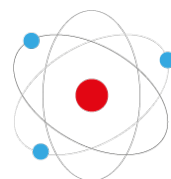




While you are waiting, please complete our registration form
<https://physicspartners.com/short-delegate-registration-form/>



Physics Partners

Mastering GCSE Physics Required Practicals through simulations

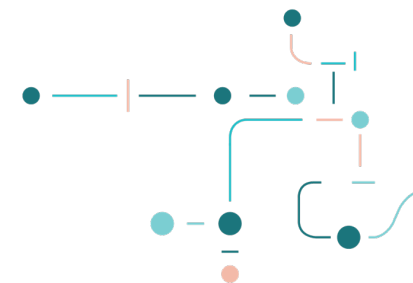
Tuesday 22 March, 4-5pm

Christina Astin

christina@astinconsulting.com

@ChristinaAstin

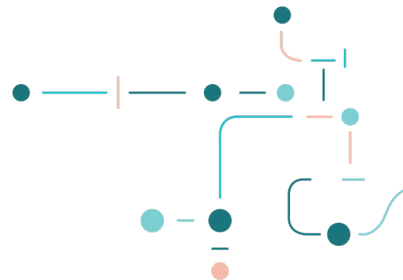
@PhysicsPartners



Register – to let us know you're here!



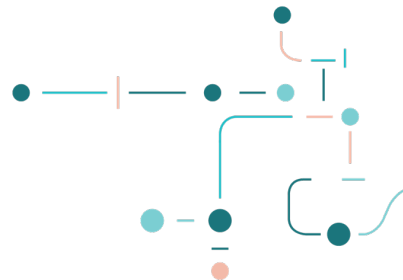
<https://physicspartners.com/short-delegate-registration-form/>



Feedback please – for further support & CPD certificate



<https://physicspartners.com/evaluation/>



Practicals can be taught by teacher demonstrations or simulations

Students can study the required practical activities through demonstrations and simulations if it is not possible to carry them out in hands on sessions in class. However, we still recommend doing hands on sessions where possible.

This will make it easier for teachers to plan and deliver the practical activities.

It should also still enable students to learn about the practical apparatus, techniques and processes in enough depth to demonstrate their understanding in exams.

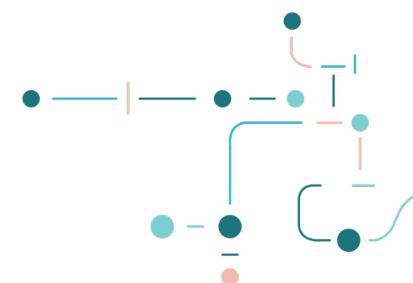


Practical science statement

Teachers continue to be provided with the opportunity to deliver practical science work by demonstration so that students are able to observe a demonstration by the teacher or observe the practical work being undertaken remotely, for example, by watching a demonstration on-line or on video.

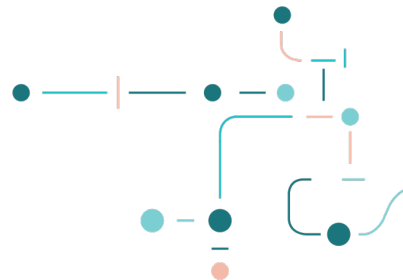
Centres will not need to submit a declaration form to confirm that they have taken reasonable steps to ensure candidates have completed the practical activities for this academic year.

While observations and/or simulations are permitted, we would still encourage students to undertake the practical work themselves where possible to enhance their experience and understanding of the subject.



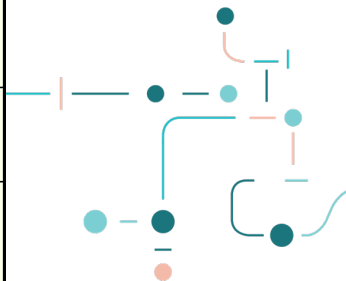
How to use simulations?

- Preparation for/follow-up to real experiment
- Scaffolding/simplification
- Alternative method
- Revision later
- Teaching remotely...



grey cell = triple science only	THERMAL					ELECTRICAL				
	specific heat capacity		insulation		absorption /emission		resistance vs length		V-I characteristics	components in series/parallel
AQA	✓ "of materials"		✓ Triple only		✓		✓		✓	
Edexcel	✓ of water & T-t of melting ice				✓ Triple only					✓ p & R
OCR	✓ "of metal"									
Recommended:	https://www.thephysicsjaviary.com/Physics/Programs/Labs/ElectricalDeterminationOfSpecificHeatLab/	Close to real version for liquid though no setting-up needed. "Idealised" results (no heat dissipated). Can change m, t & input answer to be checked	https://science-practical-simulator.web.app	Step-by-step instructions, with different materials or thicknesses. Log-in ASTINDEMO	www.sunflowerlearning.com/launch/QU1206	Lovely comparison of black/white boxes absorbing radiation then black/white radiation			https://www.thephysicsjaviary.com/Physics/Programs/Labs/ParallelCircuitLab/	Students can construct circuits - recommend simpler version with 'magnifying glass' ammeter. Can see brightness of bulbs qualitatively.
	https://science-practical-simulator.web.app	Step-by-step instructions for shc of metal, including water in thermometer hole! Log-in PHYSICSDemo			https://science-practical-simulator.web.app				https://www.thephysicsjaviary.com/Physics/Programs/Labs/ParallelCircuitLab/	Parallel circuits
	http://physics.bu.edu/~duffy/HTML5/heat_addHeat.html	for T-t (quite basic). Shows ice-water-steam. Can change mass.						https://www.thephysicsjaviary.com/Physics/Programs/Labs/ParallelCircuitLab/	https://www.thephysicsjaviary.com/Physics/Programs/Labs/ParallelCircuitLab/	Series circuits

FORCES & MOTION					WAVES					
density of solids & liq		Hooke's Law			waves in metal rod/string		reflection of light		refraction of light	
✓					✓		✓ Triple only		✓ Triple only	
					rod: 'suitability of apparatus'					
✓					✓				✓	
					rod/air: "suitability of apparatus"				glass	
✓					✓		✓		✓	
					measure v, f, λ					
https://science-practical-simulator.web.app	(rod/liquid) check & Get free	Object pulled by weights over pulley. Accel measured by light gates. https://www.thephysicsjaviary.com/Physics/Programs/Labs/MeasuringPhotogateAccelerationPre	https://phet.colorado.edu/sims/html/wave-interference/latest/wave-interference_en.html	Tools to use to measure variables, but no guidance - good! Choose "slits" and "no barrier"	https://virtlabs.tech/apps/physics03/lab12/index.html	Sounds reflecting in metal rod. Complex sim but maybe ok for a demo of the idea.	https://www.physicsclassroom.com/Physics-Interactives/Reflection-andMirrors/Plane-Mirror-images/Plane-Mirror-interactive	Tutorial with quiz learning about law of reflection - pretty useful.	https://phet.colorado.edu/sims/html/bending-light/latest/bending-light_en.html	Great sim to explore refraction and then try to find refractive index of mystery substance. Use "intro" option.
https://www.obslearningmedia.org/resource/arc-t15-sc-densitylab/density-lab/	Measure known materials then test unknown.	Object accel in inclined plane (aeroplane!) Accel found from v-t graph	https://www.sunflowerlearning.com	Similar to PHET but takes you through step-by-step	https://ophysics.com/v8.html	Standing waves on strings. Can change f, measure wavelength (also change tension and mass per unit l)	https://ophysics.com/09.html	Learning about where the image in a plane mirror is formed.	https://ophysics.com/07.html	Good for learning - angles and refractive index shown
		good for learning the basics	www.sunflowerlearning.com/launch/CT9442	Clear experiment set-up with graphs plotted (s, v or a) - Log in with my email & p/w PHYSICSDemo till 5/4/22	https://www.falstad.com/ripple/	No tools provided - would need to freeze and use ruler. Choose "plane waves".	https://www.obslearningmedia.org/resource/arc-t15-sc-standingwave/standing-wave-simulator/	A nice sim to show how a concave mirror image is formed.	https://www.thephysicsjaviary.com/Physics/Programs/Labs/Refractionlab/	Semi-circular prism; moving ray can be paused to take data



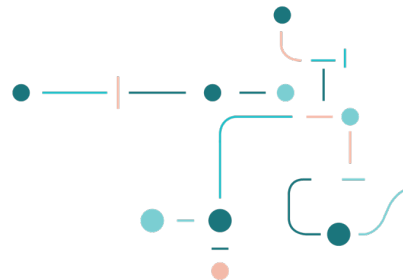
Questions to think about

Teacher demonstrates sim 'live':

