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NB. Separate chemistry content is written in **bold and italic**

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2 P	4.6 Waves		4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1	RP9	
2 P	4.6 Waves		4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light	RP9	
2 P	4.6 Waves	4.6.2 Electromagnetic waves	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation	RP9	
Ъ	4.6 Waves	4.6.2 Electromagnetic waves 4.6.3 Black body radiation	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation	RP9	
Paper 2 P		4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism,	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.1 Poles of a magnet	RP9	
2 P		4.6.2 Electromagnetic waves 4.6.3 Black body radiation	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagentic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.7.1.1 Poles of a magnet 4.7.1.2 Magnetic fields	RP9	
2 Paper 2 P		4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Usible light 4.6.3.1 Emission and absorption of IR radiation 4.7.1.1 Poles of a magnet 4.7.1.2 Hagnetic fields 4.7.2.1 Electromagneticm	RP9	
2 Paper 2 P		4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism,	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.1 Poles of a magnet 4.7.2.2 Electromagnetism 4.7.2.2 Fleming's left hand rule (HT)	RP9	
2 Paper 2 P		4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Usible light 4.6.3.1 Emission and absorption of IR radiation 4.7.1.1 Poles of a magnet 4.7.1.2 Hagnetic fields 4.7.2.1 Electromagneticm	RP9	
2 Paper 2 P		4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.1.5 Wave for detection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.1 Poles of a magnet 4.7.2.1 Electromagnetism 4.7.2.3 Electric motors (HT)	RP9	
aper 2 Paper 2 P		4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.5 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.1 Poles of a magnet 4.7.1.2 Magnetic fields 4.7.2.1 Electromagnetism 4.7.2.2 Fleming's left hand rule (HT) 4.7.2.4 Loudspeakers (HT)	RP9	
2 Paper 2 P	4.7 Magnetism and electromagnetism	4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields 4.7.2 The motor effect	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.1 Poles of a magnet 4.7.2.1 Electromagnetism 4.7.2.3 Electric motors (HT) 4.7.2.3 Electric motors (HT) 4.7.3.1 Induced potential (HT) 4.7.3.3 Microphones (HT)	RP9	
aper 2 Paper 2 P	4.7 Magnetism and electromagnetism	4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields 4.7.2 The motor effect 4.7.3 Induced potential, transformers and the	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagentic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.2 Magnetic fields 4.7.1.2 Leterromagnetism 4.7.2.3 Electric motors (HT) 4.7.3.4 Loudspeakers (HT) 4.7.3.4 Transformers (HT) 4.7.3.4 Transformers (HT)	RP9	
aper 2 Paper 2 P	4.7 Magnetism and electromagnetism	4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields 4.7.2 The motor effect 4.7.3 Induced potential, transformers and the	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.2 Poles of a magnet 4.7.1.2 Magnetic fields 4.7.2.1 Electromagnetism 4.7.2.2 Fleming's left hand rule (HT) 4.7.2.3 Electric motors (HT) 4.7.3.1 Induced potential (HT) 4.7.3.1 Induced potential (HT) 4.7.3.2 Uses of the generator effect (HT) 4.7.3.3 Microphones (HT) 4.7.3.4 Low solar system	RP9	
aper 2 Paper 2 P	4.7 Magnetism and electromagnetism	 4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields 4.7.2 The motor effect 4.7.3 Induced potential, transformers and the National Grid (HT) 	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection of waves 4.6.1.3 Reflection and exploration (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 1 4.6.2.3 Properties of electromagentic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.7.1.1 Poles of a magnet 4.7.1.2 Hectromagnetism 4.7.2.2 Fleming's left hand rule (HT) 4.7.3.2 Hectric motors (HT) 4.7.3.2 Uses of the generator effect (HT) 4.7.3.1 Muced potential (HT) 4.7.3.2 Uses of the generator effect (HT) 4.7.3.4 Transformers (HT) 4.7.3.4 Transformers (HT) 4.8.1.1 Our solar system 4.8.1.2 The life cycle of a star	RP9	
aper 2 Paper 2 P		 4.6.2 Electromagnetic waves 4.6.3 Black body radiation 4.7.1 Permanent and induced magnetism, magnetic forces and fields 4.7.2 The motor effect 4.7.3 Induced potential, transformers and the National Grid (HT) 4.8.1 Solar system; stability of orbital motions; 	4.6.1.2 Properties of waves 4.6.1.3 Reflection of waves 4.6.1.4 Sound waves (HT) 4.6.2.1 Types of electromagnetic waves 4.6.2.2 Properties of electromagnetic waves 4.6.2.3 Properties of electromagnetic waves 2 4.6.2.4 Uses and applications of electromagnetic waves 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3.1 Emission and absorption of IR radiation 4.6.3.2 Perfect black bodies and radiation 4.7.1.2 Poles of a magnet 4.7.1.2 Magnetic fields 4.7.2.1 Electromagnetism 4.7.2.2 Fleming's left hand rule (HT) 4.7.2.3 Electric motors (HT) 4.7.3.1 Induced potential (HT) 4.7.3.1 Induced potential (HT) 4.7.3.2 Uses of the generator effect (HT) 4.7.3.3 Microphones (HT) 4.7.3.4 Low solar system	RP9	

