Dallam School

Curriculum overview

Department: Physics
Year Group: 10

Autumn		Spring		Summer	
Forces in balance (14 lessons)	**Density and pressure (9 lessons)**	**Radioactivity (14 lessons)**	**Motion (7 lessons)**	**Forces and acceleration (11 lessons)**	**Mechanical energy (7 lessons)**
Analyse forces that keep objects at rest or in equilibrium	**Apply the concept of density to explain why objects float and sink**	**Explore how nuclear reactions release radiation and energy**	**Use motion graphs to represent and interpret the journeys of athletes in races**	**Investigate factors affecting the acceleration and deceleration of cars**	**Make predictions about a system using a mathematical model for energy stores**
By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*					
➢ Different types of force. ➢ Scalar quantities have magnitude only. ➢ Vector quantities have magnitude and direction. ➢ The principle of moments. ➢ Newton's third law. ➢ Key features of third law force pairs. ***Keywords*** ➢ vector / scalar ➢ magnitude ➢ load ➢ moment ➢ displacement ➢ resultant ➢ parallelogram ➢ free body ➢ centre of mass ➢ gear	➢ Density is the mass per unit volume. ➢ Pressure is the force acting per unit area. ➢ The pressure in a gas is caused by random impacts of gas molecules with a surface. ➢ Pressure in liquids increases with depth. ➢ The upthrust on an object in a fluid is an upward force on and object due to pressure of the fluid. ***Keywords*** ➢ pressure ➢ density ➢ upthrust ➢ altitude ➢ random	➢ Different models of the atom (Thompson model, Rutherford model, Bohr model). ➢ The properties of alpha, beta, and gamma radiation. ➢ Uses of nuclear radiation in medicine and industry. ➢ The processes of nuclear fission and nuclear fusion. ***Keywords*** ➢ random ➢ spontaneous ➢ nucleus ➢ alpha / beta / gamma ➢ contamination ➢ irradiation ➢ isotope ➢ ionisation ➢ fission / fusion	➢ Typical speeds of everyday objects. ➢ The gradient of a distance-time graph represents speed. ➢ The area under a speed-time graph represents distance travelled. ➢ Acceleration is a change of speed or direction. ***Keywords*** ➢ acceleration ➢ deceleration ➢ gradient ➢ area ➢ speed ➢ velocity ➢ tangent	➢ The resultant force acting on an object is directly proportional to its acceleration. ➢ The terminal velocity of an object is the velocity it eventually reaches whilst falling. ➢ Stopping distance of a vehicle depend on the braking and thinking distance. ➢ The total momentum of a closed system is always conserved. ***Keywords*** ➢ acceleration ➢ mass ➢ inertia ➢ stopping / braking / thinking distance	➢ The gravitational potential energy store is determined an object's mass and position in a gravitational field. ➢ The kinetic energy store depends on the mass and speed of an object. ➢ Hooke's law for springs. ***Keywords*** ➢ elastic ➢ kinetic ➢ gravitational ➢ energy store ➢ energy shift ➢ mechanical work ➢ dissipate ➢ conservation of energy ➢ limit of proportionality

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They will understand *(key concepts)*					
➢ How to identify third law force pairs in real world examples. ➢ How to calculate the moment of a force about a point. ➢ How levers act as force multipliers. ➢ Why cars and bikes use high and low gears.	➢ How Brownian motion is evidence of the random motion of particles in a gas. ➢ How to use kinetic theory to explain the relationship between gas temperature, pressure and volume. ➢ Why the pressure varies along a column of liquid or gas.	➢ How to represent alpha and beta emission using nuclear decay equations. ➢ The evidence which led to changes in the models used to represent the atom. ➢ How the properties of different types of ionising radiation explain their uses in medicine and industry.	➢ The difference between speed and velocity. ➢ How to represent the motion of objects using distance- and speed-time graphs. ➢ How to interpret speed-time and distance-time graphs. ➢ The difference between acceleration and deceleration.	➢ How to use free body force diagrams to explain the speed-time graph of a skydiver. ➢ How speed and other factors affect thinking distance and braking distance. ➢ How safety features reduce impact forces by decreasing the rate of change of momentum.	➢ How to calculate changes in the gravitational, kinetic, and, elastic energy stores of a system. ➢ How to apply the principle of conservation of energy to predict the behaviour of a system. ➢ How to describe the behaviour of elastic objects.
They will know how to *(key skills)*					
➢ Draw free body force diagram. ➢ Use scale drawings to find the resultant of two forces. ➢ Use scale drawings to resolve forces into components. ➢ Determine the centre of mass of an object. ➢ Solve balance beam problems.	➢ Measure the density of regular and irregular objects. ➢ Change the subject of an equation to calculate the density, mass, or volume of an object. ➢ Verify inverse proportion between two variables.	➢ Interpret experimental data to determine the types of radiation being emitted by a sample. ➢ Use an activity-time graph to determine the half-life of a radioactive substance. ➢ Evaluate the risks and benefits of using nuclear power as an energy resource.	➢ Calculate the speed from a distance-time graph. ➢ Calculate the distance travelled and acceleration from a speed-time graph. ➢ Calculate the area of rectangles, triangles, and trapeziums. ➢ Solve 1-dimension motion problems using SUVAT equations. ➢ Make unit conversions for distance and time units.	➢ Investigate the relationship between force and acceleration. ➢ Use the principle of conservation of momentum to predict the motion of objects after a collision or explosion.	➢ Solve quantitative problems involving energy conservation. ➢ Use experimental means to test the validity of Hooke's law for a spring and other elastic objects.