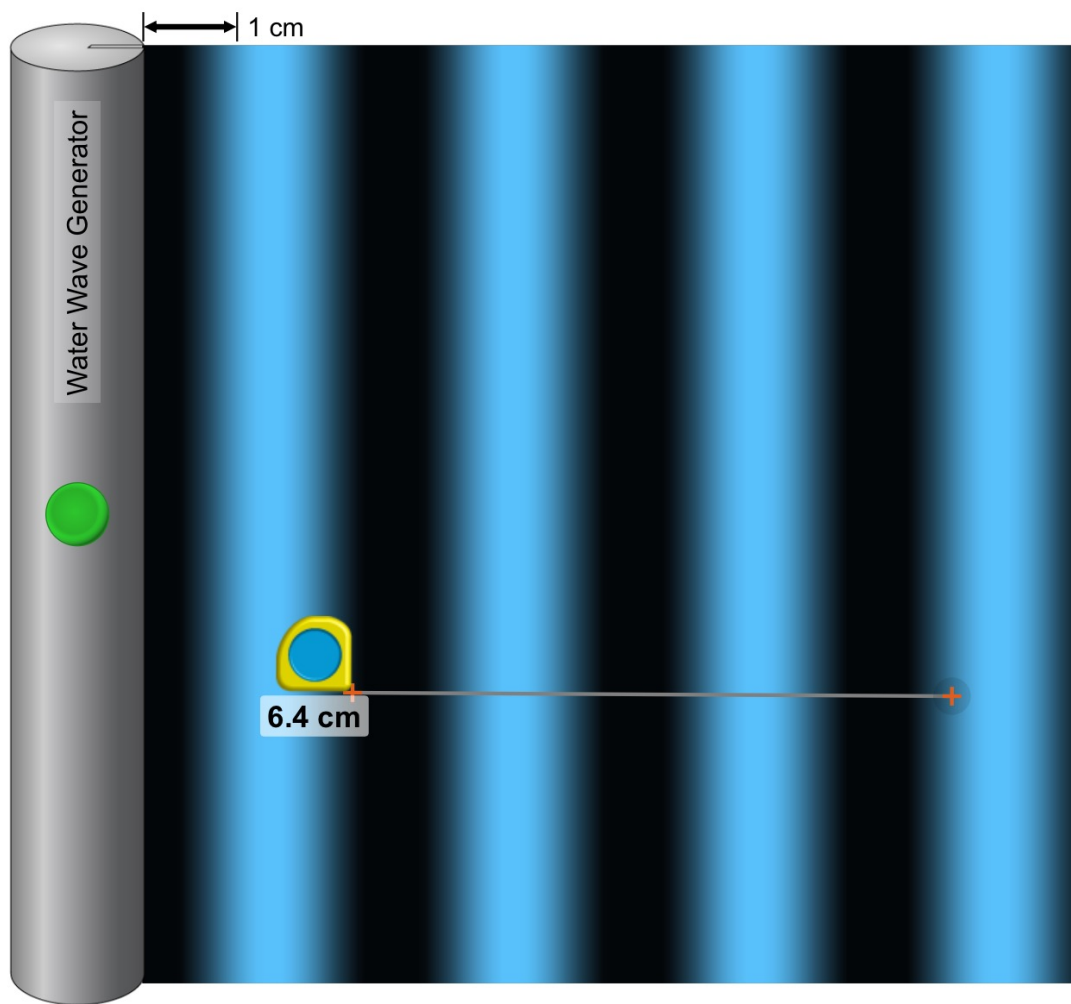
- Demo sim before or after doing the real thing?
- Demo less/more complex version of real experiment?
- Students construct their own data table and graph?

Students drive sims:

- How to introduce the sim to your students?
 - Demo first, then let loose? Send instructions? Let them play?
- Students could share screenshots with you?
- Some sims require students to calculate a value which can be checked



Ripple tank



5.44 s

Water Wave Generator

Frequency: min to max

Amplitude: 0 to max

☐ Graph

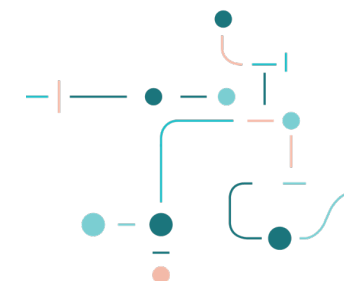
No Barrier

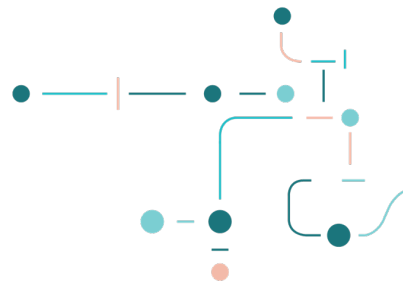
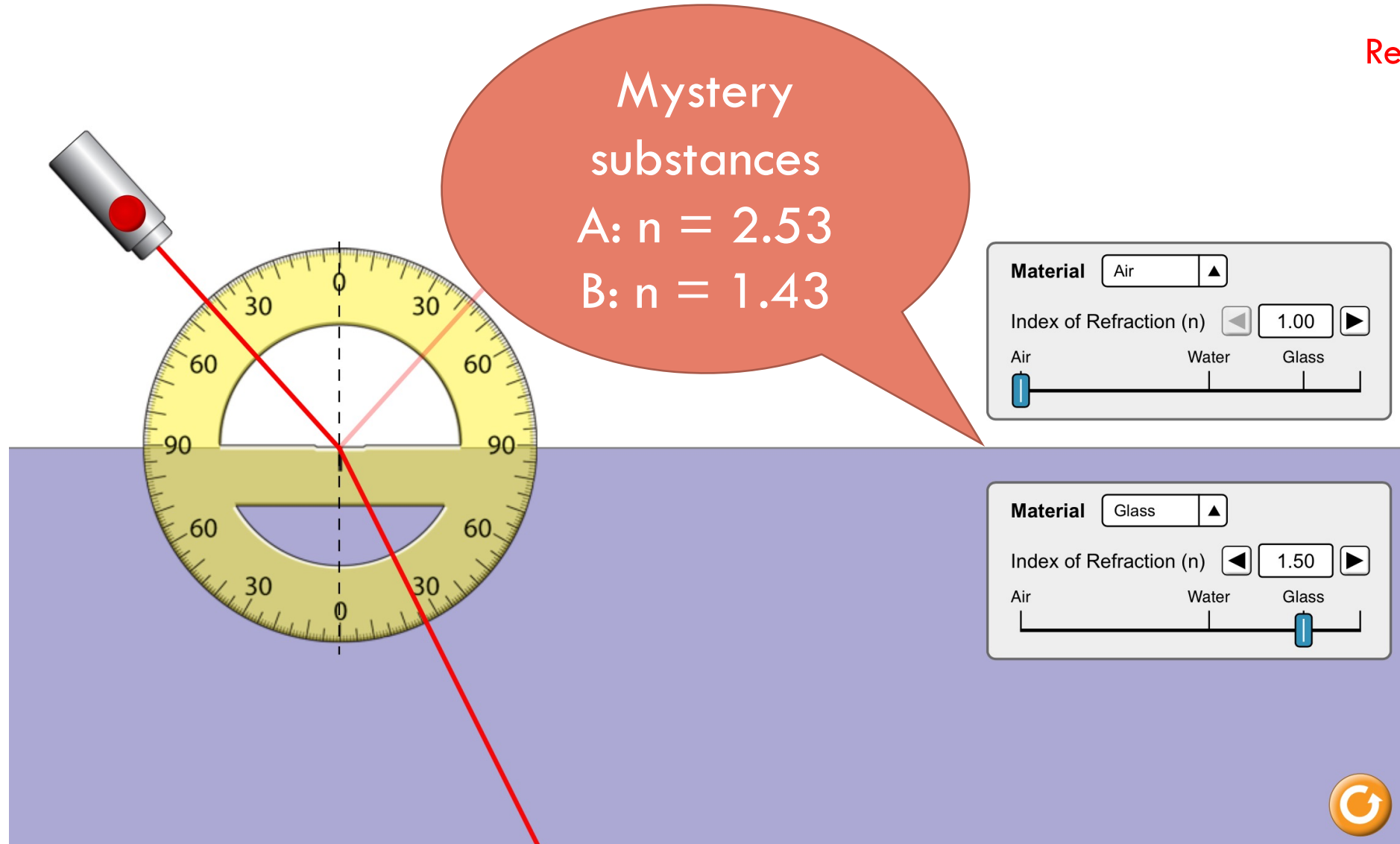
Slit Width: 0.5 to 2.5 (1.5 cm)

