

Scheme of Work for Years 10 and 11 -- Physics

Summary of topics studied in Physics in the new GCSE

How Science Works (from all three Sciences)

- 0.1 The thinking behind the doing
- 0.2 Fundamental ideas
- 0.3 Observation as a stimulus to investigation
- 0.4 Designing an investigation
- 0.5 Making measurements
- 0.6 Presenting data
- 0.7 Using data to draw conclusions
- 0.8 Societal aspects of scientific evidence
- 0.9 Limitations of scientific evidence

Physics 1

- 1.1 How is heat (thermal energy) transferred and what factors affect the rate at which heat is transferred?
- 1.2 What is meant by the efficient use of energy?
- 1.3 Why are electrical devices so useful?
- 1.4 How should we generate the electricity we need?
- 1.5 What are the uses and hazards of the waves that form the electromagnetic spectrum?
- 1.6 What are the uses and dangers of emissions from radioactive substances?
- 1.7 What do we know about the origins of the Universe and how it continues to change?

Physics 2

- 2.1 How can we describe the way things move?
- 2.2 How do we make things speed up or slow down?
- 2.3 What happens to the movement energy when things speed up or slow down?
- 2.4 What is momentum?
- 2.5 What is static electricity, how can it be used and what is the connection between static electricity and electric currents?
- 2.6 What does the current through an electrical circuit depend on?
- 2.7 What is mains electricity and how can it be used safely?
- 2.8 Why do we need to know the power of electrical appliances?
- 2.9 What happens to radioactive substances when they decay?
- 2.10 What are nuclear fission and nuclear fusion?

Physics 3

- 3.1 How do forces have a turning effect?
- 3.2 What keeps bodies moving in a circle?
- 3.3 What provides the centripetal force for planets and satellites?
- 3.4 What do mirrors and lenses do to light?
- 3.5 What is sound?
- 3.6 What is ultrasound and how can it be used?
- 3.7 How can electricity be used to make things move?
- 3.8 How do generators work?

3.9 How do transformers work?

3.10 What is the life history of stars?

Homework at GCSE will usually take the form of practice calculations based on work completed during the lesson where this is appropriate, or of completion of past GCSE questions, which reinforce the work completed during the lessons and/or extend its use to further applications of the topics covered to everyday life. Sometimes posters and/or presentations will be set following research.

How Science works will be taught during the course as and when opportunity arises whether in practical, during discussions or simply by reference to current news items.

TIME SCALE **Separate Science Physics**

We have 3 modules to cover in 2 years so we need to cover the Core and part of the Additional Science in Year 10. Pupils will take the Core Physics 1 examination in June of Year 10 and the Additional Physics 2 in January of Year 11 and Physics 3 in June of Year 11.

In order that the work for the Core is fresh in the pupils' minds we will begin Year 10 with some sections of the Additional Science Physics 2. . We have mostly included those topics, which are related to P1 and can be taught in a parallel curriculum. Monitoring will take place during the year as to how long each topic takes and adjustments made next year


Year 10


Term	AQA	Text book Section	Topic	Resources and experiments/demos	Suggested Homework
Autumn Term	12.5	P2 4.1 and P2 4.2	Electrical charges - Charge on the move - current	Van de Graaf Rods experiment Balloon/ water/ pieces of paper Electroscope	e-sci act P.2.4.2
		P2 4.3	Uses and dangers of static electricity – photocopiers / precipitators / paint spraying / lightning / refueling aircraft / powder in pipes	Video e-sci lightning & photocopier simulations	e-sci Act P2.4.3 Past questions & e-sci summary & exam quest 2.4
		P2 4.5	Static issues	e-sci act P 2.4.5	
	12.6	P2 5.1	Electric circuit symbols / use of meters / definitions / $V = I \times R$	e-sci circuit symbol dominoes & matching symbols	
		P2 5.4 and P2 5.5	Series and Parallel circuit	Experiment to find how current & pd across each bulb is related to total current & pd in circuits e-sci animation	E-sci act 2.5.4 & 2.5.5
		P2 5.2	Resistance of wire and carbon resistor	e-sci drag&drop res of wire I-V characteristic for	

