Putteridge
High
School

Extended Learning

Science - Physics

Years 9, 10 & 11

Putteridge High School

Science - Physics

Year 9 - Autumn Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science Physics

Year: 9

Term: 1

Topic: Waves

Learning Objectives

- Recall examples of transverse and longitudinal waves and compare these two wave types
- Label a wavelength and amplitude on a wave and define the terms frequency and period of a wave
- Recall and apply the wave speed (Ws) equation Ws = distance/time, Ws = frequency x wavelength
- Recall the core practical method for measuring wave speeds in a ripple tank and a solid bar

Extended Learning Opportunities

- BBC Bitesize- Waves https://www.bbc.com/education/topics/zsb44qt
- Log in to the school Focus Educational Software site to access an interactive simulation of the core practical for this topic **SP4b Investigating waves** (Log in through moodle https://moodle.putteridgehigh.org/course/view.php?id=467)
- Download a frequency app e.g. Keuwlsoft Audio frequency counter onto your smartphone or tablet and have fun looking at the oscilloscope http://www.keuwl.com/AudioFrequencyCounter/
- IOP diagnostic testing http://www.iop.org/education/educate/page_67488.html
- Make your own rainbow http://www.physicscentral.com/experiment/physicsathome/rainbow.cfm
- Measuring the speed of sound http://practicalphysics.org/measuring-speed-sound-using-echoes.html

Putteridge High School

Science - Physics

Year 9 - Spring Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science Physics

Year: 9

Term: 2

Topic: CP5 The electromagnetic spectrum

Learning Objectives

- Recall the waves of the electromagnetic spectrum, Gamma rays, X-rays, Ultra violet rays, visible light, infra-red radiation, microwaves, radio waves.
- Describe the wavelength, frequency and energy of waves across the EM spectrum.
- Describe the uses of electromagnetic waves.
- Explain the risks of electromagnetic waves.
- Compare the properties and risks of different EM waves recalling similarities in the way they move and differences in their wavelength, frequency, energy and dangers.

Extended Learning Opportunities

- BBC Bitesize – Light and the electromagnetic spectrum https://www.bbc.com/education/topics/zpvrrwx
- Log in to the school Focus Educational Software site to access an interactive simulation of the core practical for this topic **SP5a Refraction in a glass block** (Log in through Moodle https://moodle.putteridgehigh.org/course/view.php?id=467)
- Make a mnemonic to remember the order of the electromagnetic waves
- Listen to the electromagnetic radiation song https://www.youtube.com/watch?v=JIQagFY9fco
- Disappearing coin trick (Refraction) https://www.stevespanglerscience.com/lab/experiments/disappearing-money-sick-science/
- Observe the infra-red rays coming out of a remote control using the camera on your mobile phone. (Iphones don't work) https://www.sony.com/electronics/support/articles/00025283
- Investigating UV light Look at different pound notes under a U.V. light to see the antiforgery symbols Write secret messages in lemon juice or washing powder solutions that can only be seen under UV light
- Make your own spectroscope to split light file:///C:/Users/jhill/Downloads/Make%20Your%20Own%20Spectroscope%20FINAL.pdf

Putteridge High School

Science - Physics

Year 9 - Summer Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science Physics

Year: 9

Term: 3

Topic: CP1 Motion

Learning Objectives

- Recall the definition of scalar and vector quantities and recall examples of each
- Explain how an object can have a constant speed but a changing velocity
- Explain why most distance travelled are greater than the displacement of an object
- Recall and apply the equations for
  Speed (m/s) = distance (m)/time (s) and
  Acceleration (m/s^2) = change in velocity (m/s)/ time (s)
- Interpret the motion of an object using distance time and speed time graphs
- Calculate speed from the gradient of a speed time graph and acceleration from the gradient of a speed time graph
- Calculate the area under a speed/velocity time graph to work out the distance travelled

