

Physics at home 14-16

For students working remotely because of school closures, these ideas are divided by physics topic. We hope this saves time right now, along with the [Physics at home 11-14](#) links and [CLEAPSS advice for practicals at home](#).

Forces

- Types – **Marvin and Milo** [Loop the loop](#), [Head hanger](#), [Unbalanced balloons](#)
- Gravity – **Veritasium** [Misconceptions About Falling Objects](#)
- Hooke's law – **PhET** [Hooke's law](#); [Masses and Springs: Basics](#) – 'Stretch' tab
- **PhET** [Under Pressure](#) and/or use **PhyPhox** ([free download](#)) and the [pressure sensor](#) to show atmospheric pressure changing with height by lifting phone up and down.
- Moments **PhET** [Balancing Act](#), Vectors **IOP Quick** [Static crate](#)

Forces & Motion

- **Careers clips** [Forces and Motion in Games Programming](#)
- Balanced forces – [Does a Falling Slinky Defy Gravity?](#) **Marvin & Milo** [Slinky drop](#)
- Graphs – **PhET** [Moving man](#) – Charts tab [and PDF instructions](#); [PASCO SPARKvue](#) - uses phones as sensors
- Newton's laws – 1st Law **PhET** [Forces and Motion: Basics](#), 2nd Law ($F = ma$) – **PhET** [Forces in 1 Dimension](#); 3rd law – **Veritasium** [Best Film on Newton's Third Law](#). [Ever](#)
- Momentum – **Marvin and Milo** [Bouncing balls](#), [Hovercrafty](#); **TAP** Episode 222 [Egg and sheet](#); **PhET** [Collision Lab](#)
- Circular motion – [Circular Motion Demonstration with Sparkler](#)

Waves in matter

- **Careers clips** [Ultrasound in Physiotherapy](#) and [Ultrasound scans](#)
- Free software https://www.zeitnitz.eu/scope_en computer sound card oscilloscope, compare with **Quick** [Slink-o-Scope](#) to explain why a transverse graph is drawn to show displacement for a longitudinal sound wave.
- **Practical Physics** [Measuring the speed of sound using echoes](#)
- **Classroom Physics** [Sound pull-out](#)
- Mechanical waves – **IOP Physics** [A simple wave machine](#); **PhET** [Wave on a String](#)
- Speed of waves on water **BBC Bitesize** – [required prac](#) method 2 with baking trays/dishes

Light and EM Waves

- Visible spectrum – **Marvin and Milo** [Garden Rainbow](#)
- E-M waves – **PhET** [Radio Waves & Electromagnetic Fields](#)
- Black body radiation **PhET** [Blackbody radiation](#)
- Refraction – **PhET** [Bending light](#); **Marvin and Milo** [Pouring light](#), [Lighting a home with water bottles](#)
- Lenses – **PhET** [Geometric optics](#) (select principal rays)
- Colour addition – **Marvin and Milo** [Deceptive CD](#)

Electricity

- Current – [Kung Fu circuit symbols](#); circuits **PhET** [Circuit Construction Kit: DC](#)
- The **Sci-Tunes** video '[We Are Electrons](#)' is a useful summary of current electricity
- **The Universe and More** – [Crack the circuit](#) building circuits game
- Static – [Dancing Oobleck streams with a static charge](#) **Marvin and Milo** – [Forceful Comb](#), [Static Spinning Straw](#), repulsion with 2 straws

Magnetism and electromagnetism

- Fridge magnets and toys e.g **Marvin and Milo** [Moody magnets](#)
- Field due to current in a wire – **Khan Academy** [Magnetic effect of an electric current](#);
- **IOP Physics** [electric motor demonstration film](#); **School Physics** [DC electric motor](#)
- E-M induction – **PhET** [Faraday's law](#); animation [AC generator](#); video [Electromagnetic induction](#); **Veritasium** [Levitating barbeque](#); **Veritasium** [First Electric Generator](#)
- Transformers – Demo [How transformers work](#); interactive [The transformer](#);

Energy

Best used after teacher-led introduction to the energy topic to avoid confusion.

- Shifting between stores – **Exploratorium** [Coupled pendulums](#); **Sixty symbols** [Coupled pendulums](#); **PhET** [Energy Skate Park: Basics](#) (uses bar charts for stores emptying and filling, useful model for students)
- **Marvin and Milo** Conduction [Melting race](#) and SHC [Flame Balloons](#), asking student to explain the effects in terms of energy transfers at a particle level
- The **SciTunes** video '[Energy!](#)' is a useful summary

Particles

- Density – **Marvin and Milo** [Sinking sugar](#) and [Cartesian ketchup sachet diver](#)
- Particle model – **Exploratorium** [Gas model](#)
- Anomalous behaviour of water – **IOP Quick** [Ice-water-oil](#)
- Evaporation – **Marvin and Milo** [Drinks cooler](#)
- Gas laws – **PhET** [Gas Properties](#); [Baby brains in a vacuum](#); **The Naked Scientists** [Cool coin launcher](#)

Atomic Structure

- Alpha scattering – **PhET** [Rutherford Scattering](#)
- Marie Curie [short story](#) & [her story continued](#)
- Videos of experiments **IOP Spark** [Teaching radioactivity](#) - select as needed
- **xkcd** [Radiation dose infographic](#) showing dose from 'sleeping with someone' up to 'fatal dose'; video of the [most radioactive places on Earth](#)
- Background radiation – **IOP worksheet** [Measuring your annual dose](#)
- [Practical Radioactive Decay simulation](#) – use coins, M&Ms or Lego bricks, plot a graph for the number decaying against 'throw number' (effectively time).

Space

- **PhET** [My Solar System](#)
- Free fall – **Marvin and Milo** [Marvin and Milo Water fall](#)
- Planet separation to scale – [Toilet paper solar system](#) (can use string if you are short!)
- **IOP videos** [Models of the Solar System - Earth, Sun and Moon](#); [The Life Cycle of Stars, Life Cycle of a Star](#); [Star formation](#); [How Big is the Universe?](#); [The Expanding Universe and the Big Bang](#)
- [Scale of the universe](#), [Powers of ten](#) videos; Interactive [Solar system tour](#); [Magnifying the universe](#) simulation
- Doppler effect – **NSO** [Redshift](#); **Marvin and Milo** [Doppler spin](#)
- **NSO** [Expansion of the Universe](#) – balloon model **NSO** [Big Bang Demo](#), PDF instructions for [washers/elastic expanding universe](#) with data analysis

Collated by the IOP's **Professional Practice Group**. See [IOPSpark](#) and [TalkPhysics](#) for more.