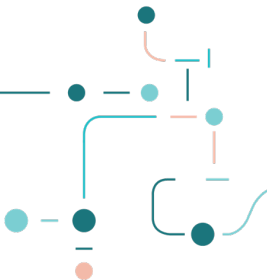
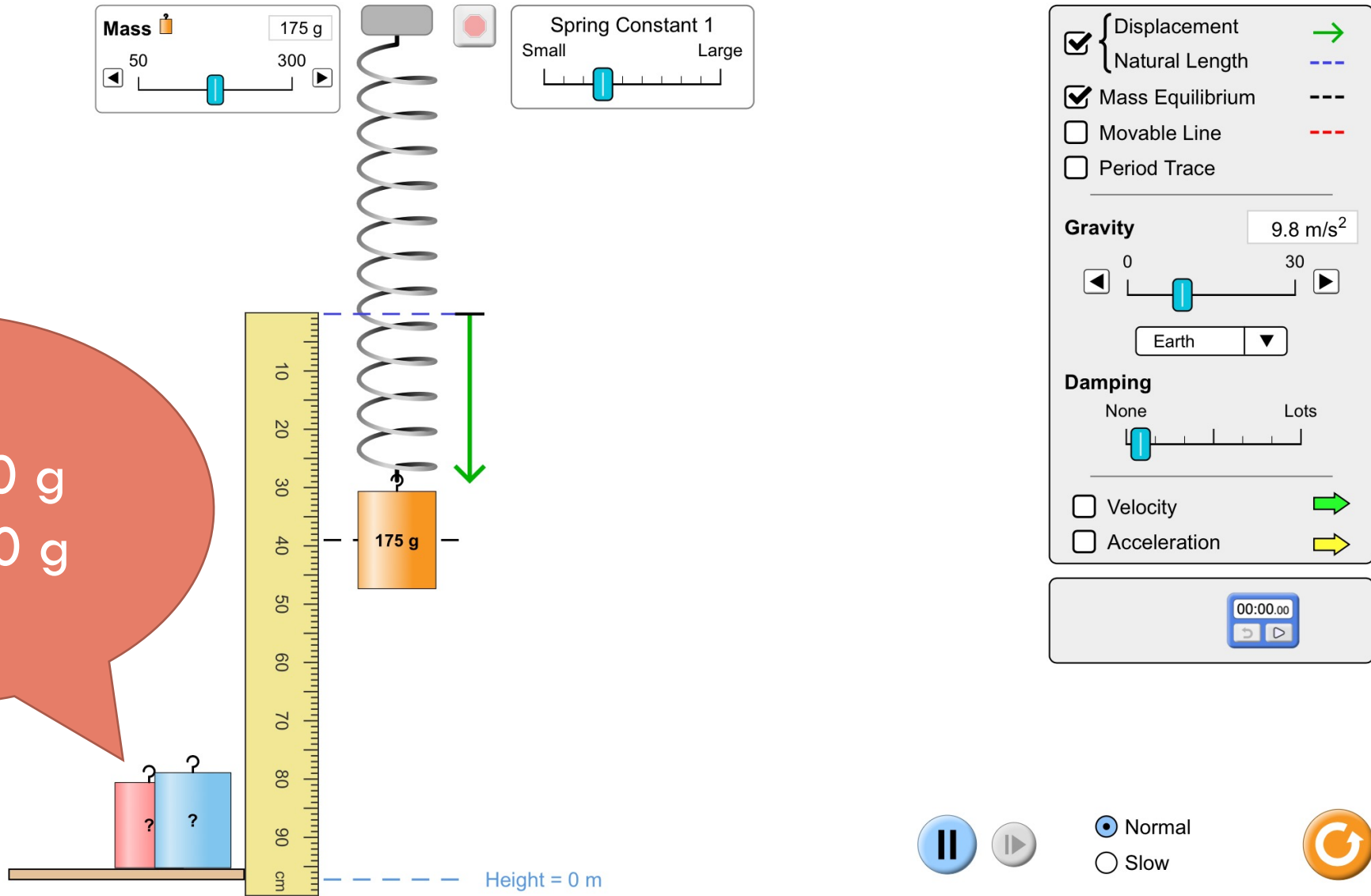
Slit Separation: 1 to 5 (3.0 cm)

Normal

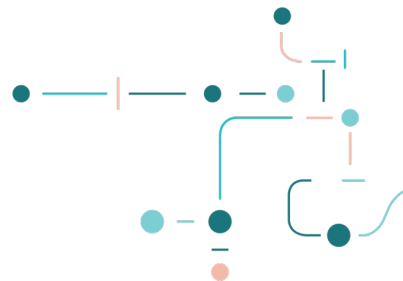
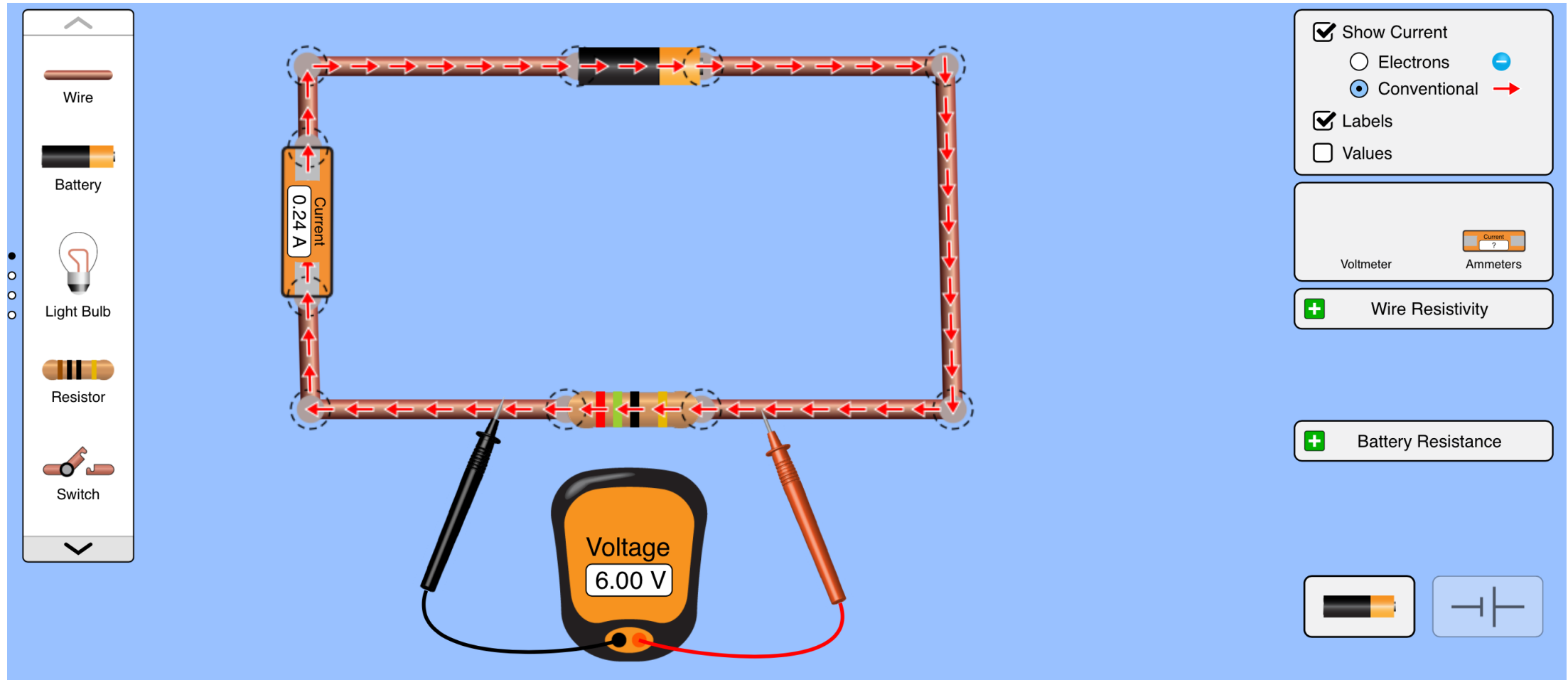
Slow