Required Practicals for Separate Sciences

Subject	RP#	Spec. ref	Summary
	1	4.1.1.2	MICROSCOPY - Use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included.
	2	4.1.1.6	CULTURING MICROORGANISMS - Investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.
8461 - Biology	3	4.1.3.2	OSMOSIS - Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.
	4 5	4.2.2.1 4.2.2.1	FOOD TESTS - Qualitative reagents to test for a range of carbohydrates, lipids and proteins. ENZYMES - Investigate the effect of pH on the rate of reaction of amylase enzyme.
	6	4.4.1.2	PHOTOSYNTHESIS - Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.
	7	4.5.2	REACTION TIME - Plan and carry out an investigation into the effect of a factor on human reaction time.
8	8	4.5.4.1	TROPISMS - Investigate the effect of light or gravity on the growth of newly germinated seedlings.
	9	4.7.2.1	SAMPLING - Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species
	10	4.7.2.3	DECOMPOSITION - Investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.
	1	4.4.2.3	SOLUBLE SALTS - Preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution.
۲	2	4.4.2.5	TITRATION - Determination of the reacting volumes of solutions of a strong acid and a strong alkali by titration. Determination of the concentration of one of the solutions in mol/dm ³ and g/dm ³ from the reacting volumes and the known concentration of the other solution (HT).
mist	3	4.4.3.4	ELECTROLYSIS - Investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis.
8462 - Chemistry	4	4.5.1.1	TEMPERATURE CHANGE - Investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals.
8462	5	4.6.1.2	RATES OF REACTION - Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity.
	6	4.8.1.3	CHROMATOGRAPHY - Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.
	7	4.8.3	CHEMICAL ANALYSIS - Use of chemical tests to identify the ions in unknown single ionic compounds covering the ions from Flame tests to Sulfates.
	8	4.10.1.2	POTABLE WATER - Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.
	1	4.1.1.3	SPECIFIC HEAT CAPACITY - An investigation to determine the specific heat capacity of one or more materials. The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored.
	2	4.1.2.1	ENERGEY TRANSFERS - Investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material.
	3	4.2.1.3	RESISTANCE - Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits.
cs	4	4.2.1.4	I-V CHARACTERISTICS - Use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature.
8463 - Physics	5	4.3.1.1	DENSITY - Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. Volume should be determined from the dimensions of regularly shaped objects, and by a displacement technique for irregularly shaped objects. Dimensions to be measured using appropriate apparatus such as a ruler, micrometer or Vernier callipers.
84(6	4.5.3	SPRING CONSTANT - Investigate the relationship between force and extension for a spring.
	7	4.5.4.2.2	ACCELERATION - Investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force.
	8	4.6.1.2	WAVES - Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements.
	9	4.6.1.3	REFLECTION OF WAVES - Investigate the reflection of light by different types of surface and the refraction of light by different substances.
	10	4.6.2.2	I.R. RADIATION - Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.