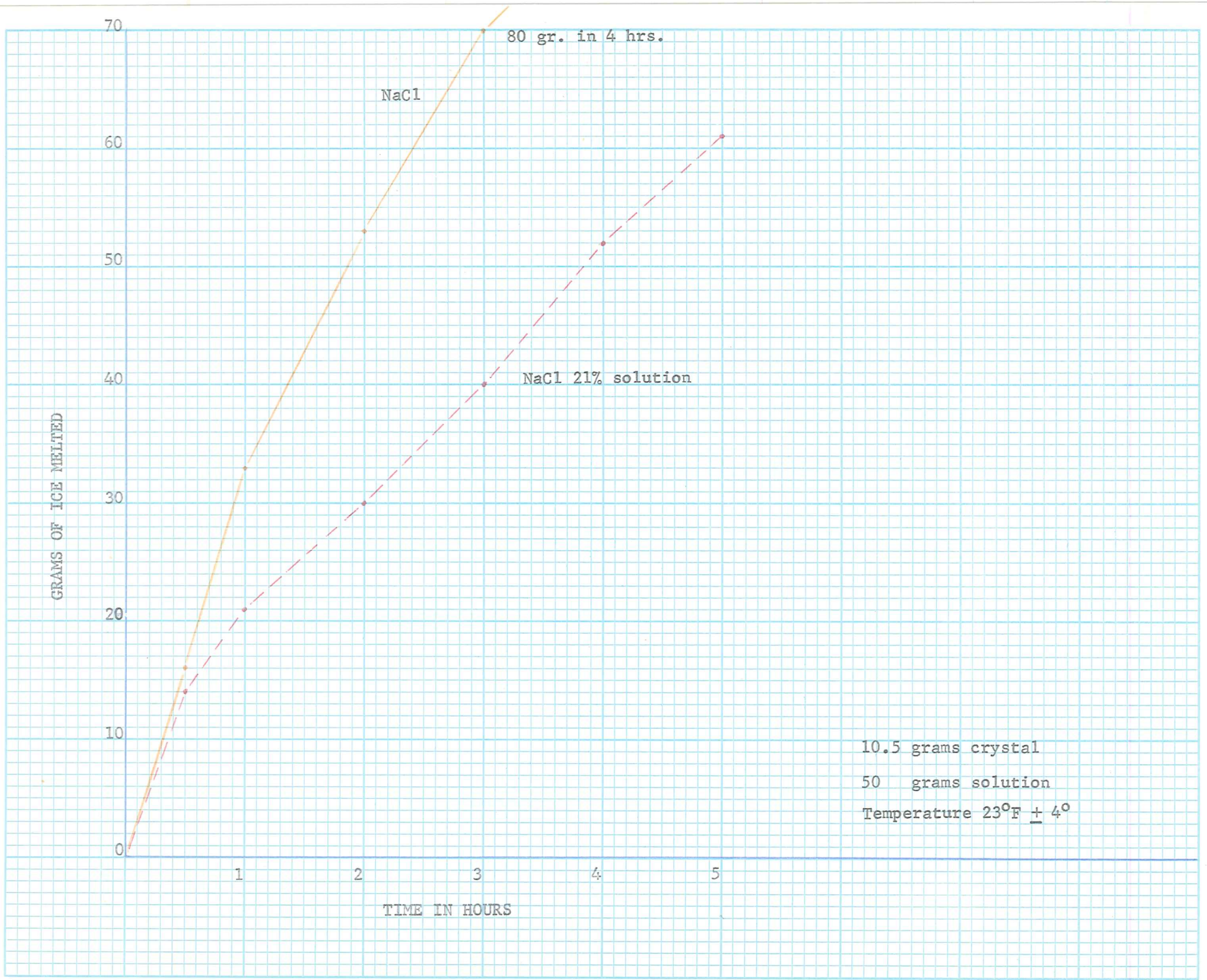
TIME IN HOURS

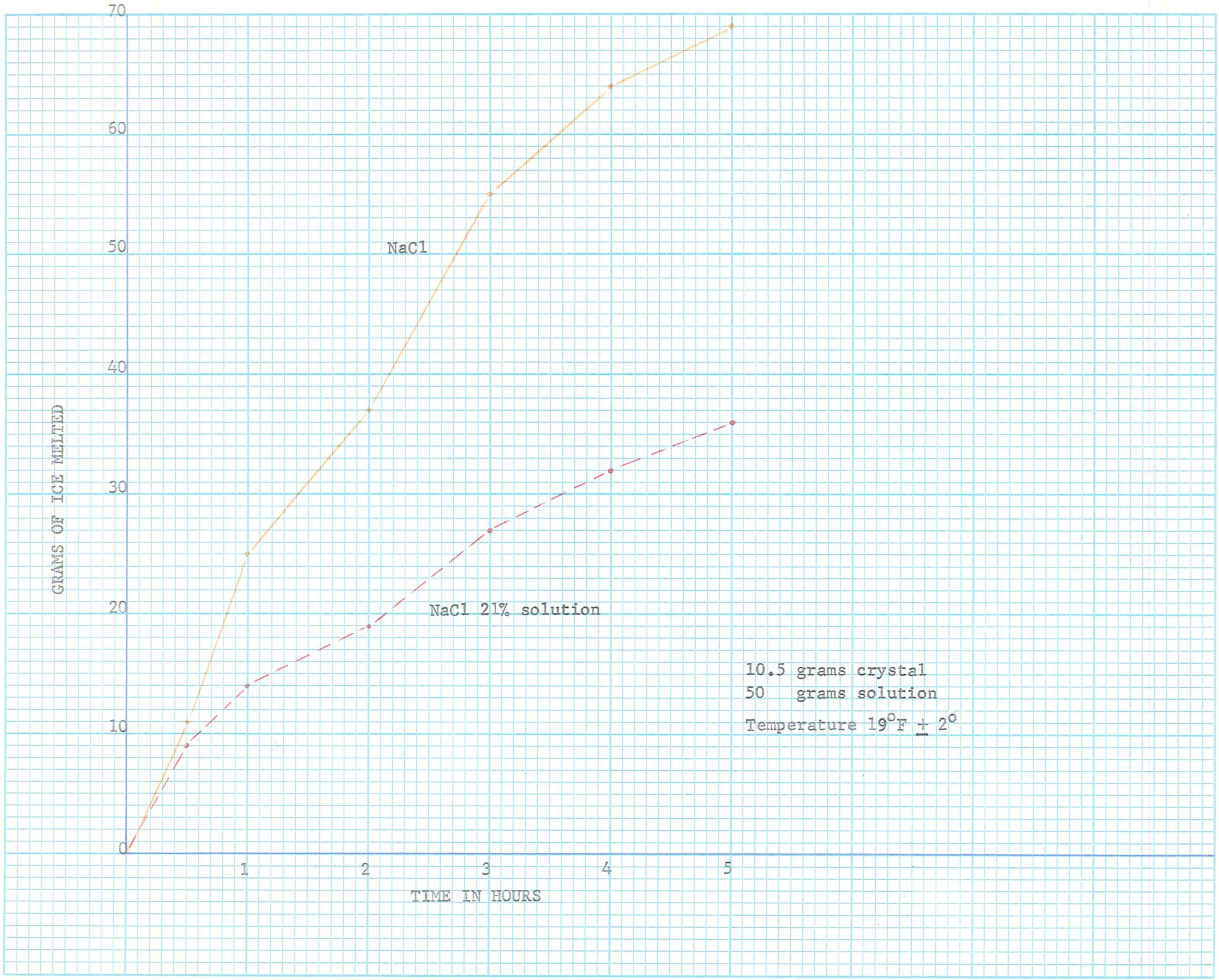


