SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Highly Commended

Scientific Inquiry

Year R-2

Piper Lashmar

Kangaroo Island Community Education

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Australian Government
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SASTA South Australian Science Teachers Association

The Blu-Tack Test

Piper Lashmar 0278-005

Word Count: 1085 words

Questioning and Predicting

Blu-Tack is important because it makes things stick up on walls and you can stick and un-stick things. Other adhesives like glue can't do this. I have noticed that Blu-Tack gets really stretchy and sticky when it's hot. When it's cold Blu-Tack is stiff and rigid. I was interested to learn more because on a hot day my pictures fall off and it's frustrating. On cold days when I play with Blu-Tack in my hands it gets hotter and it becomes stretchier.

My question is what happens to the stretchiness and stickiness of Blu-Tack when the temperature changes.

I predict that when the Blu-Tack gets hot it's stretchier and stickier and when the Blu-Tack is cold it's hard to stretch and it's less sticky.

Planning and Conducting

Variables:

- Brand of Blu-Tack
- How much Blu-Tack is used
- Shape of the Blu-Tack
- Temperature of the Blu-Tack
- Force used to stretch the Blu-Tack
- How fast the Blu-Tack is pulled to stretch it

The variable I changed was the Blu-Tack's temperature.

The variables I measured were the length the Blu-Tack stretched before it broke and the maximum force while stretching the Blu-Tack.

I tested each temperature more than once because if something went wrong it won't be a fair test. I tested each temperature four times and for a couple of temperatures I re-did it. I calculated an average of my results for each temperature.

Method:

1. Use a knife to cut a strip of Blu-Tack into four equal pieces.
2. Put the Blu-Tack and the thermometer in the fridge for an hour.
3. Clamp the force sensor on the table using wood.
4. Use Blu-Tack to stick the metre ruler to the table. Make sure the start of the ruler is underneath the hook and it isn't wonky.
5. Attach the force sensor to the USB module and laptop.
6. Open the software.
7. Set the force sensor by pressing and holding the sensor button so it goes to zero Newtons.
8. Rule up two tables in your journal, one for force and one for length.

9. Look at the thermometer, measure the temperature and record it in both tables.
10. Set the data logger range: +/- 10 N or +/- 50 N
11. Quickly get a piece of Blu-Tack out of the fridge.
12. Hook the Blu-Tack on the force sensor making sure it won't fall off.
13. Tell a helper to press start on the laptop to record the force.
14. Start stretching the Blu-Tack by pulling on it and looking at the ruler and the Blu-Tack.

15. Use the ruler to record the length of the Blu-Tack when it breaks.
16. Use the Neulog software to measure the maximum force when the Blu-Tack is stretched.
17. Save the force graph to the laptop.
18. Take the piece of stretched Blu-Tack off and keep it for later.
19. Repeat the test three more times using new Blu-Tack pieces from the fridge.
20. Repeat the test but put the Blu-Tack in the freezer.
21. Repeat the test, but instead of putting the Blu-Tack in the fridge, follow these instructions to warm it up.
22. Boil water in a kettle but stop it so it's not too hot.
23. Get an adult to hold the thermometer in and see how hot it is.
24. Add some cold water and mix it until it's the right temperature.
25. Gently stick the Blu-Tack on the outside of the kettle and leave it there for 5 minutes to get warm.
26. Peel a piece of Blu-Tack off the kettle and repeat the test at 35 and 48 °C.

Equipment and Materials

Materials:

- Block of wood
- Clamp
- Neulog force sensor data logger, USB module and software
- Laptop
- Metal meter ruler

- Blu-Tack, cut into 3.5 cm pieces
- Extra Blu-Tack for sticking the ruler
- Avanti kitchen thermometer
- Wooden 30 cm ruler
- Small kitchen knife
- Fridge/Freezer
- Kettle
- Water at 48 °C and 35 °C
- Cup
- Cold water
- Avanti freezer thermometer

Risk Assessment:

Hazard	Risk (low, medium, high)	How I will control the risk
When using the kettle you get burnt.	High	Get an adult to help use the kettle and measure the temperature. Check that the kettle isn't to hot before you measure the temperature.
If you spill water on the floor people might slip over.	Low	Work on a bench with the kettle far away from the edge. Keep a towel handy to dry your hands.
When you clamp the force sensor you might jam you finger in it.	Low	Get an adult to help do the clamp.
The metal metre ruler is sharp and you might cut yourself on it.	Medium	Be really careful and don't slide your finger across the ruler.

Processing and Analysing Data and Information

Table 1. Table showing the how far the Blu-Tack stretched before it broke. Green means I didn't attach the Blu-Tack properly. Red means I forgot to measure length properly.

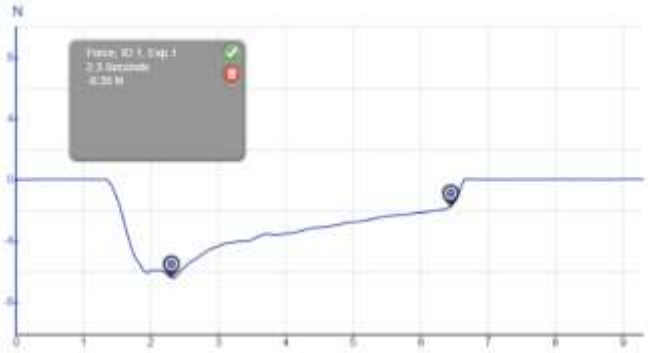
Temperature (°C)	Length the Blu-Tack stretches before it breaks (cm)						
	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Average
-20	10	12.5	7	7.5			9.25
3	32	19	8	18	15	12	19.2
18	88	53	63	55			57
35	29	37	33	24			30.75
48	20	32	36	45	67	31	38.5

Table 2. Table showing the maximum force when the Blu-Tack was stretched. Red means the force maxxed out. Blue means the results are really different.

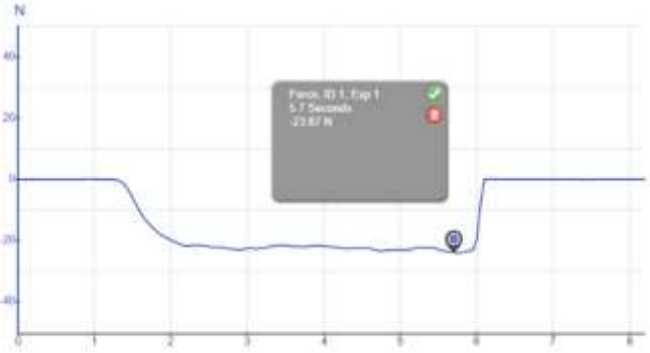
Temperature (°C)	Maximum Force (N)						
	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Average
-20	-23.87	-31.15	-31.68	-23.2			-27.475
3	-9.46	-10	-12.68	-10.07	-26.77	-32.3	-10.74
18	-7.23	-6.76	-6.12	-6.35			-6.615
35	-10.89	-10.41	-10.28	-9.74			-10.33
48	-11.58	-10	-11.1	-9.32	-11.05	-11.21	-9.04

Here are examples of my force graphs at each temperature, plus a mistake.

18 °C, Run 4

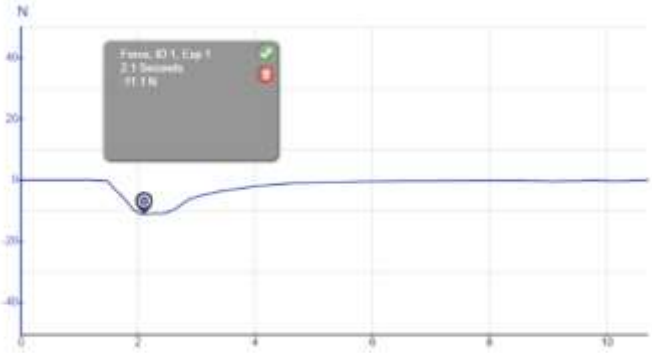


-18 °C, Run 4

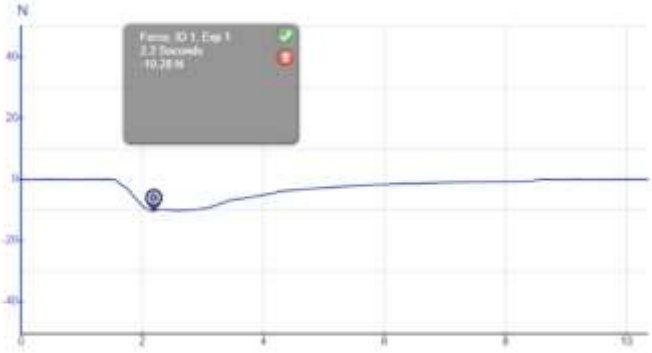


3 °C, Run 4

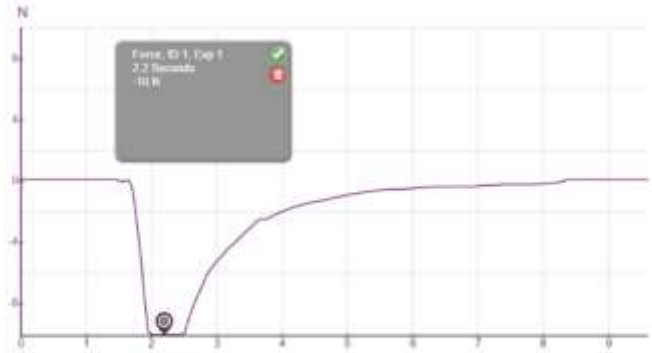
48 °C, Run 3



35 °C, Run 3



48 °C Run 2 – a mistake



The smallest force to stretch the Blu-Tack is at room temperature, about -6.6 N. The force in the fridge was -10.4 N and freezer was -27.4 N. These forces were much bigger because you need to pull harder. It breaks quickly when it's cold because you can't stretch it as far, only 9 cm in the freezer and 19 cm in the fridge. The Blu-Tack stretched 57 cm at room temperature.

When the Blu-Tack is hot, it's easy to break and fairly stretchy. There's not much difference between the length and force measurements for the two hot temperatures. At 35 °C, the Blu-Tack stretched 30.7 cm and at 48 °C it stretched 38.5 cm. The forces were nearly the same, -10.3 N and -9.0 N.

My prediction was just a bit right. When the Blu-Tack is cold it's hard to stretch and it's less sticky because more force is needed. But I predicted that when the Blu-Tack gets hot it's stretchier and

stickier. This wasn't right because you can't stretch it as far as at room temperature and it needs about the same force.

Evaluating

When the Blu-Tack is hooked on the force sensor it doesn't measure zero anymore. I could press the button to make it zero again before I measure the force.

When I was cutting Blu-Tack for the freezer, I accidentally pressed my fingers into one piece. This means the test might not be the same. To improve I could only press down on the knife harder, using more force cuts better. I could re-do the test.

I took different times to stretch the Blu-Tack each time, which made the tests different. It would be good to get something that stretches the Blu-Tack so that the time is the same.

It took a bit of time to get the Blu-Tack out of the fridge and set it up, so it might have been warmer than 3 °C when I tested it. I could test the cold Blu-Tack in a big fridge to make sure it's at the right temperature.

The temperature of the kettle water dropped by 3 °C when I did tests. I could improve by doing it quicker so it doesn't get colder.

I could have tested other brands, not just Blu-Tack.

My results show that Blu-Tack is supposed to be used at room temperature. It has its longest stretchiness and the lowest force at 18 °C. It would be good for people to design a different Blu-Tack to use in places where it's hot or cold. My experiment could be used to test a new type of Blu-Tack.

References

https://neulog.com/wp-content/uploads/2014/07/Neulog%20NUL-211%20Force%20Logger%20Sensor%20V11042014.pdf

https://www.instituteofmaking.org.uk/blog/materials-up-close-personal-blu-tack

https://www.thenakedscientists.com/articles/questions/how-does-blu-tack-work

https://www.thenakedscientists.com/articles/questions/why-blu-tack-sticky

https://www.sciencefocus.com/science/how-does-blu-tack-stick-but-not-feel-sticky

Thank-you to Mum for helping me so much with my project. Mum helped me learn to use the force sensor, helped me to set it up on the computer and do the tests. She taught me to rule up a table and figure out an average. She also helped me with the kettle and typed my report while I spoke it to her.