				carbon resistor	
			Resistance of different lengths and diameters PSA	Experiment to plot graph of res v length & res v diameter	
		P2 5.3	Resistance of diode and bulb	I- V characteristic e-sci sim of graphs	E sci hwk 2.5.2
		P2 5.2	Resistance of LDR and thermistor ISA	Experiments to show how res varies with temp and light levels	e-sci act 2.5.3 comp quiz
		P2 5.6	Circuits in control		
	12.7	P2 6.1	Alternating current – oscilloscope traces period / frequency Mains = 50 Hz 230V / traces for mains live and neutral wires	Oscilloscopes to demo dc and ac with time base on & off	E-sci act P2.6.1
		P2 6.2	Cables and plugs structure and wiring / possible errors in wiring & dangers of mains electricity	Wire plugs samples of incorrect wiring e-sci drag & drop plugs e-sci anim wiring plug	e-sci act 2.6.2
		P2 6.3	Fuses / calculating values / earthing	Fuse demo use of kettle/ iron etc to find real fuse values e-science earthing demo	e-sci act 2.6.3 & hwk 2.6.3

11.3 and 12.8	P1a 3.1 and P1a3.2 and P2 6.4	Everyday Electrical devices energy transferred & power used and potential difference Energy = power/time Electrical power = I x V energy (kWh) = power (kW) x time (hours) Costs	e-sci "spot the devices" e-sci elec energy trans drag & drop e-sci photo elec devices I kitchen e-sci muscle power exp P1a 3.2 e-sci units drag & drop Power experiment (measure I and V) P2.6.4 power calculations from appliances	e-sci hwk P2.6.4 e-sci act P1a 3.2
11.3 and 12.8	P1a3.3 and P 2 6.5	Electrical energy used & charge $Q = I \times t$ $W = Q \times V$		e-sci hwk P2.6.5
11.3	P1a 3.4	National Grid & transformers - brief description of transformer construction higher V less energy loss	Demo of transformer to show step up and down transmission lines demo	e-sci summ & exam ques P2.6 & P1a.3 e-sci P1a 3.4 act (Nat grid)
	P1a3.5 and P2 6.6	Electrical Issues and safety issues	e-sci rollover hazards	
11.4	P1a 4.1	Power stations Coal Oil Gas and Nuclear	e-sci opener quiz KS3 +	e-sci act P1a 4.1

			<p>comparison of energy released per kg/ waste / greenhouse gases / start up time / reliability / building costs /location</p> <p>All used to produce heat to make steam to drive turbines</p>	<p>how oil formed* + energy +resources</p> <p>e-sci diags</p> <p>nuclear/fossil/gas & virt</p> <p>construct coal/gas/nuclear</p>	
		P1a 4.2 and P1a 4.3	<p>Wind/ wave /tidal /hydroelectric inc pumped storage – all drive turbines directly solar – can produce electricity directly using solar cells geothermal – steam from hot rocks drives turbines comparison of energy released per kg/ waste / start up time / reliability / building costs /location</p>	<p>Boardworks / laminated resources /e-sci sims and photos</p> <p>wave energy / hydroelectric / biomass demos</p> <p>Dinorwic video -- pumped storage</p> <p>Solar cell and wind energy experiments leading to practice ISA</p>	<p>Powerpoint presentations following research into renewable energy</p> <p>e-sci P1a 4.2 act sheet</p>
		P1a 4.4	<p>Environmental effects of fossil fuels / nuclear/ renewables</p>	<p>e-sci drag & drop on environmental effects</p>	<p>e-sci act P1a 4.4 x2</p> <p>e-sci hwk P1a 4.4</p>
		P1a 4.5	<p>Issues debate</p>	<p>P1a 4.5 nuclear debate views powerpoint</p> <p>P1a 4.5 energy debate comparing resources</p>	<p>e-sci summary & exam ques P1a 4</p> <p>+ end of P1a questions</p>

