5th Year Syllabus – Revision Checklist

Mechanics

Content	Depth of treatment	Activities	Science/Technology/Society	Revision
Motion				
1. Linear motion	Units of mass, length and time – definition of units not required.			
	Displacement, velocity, acceleration: definitions and units.	Measurement of velocity and acceleration, using any suitable apparatus. Use of distance-time, velocity-time graphs.	Sports, e.g. Athletics.	☐ ☐ ☐
	Equations of motion. Derivation.	Measurement of *g*. Appropriate calculations.		
2. Vectors and scalars	Distinction between vector and scalar quantities.		Vector nature of physical quantities: everyday examples.	☐
	Composition of perpendicular vectors.	Find resultants using newton balances or pulleys.		☐ ☐
	Resolution of co-planar vectors.	Appropriate calculations.		
Forces				
1. Newton's laws of motion	Statement of the three laws.	Demonstration of the laws using air track *or* tickertape timer *or* powder track timer, etc.	Applications: • seat belts • rocket travel. Sports, all ball games.	
	Force and momentum: definitions and units. Vector nature of forces to be stressed. $F = ma$ as a special case of Newton's second law. Friction: a force opposing motion.	Appropriate calculations.	Importance of friction in everyday experience, e.g. walking, use of lubricants, etc.	☐ ☐ ☐

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2. Conservation of momentum	Principle of conservation of momentum.	Demonstration by any one suitable method.	Collisions (ball games), acceleration of spacecraft, jet aircraft.	☐
		Appropriate calculations (problems involving change of mass need not be considered).		☐
				☐
3. Circular motion	Centripetal force required to maintain uniform motion in a circle.		Demonstration of circular motion.	☐
	Definition of angular velocity ω.			☐
	Derivation of $v = r\omega$			☐
	Use of $a = r\omega^2$, $F = m\,r\omega^2$		Appropriate calculations.	
4. Gravity	Newton's law of universal gravitation. $F = Gm_1m_2/d^2$	Compare gravitational forces between Earth and Sun and between Earth and Moon.	Solar system.	
	Weight = mg			
	Variation of g, and hence W, with distance from centre of Earth (effect of centripetal acceleration not required).	Appropriate calculations.	"Weightlessness" and artificial gravity.	☐
				☐
	Value of acceleration due to gravity on other bodies in space, e.g. Moon.	Calculation of weight on different planets.	Presence of atmosphere.	☐
	Circular satellite orbits – derivation of the relationship between the period, the mass of the central body and the radius of the orbit.	Appropriate calculations.	Satellites and communications.	
5. Density and pressure	Definitions and units.	Demonstration of atmospheric pressure, e.g. collapsing-can experiment. Appropriate calculations.	Atmospheric pressure and weather.	☐
	Pressure in liquids and gases.		The "bends" in diving, etc.	☐
	Boyle's law.			
	Archimedes' principle. Law of flotation.	Demonstration only. Calculations not required.	Hydrometers.	☐

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6. Moments	Definition. Levers. Couple.	Simple experiments with a number of weights. Appropriate calculations. (Only problems involving co-planar, parallel forces need be considered.)	Torque, e.g. taps, doors. Handlebars on bicycles. Reference to moving-coil meters and simple motor.	☐ ☐ ☐
7. Conditions for equilibrium	Vector sum of the forces in any direction is zero. The sum of the moments about any point is zero.	Appropriate calculations.	Static and dynamic equilibrium.	☐ ☐ ☐
8. Simple harmonic motion (SHM) and Hooke's law	Hooke's law: restoring force $\propto$ displacement. $F = -ks$ $ma = -ks$ $a = = -\omega^2 s$ Systems that obey Hooke's law e.g. simple pendulum, execute simple harmonic motion: $T=2\pi/\omega$	Demonstration of SHM, e.g. swinging pendulum or oscillating magnet. Appropriate calculations.	Everyday examples.	☐ ☐ ☐
Energy				
1. Work	Definition and unit.	Simple experiments. Appropriate calculations involving force and displacement in the same direction only.	Lifts, escalators.	☐ ☐ ☐
2. Energy	Energy as the ability to do work. Different forms of energy. $E_P = mgh$ $E_k = \frac{1}{2}mv^2$ Mass as a form of energy, $E = mc^2$ Conversions from one form of energy to another. Principle of conservation of energy.	Demonstrations of different energy conversions. Appropriate calculations.	Sources of energy: renewable and non-renewable. Mass transformed to other forms of energy in the Sun. Efficient use of energy in the home.	☐ ☐ ☐