Extended Learning Opportunities

- BBC Bitesize- Motion and forces https://www.bbc.com/education/topics/zcw22nb
- Make a poster about scalars and vectors and explaining speed v velocity and distance v displacement
- IOP diagnostic testing Forces and motion
  http://www.iop.org/education/educate/page_67488.html
- How can distance time graphs be used to investigate sporting fitness

  https://www.stem.org.uk/resources/elibrary/resource/30818/distancetime-graphs

Putteridge High School

Science - Physics

Year 10 – Extended learning opportunities

Autumn Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science physics

Year: 10

Term: 1

Topic: Forces and motion

Learning Objectives

- Recall Newton's three laws of motion and apply them to explain the motion of an object
- Explain how different factors can affect the thinking distance and braking distance of a vehicle and therefore affect the stopping distance
- Recall the relationship between mass and weight and how to convert between the two
- Describe the core practical method for investigating the effect of force and mass on acceleration using light gates
- Recall the equations momentum (kgm/s) = Mass (kg) x Velocity (m/s)
  AND Force (N) = Mass (kg) x acceleration (m/s^2)
- Understand and apply the concept of conservation of momentum to collision situations total moment of objects before collision = total momentum of objects after collision
- Understand how increasing the time of a collision reduces the forces on an object, apply this idea to explain how crumple zones and padding reduce the impact force

Extended Learning Opportunities

- BBC Bitesize- Motion and forces https://www.bbc.com/education/topics/zcw22nb
- Log in to the school Focus Educational Software site to access an interactive simulation of the core practical for this topic **SP2d Force and acceleration** (Log in through Moodle https://moodle.putteridgehigh.org/course/view.php?id=467)
- IOP Diagnostic testing BOTH KS 3 motion and forces, KS4 forces and motion http://www.iop.org/education/educate/page_67488.html
- Your weight on other worlds https://www.exploratorium.edu/ronh/weight/
- Make a bottle rocket, read the what's going on section at the bottom of the webpage http://www.bbc.co.uk/bang/handson/waterbottlerockets.shtml
- How rockets work https://www.nasa.gov/pdf/153415main_Rockets_How_Rockets_Work.pdf
- Investigate factors that affect your reaction (thinking) time http://www.bbc.co.uk/blogs/theoneshow/consumer/2009/01/22/brain-training-how-fast-are-yo.html
- Practical physics forces and motion section http://practicalphysics.org/forces-and-motion.html

Putteridge High School

Science - Physics

Year 10 – Spring Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science

Year: 10

Term: 2

Topic: Conservation of energy

Learning Objectives

- Recall the energy stores and describe how energy is transferred between stores
- Recall the formulas for gravitational potential energy, kinetic energy, weight, energy efficiency
- Be able to calculate gravitational potential energy and kinetic energy and apply the idea of conservation of energy
- Understand the conservation of energy and interpret Sankey diagrams of energy efficiency, understand how items can be made more efficiently
- Evaluate the different energy resources used to generate electricity

Extended Learning Opportunities

- BBC Bitesize- Conservation of energy

  https://www.bbc.com/education/topics/z39ww6f
- Make a diary entry about the energy changes you see around you on an average day
- Practical physics energy investigations

  http://practicalphysics.org/energy.html
- Investigating energy transfers in a pendulum

  http://practicalphysics.org/investigating-energy-transfers-pendulum.html
- PHET energy stores and changes

  https://phet.colorado.edu/en/simulation/legacy/energy-forms-and-changes
- PHET Energy at the skate park simulation
  https://phet.colorado.edu/en/simulation/legacy/energy-skate-park
- Energy resources activities including the wind power challenge at practical action

  https://practicalaction.org/renewable-energy-resources
- Research electrical energy production around the world

Putteridge High School

Science - Physics

Year 10 – Summer Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science Physics

Year: 10

Term: 3

Topic: CP6 Radioactivity

Learning Objectives

- Describe the structure of an atom, recall the properties of the three subatomic particles (electrons, protons and neutrons) and define the term isotope
- Compare the properties of the three types of radioactivity alpha, beta and gamma including mass, charge, penetrating ability, ionising ability, range and danger
- Explain the changes in the nucleus when radioactivity is released and show this in nuclear equations
- Describe a practical method for measuring radioactivity with a Geiger counter
- Recall examples of natural and artificial background radiation and how it must be taken into account when measuring radioactivity of substances
- Evaluate the use of the different types of radioactivity
- Explain precautions taken when handling radioactivity to prevent contamination and irradiation