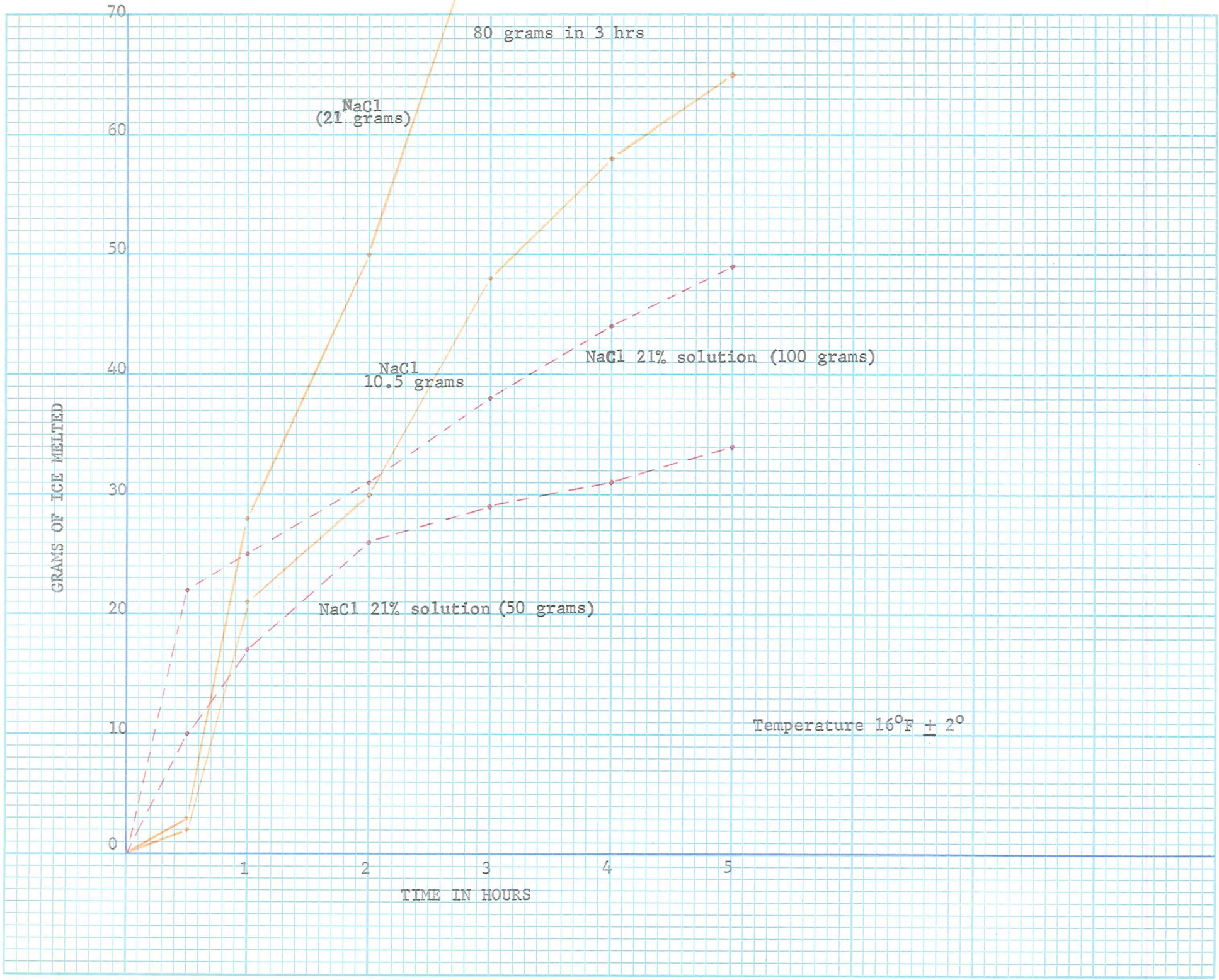


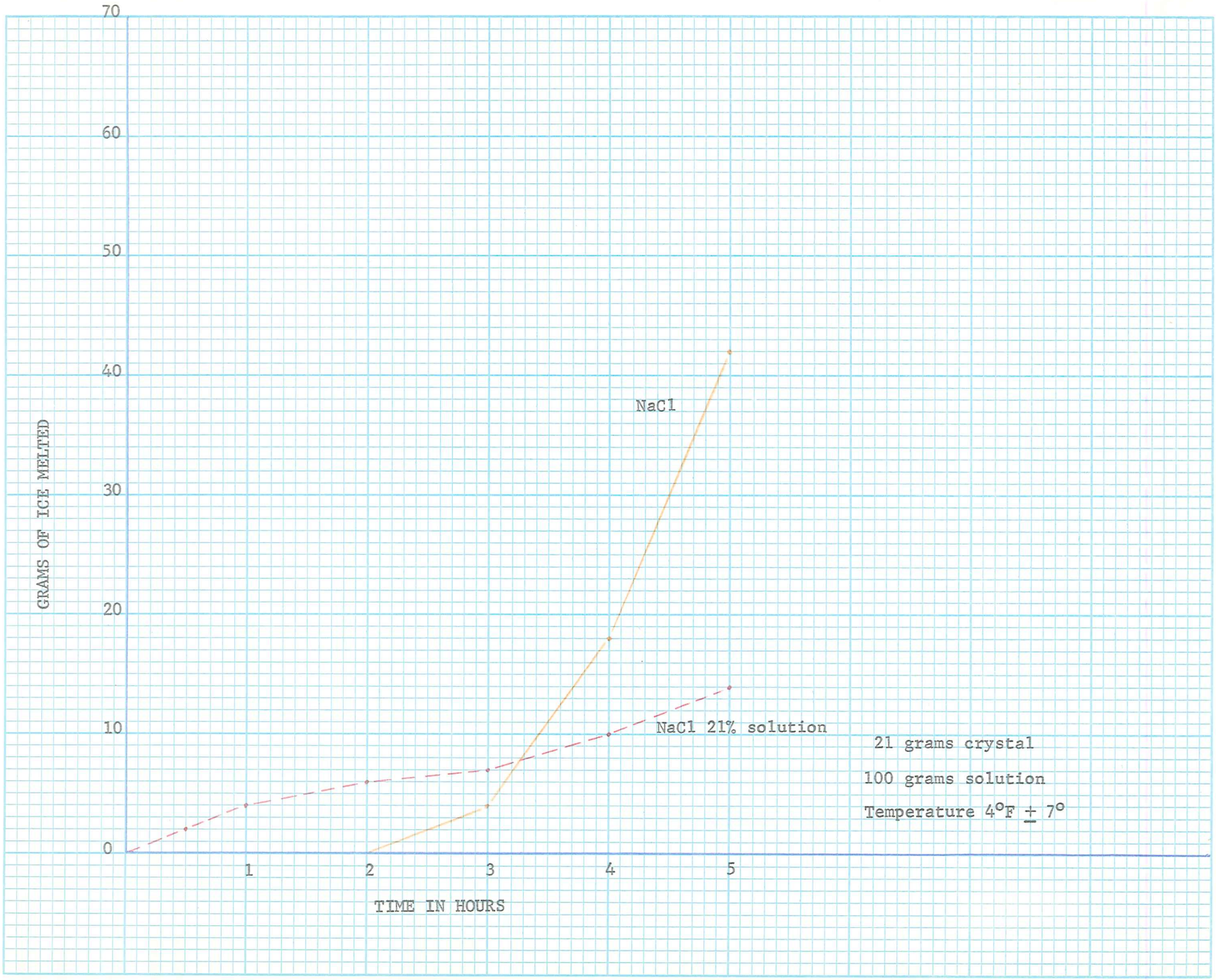