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3. Power	Power as the rate of doing work or rate of energy conversion. Unit. Percentage efficiency = (Power output /Power input)x 100	Estimation of average power developed by • person running upstairs • person repeatedly lifting weights, etc. Appropriate calculations.	Power of devices, e.g. Light bulbs, motors, etc.	☐ ☐ ☐

MECHANICS: Experiments
1. Measurement of velocity and acceleration.
2. To show that $a \propto F$.
3. Verification of the principle of conservation of momentum.
4. Measurement of g.5. Verification of Boyle's law.
6. Investigation of the laws of equilibrium for a set of co-planar forces.
7. Investigation of relationship between period and length for a simple pendulum and hence calculation of g.

Temperature

Content	Depth of treatment	Activities	Science/Technology/Society	Revision
1. Concept of temperature	Measure of hotness or coldness of a body. The SI unit of temperature is the kelvin (definition of unit in terms of the triple point of water not required). Celsius scale is the practical scale of temperature. t /ºC = T /K – 273.15			☐ ☐ ☐
2. Thermometric properties	A physical property that changes measurably with temperature.	Demonstration of some thermometric properties: • length of liquid column, e.g. length of mercury column • emf of thermocouple • pressure of a gas at constant volume • volume of a gas at constant pressure • resistance • colour.		☐ ☐ ☐
3. Thermometers	Thermometers measure temperature. Two thermometers do not necessarily give the same reading at the same temperature. The need for standard thermometers - use any commercial laboratory thermometer as school standard.	Graduate two thermometers at ice and steam points. Compare values obtained for an unknown temperature, using a straight-line graph between the reference points.	Practical thermometers, e.g. • clinical thermometer • oven thermometers • boiler thermometers • temperature gauge in a car.	☐ ☐ ☐

Heat

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1. Concept of heat	Heat as a form of energy that causes a rise in temperature when added or a fall in temperature when withdrawn			☐ ☐
Quantity of Heat				
1. Heat capacity, specific heat capacity	Definitions and units.	Appropriate calculations.	Storage heaters.	☐ ☐
2. Latent heat, specific latent heat	Definitions and units.	Appropriate calculations.	Heat pump, e.g. refrigerator. Perspiration.	☐ ☐
Heat Transfer				
1. Conduction	Qualitative comparison of rates of conduction through solids.	Simple experiments.	*U*-values: use in domestic situations.	☐ ☐ ☐
2. Convection		Simple experiments.	Domestic hot-water and heating systems.	☐ ☐
3. Radiation	Radiation from the Sun. Solar constant (also called solar irradiance).	Simple experiments.	Everyday examples. Solar heating.	☐ ☐

HEAT: Experiments

1. Calibration curve of a thermometer using the laboratory mercury thermometer as a standard.
2. Measurement of specific heat capacity, e.g. of water *or* a metal by a mechanical *or* electrical method.
3. Measurement of the specific latent heat of fusion of ice.
4. Measurement of the specific latent heat of vaporisation of water.

Waves

Content	Depth of treatment	Activities	Science/Technology/Society	Revision
1. Properties of waves	Longitudinal and transverse waves: frequency, amplitude, wavelength, velocity. Relationship $c = f\lambda$	Appropriate calculations.	Everyday examples, e.g. • radio waves • waves at sea • seismic waves.	☐ ☐ ☐
2. Wave phenomena	Reflection. Refraction. Diffraction. Interference. Polarisation.	Simple demonstrations using slinky, ripple tank, microwaves, *or* other suitable method.		
	Stationary waves; relationship between inter-node distance and wavelength.			☐ ☐ ☐
	Diffraction effects • at an obstacle • at a slit with reference to significance of the wavelength.			
3. Doppler effect	Qualitative treatment. Simple quantitative treatment for moving source and stationary observer.	Sound from a moving source. Appropriate calculations without deriving formula.	Red shift of stars. Speed traps.	☐ ☐ ☐