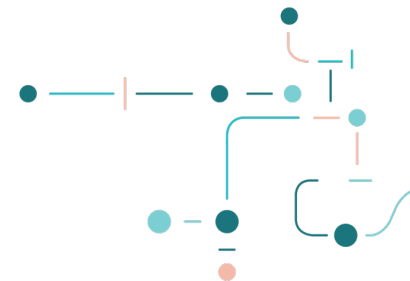
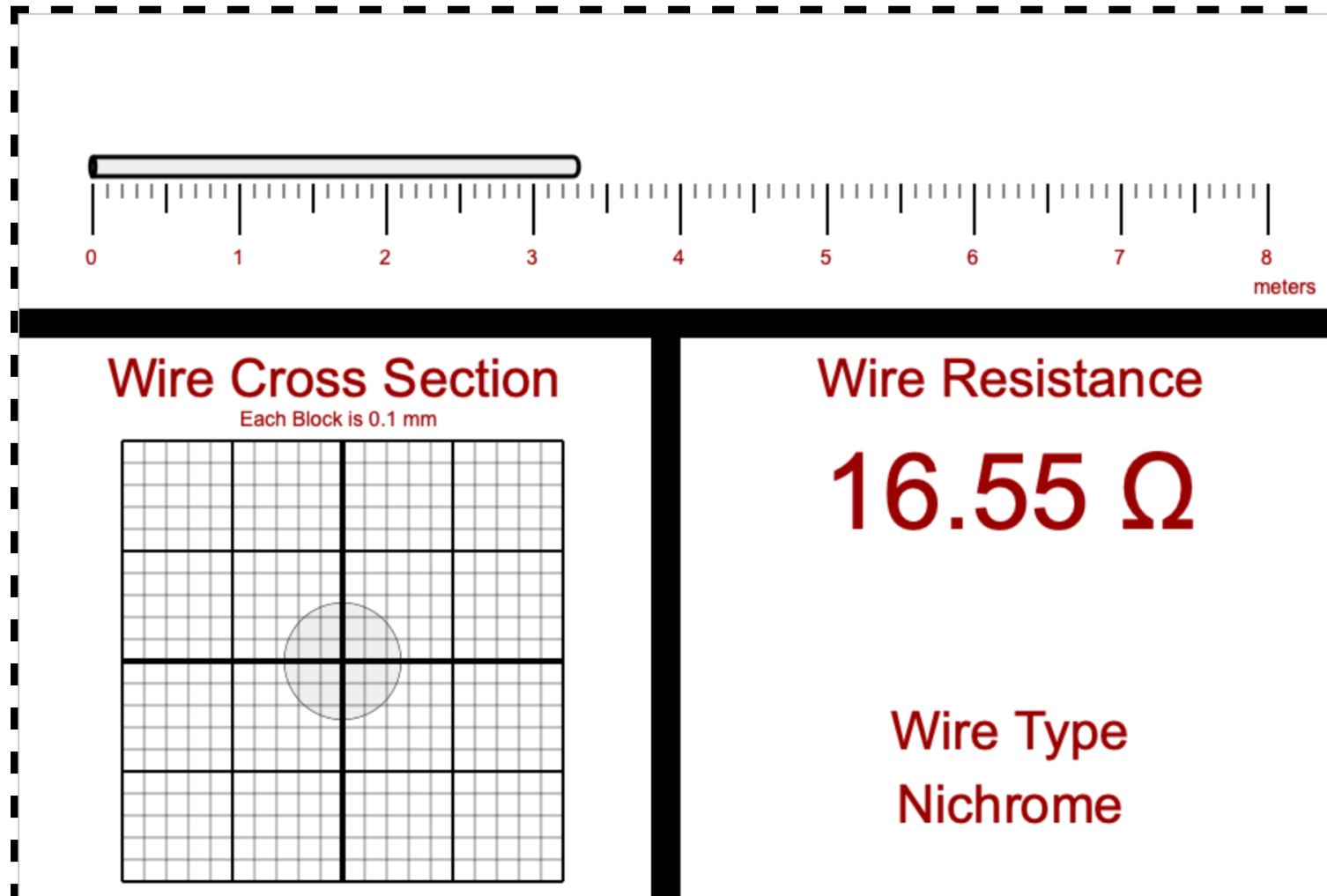




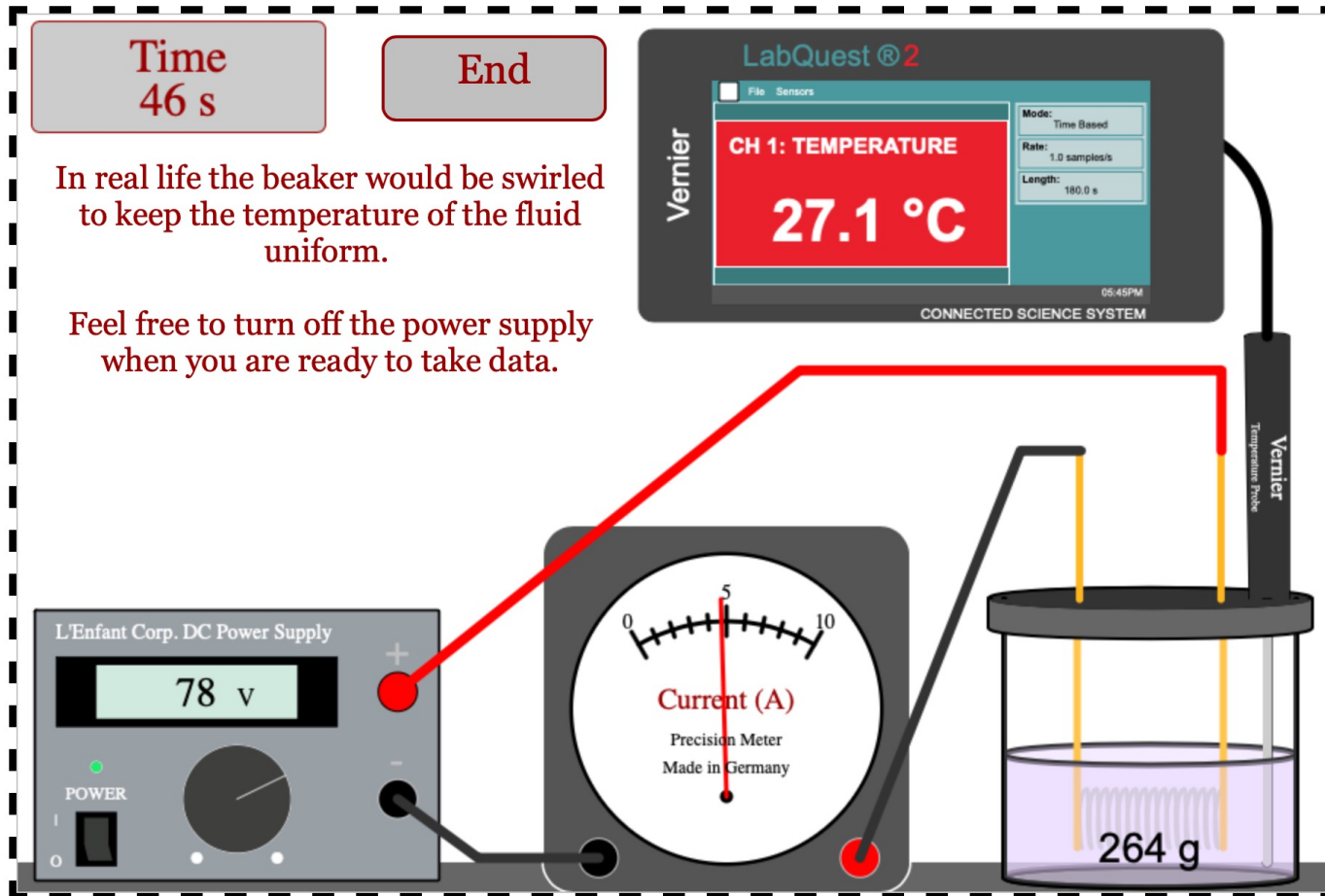
V-I of components; series/parallel circuits



Resistance of a Wire Lab



Electrical Determination of Specific Heat Lab

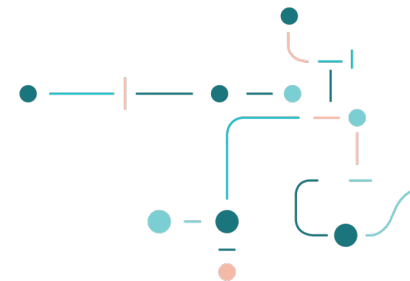
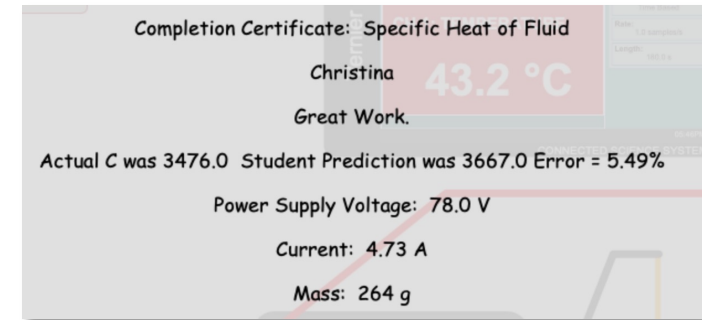


