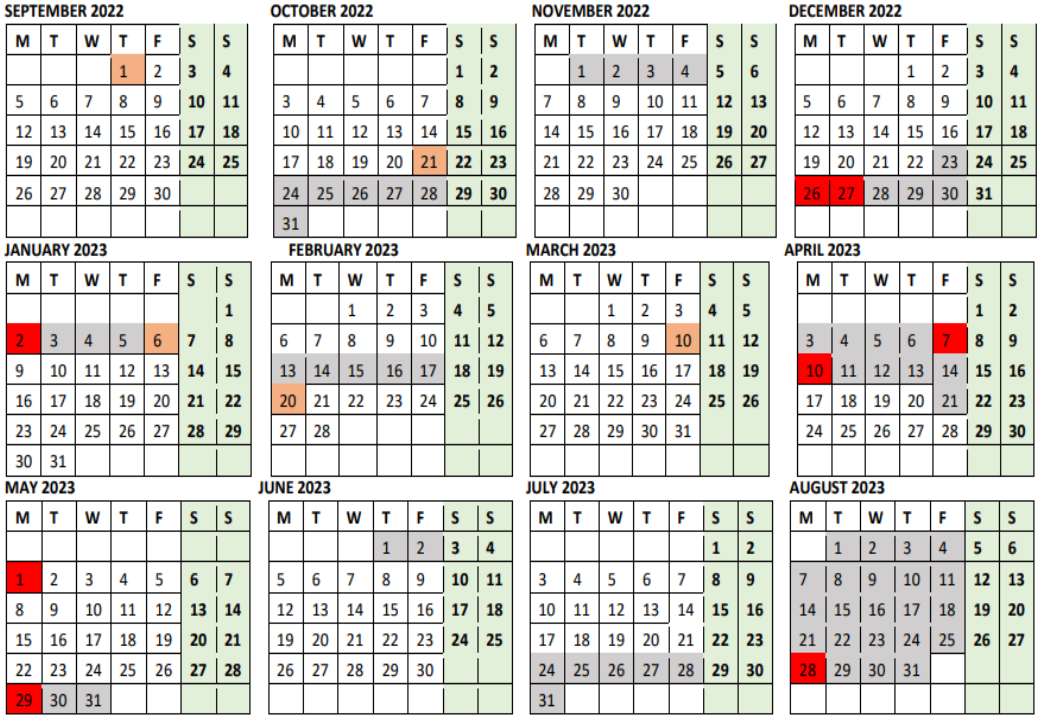
Physics **SOW** & **Required Practical** (2024-2025): **Y13**

AQA A-level Physics: 7408

Year 13: *(green covered)*

1. *Particles and radiation*
2. *EM radiation and Q phenomena*
3. *Waves*
4. *Mechanics*
5. *Materials*
6. *Electricity*
7. *Further mechanics*
13. Astrophysics (option)
8. Gravitational and electric field
9. Electromagnetism
10. Capacitors
11. Nuclear physics
12. Thermal physics



Week (5h/week)	Date	Spec ref	Topics	PG	Lessons Objectives	Skill development opportunity	Cross-curricular	Additional notes/assessments
7. Further mechanics **(**Spec_ref: 3.6.1.1 to 3.6.1.4)								
W1	02-09-24		• N/A • Recap of Further Mechanics • FD and gap analysis	✓ ✓				**Monday (4th) INSET day** *RP7 is pushed to the end of the term.* *At the moment, there are no science technician and all the science staff are new. Thus as HoD, my work load is quite high.*
13. Astrophysics (Spec_ref: 3.9.1.1 to 3.9.3.4)								
W2	09-09-24	3.9.1.1, 3.9.1.2, 3.9.1.4 3.9.1.2,	• 13.1 Optics and optical telescope Recap • 13.2 Comparing telescopes	✓ ✓	• Know how convex lens refract light to a focal point to form an image and able to draw ray diagrams for convex lens (using ray diagrams rules) • Able to draw the ray diagram for reflective, refractive & Cassegrain telescope. • Able to compare eye and CCDs as detectors in terms of Q. efficiency & resolution	• Students sketch ray diagrams. This knowledge is consolidated through use of a simulation/animation • Discussion of angular magnification and rehearsal of calculations.		Prior knowledge: Refraction, ray diagrams and behaviour of converging and diverging lenses, Law of Reflection, ray diagrams for convex mirror.