Spring Term	11.5	P1b 5.1 and P1b 5.2 and P1b 5.3 and P1b 5.4	Em radiation gamma rays, X rays ,UV ,visible, IR microwaves radio waves (inc wavelength / decreasing frequency) travel at same speed in a vacuum / uses /hazards /reducing exposure /absorption effects / effect on living cells	Electromagnetic spectrum demos – invisible rays UV experiment with sun cream e-sci clip  smugglers + X rays e-sci clip diff between UV & visible e-sci drag & drop IR/mic/rad	Past exam questions e-sci act P1b 5.1 x 2 e-sci act P1b 5.2 x 2 (X-rays +gamma rays) e-sci act P1b 5.3 ozone layer comprehension e-sci act P1b 5.4 IR/mic /rad
		P1b 5.5 and P1b 5.6	Communications by radio and microwaves (satellite & mobile phones) infra red and visible light (optical fibres) Analogue & digital - definitions / why digital better $v = f \times \lambda$	Fibre optics to transmit radio program oscilloscope traces of analogue/ digital IR TV remote switches on trace on oscilloscope e-sci drag&drop x 2 wavebands e-sci sim diff an /dig	e-sci hwk P1b 5.1 e-sci act P1b 5.5 (rad) e-sci act P1b 5.6an/dig
		P1b 5.7	Microwave Issues – hazards of mobile phones	e-sci mobile phones signals + masts	e-sci act mobile danger e-sci sum & exam ques

				e-sci multi choice revision quiz	P1b 5
11.1	P1a 1.3	Conduction – definition particles(!) Include electrons in metals everyday examples	Rods exp/ ice exp  types of insulation	e-sci act P1a 1.3	
	P1a 1.4	Convection - definition particles(!) air/ water expands / less dense /rises particles “move apart” everyday examples – radiator / hot air balloon / hot water system / sea breezes	Pot perm exp/ smoke box e-sci pic “eagle on conv current”	e-sci act P1a1.4	
11.1	P1a 1.1 and P1a 1.2	Radiation - transfer of energy by em waves/ all bodies emit radiation / dark matt surfaces best emitters and absorbers Greenhouse & solar panel	Flasks + heater / Leslies cube / metal sheets + heater + pennies + wax e-sci “testing surfaces” exp? E-sci solar panels animation		
	P1a 1.5	Heat transfer by Design Transfer of heat depends on material/ shape/ dimensions/ temp diff across surface Examples vacuum flask / house insulation / U values / pay back time Cooling by design – fridge/ car engine	Exp with diff types of insulation e-sci prac 1a 1.3 exp with diff shapes of container e-sci payback drag & drop e-sci prac P1a 1.5 heat sink vacuum flask / examples	e-sci act P1a 1.5 “house” e-sci hwk P1a 1.5 vacuum flask e-sci sum & exam ques P1a 1	



				of house insulation (loft ins pic e-sci + roll over all types ins) e-sci heat energy multi choice revision	
		P1a 1.6	Issues		
	11.2	P1a 2.1 and P1a 2.2	Forms of energy + conservation of energy	Energy circus e-sci act P1a 2.1 + powerpoint cons of energy + pendulum + rollercoaster	
		P1a 2.3 and P1a 2.4	Useful energy / wasted energy transfer to surroundings and efficiency efficiency = useful energy transferred/ energy input efficiency of light bulbs/ electrical appliances labelling	Light bulbs e-sci disc brakes Eff of elec motor e-sci P1a 2.4	e-sci act P1a 2.3 e-sci struc ques P1a 2.4
		P1a 2.5	Issues		e-sci sum & exam ques P1a 2



