

# MARINA INTERNATIONAL SCHOOL

## PHYSICS SCHEME OF WORK

### FORM 5 - TERM 1

WEEK	TOPIC	TOPIC DETAILS
1.1	LIGHT WAVES- Reflection of Light	<ul style="list-style-type: none"><li><input type="checkbox"/> Describe the formation of an optical image by a plane mirror, and give its characteristics</li><li><input type="checkbox"/> Recall and use the law angle of incidence = angle of reflection</li><li><input type="checkbox"/> Recall that the image in a plane mirror is virtual</li><li><input type="checkbox"/> Perform simple constructions, measurements and calculations for reflection by plane mirrors</li></ul>
1.2	Refraction of Light	<ul style="list-style-type: none"><li><input type="checkbox"/> Describe an experimental demonstration of the refraction of light</li><li><input type="checkbox"/> Use the terminology for the angle of incidence <math>i</math> and angle of refraction <math>r</math> and describe the passage of light through parallel-sided transparent material</li><li><input type="checkbox"/> Recall and use the definition of refractive index <math>n</math> in terms of speed</li><li><input type="checkbox"/> Recall and use the equation <math>\sin i / \sin r = n</math></li><li><input type="checkbox"/> Give the meaning of critical angle</li><li><input type="checkbox"/> Recall and use <math>n = 1 / \sin c</math></li><li><input type="checkbox"/> Describe internal and total internal reflection</li><li><input type="checkbox"/> Describe and explain the action of optical fibres particularly in medicine and communications technology</li></ul>
2.1	LIGHT WAVES-Thin Converging Lens	<ul style="list-style-type: none"><li><input type="checkbox"/> Describe the action of a thin converging lens on a beam of light</li><li><input type="checkbox"/> Use the terms principal focus and focal length</li><li><input type="checkbox"/> Show understanding of the terms real image and virtual image</li><li><input type="checkbox"/> Draw ray diagrams for the formation of a real image by a single lens</li><li><input type="checkbox"/> Draw and use ray diagrams for the formation of a virtual image by a single lens</li><li><input type="checkbox"/> Describe the nature of an image using the terms enlarged/same size/diminished and upright/inverted</li><li><input type="checkbox"/> Use and describe the use of a single lens as a magnifying glass</li></ul>
2.2	Dispersion of Light	<ul style="list-style-type: none"><li><input type="checkbox"/> Give a qualitative account of the dispersion of light as shown by the action on light of a glass prism including the seven colours of the spectrum in their correct order</li><li><input type="checkbox"/> Recall that light of a single frequency is described as monochromatic</li></ul>

WEEK	TOPIC	TOPIC DETAILS
2.3	Electromagnetic Waves	<ul style="list-style-type: none"> <li><input type="checkbox"/> Describe the main features of the electromagnetic spectrum in order of wavelength</li> <li><input type="checkbox"/> State that all electromagnetic waves travel with the same high speed in a vacuum</li> <li><input type="checkbox"/> State that the speed of electromagnetic waves in a vacuum is <math>3.0 \times 10^8</math> m / s and is approximately the same in air</li> <li><input type="checkbox"/> Describe typical properties and uses of radiations in all the different regions of the electromagnetic spectrum including: <ul style="list-style-type: none"> <li>-- radio and television communications (radio waves)</li> <li>-- satellite television and telephones (microwaves)</li> <li>-- electrical appliances, remote controllers for televisions and intruder alarms (infrared)</li> <li>-- medicine and security (X-rays)</li> </ul> </li> <li><input type="checkbox"/> Demonstrate an awareness of safety issues regarding the use of microwaves and X-rays</li> </ul>
3.1	SOUND WAVES	<ul style="list-style-type: none"> <li><input type="checkbox"/> Describe the production of sound by vibrating sources</li> <li><input type="checkbox"/> Describe the longitudinal nature of sound waves</li> <li><input type="checkbox"/> Describe compression and rarefaction</li> <li><input type="checkbox"/> State that the approximate range of audible frequencies for a healthy human ear is 20 Hz to 20 000 Hz</li> <li><input type="checkbox"/> Show an understanding of the term ultrasound</li> <li><input type="checkbox"/> Show an understanding that a medium is needed to transmit sound waves</li> <li><input type="checkbox"/> Describe an experiment to determine the speed of sound in air</li> <li><input type="checkbox"/> State typical values of the speed of sound in gases, liquids and solids</li> <li><input type="checkbox"/> Relate the loudness and pitch of sound waves to amplitude and frequency</li> <li><input type="checkbox"/> Describe how the reflection of sound may produce an echo</li> </ul>
4.1	SIMPLE PHENOMENON OF MAGNETISM	<ul style="list-style-type: none"> <li><input type="checkbox"/> Describe the forces between magnets, and between magnets and magnetic materials</li> <li><input type="checkbox"/> Explain that magnetic forces are due to interactions between magnetic fields</li> <li><input type="checkbox"/> Give an account of induced magnetism</li> <li><input type="checkbox"/> Distinguish between magnetic and non-magnetic materials</li> <li><input type="checkbox"/> Describe methods of magnetisation, to include stroking with a magnet, use of direct current (d.c.) in a coil and hammering in a magnetic field</li> <li><input type="checkbox"/> Describe methods of demagnetisation, to include hammering, heating and use of alternating current (a.c.) in a coil</li> <li><input type="checkbox"/> Draw the pattern of magnetic field lines around a bar magnet</li> <li><input type="checkbox"/> Describe an experiment to identify the pattern magnetic field lines, including the direction</li> <li><input type="checkbox"/> Distinguish between the magnetic properties of soft iron and steel</li> <li><input type="checkbox"/> Distinguish between the design and use of permanent magnets and electromagnets</li> </ul>

