THIRD FORM REVISION

These are the topics worthy of attention:

FORCES AND MOTION

- Balanced forces result in equilibrium (revise) but also steady speed, e.g. drag in fluids and friction between solids.
- Unbalanced forces result in speeding up and slowing down. Revise speed measurement then show examples of acceleration ; define and measure it using a ticker tape.
- Introduce the idea that gravitational pull results in acceleration and measure with a ticker-tape and falling weight. Link F=ma with F = mg
- Balanced forces can result in turning if the forces are not acting along the same line or point.
- Concept of moments terms of force x (perpendicular) distance to pivot.
- Idea of a small force balancing a large one leading to the idea of a lever and simple machines.
- Pressure on solids in terms of force /area and particle picture
- Pressure in fluids; liquid pressure increasing with depth (link to upthrust) and pressure acting in all directions-particle picture.
- Incompressibility of liquids; syringe pressure leading to small forces pushing a long way to exert large forces moving a short distance. Application to simple hydraulic machines and comparison with levers.
- Pressure in gases; atmospheric pressure and different types of units including atmospheres/bars, kN/m^2 and Pascal. Particle picture.

ENERGY

- Energy transformations and examples of transducers
- Illustrating energy transformations firstly using flow diagrams then Sankey diagrams. Eg an electric motor to lift a load or a light bulb off a joule meter.
- Electrical Energy from the mains $\longrightarrow$ Light energy in bulb + heat energy in bulb
- Measuring energy using a Joulemeter through a circus and introduce power through the Joulemeter, so pupils have some idea about orders of magnitude.
- Heat Energy and Specific Heat Capacity
- Heat energy and Expansion.
- Heat transfer by Conduction/Convection and Radiation.

WAVES

General waves

- A wave transports energy from one place to another without the net movement of matter, as vibrations in some medium
- The difference between longitudinal and transverse waves

- All waves obey the law of reflection at plane, reflective surfaces
- Use of the terms: wavelength, frequency, amplitude, period
- A change in medium for a wave can cause a change in wavelength which subsequently causes a change in wave speed (**No v=fλ)**
- The depth of water effects the speed of ripples
- The above effect can cause a change in direction of the wave, known as refraction.

Light

- Light is a transverse wave without a material medium
- Speed of light recap
- Refraction of light in transparent media – rectangular glass blocks, apparent depth in water etc. (**No Snell's law)**
- Refractive index as in $\frac{n_1}{n_2} = \frac{c_2}{c_1}$
- Total internal reflection – semi circular glass block
- The use of TIR in optical fibres and other devices (possible extension project here, optical fibres vs. electrical cables, digital signalling)
- Use of refraction in lenses, concave, convex, focal length
- Forming images using convex lenses, cameras, slide projectors, magnifying glasses
- The parts of the eye, the eye as an optical device, correction of long/short sight using lenses

Sound

- Sound is a longitudinal mechanical wave that can travel through solids, liquids or gases.
- Sounds are caused by vibrations
- Representing sounds on an oscilloscope screen, link between loudness and amplitude and frequency and pitch
- The frequency range of human hearing
- The basic principal of the operation of musical instruments
- The uses of ultrasound
- The speed of sound, echolocation

ELECTRICITY

GETTING TO GRIP WITH VOLTAGE

- Voltage of batteries in series is the sum of individual battery voltages.

- Voltage can be thought of as an electrical ‘push’ acting on charges to move them around a circuit; as an amount of energy transferred per unit charge to the surroundings in any circuit resistance.
- The bigger the voltage the bigger the amount of energy given to the charges and therefore the bigger the amount of energy given to circuit elements by the charges.
- The relationship between the push of the battery and the size of the electric current is summarised by: $V = I \times R$. Where V: voltage measured in volts, I: current measured in amperes and R: resistance measured in ohms.
- 1 volt is defined as 1 joule per coulomb. This means that if 1 coulomb of charge passes through a component (e.g. a bulb) and 1 joule of energy is transferred by the charge to the bulb, then the voltage across the bulb is 1 volt.
- If the voltage across a battery is 3 volts, this means that 3 joules of energy are transferred from the battery to each coulomb of charge passing through it.
- The instrument used to measure voltages is the voltmeter
- Voltmeters are always connected across circuit components, i.e. in parallel with them.
- Voltages are sometimes called potential differences (pds). Both terms have the same meaning.
- In a series circuit the voltage across the battery is shared across the components, i.e. the sum of the voltages across the components equals the voltage across the battery.
- If the components have equal resistances then the voltage dropped across each will be the same. If the one component has a larger resistance then the other, proportionally more voltage will be dropped it than the other component.
- When bulbs are added in parallel, each bulb get the full battery voltage across it.
- Even if the components in parallel have different resistances, the voltage dropped across them when connected in parallel will be the same as the battery voltage. However the current the flows through them will be different and given by the relationship: $V = I \times R$.

ELECTRICAL POWER

- Electrical power is calculated by the formula: Power (watt) = voltage (volts) × current (amps).
- Be able to predict how long batteries will last in various series and parallel circuits.
- When bulbs are added in parallel, each bulb get the full battery voltage across it.
- Even if the components in parallel have different resistances, the voltage dropped across them when connected in parallel will be the same as the battery voltage. However the current the flows through them will be different and given by the relationship: $V = I \times R$.

Some of the above elec section will not be examined. More information will be given nearer the exam time.