Thanks to Dad for helping set the force sensor up with the clamp and wood and for lending me his metal ruler. Dad also took photos of me.

Thanks to Ms Young for helping me think about what to do with tricky words.

Friday 25th of April 2025

I wonder how streche blue tach is if it is hot or cold? this is because Ive seen pichers fall of the wall after a long time and after a hot day. also ~~becase~~ because I testerd put a bit of blue tack on mums cup of tea x I ~~aa~~ noatist that it was strechyer after I put it on there.

this is the blue ~~talk~~ tack I am yousing for my ikspmererment

Friday 25th of April 2025

~~qe queschens~~ questions I ~~har~~ have

1. dus the blue tack get strechyer?
2. wat hapins wen it gets colder?
3. if it can Strech longer wen it is colder?
4. why dus the ~~Strechyness~~ ~~AUS~~ ~~AUS~~ Strechyness change wen ~~it~~ it is hot ore cold?
5. will it be Squishyer wen it is hotter?
6. will it be stickyer wen it is hot?
7. wat is it made uot of?

Words for ~~Stithy~~ Sticky things

adhesive bluetak Stiking to a ~~surfers~~ Surfers
reversible it can un stick and ree stick
bond how blue tack ~~stik~~ ~~Stickes~~ Sticks
pressure it pooshers down on Sumthing ofer a spac
~~fors~~ force pooshing hard on Sumpthing
rigid it cant moov, ~~it~~ it is reely hard
flow wen we tuch blue tack it flows like a liqued
cohesive the blue ~~talk~~ tack Sticking to its Self

5-5-25

today I want to plan the equipment and Materials.

we will need a

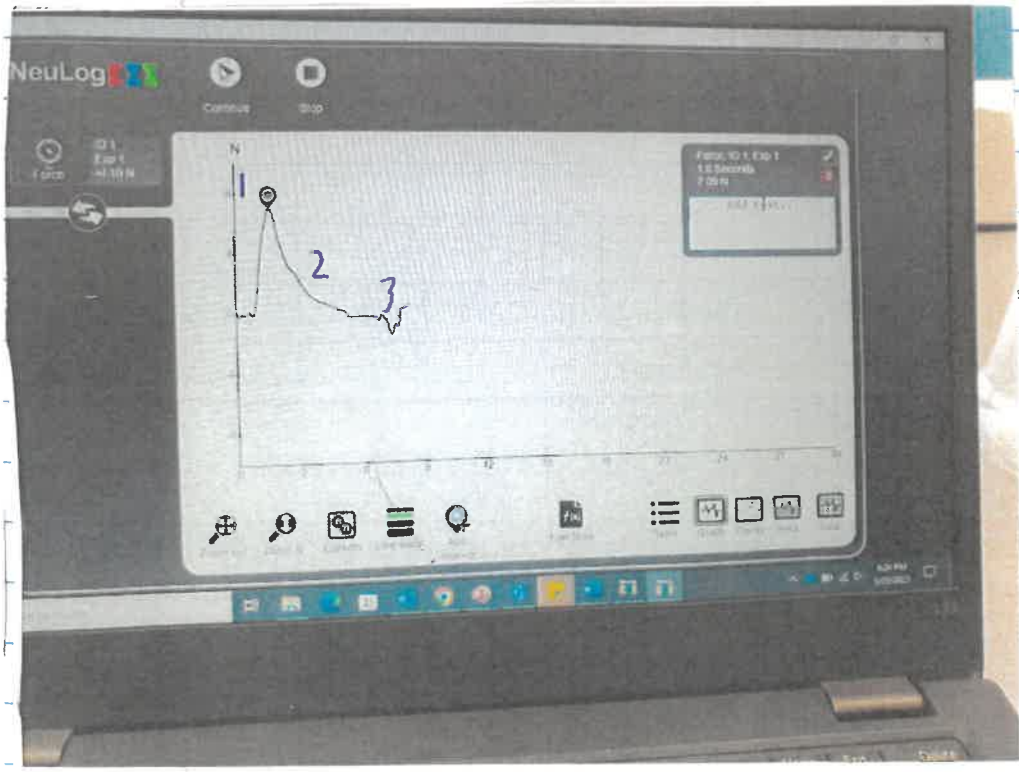
- cetle with hot water
- Jug with cold water
- blue tack
- ~~skailse~~ scales to measure bluetack
- mould to make the blue tack the same shape ore cooky cuters?
- fors spring
- ~~drd d~~ ~~dadata logger~~ dater logger
- ~~footer~~ ruler
- sumpthing to hold the ~~dada~~ dater logger
- thermometer
- laptop for dater logger

thees are the fors springs I cood yoos to test how strong the bluetack is.

you yous the fors springs by putti[ng] the blue tack on the spring ~~you put the blue tack on the spring~~ than you pull the springs and strech the blue tack untill it brakes. it is tricky because you ~~hakto~~ hafto ~~tock~~ look at the measure and pull the blue tack untill it ~~brak~~ bracks.

Sunday 1/6/2025

this is a data logger with a fors senser. you can yoos this insted of a fors spring its good ~~b~~ because its easier to measure the forse than yoosing a fors spring it also shoas a graph.



this is a graph from the data logge I ~~tesdetd~~ ~~testd~~ ~~tese~~ tested streching a peis of blue tack ① this part of the graph shoas how the fors is big wen a thick ~~peas~~ piece of thick blue tack is streched ② this ~~shos~~ shoas that the blue tack is getting thinner so the fors goas down.

③ this is were where the blue tack has brake

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☐ Models & Inventions and ☑ Scientific Inquiry

This must be included with your report, logbook or entry. One form per entry.

STUDENT(S) NAME: Piper Lashmar ID: 0278-005

SCHOOL: Kangaroo Island Community Education

Activity: Give a brief outline of what you are planning to do.

I will test if Blu Tack is stretchier when it's cold or hot. I will heat the Blu Tack up with hot water and cool it down in the fridge and freezer. I will use a data logger with a force sensor to test the Blu Tack.

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead? **Only batteries can be used for Models & Inventions entries*
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control / manage the risk
1. When the Blu Tack breaks, it might flick in your face.	1. Wear safety glasses when breaking the Blu Tack. Use small pieces of Blu Tack.
2. When using a kettle hot water might splash and you might get burnt.	2. Ask an adult to help with using the kettle. If you get burnt, put your hand under cold water.
3. Don't get your hands in the hot water because you might get burnt.	3. Use gloves or tongs to get Blu Tack out of hot water.
4. Don't plop the Blu Tack in the hot water because it might splash in your face.	4. Wear safety glasses when putting Blu Tack in hot water. Put it in the water carefully and use tongs.
5. If you spill water on the floor people might slip up.	5. Clean spilt water up straight away and tell people that the floor is wet. Put up a sign to tell people that the floor is slippery.
6. Don't get the laptop or data logger too close to water because you might get an electric shock.	6. Keep the data logger and laptop on another bench away from the water. Dry the Blu Tack with paper towel.

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): Piper Lashmar

Piper

SIGNATURE(S):

☑ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

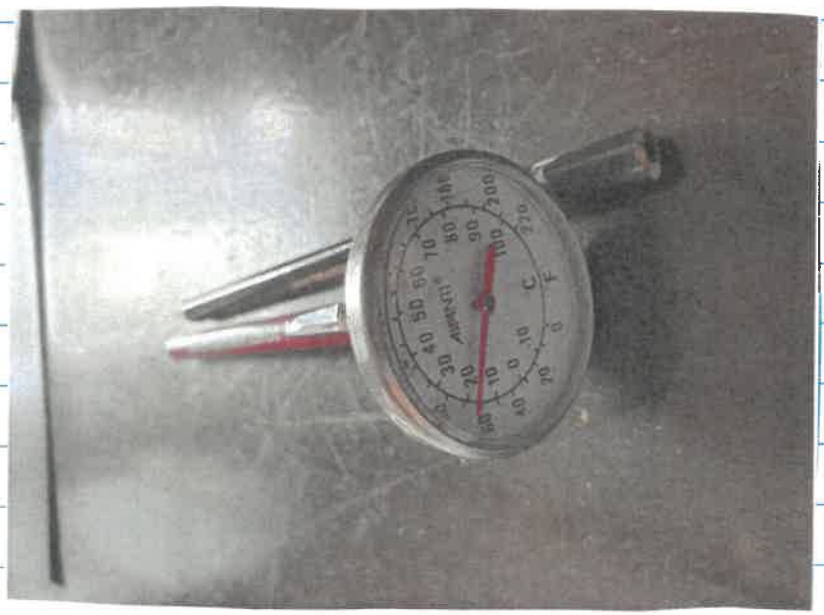
TEACHER'S NAME: Rachel Pillar

SIGNATURE: RPi DATE: 5/5/25

9/6/2025

temperaturesi I plan to test the blue tack at

- room ~~tem~~ temperature about 18°c
- 3°c in the fridge
- the ~~freaser~~ freezer about -18°c
- ~~30 digreez Selsyas~~ 30°c in warm water
- 40°c in wormer water
- we will test 3 times at each temperatere incase sumpthing goes rong this makes 15 tests in toatle
- we will need 15 peises of blue tack

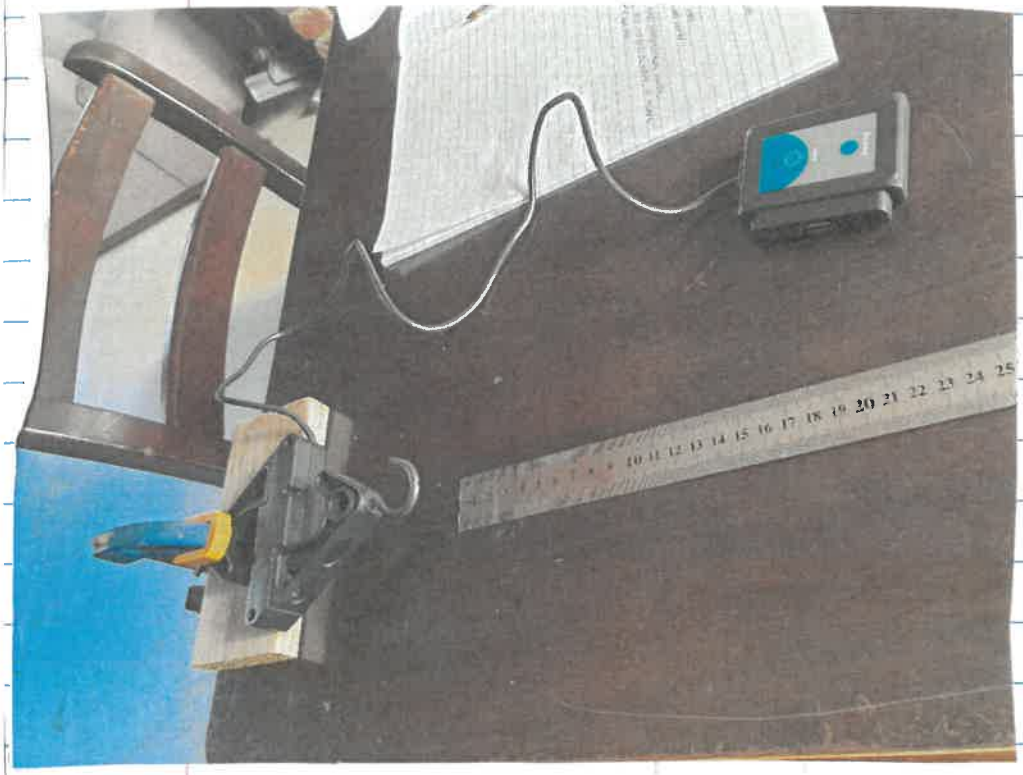


This is a thomometer ~~th~~ that I will use to measure the ~~temper~~ temperiche r of the ~~b~~ blue tack. it is a bit hard to measure the egsact temperiche