Time
46 s

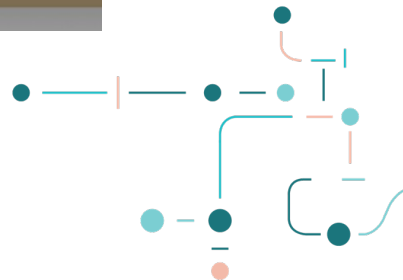
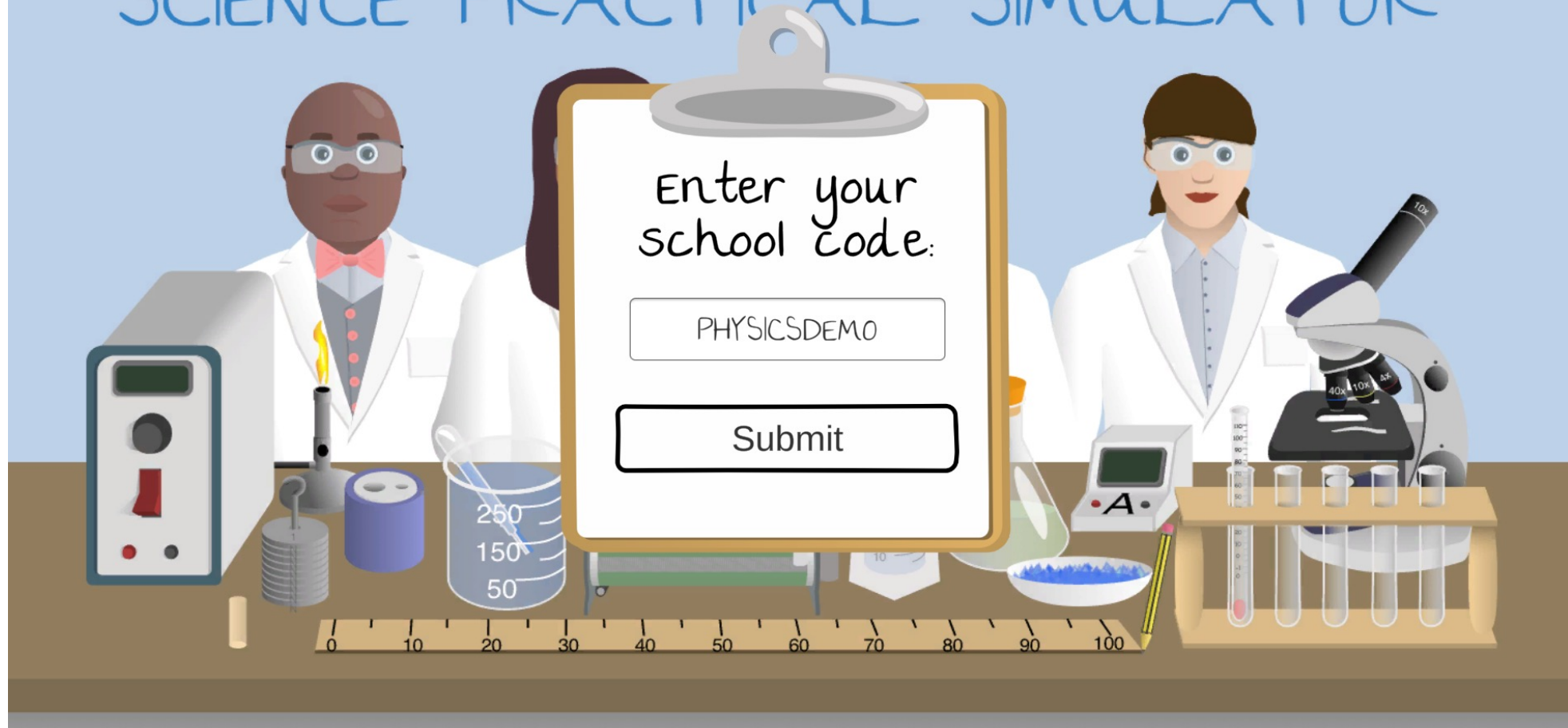
End

In real life the beaker would be swirled to keep the temperature of the fluid uniform.

Feel free to turn off the power supply when you are ready to take data.

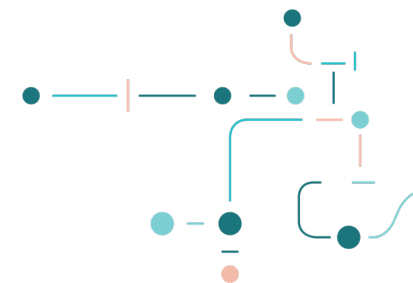


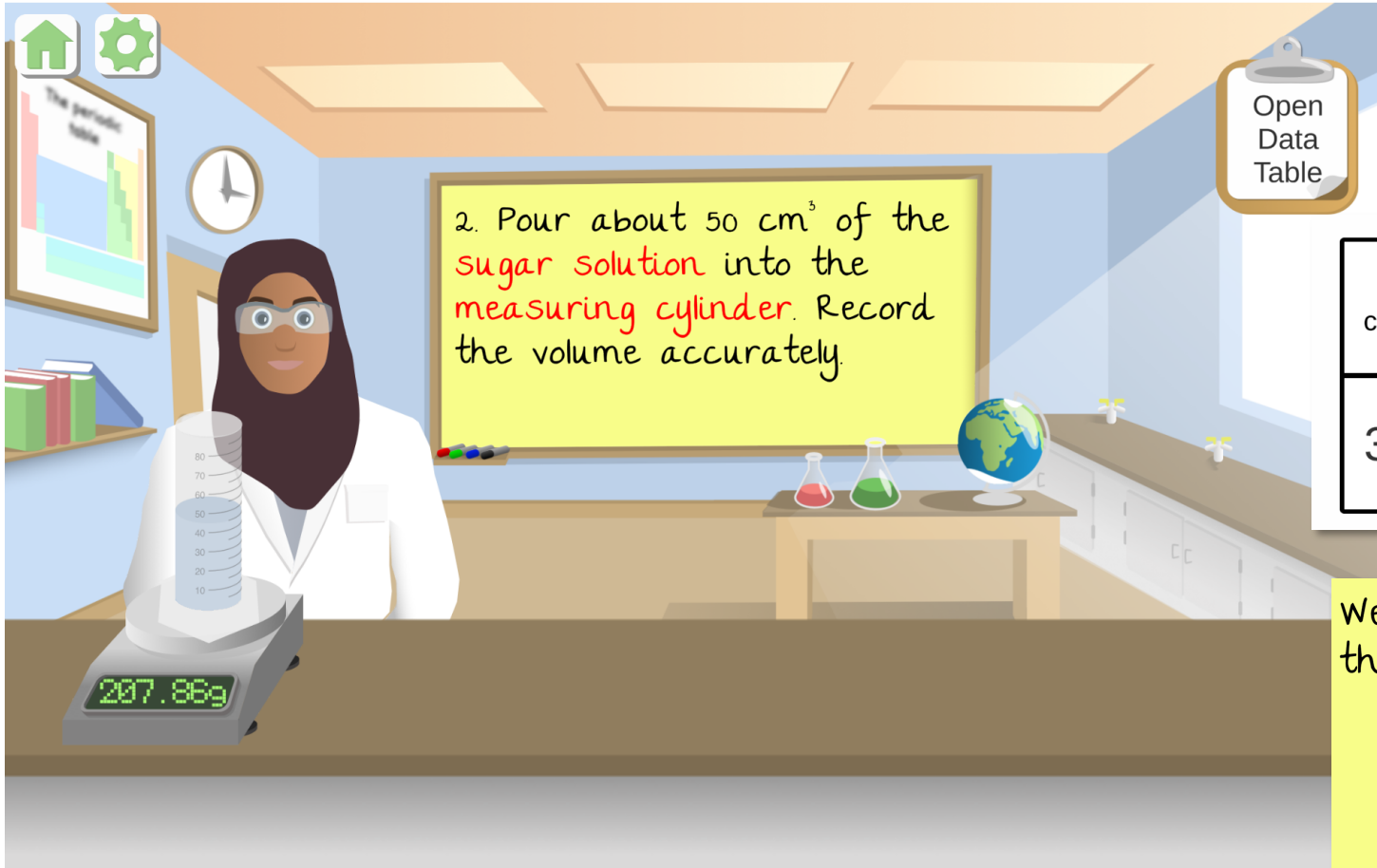
SCIENCE PRACTICAL SIMULATOR





	Layers of foam insulation			
	No Insulation	2 layers	4 layers	6 layers
Time mins	Temperature °C			
0	86	86	85	
3	81	82	81	
6	76	77	77	
9	71	72	74	
12	66	67	70	
15	62	63	66	





Mass of empty cylinder in g	Volume of liquid in cm ³	Mass of cylinder plus liquid in g	Mass of liquid in g	Density of liquid in g/cm ³
35.00	46	207.86	172.86	4

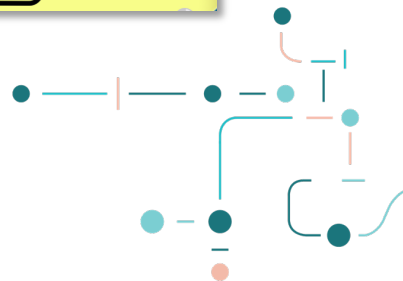
Well done, you've correctly identified that the liquid has a density of 3769 kg/m³.