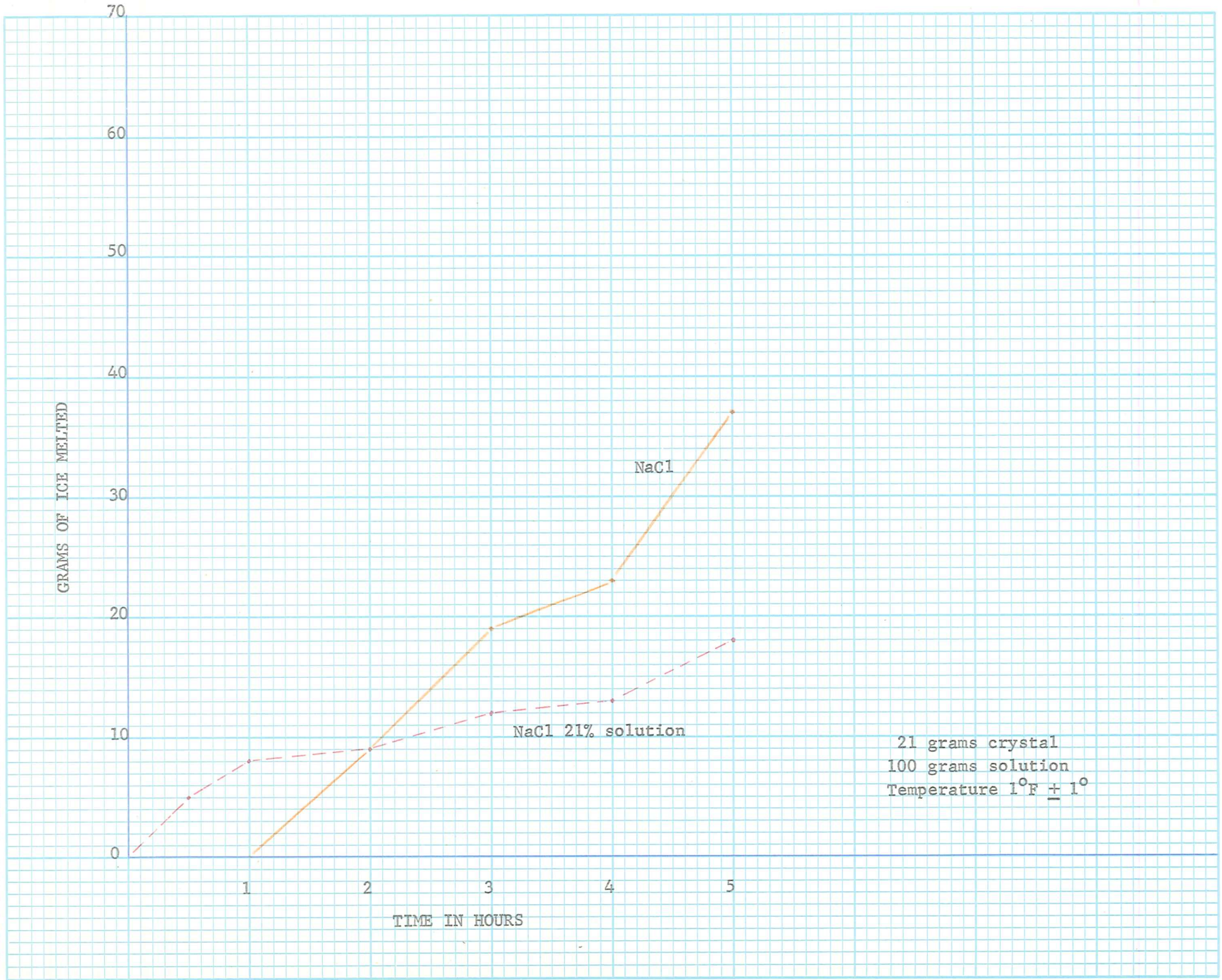