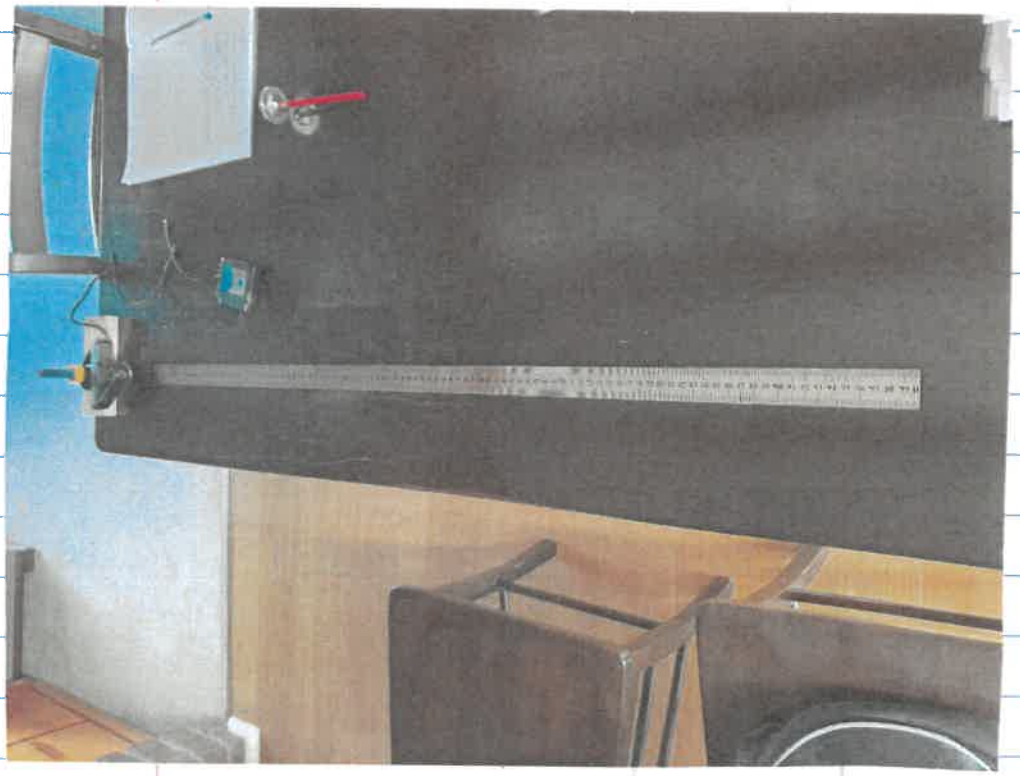
9/6/25

This is me sticking the meter rooler on the table so I can measure how far the blue tatack ca can streach

9/6/25



this is th the fors senser Dad helped me set up by clamping it up with a peas of wood.



temperature (°C)	How far the blue tack stretched run 1 (cm)	run 2	Stretched run 3	Before it broke run 4 (cm)	Average
-18	10		12.5	7	7.5
3	32		19	change solvent I didn't attach properly 8	18
18	88 I didn't measure it properly		58	63	55 57 not including run 1
35	29		37	33	24
48	20		32	36	45

Need hard to pu

temperature (°)	maximum force (N) run1	run2	run3	run4	Average
-18	-23.87	-31.15	-31.68	-232	-
3	-9.46	-10 ☆	-12.68		-10.07
35	-10.89	-10.41	-10.28		-9.74
18	-7.23	-6.76	-6.12	-6.39	-6.62
48	-11.58	-10 ☆	-11.1	-9.32	

The graph looks verry difrent

14/6/25

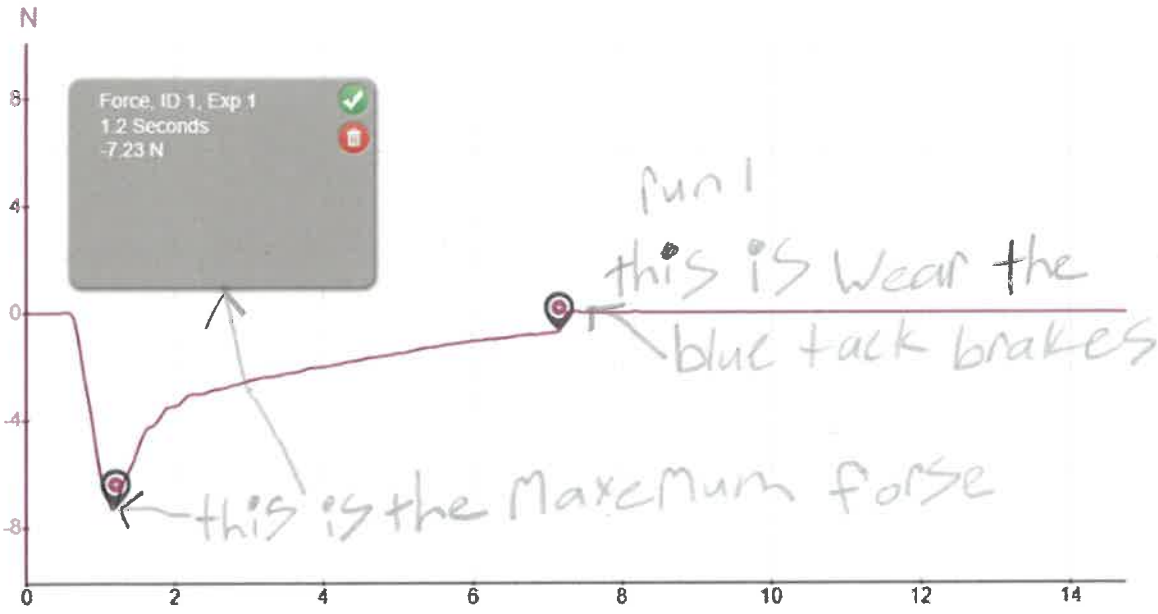
to day I colected my results it toock a bit of time and som changers to get it to work.

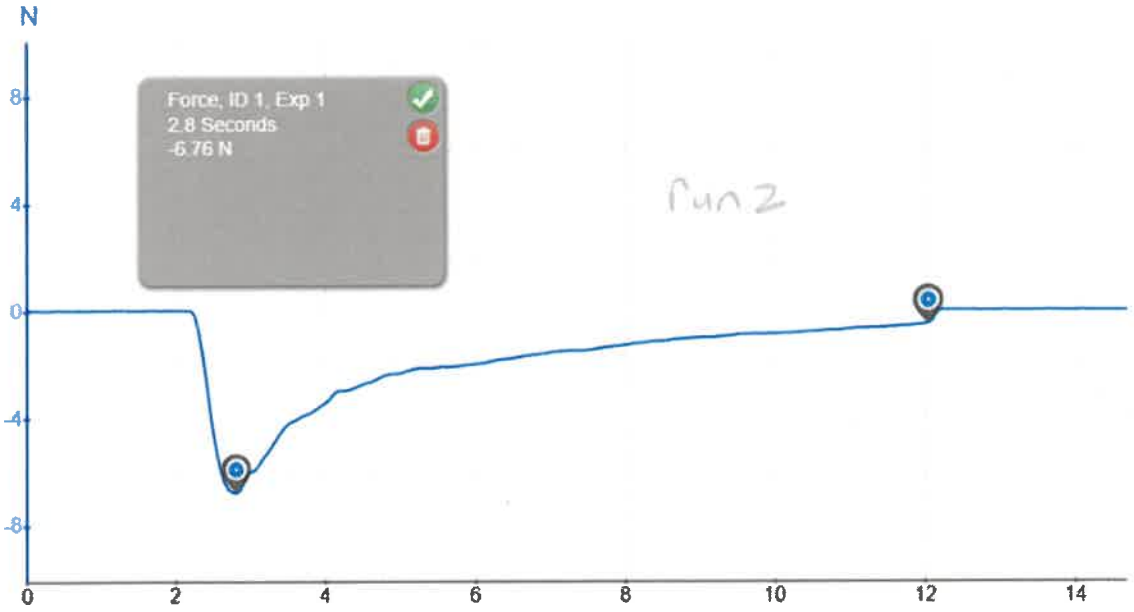
hear are the things I had to do ore change:

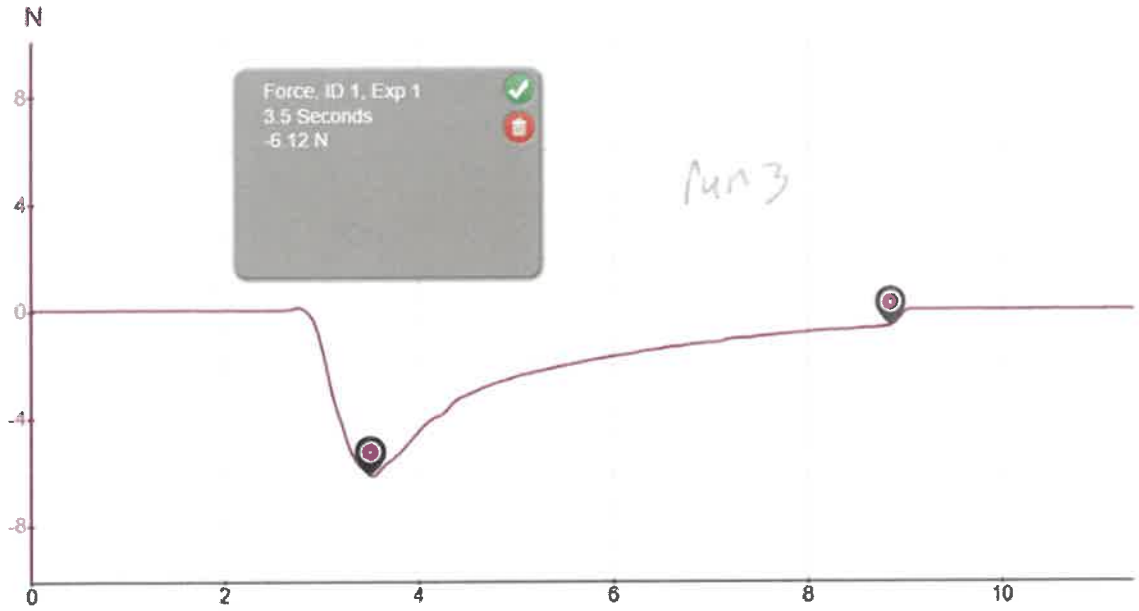
- I had to calibrate the fors senser to make sure I did it propilys
- it was inportent that I looked at the blue tack so I see when it brackes and so I can measure it. Som one else had to start and stop the darter bager on the laptop I asked Mum to ~~hu~~ help me.
- ~~We~~ I left the blue tack in the frige ore freaser fore atleast an houer.
- Som ~~the~~ things that whent wrong in my test is when I ~~dident~~ put the blue tack on the forc senser properly
- also I neaded to change the range on the fors senser from 10 n to 50 n
- I dident leav the blue tack on the cetile for long anuf for the 48 °C samples I will ~~need~~ need to do again
- the cichen thomometer coden measure lower than -20 °C