Summer Term	11.6 12.9	P1b 6.1 and P1b 6.2 P2 7.1	Observing nuclear radiation structure of atom - isotopes $\alpha\beta\gamma$ radiation – nature penetrating power/ deflection in electric & magnetic fields / ionization / absorption by air & materials / hazards/ exposure reduction Nuclear reactions equations – background radiation	Video radiation all around us e-sci sim observing nuclear radiation Absorption exp range in air ex background count e-sci sim absorption	e-sci act P 1b 6.1 e-sci hwk P1b 6.2 e-sci act P1b 6.2 e-sci act & ict p 1b 6.5 background
	11.6	P1b 6.3	Half-life definition & graphs	Half life video exp e-sci sim half life	e-sci act P1b 6.3
	11.6	P1b 6.4	Uses of radioactivity – tracers/ thickness monitoring / dating/ sterilizing food & medical equipment	Videos on uses e-sci powerpoint tracers	e-sci act P1b 6.4 x 2 e-sci hwk P 1b 6.4
	11.6	P1b 6.5	Radioactivity Issues	e-sci Nuclear reactor simulation ** e-sci multi choice quiz	e-sci sum & exam ques P 1b 6
	11.7	P1b 7.3	Looking into space – advantages & disadvantages of refracting/ reflecting/ radio / space telescopes	Refracting telescopes Yr 10 starter	
	11.7	P1b 7.1 and P1b 7.2	Big Bang and Red shift	Video – Physical processes	e-sci act & ict P1b 7.1 e-sci P1b 7.2
		P1b 7.4	Looking into the unknown	e-sci multi choice revision ques	e-sci sum & exam ques P1b7 e-sci end of unit ques1b

			ISA		
(If time)	12.9	P2 7.2	Discovery of the nucleus		
	12.10	P2 7.3	Nuclear Fission		
		P2 7.4	Nuclear Fusion		
		P2 7.5	Nuclear Energy issues		

Year 11

Term	AQA	Text book Section	Topic	Resources & experiments	Suggested homework
Autumn Term	12.9	P2 7.1	Revision from module P1 of basic radioactivity – background/ alpha beta gamma /		e-sci act P2.7.1 nuclear reactions
		P2 7.2	Discovery of the nucleus	Video –Rutherford e-sci summary animation	e-sci act P2.7.2 rutherford
	12.10	P2 7.3	Nuclear Fission and reactor	Video - fission	e-sci hwk P2.7.3
		P2 7.4	Nuclear Fusion	e-sci Anim fusion/fission	e-sci act P2.7.4
		P2 7.5	Nuclear Energy issues		e-sci summary & exam ques P2.7

	12.1	P2 1.1 and P2 1.2	Distance-Time Graphs and Velocity and Acceleration	Boardworks E sci animation P2.1.1 ways of measuring distance & speed Treasure Island	e-sci act P2.1.2
		P2 1.3 and P2 1.4	Velocity – Time graphs and Using graphs	e-sci Prac ticker tape (P2.1.3) e-sci Drag & drop x2 Use of motion sensor or ticker tapes  e-sci powerpoint calc of diff speeds P 2.2.6	e-sci act P2.1.3 e-sci hwk P2.1.4
		P2 1.5	Transport Issues stopping/ braking /thinking distances	e-sci discussion on fuel prices	e-sci summary & exam style questions P2.1
	12.2	P2 2.1 and P2 2.2 and P2 2.3	Forces between objects Friction Resultant Force Force and Acceleration $F = m \times a$	Forces circus Friction tests Experiment with trolleys and light gtaes  e-sci diagrams of forces drag & drop resultant forces	e-sci matching forces and resultant forces act P.2.2
		P2 2.4 and P2 2.6	On the Road braking thinking and stopping distances and Speed Limits	e-sci Reaction timer e-sci video P2.1.5 e-sci drag & drop“on theroad” e-sci drag & drop stopping & collisions	e-sci act P2.2.4

		P2 2.5	Falling Objects $Wt = m \times g$ Terminal velocity	Parachute exp? E-sci Terminal vel simulation Experiment with light gate to find g 	e-sci free fall ict ? e-sci summary & exam style questions P2.2
	12.3	P2 3.1	Energy and Work	e-sci prac work done P2.3.1 e-sci drag & drop “energetic challenge” & diag PE gain	e-sci act 2.3.1
		P2 3.2	Kinetic Energy $KE = \frac{1}{2} m v^2$	2 x Drag & drop on KE P2.3.2 and dominoes	
	12.4	P2 3.3 and P2 3.4	Momentum and Collisions and Explosions	Air Track collisions & explosions  e-sci drag & drop explosions	P2.3.3 act collisions
		P2 3.5	Changing Momentum $Ft = mv - mu$	E-sci powerpoint on mtm & force	
		P2 3.6	Forces for safety - air bags seat belts etc	e-sci powerpoint on crumple zones etc	Summary & exam style questions P 2.3
	12.5 – 12.8	P2.4 – P2.6	Revision of electricity completed last year	Need to do revision exp to use as PSA	
Spring Term	13.1	P3 1.1 and P3 1.3	Introduction Moments and Moments in Balance	e-sci powerpoint revisionP3 e-sci powerpoint calc moments e-sci drag & drop on balancing objects	