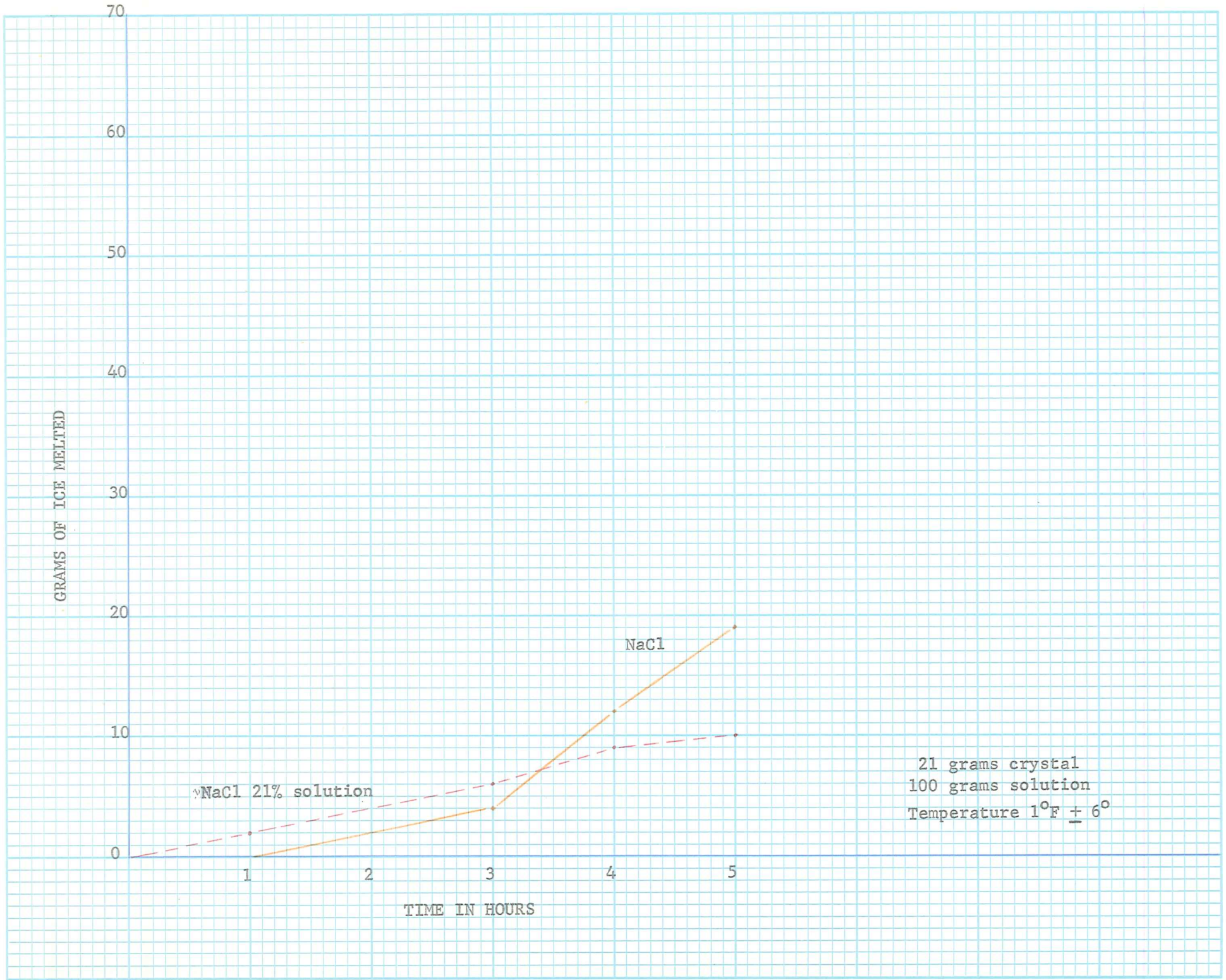












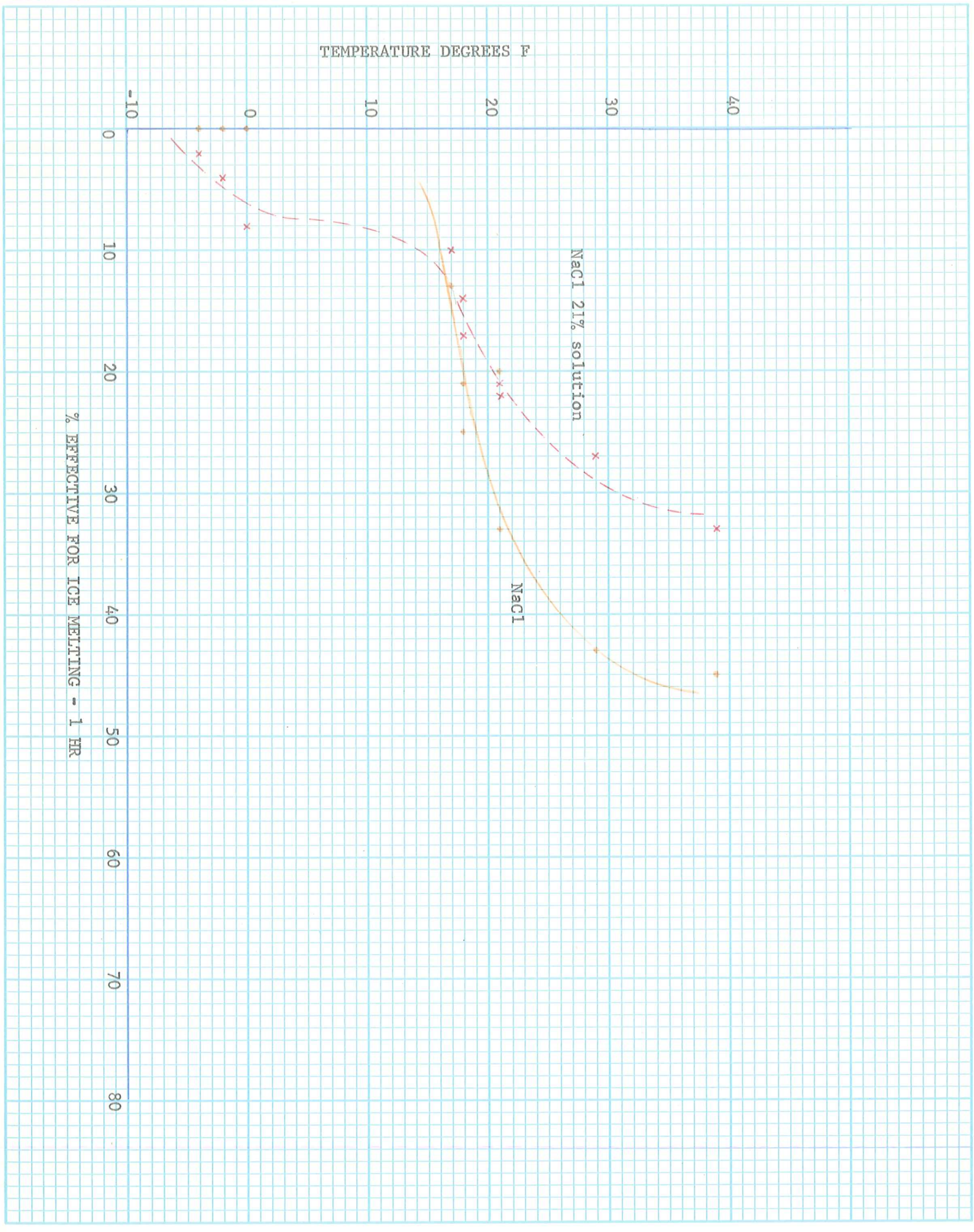