		3.9.1.4 3.9.2.2	• 13.3 Parallax and parsecs	✓	• State what is resolving power (RP) and the merits of refractive and reflective telescopes • Able to describe how VIS, RW, IR and x-rays telescope work (in single dish set-up) • State what is collective power(CP) and able to compare RP & CP of VIS, RW, IR and x-ray telescope • State what is parallax and calculate distances using parallax • State what is parsec and describe why parsec & light years are used as measurement of distance.	• Student's research different type of telescope and the wavelength that are used to observe astronomical objects. Group discussion as to why different wavelength are used to observed same/different objects. • Students complete the angular resolution activity. • AO1, MS4.7 • Discussion of the scale of the universe and the need for light years and parsecs to measure immense distances. A YouTube video is used to support this discussion. • Develop the understanding of distance comparison between stellar objects and galactic objects • Students are able to change SI units to cosmological units using Equation sheet • AO1, MS4.7		

W3	16-09-24	3.9.2.1, 3.9.2.2, 3.9.2.6	• 13.4 Magnitude	✓	• State what is apparent magnitude, *m* and know that the scale of apparent magnitude were invented by ancient Greeks where dimmest objects have a magnitude of 6 • State what is absolute magnitude, *M* and know how it is related to apparent magnitude & distance by *m-M* formula and use it to calculate the distance of stars • State what is a standard candle and explain how type 1a supernova are used as standard candle to determine distances	Student should appreciate that a difference of 1 on the magnitude scale is equal to an intensity of 2.56 and understand that brightness is subjective. Rehearsal of calculations using past paper questions. • AO1, MS0.5		
		3.9.2.3	• 13.5 Stars as black bodies	✓	• State what is Black body radiation and describe the shape of BB radiation curve as a fn of temperature • State what is Wien's law and use it to estimate the temperature of a body • State what is Stefan's law and use it to compare the power	• Demonstration: filament bulb with increasing current. Students note the sequence of colour changes that occur in the visible light. • Students should able sketch black-body curves for bodies at different		

					output, temperature and size of a star	temperatures. Interpret black-body curves to estimate temperatures using Wien's law. • Rehearsal of examination style questions. • AO1, AO2		
		3.9.2.4 3.9.2.5	• 13.6 Stellar classification	✓	• State what is Balmer series, explain how Balmer series are formed and describe how Balmer series are used to determine stellar temperature • State the letters used to classify stars and able to classify stars inti one of sven spectral classes using colour, temperature and absorption lines • State what is H_R diagram, able to draw H-R diagram and explain how a MS stars move in H_R diagram as it evolves	• Introduction and discussion of HR diagram using YOU tube clip. • Students sketch and label the Hertzsprung-Russell diagram including values on the axes and positions of main sequence, dwarfs and giants. Recall the position of the sun on the HR diagram. • AO1		The Hertzsprung-Russell diagram can be thought of as the periodic table of the stars. In what ways is this true?
W4	23-09-24		• A-level Paper 1 test • FD and gap analysis					This test is pushed to the last week of the term and will be set as Ma1

			• buffer					
W5	30-09-24	3.9.2.5 3.9.2.6	• 13.7 Evolution of stars	✓	• Able to describe how a sun like star evolves from formation to white dwarf and moves around in H_R diagram as it evolves • Able to describe how a massive star evolves and explode into a supernova • State what is BH, describe how neutron star & BH are formed and derive the Schwarzschild of a BH	• Students research one or more of supernovae, neutron stars and black holes. • Students present research and questions for peer assessment. • AO1		
		3.9.3.2 3.9.3.2	• 13.8 Doppler shift and redshift	✓	• State what is Doppler effect & describe what happens to a wave when the source of a wave is in motion • Able to calculate Doppler shift & explain different types of red shift and its applications	• Demonstration of Doppler. • Use the Doppler effect equations to carry out calculations. Practise of questions for a binary system. • AO1, AO2		