Vibrations & Sound

Content	Depth of treatment	Activities	Science/Technology/Society	Revision
1. Wave nature of sound	Reflection, refraction, diffraction, interference. Speed of sound in various media.	Demonstration of interference, e.g. two loudspeakers and a signal generator. Demonstration that sound requires a medium.	Acoustics. Reduction of noise using destructive interference. Noise pollution.	☐ ☐ ☐
2. Characteristics of notes	Amplitude and loudness, frequency and pitch, quality and overtones. Frequency limits of audibility.		Dog whistle.	☐ ☐
3. Resonance	Natural frequency. Fundamental frequency. Definition of resonance and examples.	Demonstration using tuning forks *or* other suitable method.	Vocal cords (folds).	☐ ☐
4. Vibrations in strings and pipes	Stationary waves in strings and pipes. Relationship between frequency and length. Harmonics in strings and pipes $f = (1/2l)\sqrt{(T/\mu)}$ for a stretched string.	Use string and wind instruments, e.g. guitar, tin whistle. Appropriate calculations.	String section and woodwind section in orchestras.	☐ ☐ ☐
5. Sound intensity level	Sound intensity: definition and unit. Threshold of hearing and frequency response of ear. Sound intensity level is measured in decibels. Doubling the sound intensity increases the sound intensity level by 3 dB. The dB(A) scale is used because it is adapted for the ear's frequency response.	Use of sound-level meter.	Examples of sound intensity level. Hearing impairment. Ear protection in industry, etc.	☐ ☐ ☐

SOUND: Experiments

1. Measurement of the speed of sound in air.
2. Investigation of the variation of fundamental frequency of a stretched string with length.
3. Investigation of the variation of fundamental frequency of a stretched string with tension.

Light

Content	Depth of treatment	Activities	Science/Technology/Society	Revision
Reflection				
1. Laws of reflection		Demonstration using ray box or laser or other suitable method.		☐
				☐
2. Mirrors	Images formed by plane and spherical mirrors. Knowledge that $1/f = 1/u + 1/v$ $m = v/u$	Real-is-positive sign convention. Simple exercises on mirrors by ray tracing *or* use of formula.	Practical uses of spherical mirrors: Concave Convex • dentists • supermarkets • floodlights • driving mirrors • projectors.	☐ ☐ ☐
Refraction				
1. Laws of refraction	Refractive index.	Demonstration using ray box *or* laser *or* other suitable method.	Practical examples, e.g. real and apparent depth of fish in water.	☐ ☐
	Refractive index in terms of relative speeds.	Appropriate calculations.		☐
2. Total internal reflection	Critical angle. Relationship between critical angle and refractive index. Transmission of light through optical fibres.	Demonstration. Appropriate calculations.	Reflective road signs. Mirages. Prism reflectors. Uses of optical fibres: • telecommunications • medicine (endoscopes).	☐ ☐ ☐
3. Lenses	Images formed by single thin lenses. Knowledge that $1/f = 1/u + 1/v$ $m = v/u$ Power of lens: $P = 1/f$ Two lenses in contact: $P = P_1 + P_2$	Simple exercises on lenses by ray tracing *or* use of formula.	Use of lenses.	☐ ☐ ☐
	The eye: optical structure; short sight, long sight, and corrections.		Spectacles.	

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Wave nature of light				
1. Diffraction and interference	Use of diffraction grating formula: $n\lambda = d \sin\theta$ Derivation of formula.	Suitable method of demonstrating the wave nature of light. Appropriate calculations.	Interference colours • petrol film, soap bubbles.	☐ ☐ ☐
2. Light as a transverse wave motion	Polarisation.	Demonstration of polarisation using polaroids *or* other suitable method.	Stress polarisation. Polaroid sunglasses.	☐ ☐
3. Dispersion	Dispersion by a prism and a diffraction grating. Recombination by a prism.	Demonstration.	Rainbows, polished gemstones. Colours seen on surfaces of compact discs.	☐ ☐
4. Colours	Primary, secondary, complementary colours. Addition of colours. Pigment colours need not be considered.	Demonstration.	Stage lighting, television.	☐ ☐
5. Electromagnetic spectrum	Relative positions of radiations in terms of wavelength and frequency. Detection of UV and IR radiation.	 Demonstration.	Ultraviolet and ozone layer. Infrared camera: • medical applications • night vision. Greenhouse effect.	☐ ☐ ☐
6. The spectrometer	The spectrometer and the function of its parts.	Demonstration.		☐ ☐

LIGHT: Experiments

1. Measurement of the focal length of a concave mirror.
2. Verification of Snell's law of refraction.
3. Measurement of the refractive index of a liquid *or* a solid.
4. Measurement of the focal length of a converging lens.
5. Measurement of the wavelength of monochromatic light.