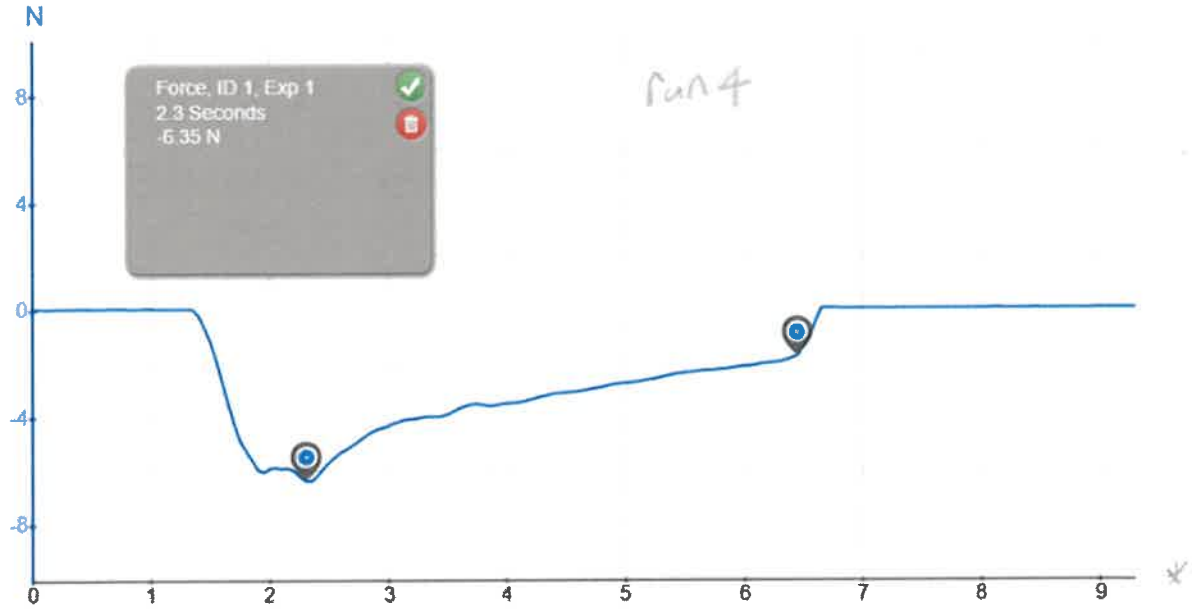
14/6/2025

Room Temperature, 18 °C

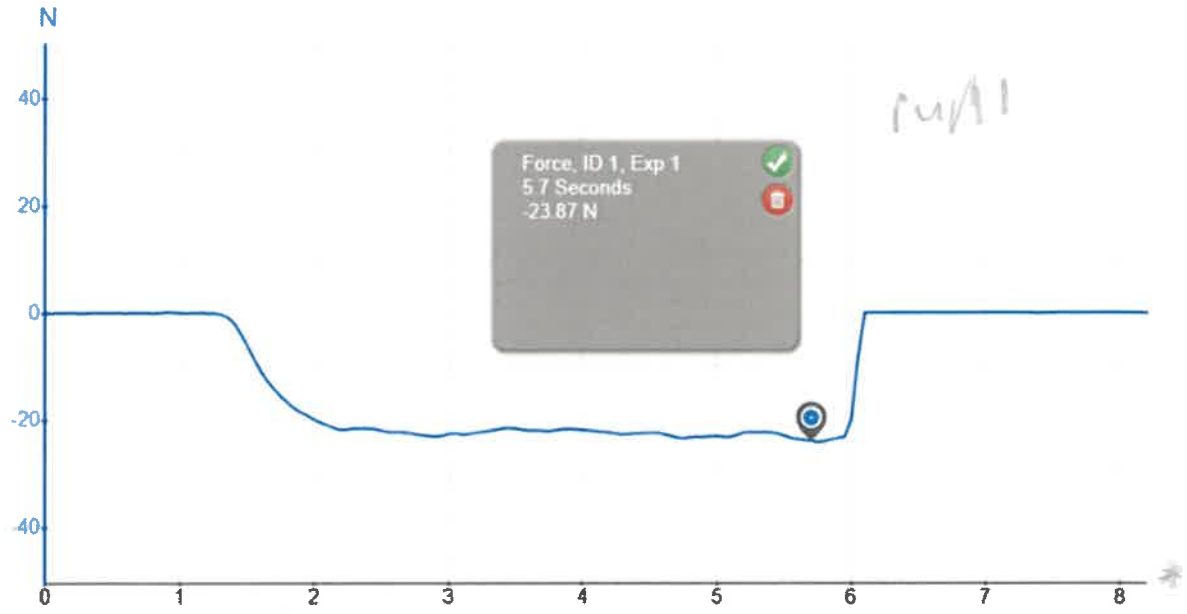


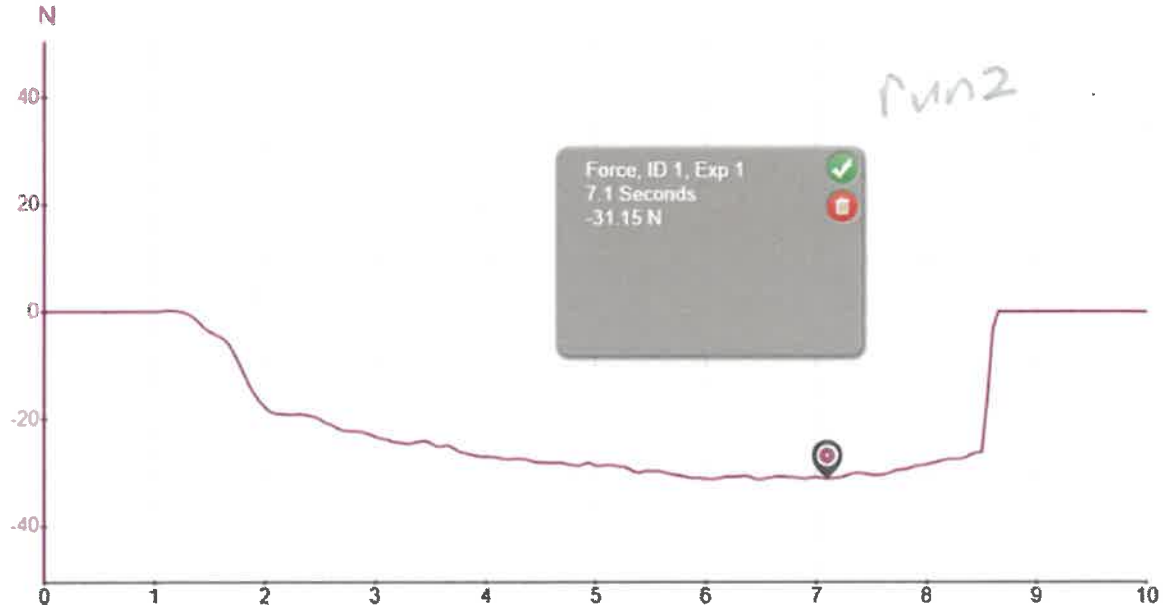


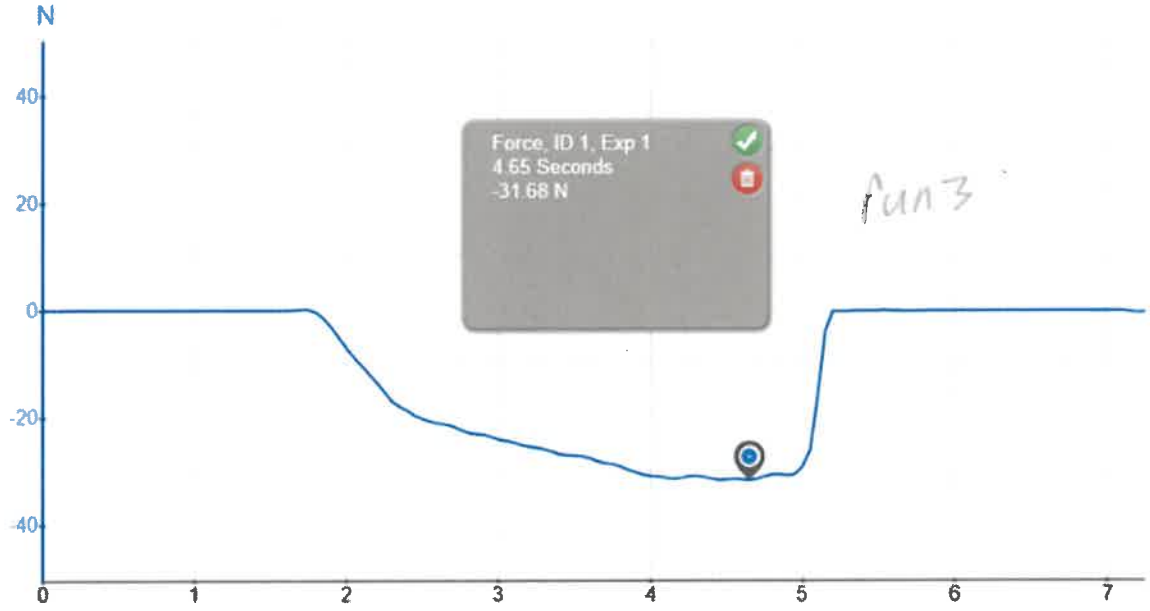

N
8
4
0
-4
-8
0
2
4
6
8
10
Force, ID 1, Exp 1
3.5 Seconds
-6.12 N
run 3

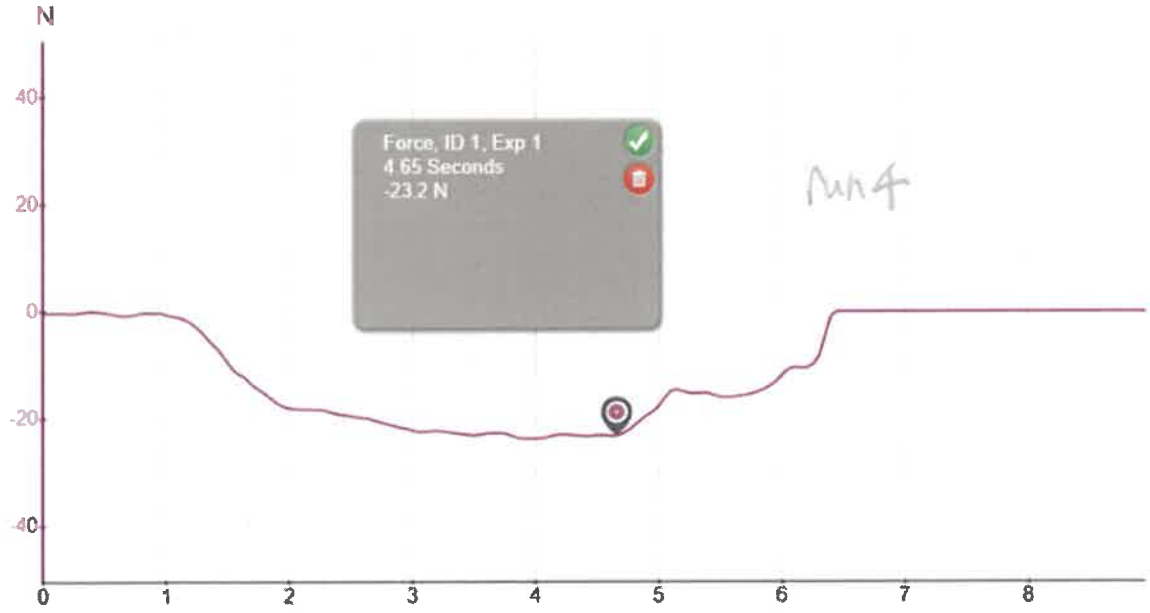

N
8
4
0
-4
-8
0
1
2
3
4
5
6
7
8
9
Force, ID 1, Exp 1
2.3 Seconds
-6.35 N
run 4

Freezer, - 18 °C

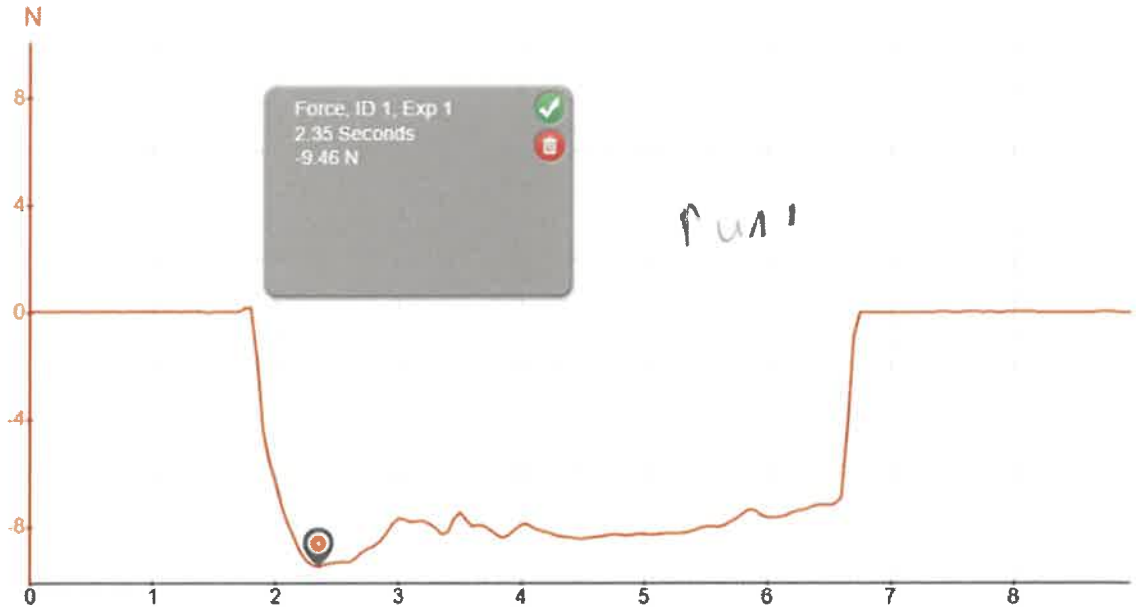

N
40
20
0
-20
-40
0
1
2
3
4
5
6
7
8
run1
Force, ID 1, Exp 1
5.7 Seconds
-23.87 N


N
40
20
0
-20
-40
0
1
2
3
4
5
6
7
8
9
10
run2
Force, ID 1, Exp 1
7.1 Seconds
-31.15 N

