

## **Scheme of Work for Years 10 and 11 -- Core + Additional Science (Physics)**

### **Summary of topics studied in Physics in the new GCSE for Core and Additional Science**

#### **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 (from GCSE Science) 11.1 to 11.7**

- 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 (from GCSE Additional Science)**

- 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 current 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 nucl

Those girls taking Science and Additional Science will take module P1 in June of Year 10 and module P2 in June of year 11. As they will have examination leave from the middle of May of year 11 they will have less weeks in Year 11 than year 10. This means that although the girls will concentrate on P1 during year 10 they will need to have covered some of the material from P2 in order to have finished the course before they go on examination leave in Year 11. We have included those topics, which are related and can be taught in a parallel curriculum. Monitoring will take place during each year as to how long each topic takes and adjustments made the following year.


## Year 10 – Module P1

Autumn Term	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
	11.4	P1a 4.1	Power stations Coal Oil Gas and Nuclear comparison of energy released per kg/ waste / greenhouse gases / start up time / reliability / building costs /location All used to produce heat to make steam to drive turbines	e-sci opener quiz KS3 + how oil formed* + energy +resources e-sci diags nuclear/fossil/gas & virt construct coal/gas/nuclear	e-sci act P1a 4.1

		P1a 4.2 and P1a 4.3	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	Boardworks / laminated resources /e-sci sims and photos wave energy / hydroelectric / biomass demos Dinorwic video -- pumped storage Solar cell and wind energy experiments leading to practice ISA	 Powerpoint presentations following research into renewable energy e-sci P1a 4.2 act sheet
		P1a 4.4	Environmental effects of fossil fuels / nuclear/ renewables	e-sci drag & drop on environmental effects	e-sci act P1a 4.4 x2 e-sci hwk P1a 4.4
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	

				<p>“testing surfaces” exp? E-sci solar panels animation</p>	
		P1a 1.5	<p>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</p>	<p>Exp with diff types of insulation e-sci prac 1a 1.3 exp with diff shapes of container e-sci payback drag &amp; drop e-sci prac P1a 1.5 heat sink vacuum flask / examples of house insulation (loft ins pic e-sci + roll over all types ins) e-sci heat energy multi choice revision</p>	<p>e-sci act P1a 1.5 “house” e-sci hwk P1a 1.5 vacuum flask  e-sci sum &amp; exam ques P1a 1</p>
		P1a 1.6	Issues		
			ISA		
Spring term	11.3 and	P1a 3.1 and P1a3.2	<p>Everyday Electrical devices energy transferred &amp; power used and potential difference Energy = power/time Electrical power</p>	<p>e-sci “spot the devices” e-sci elec</p>	<p>e-sci hwk P2.6.4  e-sci act P1a 3.2</p>

	12.8 and 6.4	P2	= $I \times V$ energy (kWh) = power (kW) x time (hours) Costs	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	
	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	

	11.5	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 multi choice revision quiz	e-sci act mobile danger e-sci sum & exam ques P1b 5
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	Big Bang and Red shift	Video – Physical processes	e-sci act & ict P1b 7.1 e-sci P1b 7.2

		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



## YEAR 11 –module P2



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 /	Video e-sci lightning &	e-sci Act P2.4.3 Past questions & e-sci

			powder in pipes	photoopier simulations	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 = $I \times V$ 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   kitchen e-sci muscle power	e-sci hwk P2.6.4  e-sci act P1a 3.2

				exp P1a 3.2 e-sci units drag & drop  Power experiment ( measure I and V) P2.6.4 power calculations from appliances	
	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
			<b>ISA</b>		
Spring Term	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 tape 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 light gates and  trolleys 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 &	e-sci act P2.2.4

				collisions	
		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

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