3769

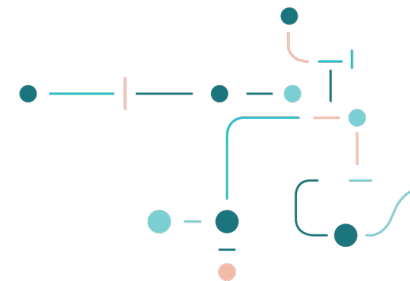
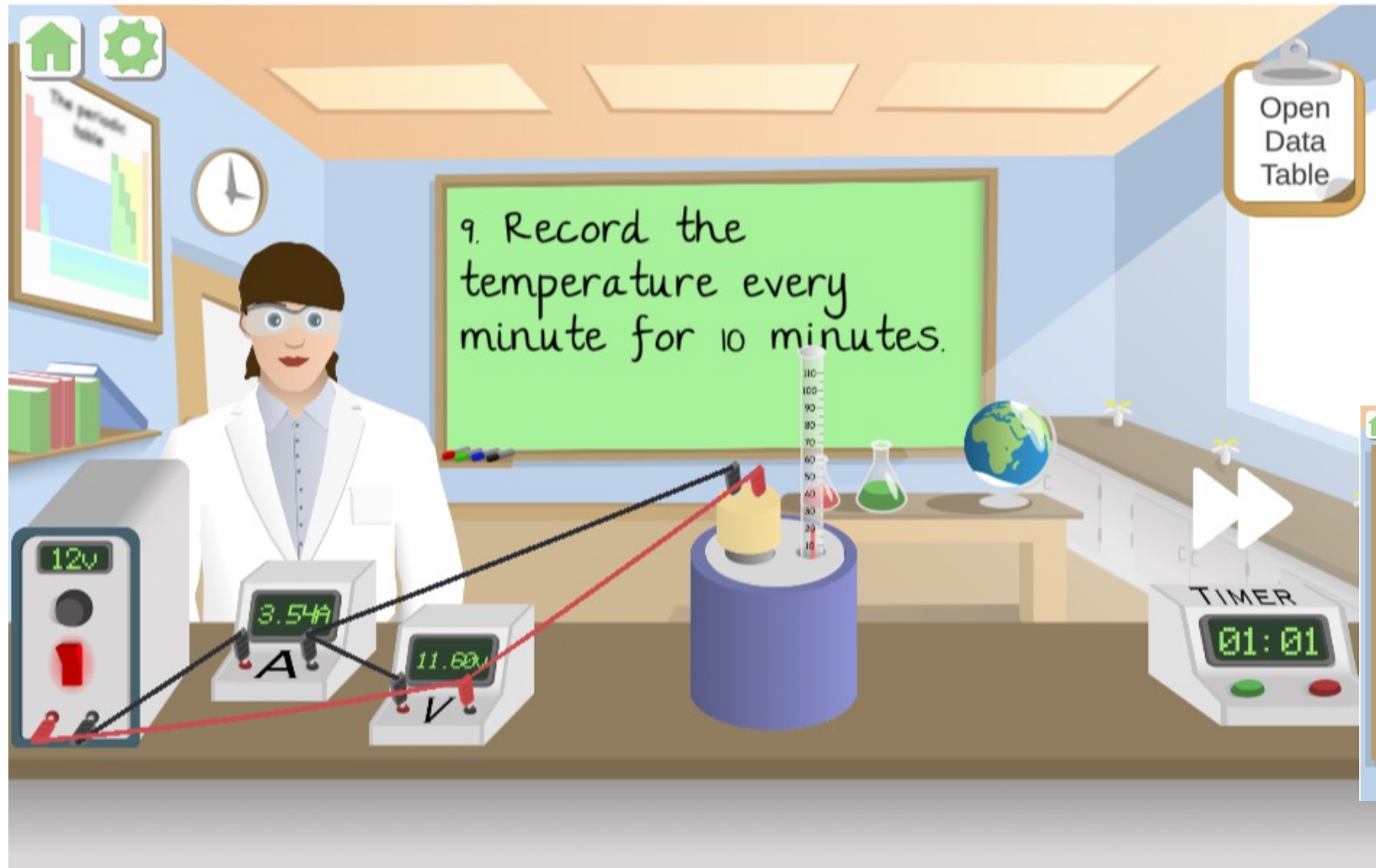
8784

10727

13132

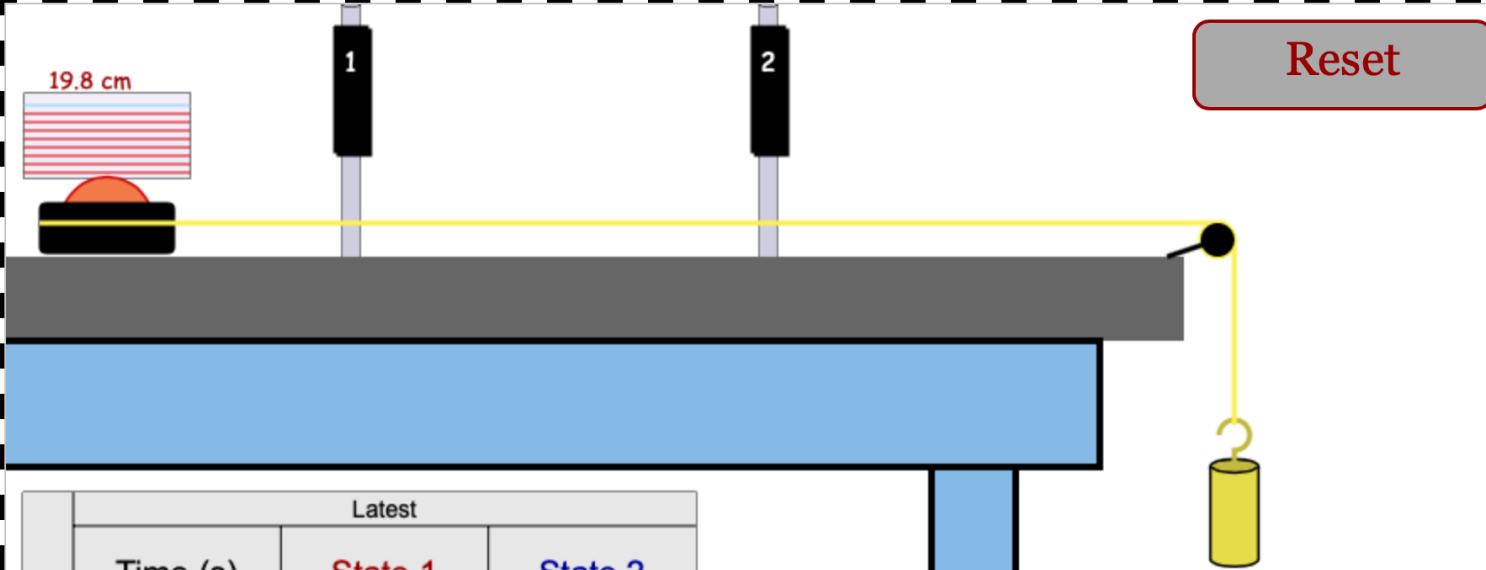


Specific Heat Capacity



$$\text{Acceleration} = F/m$$

Newton's Law Lab with Photogates



19.8 cm

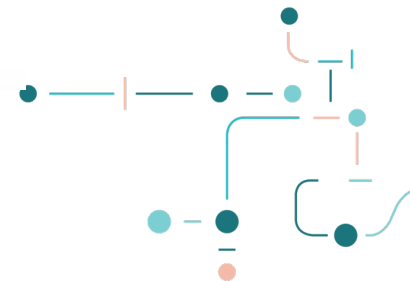
1

2

Reset

	Latest		
	Time (s)	State 1	State 2
1	1.7478	1	
2	1.9436	0	
3	2.1520		1
4	2.2646		0
5			

Use your data to find the average velocity of the craft through each gate, and the acceleration of the craft.