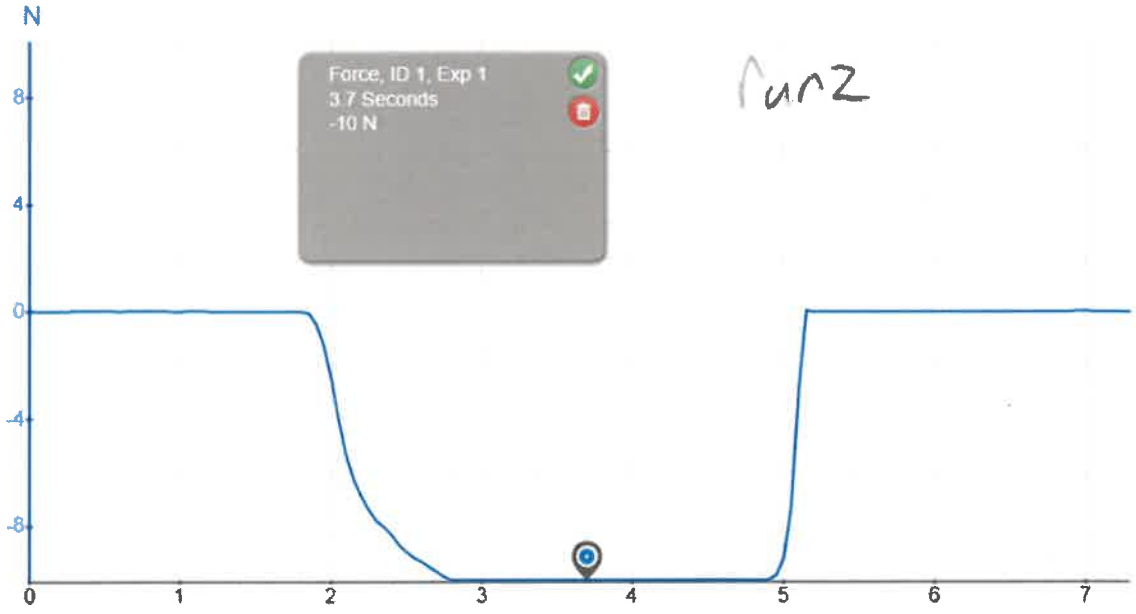

N
40
20
0
-20
-40
0
1
2
3
4
5
6
7
Force, ID 1, Exp 1
4.65 Seconds
-31.68 N
Run3


N
40
20
0
-20
-40
0
1
2
3
4
5
6
7
8
Force, ID 1, Exp 1
4.65 Seconds
-23.2 N
Run4

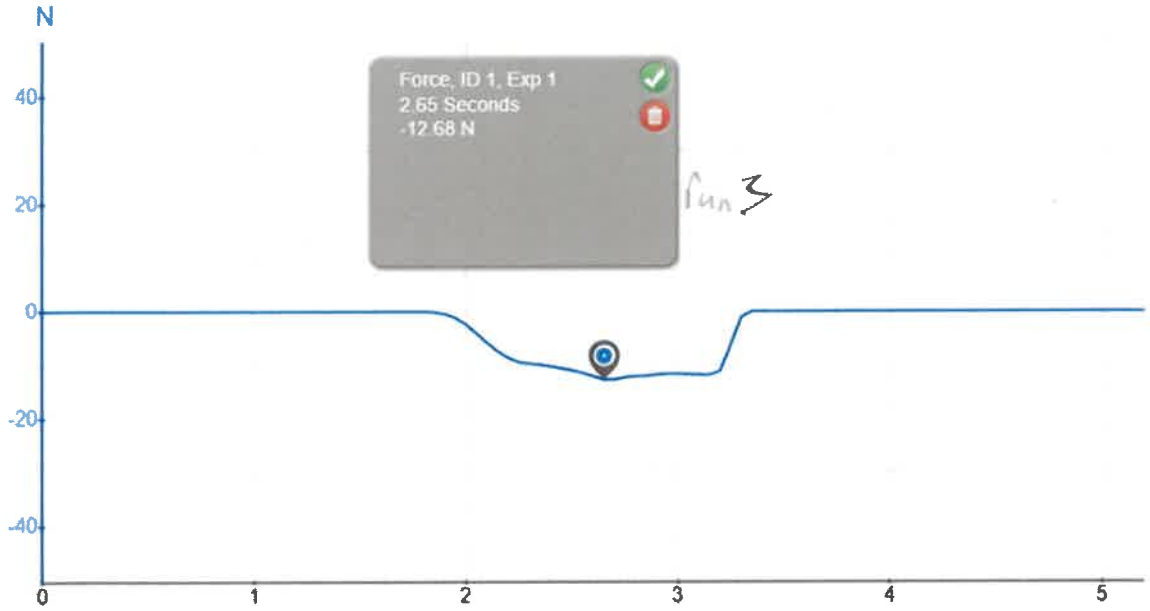
Fridge, 3 °C



run1

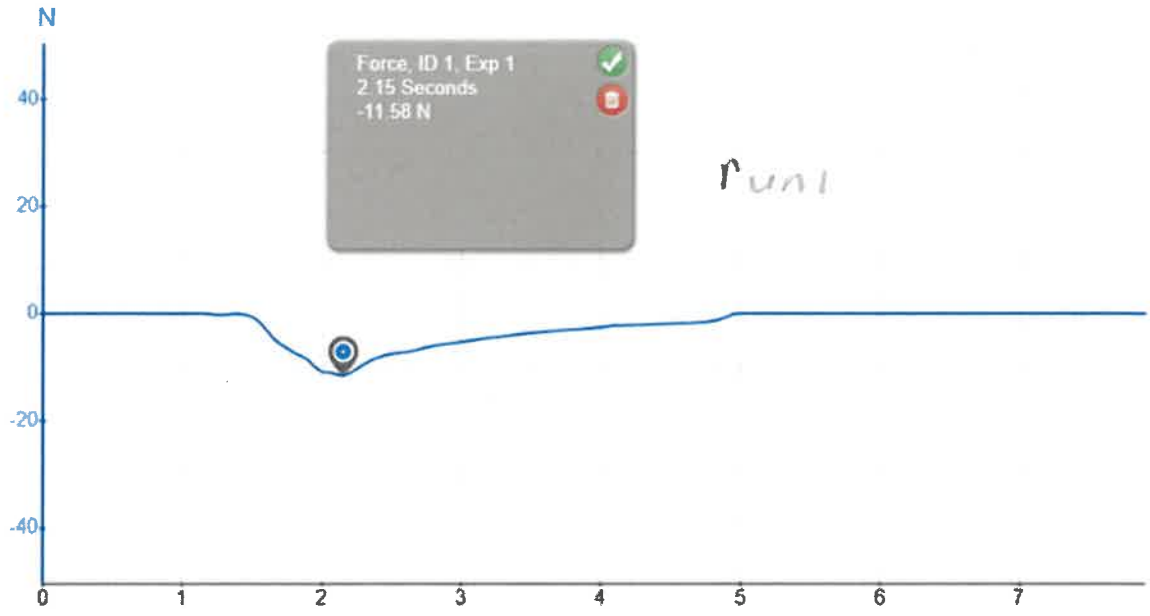


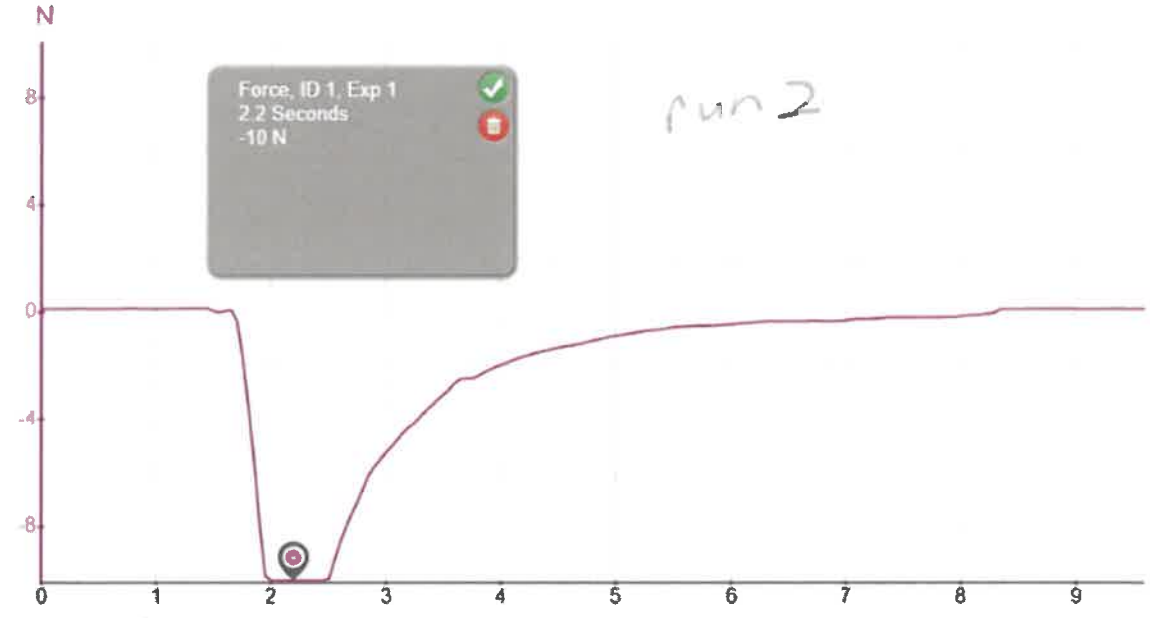
run2

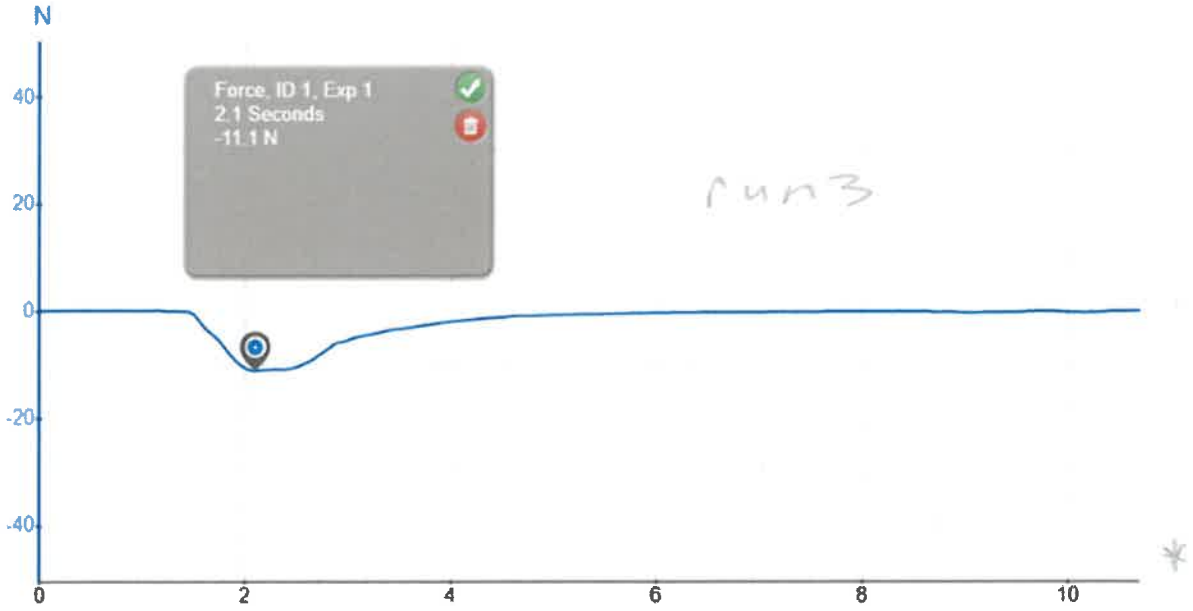

N
40
20
0
-20
-40
Force, ID 1, Exp 1
2.65 Seconds
-12.68 N
Run 3
0
1
2
3
4
5


N
40
20
0
-20
-40
Force, ID 1, Exp 1
3.75 Seconds
-10.07 N
Run 4
0
1
2
3
4
5
6
7

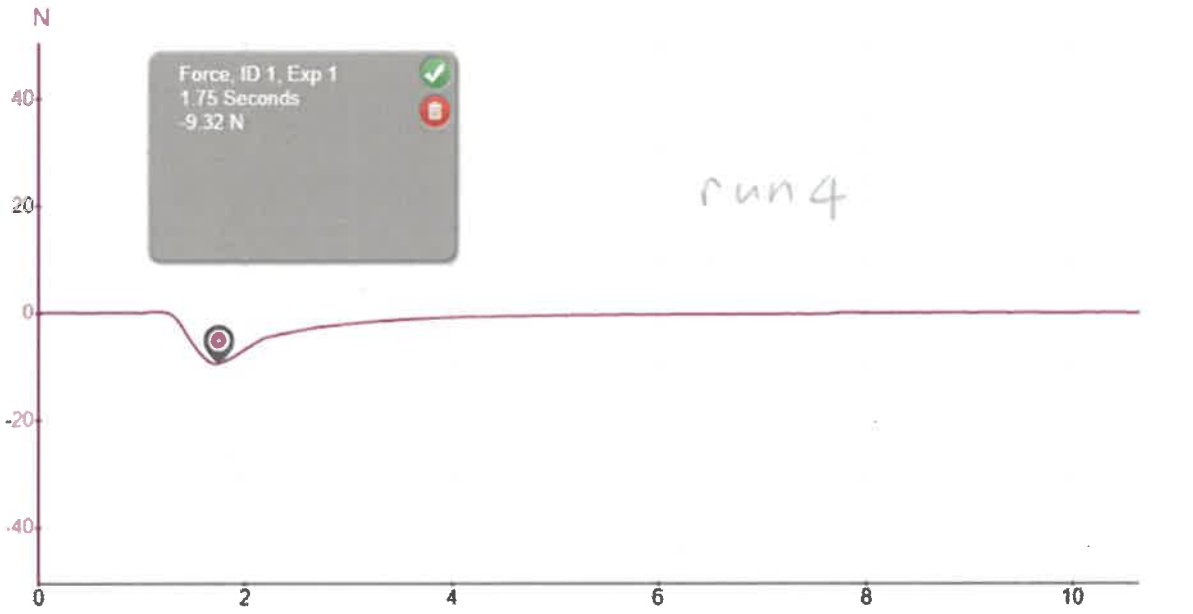
Kettle, 48 °C


N
Force, ID 1, Exp 1
2.15 Seconds
