

INTENT:



“Look deep into nature, and then you will understand everything better”

Albert Einstein

The intent of the science department is to convey to students that science underpins everything.













At The King's, we study:









- **Physics** to be able to understand the fundamental principles that govern all Energy and matter in the Universe. Physics gives us tools to understand nature from the scale of a sub-atomic particles up to the inter-galactic scale of the universe;
- **Chemistry** to be able to understand the nature of substances: how they are composed, their behaviors, and their physical and chemical properties. Chemistry allows us to identify unknown substances, monitor concentrations and synthesize new chemicals. Above all, chemistry is about finding solutions to the problems that concern us and our surroundings;
- **Biology** to be able to understand life and thereby understand ourselves. Biology allows us an understanding of the amazing complexity of many life processes and mechanisms. Biology encourages us to seek out reasons for strange, surprising and sometimes usual observations.

Science provides some incredibly challenging topics helping to gauge an awareness of topical issues and their impact on the climate, earth as well as human growth.


















****Please click on the icons to access our online portal where you can learn more about each topic****























Half term points						
9	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
	Cell Biology 	Infection and response 	Atomic structure and the periodic table 	Quantitative Chemistry 	Energy 	Particle model of matter 
	<p>Learning to include: Cell structure and transport</p> <ul style="list-style-type: none"> • The use of microscopes • animal and plant cells • transport of substances • exchanging materials <p>Cell Division</p> <ul style="list-style-type: none"> • mitosis • growth and differentiation • stem cells 	<p>Learning to include: Communicable diseases</p> <ul style="list-style-type: none"> • health and disease • preventing infections • viral diseases • bacterial diseases • diseases caused by fungi and protists • the human defence response • growing bacteria • plant diseases and defence <p>Preventing and treating disease</p> <ul style="list-style-type: none"> • vaccinations • antibiotics and painkillers • discovering and developing drugs • making and using monoclonal antibodies <p>Non-communicable disease</p> <ul style="list-style-type: none"> • cancer • smoking and the risk of disease • diet, exercise and diseases • alcohol and other carcinogens 	<p>Learning to include: Atomic structure</p> <ul style="list-style-type: none"> • atoms • chemical equations • methods of separation • history of the atom and its structure • ions, atoms and isotopes • electronic structure <p>The periodic table</p> <ul style="list-style-type: none"> • the development of the periodic table • group 1 • group 7 • explaining trends • the transition elements 	<p>Learning to include: Chemical calculations</p> <ul style="list-style-type: none"> • relative masses and moles • equation and calculations • from masses to balanced equations • expressing concentrations • yield and atom economy 	<p>Learning to include: Conservation and dissipation of energy</p> <ul style="list-style-type: none"> • changes in energy and energy conservation • energy and work • gravitational potential energy • kinetic and elastic energy stores • energy dissipation • energy efficiency • energy and power <p>Energy transfer by heating</p> <ul style="list-style-type: none"> • conduction • infrared radiation • specific heat capacity • heating and insulating buildings 	<p>Learning to include: Electric circuits</p> <ul style="list-style-type: none"> • current and charge • potential difference and resistance • component characteristics • series and parallel circuits <p>Electricity in the home</p> <ul style="list-style-type: none"> • alternating current • cables and plugs • electrical power and potential difference • electrical current and energy transfer <p>Molecules and matter</p> <ul style="list-style-type: none"> • density • states of matter • changes of state • internal energy • specific latent heat
						




