Physics at home 11-14

These ideas might help with constructive activities while students are working from home. We've made an effort to divide them by topic. More ideas will be coming, but it is hoped this will save you time right now so students can have something while we all adjust.

Forces (types and effects)

- ***Marvin and Milo*** Loop the loop, Head hanger, Unbalanced balloons
- Hooke's law ***PhET*** Hooke's law; Masses and Springs: Basics – 'Stretch' tab
- ***PhET*** Forces and Motion: Basics
- Balanced forces - ***Veritasium*** Falling Slinky ***Marvin and Milo*** Slinky drop

Forces (motion)

- Calculating speed based on changes in distance (tape measure) and time (stopwatch on phone). Model cars on ramp, pets, falling cup-cake cases for terminal velocity etc.
- Parachutes or balloon-powered cars from ExpeRImental would be great sources of data for any calculations. See also simulations like the Moving Man at PhET

Forces (gravity, pressure)

- ***Cannon ball and feather drop*** Misconceptions About Falling Objects
- Make a three hole bottle (teacher information) and investigate relationship between distance and depth of water, time taken etc.
- ***PhET*** Under Pressure, ***Marvin and Milo*** e.g., Collapsing bottle, Mushrooming marshmallows
- Floating and sinking ***Marvin and Milo*** Floating egg, All change

Static electricity

- Use the attracting can activity to introduce why charged objects exert forces on uncharged objects. Also see videos at ExpeRImental (straws and balloons) followed by this ***PhET*** simulation
- ***Marvin and Milo*** – Static UFO; On a Roll; Forceful Comb, Static Spinning Straw, but with 2 charged straws to show repulsion

Current electricity

- ***Classroom Physics*** Electric circuits
- ***PhET*** Circuit Construction Kit: DC
- Squishy circuits needs LEDs, zinc batteries, flour, oil, lemon juice

Magnetism and Electromagnetism

- Explore fridge magnets and toys ***Marvin and Milo*** Moody magnets
- From ***Catalyst*** Iron from cornflakes
- ***PhET*** Magnets and Electromagnets is a good start and Faraday's Electromagnetic lab covers nearly all of Electromagnetism for those that want to go further.

Sound

- ***Marvin and Milo*** Bottle Orchestra and Musical Coathangers (which also works with roasting racks!)
- Use soundmeter apps to learn about the effect of distance and insulating materials on amplitude. Using the free download https://www.zeitnitz.eu/scope_en gives students a 'software oscilloscope' that uses a computer's sound card would be the next step.
- Dancing Sprinkles shows that a loud sound is capable of making small grains jump. You can use it to introduce the idea that sound is a vibration of the air.
- Classroom physics - sound pull-out

Light

- Make a pinhole camera - Pringles tubes make good ones - hole in the metal end, greaseproof under plastic cap, foil removed
- Law of reflection - ***The Physics Classroom*** Who can see who?
- Refraction – ***PhET*** Bending light and ***The Physics Classroom*** Refraction and lenses
- Coloured surfaces in coloured light - ***The Physics Classroom*** Stage Lighting
- ***Marvin and Milo*** Deceptive CD for colour addition, Garden Rainbow

Matter

- Density ***Marvin and Milo*** Sinking sugar and Cartesian ketchup sachet diver
- ***Exploratorium*** Gas model
- Anomalous behaviour of water ***IOP Quick*** Ice-water-oil
- Evaporation ***Marvin and Milo*** Drinks cooler

Space Physics

- ***PhET*** My Solar System
- Size of the universe Magnifying the universe simulation, ***IOP video*** The scale of the universe, The powers of ten video, Planet separation to scale Toilet paper solar system (can also be done with string!)
- ***IOP videos*** Phases of the Moon, Models of the Solar System - Earth, Sun and Moon

Energy

It is probably best to cover forces and electricity first and avoid energy for home-based learning. Students are likely to find many conflicting models and working independently might cause more problems than it solves.

- ***Exploratorium*** Coupled pendulums ***Sixty symbols*** Coupled pendulums
- ***Marvin and Milo*** Melting race for conduction
- ***PhET*** Energy Skate Park: Basics - has bar charts for stores emptying and filling

Other ideas

- Project-based - PEEP has lots of useful info for this sort of thing which can be matched to student interests: Climate change, Energy resources, Transport, Public Health, Medical Physics, Weapons, Space, Communications, People, Robotics
- Video channels e.g ***IOP videos*** - Teaching astronomy and space - has videos of demos as well; Physics demonstration films and Careers Clips have suitable content for 11-14 year olds.

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