Extended Learning Opportunities

- BBC Bitesize https://www.bbc.com/education/topics/zxnvv9q
- IOP diagnostic testing KS Atomic structure http://www.iop.org/education/educate/page_67488.html
- How can you simulate the radioactive half life of an element? http://www.glencoe.com/sites/common_assets/science/virtual_labs/E18/E18.html
- Isotopes and atomic mass simulation https://phet.colorado.edu/en/simulation/legacy/isotopes-and-atomic-mass
- Build your own particle detector https://www.symmetrymagazine.org/article/january-2015/how-to-build-your-own-particle-detector

Putteridge High School

Science - Physics

Year 11 – Extended learning opportunities

Autumn Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science

Year: 11

Term: 1

Topic: CP9 Electric circuits

Learning Objectives

- Recall the common symbols for electrical circuit components (cell, battery, wire, lampk, fixed resistor, variable resistor, LDR, thermistor, fuse, diode, switch, ammeter, voltmeter)
- Describe the core practical method for investigating resistance in a component including setting up a circuit with an ammeter, voltmeter and variable resistor)
- Explain why resistance is less in a parallel circuit than a series circuit
- Recall and apply the six electrical circuits equations E = Q x V, Q = I x t, V = I x R, P = E/t, P = I x V, $P = I^2 \times R$
- Interpret graphs on potential difference versus current showing how resistance changes in filament lamps, fixed resistors and diodes
- Explain the role of a fuse and earth wire in electrical safety

Extended Learning Opportunities

- BBC Bitesize- Electricity and circuits https://www.bbc.com/education/topics/zcd77p3
- Log in to the school Focus Educational Software site to access an interactive simulation of the core practical for this topic **SP10e Investigating resistance** (Log in through Moodle https://moodle.putteridgehigh.org/course/view.php?id=467
- IOP diagnostic testing Electricity http://www.iop.org/education/educate/page_67488.html
- Learn how to wire a plug and why different sized fuses are used https://www.rospa.com/home-safety/uk/northern-ireland/electricity/plugs-fuses/wiring-plugs/
- PHET electrical circuits construction simulation https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc
- PHET investigating ohms law https://phet.colorado.edu/sims/html/ohms-law/latest/ohms-law_en.html

Putteridge High School

Science - Physics

Year 11 – Spring Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science Physics

Year: 11

Term: 2

Topic: CP10 Magnetism and the motor effect, CP11 Electromagnetic induction

Learning Objectives

- Describe the shape and direction of magnetic fields around bar magnets, straight wires and solenoids
- Explain electromagnetic induction and compare the structure and function of a motor and generator
- Describe the way electricity is transported by the national grid
- Describe the structure of a transformer and explain how they are able to change voltage
- Apply the transformer calculations

Extended Learning Opportunities

- Make your own motor (Take care wires can become hot)

  https://www.education.com/science-fair/article/no-frills-motor/

- BBC Bitesize

  https://www.bbc.com/education/topics/z34ddxs

  https://www.bbc.com/education/topics/zs3ccj6

Putteridge High School

Science - Physics

Year 11 – Summer Term

Putteridge High School

Extended Learning Opportunities

Subject: Combined science physics

Year: 11

Term: 3

Topic: CP12 Particle model and kinetic theory CP13 Forces and matter

Learning Objectives

- Recall and apply the equation density (kg/m^3) = Mass (kg)/Volume (cm^3)
- Describe the core practical method to calculate the density of solid objects and liquids
- Describe the kinetic theory of particles including absolute zero and conversions between degrees Celsius and kelvin
- Describe the core practical method for investigating the specific heat capacity of water
- Explain the link between gas temperature and pressure
- Describe the core practical method for investigating the extension of a spring

Extended Learning Opportunities

- BBC Bitesize Particle model https://www.bbc.com/education/topics/zts33k7
- BBC Bitesize Forces and matter https://www.bbc.com/education/topics/z2tssrd
- Log in to the school Focus Educational Software site to access an interactive simulation of the core practicals for this topic **SP14a Investigating densities, SP14c Investigating water, SP15b Investigating springs** (Log in through Moodle https://moodle.putteridgehigh.org/course/view.php?id=467)
- Investigate factors that affect gas pressure https://phet.colorado.edu/en/simulation/gas-properties