				Moments experiment and finding an unknown weight (e-sci) seesaw powerpoint	
		P3 1.2 and P3 1.4	Centre of Mass and Stability	Exp to find centre of mass of irregular object e-sci finding c of mass of diff objects crane experiment tilting and toppling e-sci bus on bends animation	e-sci hwk on toppling P3 1.4
	13.2	P3 1.5	Circular Motion	e-sci powerpoint	
	13.3	P3 1.6 and P3 1.7 and P3 1.8	Gravitational Attraction and Planetary Orbits and Satellites	e-sci powerpoint calc weight e-sci anim & diag showing how g changes as rocket moves from Earth to moon e-sci anim on planetary & satellite orbits e-sci diag on satellites & correct speed	e-sci skills P3 1.8 finding out about 2 real satellites
		P3 1.9	Turning Issues	e-sci Summary powerpoint on P3.1	e-sci exam ques P 3.1

				e-sci powerpoint on adv/dis of space exploration	
13.4	P3 2.1 and P3 2.2	Revision of reflection in plane mirrors Reflection in Curved Mirrors Ray diagrams Nature of image Magnification = $\frac{\text{Image Height}}{\text{Object Height}}$	Plane mirror experiments(e-sci P3.2.1prac) e-sci anim P3.2.1 reflection(B) Ripple tank to show concave & convex concave mirror exp e-sci prace-sci diag for virtual image in concave mirror		
	P3 2.3	Revision of refraction at interface and in prism	Glass block experiment Prism experiments		
	P3 2.4 and P3 2.5	Lenses and Using Lenses – ray diagrams	Lens prac e-sci P3.2.4 e-sci sim refraction in block& lenses (ray diags) also boardworks ray diagrams		
13.5	P3 2.6	Revision of Sound / in vacuum /range of hearing reflection and refraction	Sound experiments		
	P3 2.7	Revision of musical sounds Amplitude (Loudness) and frequency (pitch) from oscilloscope traces	Signal generator + osilloscope e-sci animation of loudness &	e-sci hwk P3.2.7	

				amplitude	
	13.6	P3 2.8	Revision of Ultrasound oscilloscope traces / above level of human hearing/ scanning babies / cleaning/ quality control – distance determination (ships?)	e-sci prac P3.2.8 ultrasound e-sci anim ultrasonic scan	
		P3 2.9	Light and Sound Issues	e-sci powerpoint rock concert e-sci powerpoint summary P3.2	e-sci exam questions P3.2
	13.7	P3 3.1	Motor effect –	aluminium strip / rolling wire / motor e-sci sim on motor effect + reversing dirns e-sci diag of motor	
	13.8	P3 3.2	Electromagnetic Induction -	wire cuts field lines / magnet into coil / generator / bike dynamo e-sci sim on generator	
	13.9	P3 3.3 and P3 3.4	Transformers - equation / step up / step down and the National Grid	Prac –sci P3.3.3 and P3.3.4 transformer efficiency Transformer demo of step up and down e-sci anim how transformer works & step up & down anim Transmission lines	e-sci transformers at home survey e-sci hwk P3.3.4 transformer calcs
		P3 3.5	More power to you		e-sci sum & exam ques P3.3

	13.10	P3 4.1	Galaxies	e-sci ppt on diff types	
		P3 4.2	Life History of a star	Video e-sci ppt & diag	e-sci act P 3.4.2
		P3 4.3	How the chemical elements formed	e-sci ppt on nebulae	e-sci act on extra terrestrial life & space exploration
		P3 4.4	Universal Issues		e-sci sum & exam ques P3.4 e-sci P3 exam ques