-11.58 N
run1
40
20
0
-20
-40
0
1
2
3
4
5
6
7


N
Force, ID 1, Exp 1
2.2 Seconds
-10 N
run 2
8
4
0
-4
-8
0
1
2
3
4
5
6
7
8
9

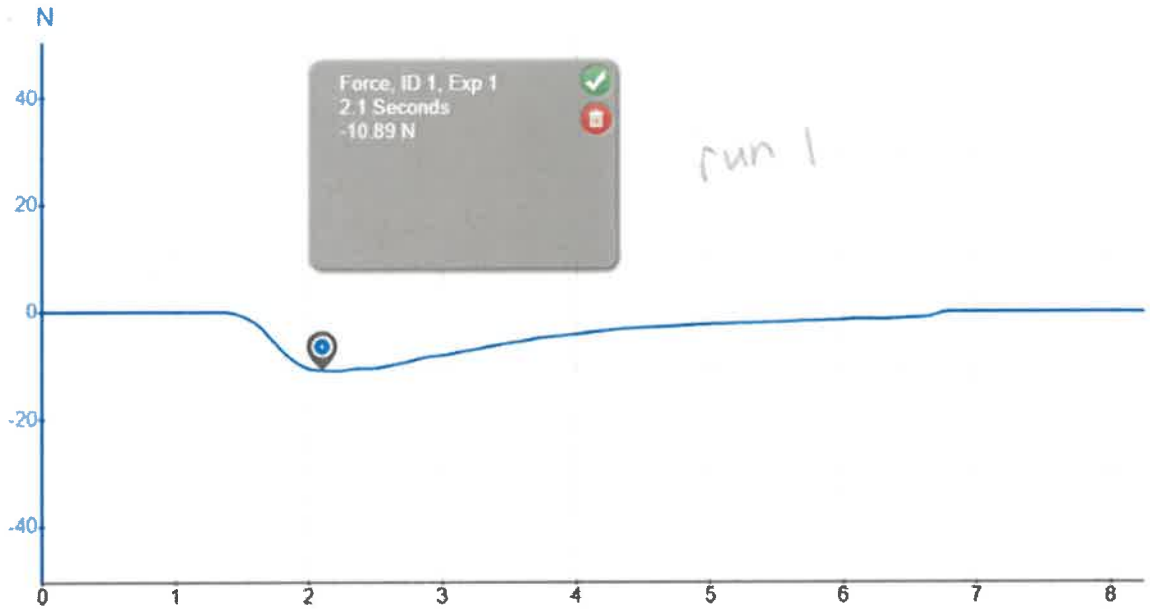

N
40
20
0
-20
-40
Force, ID 1, Exp 1
2.1 Seconds
-11.1 N
0
2
4
6
8
10

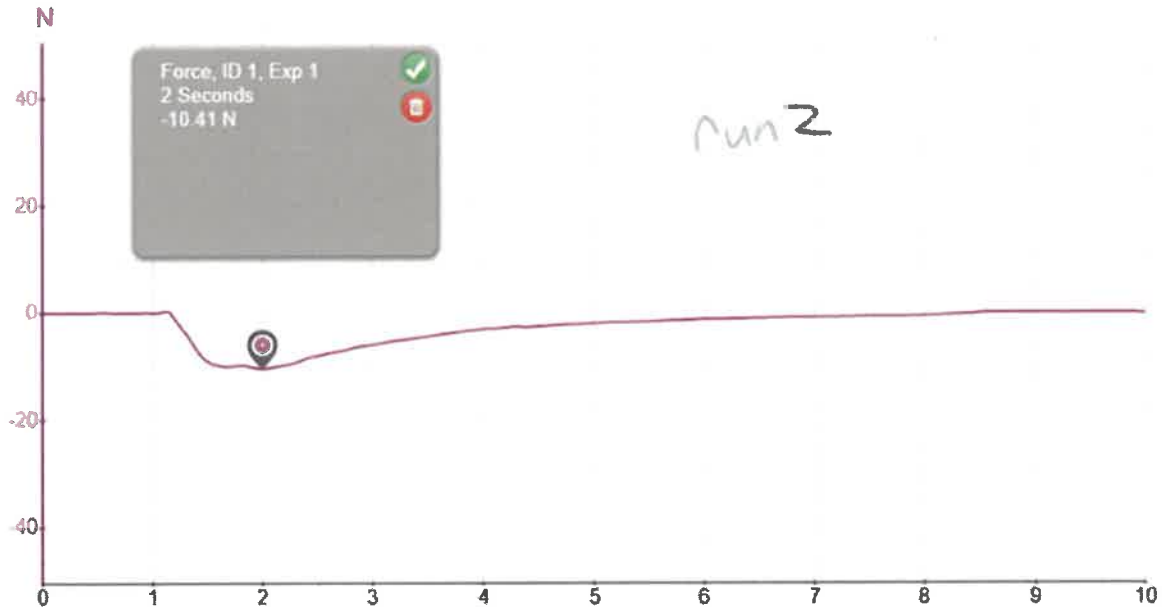
run3

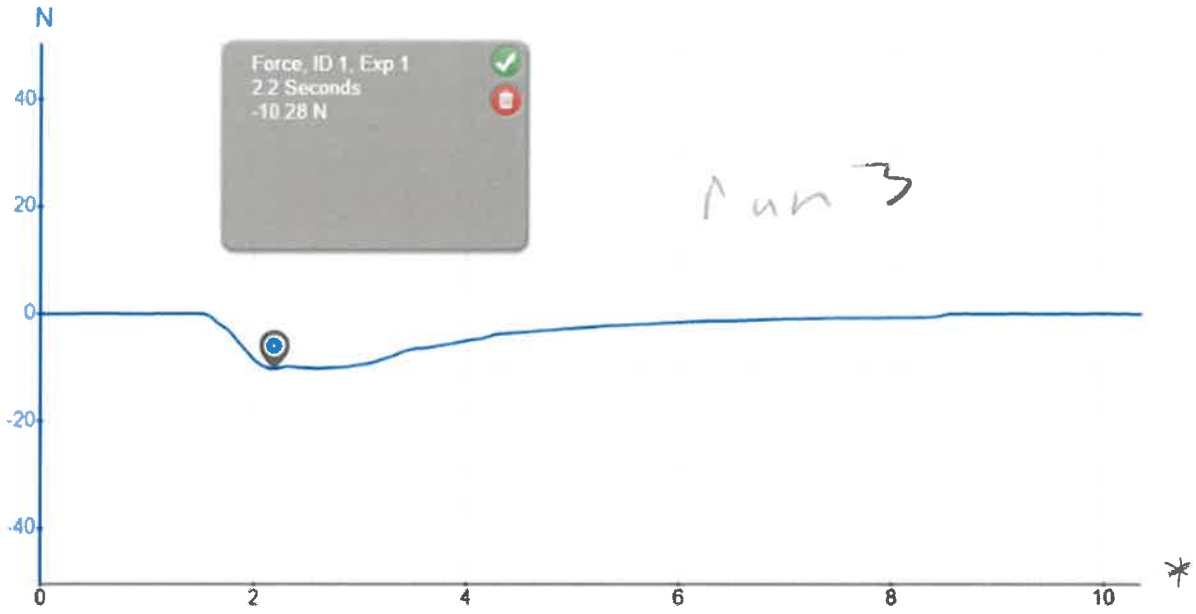

N
40
20
0
-20
-40
Force, ID 1, Exp 1
1.75 Seconds
-9.32 N
0
2
4
6
8
10

run4

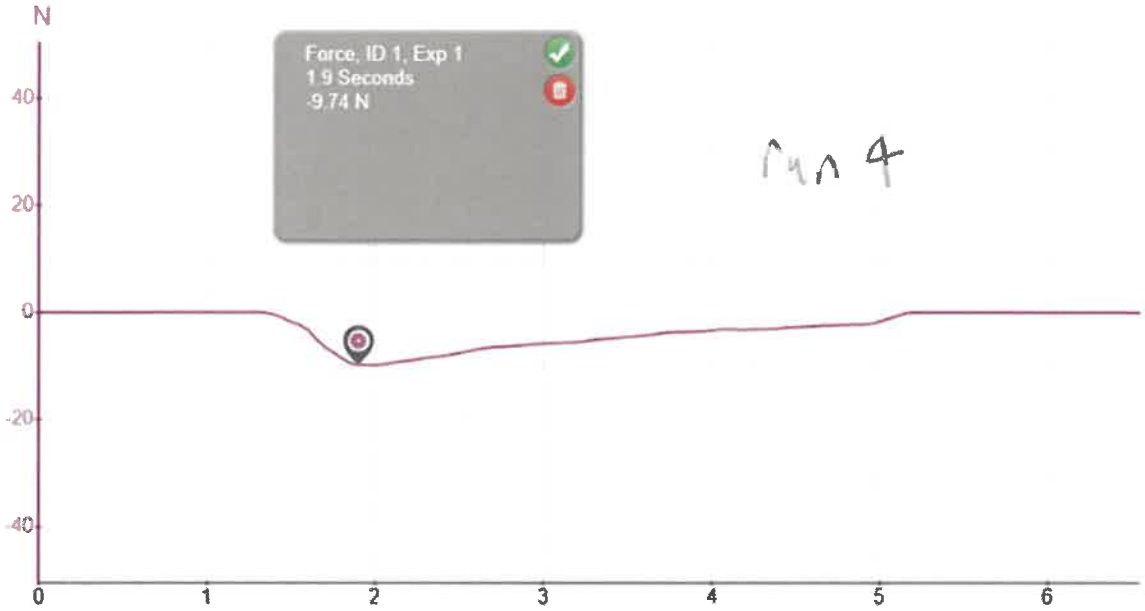
Kettle, 35 °C


N
Force, ID 1, Exp 1
2.1 Seconds
-10.89 N
run 1
40
20
0
-20
-40
0
1
2
3
4
5
6
7
8


N
Force, ID 1, Exp 1
2 Seconds
-10.41 N
run 2
40
20
0
-20
-40
0
1
2
3
4
5
6
7
8
9
10