Leslie Cube (IR emission)

Absorption/emission

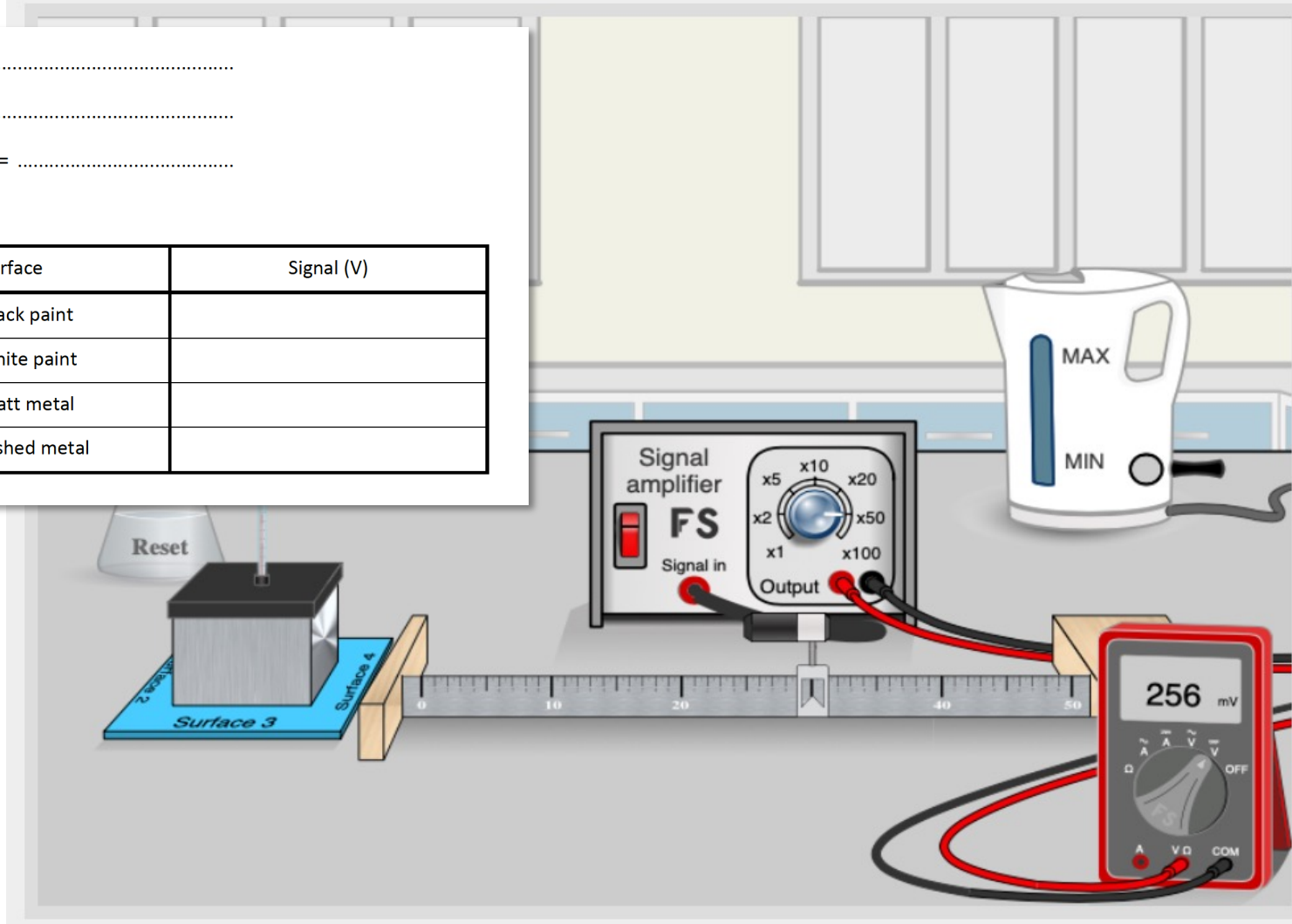
Leslie cube temperature =

Position of IR detector on ruler =

Amplification used on the amplifier =

Write your results in this table:

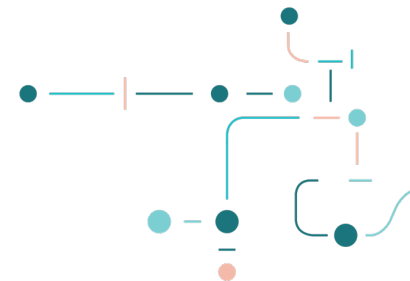
Surface	Signal (V)
1 – Black paint	
2 – White paint	
3 – Matt metal	
4 – Polished metal	

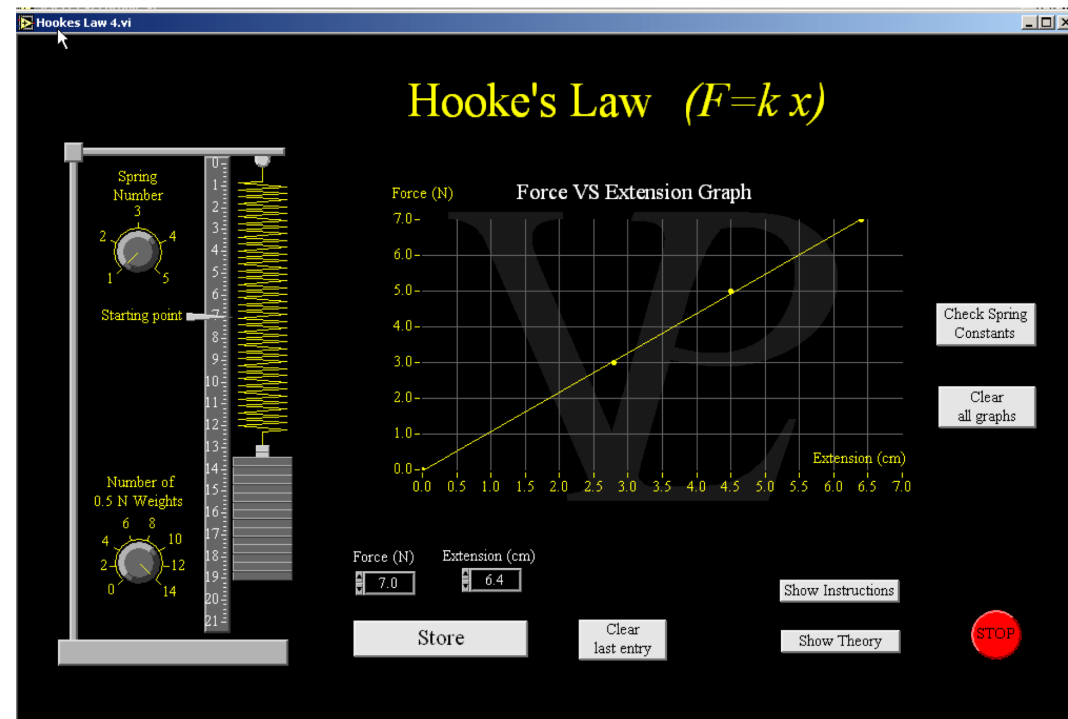
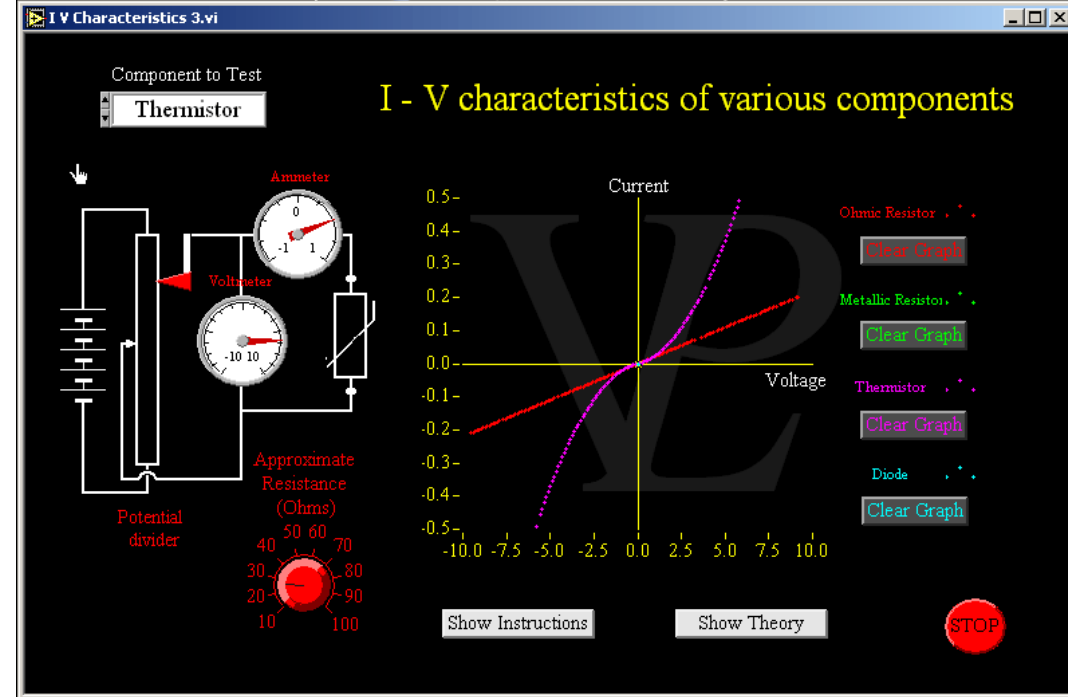
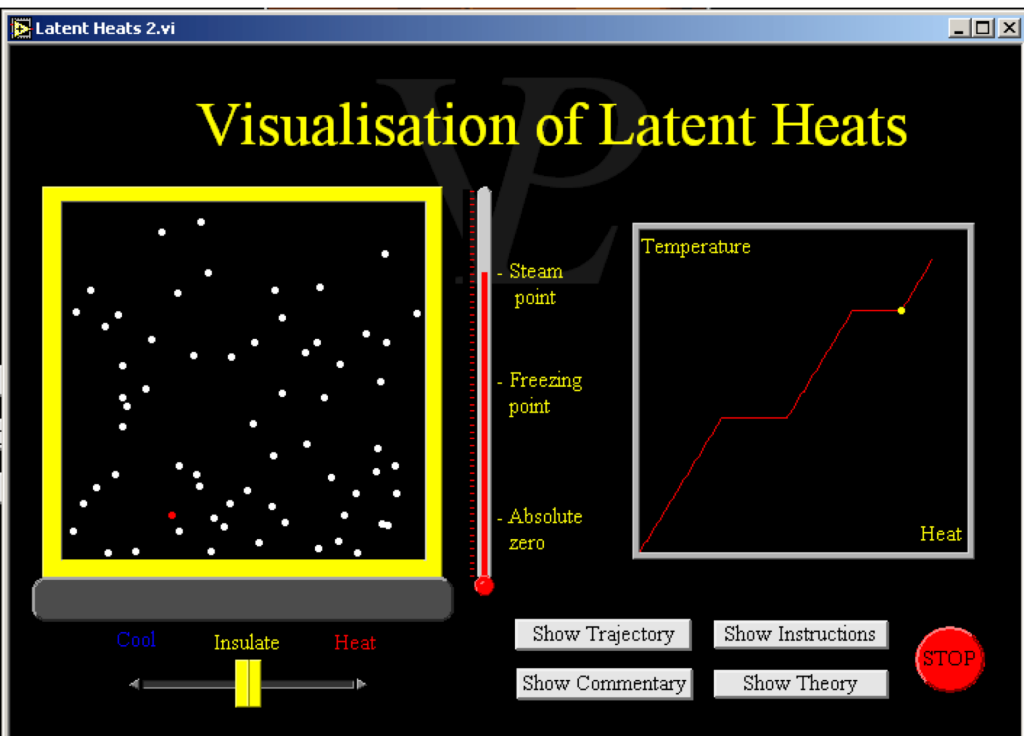
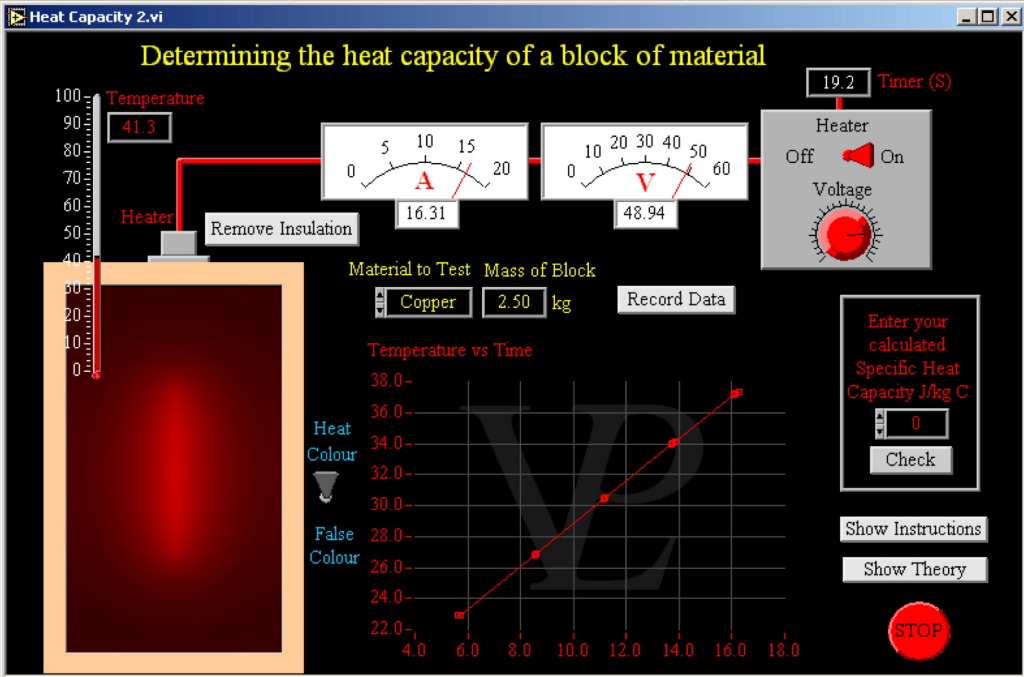