WEEK	TOPIC	TOPIC DETAILS
5.1	ELECTRICAL QUANTITIES- electric charge	<p>Electric Charge</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> State that there are positive and negative charges</li> <li><input type="checkbox"/> State that charge is measured in coulombs</li> <li><input type="checkbox"/> State that unlike charges attract and that like charges repel</li> <li><input type="checkbox"/> Describe simple experiments to show the production and detection of electrostatic charges</li> <li><input type="checkbox"/> State that charging a body involves the addition or removal of electrons</li> <li><input type="checkbox"/> Give an account of charging by induction</li> <li><input type="checkbox"/> Distinguish between electrical conductors and insulators and give typical examples</li> <li><input type="checkbox"/> Recall and use a simple electron model to distinguish between conductors and insulators</li> <li><input type="checkbox"/> Describe an electric field as a region in which an electric charge experiences a force</li> <li><input type="checkbox"/> State that the direction of an electric field at a point is the direction of the force on a positive charge at that point</li> <li><input type="checkbox"/> Describe simple field patterns, including the field around a point charge, the field around a charged conducting sphere and the field between two parallel plates (not including end effects)</li> </ul>
6.1	ELECTRICAL QUANTITIES- current	<ul style="list-style-type: none"> <li><input type="checkbox"/> State that current is related to the flow of charge</li> <li><input type="checkbox"/> Show understanding that a current is a rate of flow of charge and recall and use the equation <math>I = Q / t</math></li> <li><input type="checkbox"/> Use and describe the use of an ammeter, both analogue and digital</li> <li><input type="checkbox"/> State that current in metals is due to a flow of electrons</li> <li><input type="checkbox"/> Distinguish between the direction of flow of electrons and conventional current</li> </ul>
6.2	Electromotive Force	<ul style="list-style-type: none"> <li><input type="checkbox"/> State that the electromotive force (e.m.f.) of an electrical source of energy is measured in volts</li> <li><input type="checkbox"/> Show understanding that e.m.f. is defined in terms of energy supplied by a source in driving charge round a complete circuit</li> </ul>
6.3	Potential difference	<ul style="list-style-type: none"> <li><input type="checkbox"/> State that the potential difference (p.d.) across a circuit component is measured in volts</li> <li><input type="checkbox"/> Use and describe the use of a voltmeter, both analogue and digital</li> <li><input type="checkbox"/> Recall that 1 V is equivalent to 1 J / C</li> </ul>