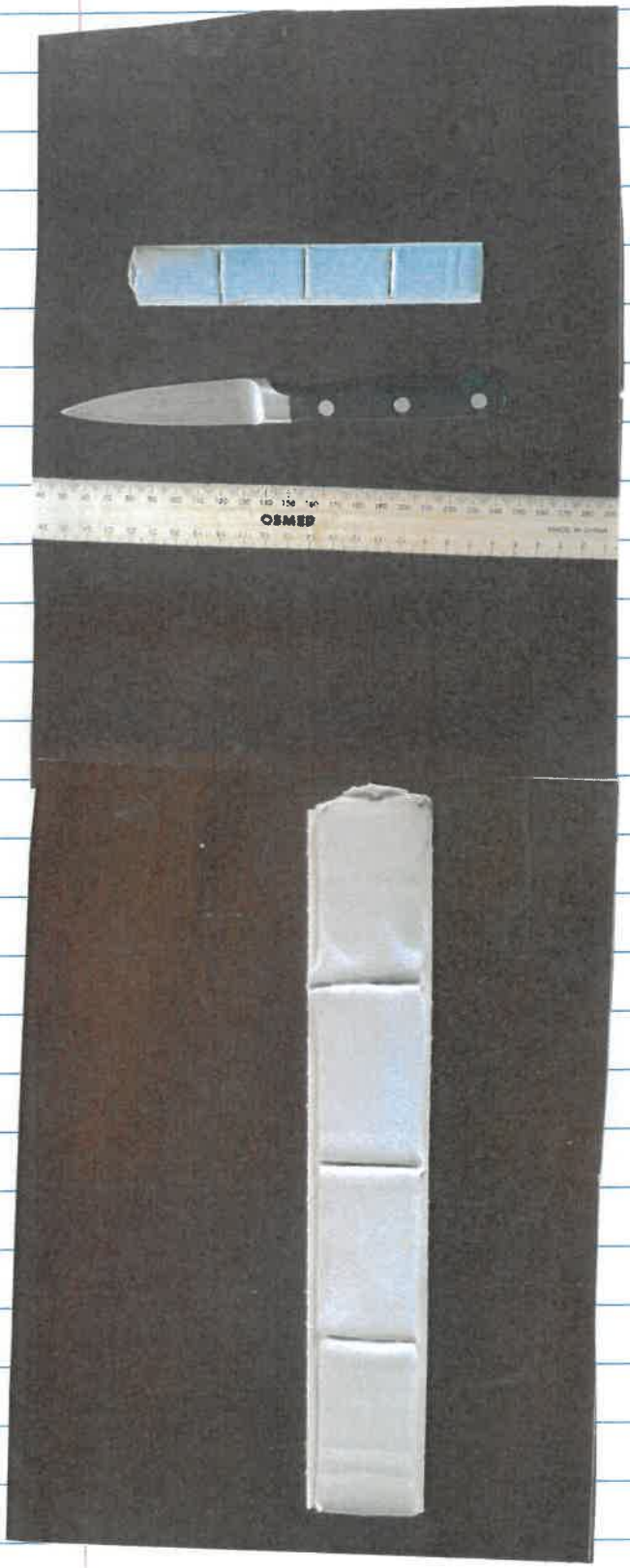

N
Force, ID 1, Exp 1
2.2 Seconds
-10.28 N
40
20
0
-20
-40
0
2
4
6
8
10

Run 3

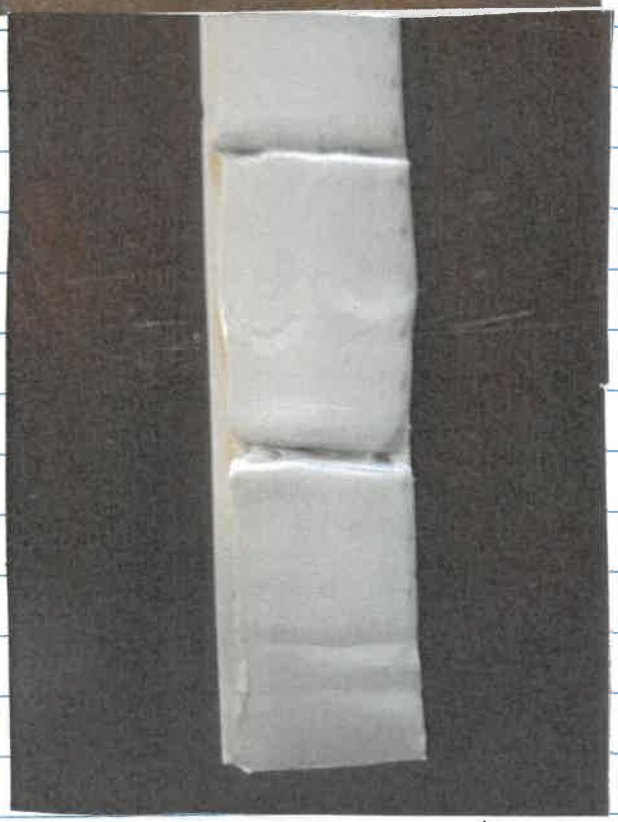

N
Force, ID 1, Exp 1
1.9 Seconds
-9.74 N
40
20
0
-20
-40
0
1
2
3
4
5
6

Run 4

15/6/25



this is me ~~cutting~~ cutting up pieces of blu-tack!



this shose ~~Wat~~ Wat happens wen youare cutting the ~~blue tack~~ tack and pushing on it, it wont ~~get~~ fear test.

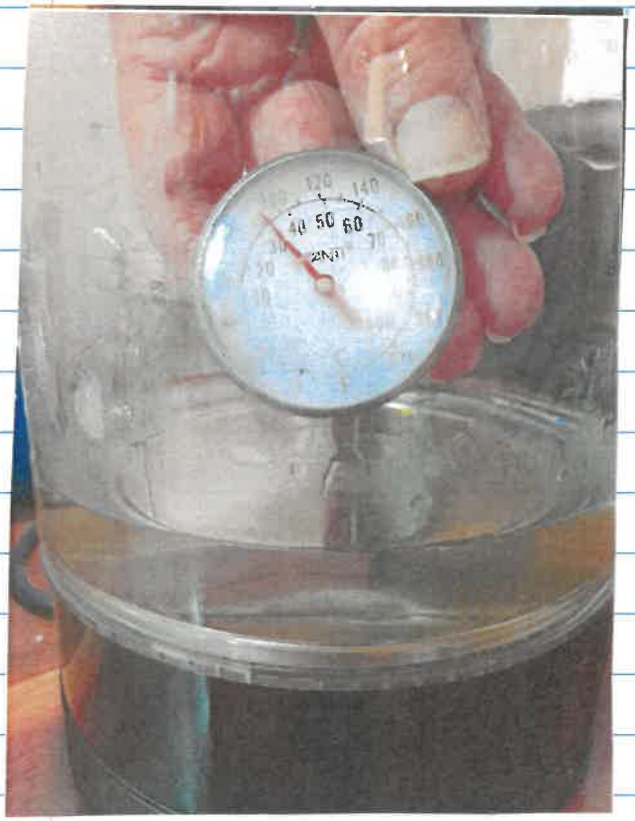
15/6/25

this shose me using a reoler to make data tables

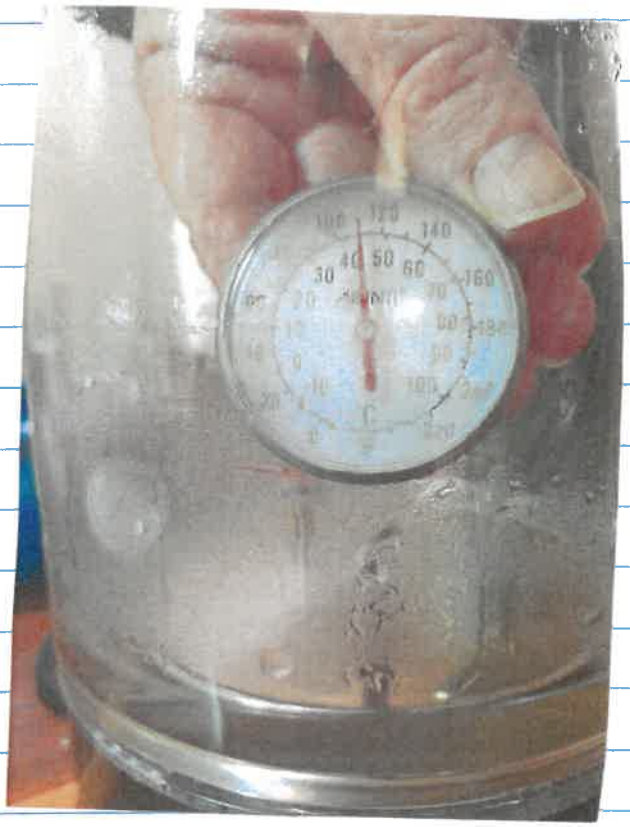
this is me hooking up blu-tack to the data logger I hade to make Shore I did it properly