<https://flashyscience.com/experiments/physics>

User ID: AstinTeacher@astinconsulting.com

Password: FlashyScience (exp 30.4.22)





VPLab

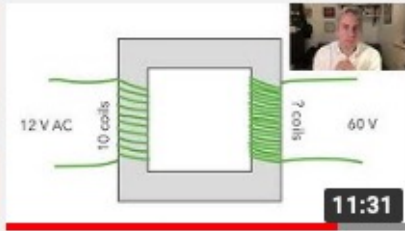
<http://vplab.ndo.co.uk/>

#PhysicsFuel: films to boost your physics teaching



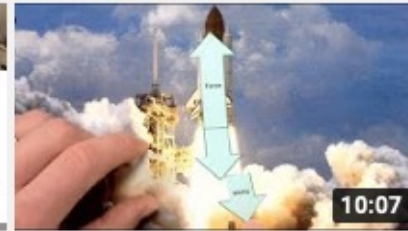
The physics of falling

83 views • 11 months ago



Transformers

73 views • 11 months ago



Upward Forces: Physics Teaching Tips

118 views • 11 months ago



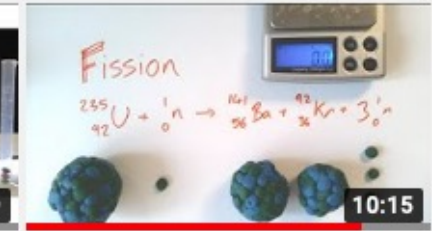
Ideal Gases: Physics Teaching Tips

42 views • 11 months ago



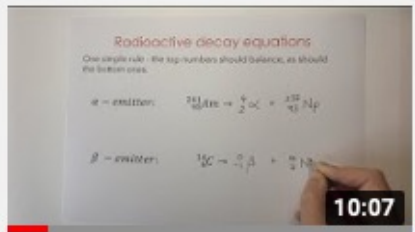
Teaching graphs

94 views • 11 months ago



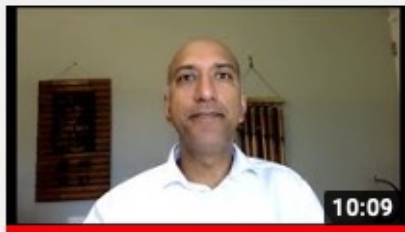
Nuclear Fission & Fusion

250 views • 1 year ago



Radioactivity

64 views • 1 year ago



Electromagnetic Induction

108 views • 1 year ago

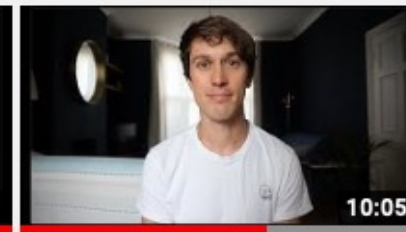
CC



Energy stores

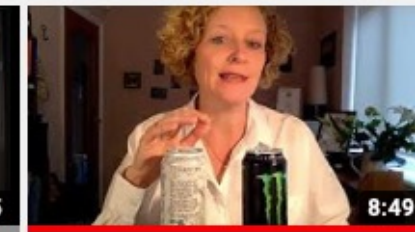
195 views • 1 year ago

CC



Specific heat capacity

171 views • 1 year ago



Energy transfer by radiation

195 views • 1 year ago

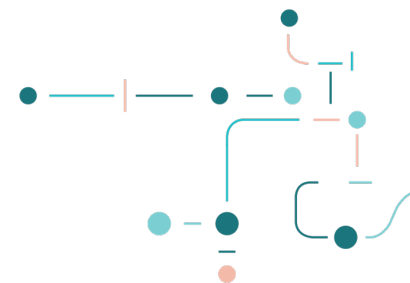
CC



Newton's third law

137 views • 1 year ago

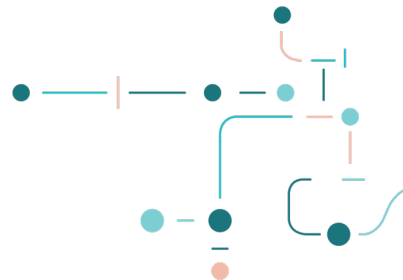
CC

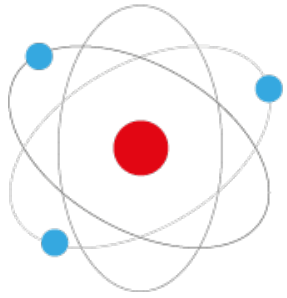


Feedback please – for further support & CPD certificate



<https://physicspartners.com/evaluation/>





Physics Partners

Feedback please!

<https://physicspartners.com/evaluation/>



(for CPD certificate, ppt slides and mailing list)

Christina Astin

christina@astinconsulting.com

[@ChristinaAstin](#)

[@PhysicsPartners](#)