WEEK	TOPIC	TOPIC DETAILS
7.1	Resistance	<ul style="list-style-type: none"> <li><input type="checkbox"/> State that resistance = p.d. / current and understand qualitatively how changes in p.d. or resistance affect current</li> <li><input type="checkbox"/> Recall and use the equation <math>R = V / I</math></li> <li><input type="checkbox"/> Describe an experiment to determine resistance using a voltmeter and an ammeter</li> <li><input type="checkbox"/> Sketch and explain the current-voltage characteristic of an ohmic resistor and a filament lamp</li> <li><input type="checkbox"/> Relate (without calculation) the resistance of a wire to its length and to its diameter</li> <li><input type="checkbox"/> Recall and use quantitatively the proportionality between resistance and length, and the inverse proportionality between resistance and cross-sectional area of a wire</li> </ul>
7.2	Electrical working	<ul style="list-style-type: none"> <li><input type="checkbox"/> Understand that electric circuits transfer energy from the battery or power source to the circuit components then into the surroundings</li> <li><input type="checkbox"/> Recall and use the equations <math>P = IV</math> and <math>E = IVt</math></li> </ul>
8.1	ELECTRIC CIRCUITS-series and parallel	<ul style="list-style-type: none"> <li><input type="checkbox"/> Understand that the current at every point in a series circuit is the same</li> <li><input type="checkbox"/> Give the combined resistance of two or more resistors in series</li> <li><input type="checkbox"/> Calculate the combined e.m.f. of several sources in series</li> <li><input type="checkbox"/> Recall and use the fact that the sum of the p.d.s across the components in a series circuit is equal to the total p.d. across the supply</li> <li><input type="checkbox"/> State that, for a parallel circuit, the current from the source is larger than the current in each branch</li> <li><input type="checkbox"/> Recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit</li> <li><input type="checkbox"/> State that the combined resistance of two resistors in parallel is less than that of either resistor by itself</li> <li><input type="checkbox"/> Calculate the effective resistance of two resistors in parallel</li> <li><input type="checkbox"/> State the advantages of connecting lamps in parallel in a lighting circuit</li> </ul>
9.1	ELECTRIC CIRCUITS	<p>More Circuit diagrams</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), heaters, thermistors, light-dependent resistors, lamps, ammeters, voltmeters, galvanometers, magnetising coils, transformers, bells, fuses and relays</li> <li><input type="checkbox"/> Draw and interpret circuit diagrams containing diodes</li> </ul>

WEEK	TOPIC	TOPIC DETAILS
9.2	Action and use of circuit components	<input type="checkbox"/> Describe the action of a diode and show understanding of its use as a rectifier <input type="checkbox"/> Describe the action of a variable potential divider (potentiometer) <input type="checkbox"/> Describe the action of thermistors and light-dependent resistors and show understanding of their use as input transducers <input type="checkbox"/> Describe the action of a relay and show understanding of its use in switching circuits <input type="checkbox"/> Recognise and show understanding of circuits operating as light-sensitive switches and temperature-operated alarms (to include the use of a relay)
10.1	DIGITAL ELECTRONICS	<input type="checkbox"/> Explain and use the terms analogue and digital in terms of continuous variation and high/low states <input type="checkbox"/> Describe the action of NOT, AND, OR, NAND and NOR gates <input type="checkbox"/> Recall and use the symbols for logic gates <input type="checkbox"/> Design and understand simple digital circuits combining several logic gates <input type="checkbox"/> Use truth tables to describe the action of individual gates and simple combinations of gates
11.1	DANGERS OF ELECTRICITY	<input type="checkbox"/> State the hazards of: -- damaged insulation -- overheating of cables -- damp conditions  <input type="checkbox"/> State that a fuse protects a circuit <input type="checkbox"/> Explain the use of fuses and circuit breakers and choose appropriate fuse ratings and circuit-breaker settings <input type="checkbox"/> Explain the benefits of earthing metal cases
12.1	ELECTROMAGNETIC EFFECTS (1)	Electromagnetic induction  <input type="checkbox"/> Show understanding that a conductor moving across a magnetic field or a changing magnetic field linking with a conductor can induce an e.m.f. in the conductor <input type="checkbox"/> Describe an experiment to demonstrate electromagnetic induction <input type="checkbox"/> State the factors affecting the magnitude of an induced e.m.f. <input type="checkbox"/> Show understanding that the direction of an induced e.m.f. opposes the change causing it State and use the relative directions of force, field and induced current
13.1	ELECTROMAGNETIC EFFECTS (1)	a.c. generator <input type="checkbox"/> Distinguish between d.c. and a.c. <input type="checkbox"/> Describe and explain a rotating-coil generator and the use of slip rings <input type="checkbox"/> Sketch a graph of voltage output against time for a simple a.c. generator <input type="checkbox"/> Relate the position of the generator coil to the peaks and zeros of the voltage output

WEEK	TOPIC	TOPIC DETAILS
13.2	Transformer	<ul style="list-style-type: none"><li data-bbox="520 170 1445 241">□ Describe the construction of a basic transformer with a soft-iron core, as used for voltage transformations</li><li data-bbox="520 248 1214 282">□ Describe the principle of operation of a transformer</li><li data-bbox="520 288 1158 322">□ Recall and use the equation <math>(V_p / V_s) = (N_p / N_s)</math></li><li data-bbox="520 329 1331 362">□ Recall and use the equation <math>I_p V_p = I_s V_s</math> (for 100% efficiency)</li><li data-bbox="520 369 1139 403">□ Understand the terms step-up and step-down</li><li data-bbox="520 409 1414 481">□ Describe the use of the transformer in high voltage transmission of electricity</li><li data-bbox="520 488 1179 521">□ Give the advantages of high-voltage transmission</li><li data-bbox="520 528 1442 562">□ Explain why power losses in cables are lower when the voltage is high</li></ul>