15/5/ 15/6/25

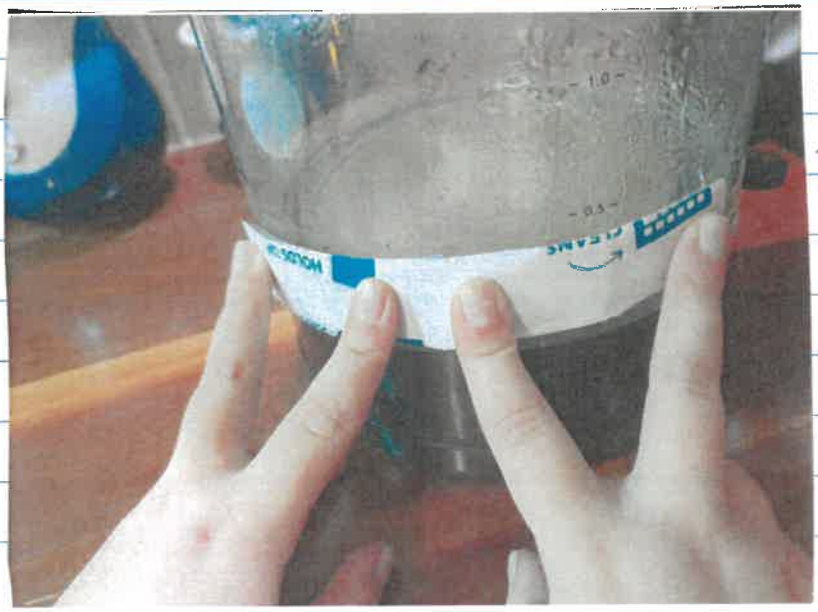
this is a ~~thormome~~ thomomerter I ~~used~~ used to measure the temperecher if it was hot ~~or~~ ore cold



this shose MuM holding the thomomerte in the cettle I took the foatoa



this is the 45 degrees (C°) measurement in the the cettle.



this is me Sticking blue tape to the cettle to Make it hot I left it in for 5 minutes

15/6/25 extra frige tests
tempeature 3°C

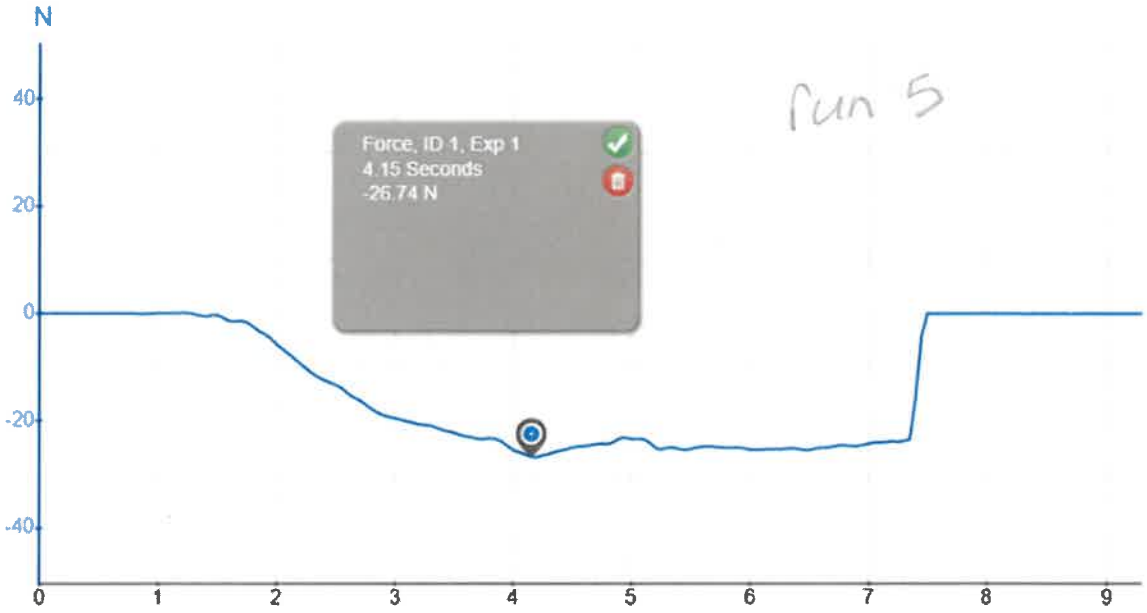
	fors(N)	length(cm)
run1	-26.77	
	-32.3	15
run2		12

temprechure 48°C

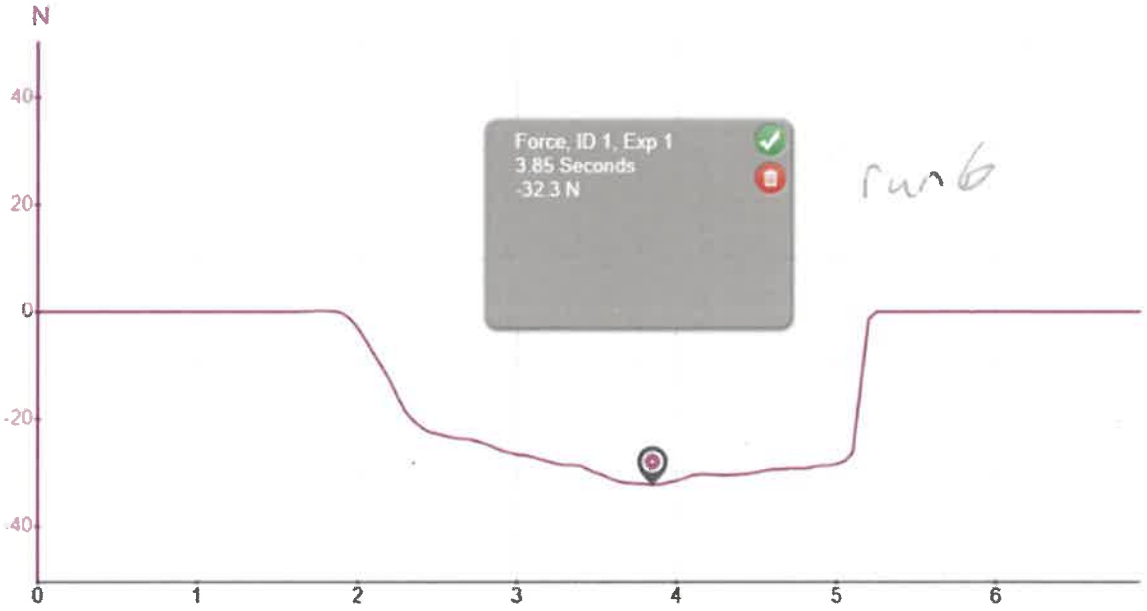
	fors(N)	length(cm)
run1	-11.05	67
run2	-11.21	31

thoas fotos show my how I tack the bluetack

3°C 15/6/2025 extra x tests

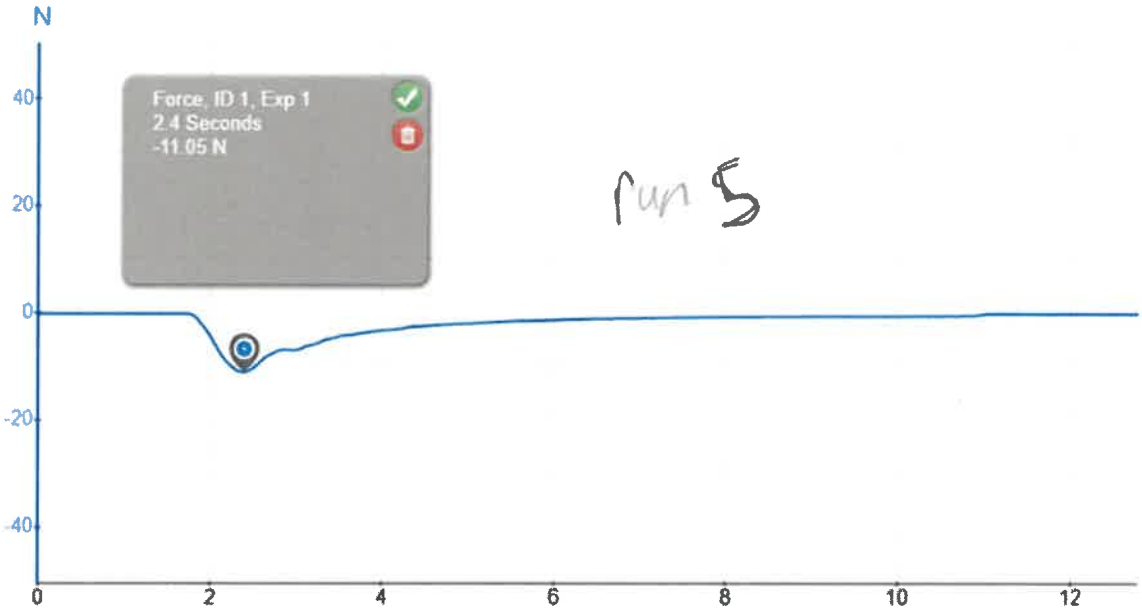


run 5

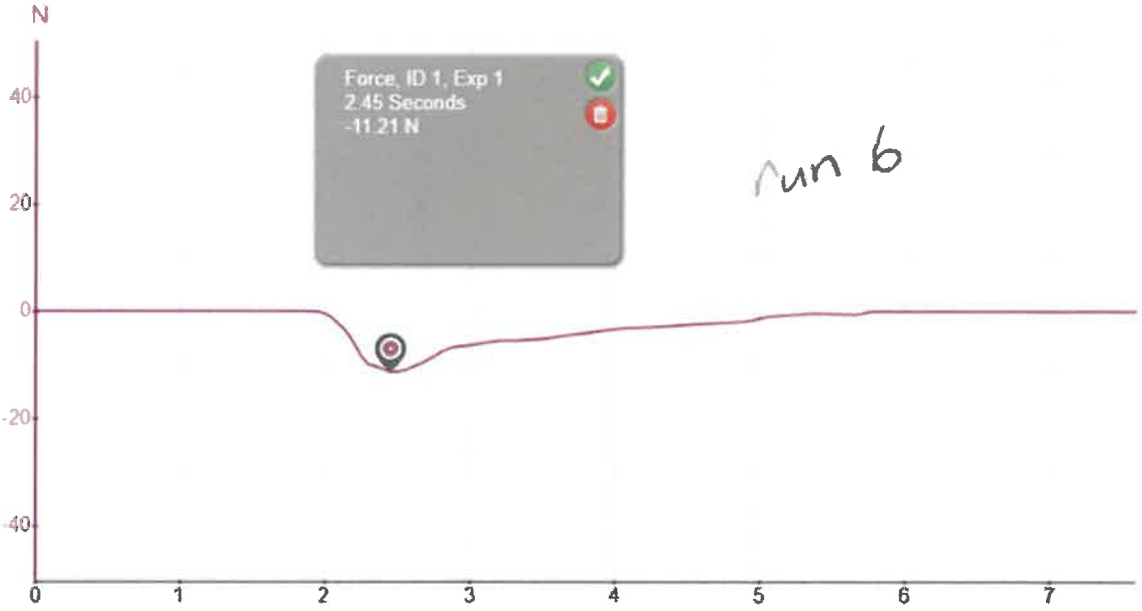


run 6

48°C



run 5



run 6

21/7, 22/7, 26/7, 28/7

I roate my report W... Mumes help on theas days.

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☐ Models & Inventions and ☑ Scientific Inquiry

This must be included with your report, logbook or entry. One form per entry.

STUDENT(S) NAME: Piper Lashmar ID: 0278-005

SCHOOL: Kangaroo Island Community Education

Activity: Give a brief outline of what you are planning to do.

I will test if Blu Tack is stretchier when it's cold or hot. I will heat the Blu Tack up with hot water and cool it down in the fridge and freezer. I will use a data logger with a force sensor to test the Blu Tack.

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead? **Only batteries can be used for Models & Inventions entries*
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control / manage the risk
1. When the Blu Tack breaks, it might flick in your face.	1. Wear safety glasses when breaking the Blu Tack. Use small pieces of Blu Tack.
2. When using a kettle hot water might splash and you might get burnt.	2. Ask an adult to help with using the kettle. If you get burnt, put your hand under cold water.
3. Don't get your hands in the hot water because you might get burnt.	3. Use gloves or tongs to get Blu Tack out of hot water.
4. Don't plop the Blu Tack in the hot water because it might splash in your face.	4. Wear safety glasses when putting Blu Tack in hot water. Put it in the water carefully and use tongs.
5. If you spill water on the floor people might slip up.	5. Clean spilt water up straight away and tell people that the floor is wet. Put up a sign to tell people that the floor is slippery.
6. Don't get the laptop or data logger too close to water because you might get an electric shock.	6. Keep the data logger and laptop on another bench away from the water. Dry the Blu Tack with paper towel.

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): _____

SIGNATURE(S): _____

☐ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: _____

SIGNATURE: _____ DATE: _____