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Curriculum overview

Department: Physics
Year Group: 11

Autumn		Spring		Summer	
Electromagnetic fields (6 lessons)	**Magnetic effects (9 lessons)**	**Mechanical waves (10 lessons)**	**The electromagnetic spectrum (9 lessons)**	**Properties of light (7 lessons)**	**Space (7 lessons)**
Explore how electromagnets constructed and used	**Explain how motors, generators, and transformers work**	**Investigate how mechanical waves behave as they travel through media**	**Discover how the components of the EM spectrum are used in everyday life**	**Construct ray diagrams to explain the behaviour of light as it passes a lens**	**Examine the scientific theories about the past and future evolution the universe**
By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*					
➢ Induced magnetism occurs when an unmagnetised magnetic material is placed in a magnetic field. ➢ A circular magnetic field is produced around a current carrying conductor. ➢ A range of different uses of electromagnets. ***Keywords*** ➢ induced ➢ magnetic field ➢ attract / repel ➢ pole ➢ solenoid ➢ uniform ➢ parallel	➢ The magnetic flux density of a magnetic field is the measure of its strength. ➢ When a conductor crosses through the lines of a magnetic field, a p.d. is induced. ➢ The direction of an induced current always opposes the change that caused it. ➢ Transformers can be used to step-up or step-down an alternating p.d. ***Keywords*** ➢ commutator ➢ alternator ➢ dynamo ➢ induction ➢ motor effect	➢ The difference between and examples of transverse and longitudinal waves. ➢ The speed of a wave is a property of the media in which the wave is travelling. ➢ Refraction occurs at the boundary between media when the speed and wavelength of a wave changes. ***Keywords*** ➢ oscillation ➢ parallel / perpendicular ➢ boundary ➢ refraction ➢ seismic ➢ amplitude ➢ wavelength ➢ frequency	➢ The 7 components of the EM spectrum in order of frequency. ➢ X-rays and gamma rays are used in medical diagnosis and treatment. ➢ Radio waves and microwaves are used in communication. ➢ The dangers posed by ultraviolet light. ➢ Black bodies are theoretical objects which are both perfect emitters and absorbers of light; the wavelength of peak emission is inversely proportional to its temperature. ***Keywords*** ➢ spectrum	➢ The difference between real and virtual images formed by a mirror. ➢ The primary and secondary colours of light. ➢ The rules governing the refraction of light at the boundary between media. ➢ The three principal rays which can be used to predict formation of images by a lens. ***Keywords*** ➢ reflection ➢ real / virtual / inverted ➢ refraction ➢ lens ➢ convex / concave	➢ The conditions needed for stable orbit. ➢ Energy is released in stars because of hydrogen nuclei fusing to form helium nuclei. ➢ The life cycle of stars. ➢ Light emitted from moving objects undergoes a wavelength shift. ➢ The expansion of the universe began at the Big Bang and continues at an accelerating rate. ***Keywords*** ➢ protostar ➢ red-shift ➢ black hole ➢ cosmology

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They will understand *(key concepts)*					
➢ How to use domain theory to explain permanent and induced magnetism. ➢ How to use the 'right-hand grip rule' to determine the direction of the magnetic field around a current carrying conductor. ➢ How the Earth's magnetic field can be modelled.	➢ How to use Fleming's left-hand rule to predict the direction of force on a current carrying conductor in a magnetic field. ➢ How electric motors and generators work. ➢ How transformers work and their role in increasing the efficiency of grid systems.	➢ How to use the wave equation. ➢ How models can be used to demonstrate wave behaviour. ➢ How ultrasound is used in medical imaging and industry. ➢ How an analysis of seismic waves produced by earthquakes can be used to infer the structure of the Earth.	➢ How the properties of different parts of the EM spectrum relate to their every day uses in communication and medicine. ➢ Advantages of using optical fibres for data transfer.	➢ How the perceived colour of an object can change under different lighting conditions. ➢ Why some objects appear transparent or translucent. ➢ Why light changes wavelength and speed in materials of different optical densities. ➢ How convex lenses are used in magnifying glasses, cameras, and vision correction.	➢ A theory for the formation of the solar system. ➢ How the cosmic microwave background radiation and red-shift provides evidence of the Big Bang. ➢ That scientists do not (yet) understand why the universe is expanding in the way observed.
They will know how to *(key skills)*					
➢ Describe and carry out a method of plotting the shape of a magnetic field. ➢ Interpret diagrams of simple electromagnetic devices to explain how they work.	➢ Calculate the force on a current carrying conductor at right angles to the lines of a magnetic field. ➢ Determine the direction of induced current when a magnet is moved in / out of a solenoid. ➢ Solve problems using the transformer equation.	➢ Investigate the relationship between frequency and wavelength of waves on a string. ➢ Interpret data on the timings of reflected waves to calculate distances.	➢ Investigate the absorption and emission of infrared radiation by different materials and surfaces. ➢ Interpret intensity-wavelength graphs for a black body.	➢ Investigate the relationship between the angle of incidence and angle of refraction. ➢ Use ray diagrams and principal rays to demonstrate image formation in convex and concave lenses. ➢ Calculate the magnification produced by a lens.	➢ Interpret graphs on recessional velocities of galaxies against distance and use this to make an estimate for the age of the universe.