# PHYSICS SCHEME OF WORK

## FORM 5 - TERM 2

WEEK	TOPIC	TOPIC DETAILS
1.1	ELECTROMAGNETIC EFFECTS (2)-The magnetic effect of a current	<ul style="list-style-type: none"><li><input type="checkbox"/> Describe the pattern of the magnetic field (including direction) due to currents in straight wires and in solenoids</li><li><input type="checkbox"/> State the qualitative variation of the strength of the magnetic field over salient parts of the pattern</li><li><input type="checkbox"/> State that the direction of a magnetic field line at a point is the direction of the force on the N pole of a magnet at that point</li><li><input type="checkbox"/> Describe the effect on the magnetic field of changing the magnitude and direction of the current</li></ul>
2.1	Force on a current-carrying conductor	<ul style="list-style-type: none"><li><input type="checkbox"/> Describe an experiment to show that a force acts on a current-carrying conductor in a magnetic field, including the effect of reversing:<ul style="list-style-type: none"><li>-- the current</li><li>-- the direction of the field</li></ul></li><li><input type="checkbox"/> State and use the relative directions of force, field and current</li><li><input type="checkbox"/> Describe an experiment to show the corresponding force on beams of charged particles</li></ul>
2.2	d.c. motor	<ul style="list-style-type: none"><li><input type="checkbox"/> State that a current-carrying coil in a magnetic field experiences a turning effect and that the effect is increased by:<ul style="list-style-type: none"><li>-- increasing the number of turns on the coil</li><li>-- increasing the current</li><li>-- increasing the strength of the magnetic field</li></ul></li><li><input type="checkbox"/> Relate this turning effect to the action of an electric motor including the action of a split-ring commutator</li></ul>
3.1	THE NUCLEAR ATOM-Atomic model	<ul style="list-style-type: none"><li><input type="checkbox"/> Describe the structure of an atom in terms of a positive nucleus and negative electrons</li><li><input type="checkbox"/> Describe how the scattering of <math>\alpha</math>-particles by thin metal foils provides evidence for the nuclear atom</li></ul>

WEEK	TOPIC	TOPIC DETAILS
3.2	Nucleus	<input type="checkbox"/> Describe the composition of the nucleus in terms of protons and neutrons <input type="checkbox"/> State the charges of protons and neutrons <input type="checkbox"/> Use the term proton number Z <input type="checkbox"/> Use the term nucleon number A <input type="checkbox"/> Use the term nuclide and use the nuclide notation AZX <input type="checkbox"/> Balance equations involving nuclide notation <input type="checkbox"/> Use and explain the term isotope <input type="checkbox"/> State the meaning of nuclear fission and nuclear fusion
4.1	RADIOACTIVITY-Detection of radioactivity	<input type="checkbox"/> Demonstrate understanding of background radiation <input type="checkbox"/> Describe the detection of $\alpha$ -particles, $\beta$ -particles and $\gamma$ -rays ( $\beta^+$ are not included: $\beta$ -particles will be taken to refer to $\beta^-$ )
4.2	Characteristics of the three kinds of emission	<input type="checkbox"/> Discuss the random nature of radioactive emission <input type="checkbox"/> Identify $\alpha$ -, $\beta$ - and $\gamma$ -emissions by recalling <ul style="list-style-type: none"> <li>-- their nature</li> <li>-- their relative ionising effects</li> <li>-- their relative penetrating abilities</li> </ul> ( $\beta^+$ are not included, $\beta$ -particles will be taken to refer to $\beta^-$ ) <input type="checkbox"/> Describe their deflection in electric fields and in magnetic fields <input type="checkbox"/> Interpret their relative ionising effects <input type="checkbox"/> Give and explain examples of practical applications of $\alpha$ -, $\beta$ - and $\gamma$ -emissions
5.1	Radioactive decay	<input type="checkbox"/> State the meaning of radioactive decay <input type="checkbox"/> State that during $\alpha$ - or $\beta$ -decay the nucleus changes to that of a different element <input type="checkbox"/> Use equations involving nuclide notation to represent changes in the composition of the nucleus when particles are emitted
6.1	HALF-LIFE	<input type="checkbox"/> Use the term half-life in simple calculations, which might involve information in tables or decay curves <input type="checkbox"/> Calculate half-life from data or decay curves from which background radiation has not been subtracted
7.1	SAFETY PRECAUTIONS	<input type="checkbox"/> Recall the effects of ionising radiations on living things <input type="checkbox"/> Describe how radioactive materials are handled, used and stored in a safe way

# PHYSICS SCHEME OF WORK

FORM 5 - TERM 3

<b>WEEK</b>	<b>TOPIC</b>	<b>TOPIC DETAILS</b>
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