% EFFECTIVE FOR ICE MELTING

"THE CHAMPION LINE" NO. 810

CROSS SECTION - 10 SQUARES TO INCH

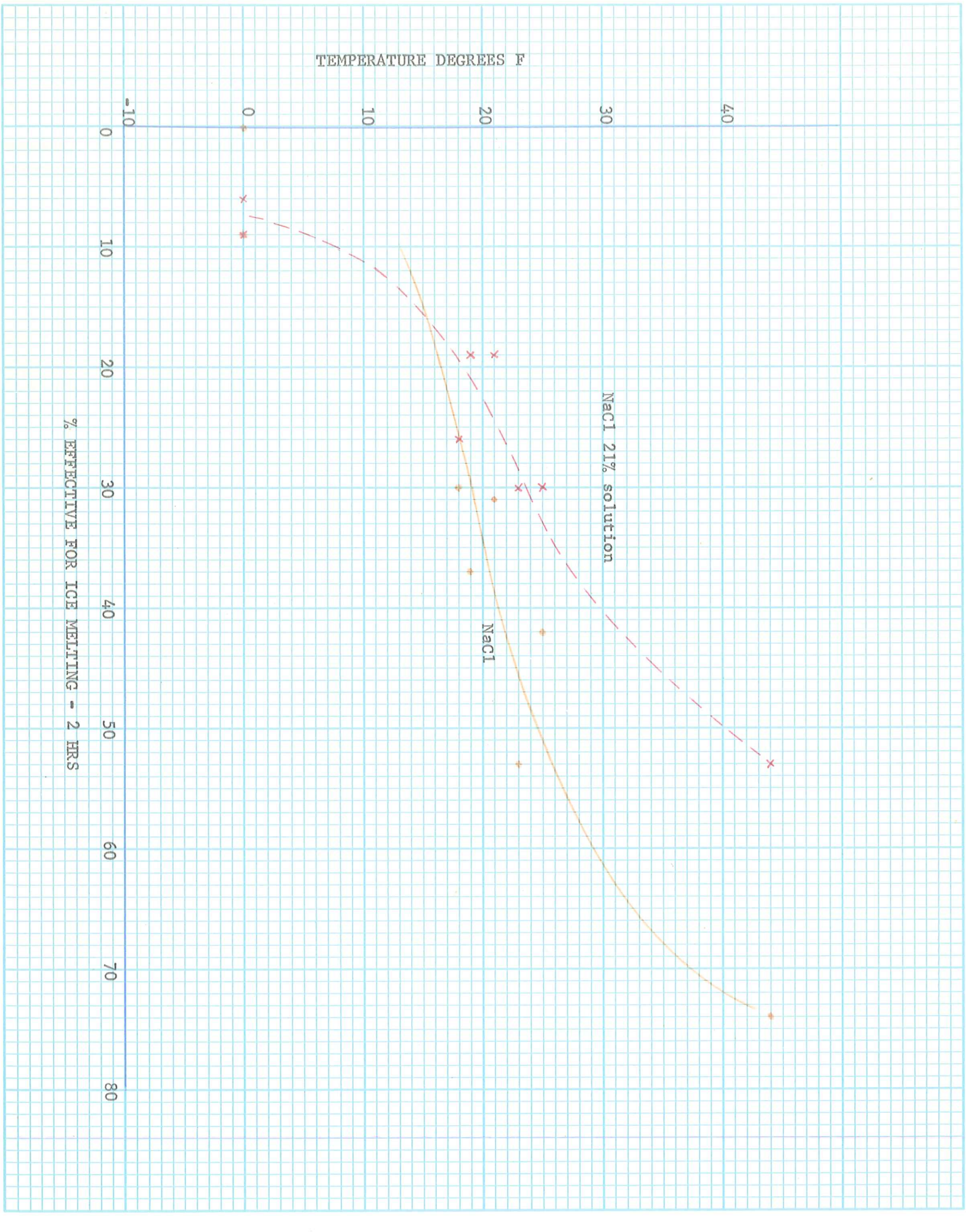
"THE CHAMPION LINE" NO. 810

CROSS SECTION - 10 SQUARES TO INCH



"THE CHAMPION LINE" NO. 810

CROSS SECTION - 10 SQUARES TO INCH



"THE CHAMPION LINE" NO. 810

CROSS SECTION - 10 SQUARES TO INCH