	<p>Organisation</p>  <p>Learning to include: Organisation and the digestive system</p> <ul style="list-style-type: none"> tissues and organs the human digestive system the chemistry of food catalysts and enzymes the factors affecting enzymes making digestion efficient <p>Organising animals and plants</p> <ul style="list-style-type: none"> the blood the structure of blood vessels the structure and function of the heart helping the heart breathing and gaseous exchange transport system in plants evaporation and transpiration 	<p>Bioenergetics</p>  <p>Learning to include: Photosynthesis</p> <ul style="list-style-type: none"> the rate of photosynthesis how plants use glucose making the most of photosynthesis <p>Respiration</p> <ul style="list-style-type: none"> aerobic respiration the body's response to exercise anaerobic respiration metabolism and the liver 	<p>Bonding, structure and matter</p>  <p>Learning to include: Structure and bonding</p> <ul style="list-style-type: none"> states of matter atoms and ions bonding: ionic and covalent giant ionic and giant covalent structures metallic bonding nanoparticles and their application 	<p>Chemical changes</p>  <p>Learning to include: Chemical changes</p> <ul style="list-style-type: none"> the reactivity series displacement reactions extracting metals making salts neutralisation and the pH scale <p>Electrolysis</p> <ul style="list-style-type: none"> introduction to electrolysis changes at the electrodes the extraction of aluminium electrolysis of aqueous solutions <p>Topic 5: Energy Changes</p>  <p>Learning to include: energy changes</p> <ul style="list-style-type: none"> exothermic and endothermic reactions using energy transfers reaction profiles bond energy calculations chemical cells and batteries fuel cells 	<p>Electricity</p>  <p>Learning to include: Energy resources</p> <ul style="list-style-type: none"> energy demands renewable energy: wind, water, sun and earth energy and the environment 	<p>Atomic structure</p>  <p>Learning to include: Radioactivity</p> <ul style="list-style-type: none"> atoms and radiation the discovery and changes to the nucleus alpha, beta and gamma radiation activity and half-life nuclear radiation in medicine nuclear fission nuclear fusion nuclear issues
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Half term points						
10	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
	Homeostasis and response	Inheritance, variation and evolution	Ecology	The rate and extent of chemical change	Chemical analysis	Using resources
	 <p>Learning to include: The human nervous system</p> <ul style="list-style-type: none"> the principles of homeostasis the structure and function of the nervous system reflex actions the brain the eye and problems <p>Hormonal coordination</p> <ul style="list-style-type: none"> principles of hormonal control controlling blood glucose treating diabetes negative feedback human reproduction and artificial control of fertility infertility treatment plant hormones and their response <p>Homeostasis in action</p> <ul style="list-style-type: none"> controlling body temperature removing waste products the human kidney dialysis kidney transplants 	 <p>Learning to include: Reproduction</p> <ul style="list-style-type: none"> Types of reproduction cell division in sexual reproduction DNA and the genome inheritance genetic disorders and screening for genetic disorders protein synthesis gene expression <p>Variation and evolution</p> <ul style="list-style-type: none"> Variation natural selections selective breeding genetic engineering cloning <p>Genetics and evolution</p> <ul style="list-style-type: none"> history of genetics theory of evolution evidence for evolution fossils and extinction classification the new system of classification 	 <p>Learning to include: Adaptations, interdependence and competition</p> <ul style="list-style-type: none"> the importance of communities distribution and abundance competition in animals and plants adaptations in animals and plants <p>Organising an ecosystem</p> <ul style="list-style-type: none"> feeding relationships materials cycling the carbon cycle <p>Biodiversity and ecosystems</p> <ul style="list-style-type: none"> the human population explosion land, water and air pollution deforestation and peat destruction global warming trophic levels food production and security biomass transfer 	 <p>Learning to include: Rates and equilibrium</p> <ul style="list-style-type: none"> rates of reaction collision theory factors that affect rates of reactions reversible reactions dynamic equilibrium  <p>Organic chemistry</p>  <p>Learning to include: Crude oil and fuels</p> <ul style="list-style-type: none"> hydrocarbons fractional distillation burning hydrocarbons cracking hydrocarbons <p>Organic reactions</p> <ul style="list-style-type: none"> reaction of alkenes structure and uses of organic molecules <p>Polymers</p> <ul style="list-style-type: none"> additional polymerisation condensation polymerisation Natural polymers DNA 	 <p>Learning to include: Chemical analysis</p> <ul style="list-style-type: none"> pure substances and mixtures analysing chromatograms testing for gases: positive and negative ions instrumental analysis  <p>Chemistry of the atmosphere</p>  <p>Learning to include: The Earth's atmosphere</p> <ul style="list-style-type: none"> history of our atmosphere our evolving atmosphere greenhouse gases global climate change atmospheric pollutants 	 <p>Learning to include: The Earth's resources</p> <ul style="list-style-type: none"> Finite and renewable resources water safe to drink treating waste water extracting metals from ores <p>Using our resources</p> <ul style="list-style-type: none"> rusting alloys and their uses properties of polymers glass, ceramics and composites the Haber process making fertilisers in the lab and in industry 

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Half term points						
11	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
	Forces	Waves	Required Practical's	Required Practical's	Required Practical's	Grade range end point:
	 <p>Learning to include: Forces in balance</p> <ul style="list-style-type: none"> vectors and scalars forces between objects resultant force levers and gears centre of mass parallelogram of force resolution of force moments and equilibrium <p>Motion</p> <ul style="list-style-type: none"> speed-distance time graphs velocity and acceleration analysing motion graphs <p>Forces and motion</p> <ul style="list-style-type: none"> Force and acceleration Weight and terminal velocity Force and braking Momentum Forces and elasticity Impact forces Safety first <p>Forces and pressure</p> <ul style="list-style-type: none"> pressure and surfaces pressure in liquids at rest atmospheric pressure up thrust and flotation 	 <p>Learning to include: Wave properties</p> <ul style="list-style-type: none"> the nature of waves the properties of waves reflection and refraction seismic waves ultrasound <p>Electromagnetic waves</p> <ul style="list-style-type: none"> The electromagnetic spectrum Light, infra-red, microwaves and radio waves Communication UV, X-rays and gamma rays Using X-rays in medicine <p>Light</p> <ul style="list-style-type: none"> reflection and refraction of light light and colour lenses 	   <p>Biology Learning to include:</p> <ul style="list-style-type: none"> cell division organisation and the digestive system photosynthesis respiration variation and evolution Genetics and evolution  	   <p>Biology Learning to include:</p> <ul style="list-style-type: none"> using a light microscope investigating the effect of a range of concentration on osmosis food tests the effect of PH on the rate of reactions of amylase enzymes investigating the effect of light intensity on the rate of photosynthesis investigating antiseptics  	   <p>Biology Learning to include:</p> <ul style="list-style-type: none"> Investigate the effect of a factor on human reaction time measure the population size of a common species in a habitat investigating the effect of gravity on seedlings investigating the decay of milk 	<p>Grade range end point:</p> <p>9-1</p>
		<p>Magnetism and Electromagnetics</p>  <p>Learning to include:</p> <ul style="list-style-type: none"> electromagnetism magnetic fields magnetic fields with electric currents the motor effect the generator effect transformers 	<p>Chemistry Learning to include:</p> <ul style="list-style-type: none"> structure and bonding chemical calculations electrolysis energy changes rates and equilibrium  	<p>Chemistry Learning to include:</p> <ul style="list-style-type: none"> preparing a salt from an insoluble base investigating electrolysis of a solution investigating temperature change 	<p>Chemistry Learning to include:</p> <ul style="list-style-type: none"> investigating the effect of concentration on the rate of a reaction calculating r_f values purifying and testing water 	

		<p>Solar system/ Red shift</p>  <p>Learning to include:</p> <ul style="list-style-type: none"> • formation of the solar system • the life history of a star • planets, satellites and orbits • the expanding universe • the beginning and future of the universe 	<p>Physics</p> <p>Learning to include:</p> <ul style="list-style-type: none"> • electric circuits • radioactivity • forces and motion • electromagnetism 	<p>Physics</p> <p>Learning to include:</p> <ul style="list-style-type: none"> • determining specific heat capacity • investigating thermal insulators • investigating resistance • investigating electrical components • calculating densities 	<p>Physics</p> <p>Learning to include:</p> <ul style="list-style-type: none"> • investigating the relationships between force and extension for a spring • investigating the relationship between force and acceleration • investigating plane waves in a ripple tank and waves in a solid • investigating infrared radiations 	
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