		3.9.3.2 3.9.3.6	• 13.9 The Big bang theory	✓	• Introduction to cosmic model: able to **state** the brief outline of different cosmological model. • Able to **state** cosmological principle, Hubble's law and **describe** how Hubble's law provides simple interpretation of the expansion of the universe. • Able to **explain** The Big Bang Theory (TBBT) and the three pieces of evidence supporting the TBBT	• Prior reading of cosmology • Demonstration of expansion of universe using dots on a balloon. • Students view video Stephen Hawking's Universe - The Big Bang. Creating a piece of extended writing on this topic area-**The BIG Write** • AO1, MS1.4		Doppler Effect video from the European Space Agency Practise of questions from IOP including for a binary system. Stephens Hawking's Universe – The Big Bang.
W6	07-10-24	3.9.3.1 3.9.3.3 3.9.3.4	• 13.10 Detection of binary stars, quasars and exoplanets • Summary & review	✓ ✓	• State what is Doppler effect and apply to binary stars • State what is quasars and how Doppler shift is used to deduce their distances • State what is exoplanets and how Doppler shift and transit time is used to detect them	• Students watch the video clip Exoplanets explained. Discussion of the difficulties in detecting exoplanets. • AO1		Exoplanets Explained video clip. Blended learning: Friday 13th

			• Buffer					
W7	14-10-24		• EOU test • Some students are off time-table due to Ma's and external UCAS exams • Buffer	☐				*EOU test did not take place as some student were off timetable, will take place in W12*
W8	21-10-24		• RP7: Investigation of Mass Spring System & Simple Pendulum System • **Ma1/Mock 1** • **FD**	✓ ✓ ✓	Investigation into simple harmonic motion using a mass-spring system and a simple pendulum: The objective of the experiment is *to determine the gravitational field g and the spring constant k*	***Developing following AT's*** *ATa: Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.* **ATb :** *Use appropriate digital instruments, including electrical multimeters, to obtain a range of measurements (to include time, current, voltage, resistance, mass).* **ATc:** *Use methods to increase accuracy of measurements, such as timing over multiple oscillations, or use of fiduciary marker, set square or plumb line.*		**INSET day 25th** ***CPAC to be assessed*** *CPAC 1a, CPAC 2a, CPAC 3a, CPAC 4a, CPAC 4b and CPAC 5b. (24-10-2024)* *Didn't finished the marking and moderating, thus* **FD** *will take place in W11 when we return from HT break*
W9	HT (28-10-24)							

W10	HT (04-11-24)							
8. Gravitational and electric field (spec_ref 3.7.1 to 3.7.3.1)								
W11	11-11-24	3.7.2.1 3.7.2.2 3.7.2.2, 3.7.2.3	• 8.1 Gravitational field • 8.2 Gravitational field Strength	✓ ✓	• Know that all matter attracts, gravity is an attractive force and explain what is gravitational field. • Able to calculate force due gravity of two masses and describe the significance of G. • Explain the inverse square law and able to graphically represent gravitational filed. • State what is gravitational field, able to calculate in a radial field (& in uniform field) • Able to derived, calculate g in a radial field and sketch it ***g*** as fn of ***r***	Students brainstorm gravity. Discussion of gravity and weight leading to Newton's Law of gravitation. Students use Newton's Law of gravitation to estimate the force between different objects eg two golf balls a metre apart, the Moon and the Earth. • AO1, MS1.4 Definition of gravitational field strength and rehearsal of calculations using $g = F / m$ and $g = GM/r^2$ **Demonstration** of magnetic field pattern around a bar magnet with iron filings. **Students draw gravitational fields around masses and**		FD on Ma1 gives and answers were corrected ***Q: Why gravitational force is not in the standard model? seen in Section 1.*** ***Prior knowledge: Basic forces including gravity are Vectors***

		3.7.2.3	• 8.3 Gravitational Potential		• State what is gravitational potential, able to calculate the gravitational potential in a radial field and sketch the relationship between *V* and *r* • State what is gravitational potential energy, able to calculate the gravitational energy at height h, where h$\ll r$ and h $\approx r$ and able to calculate the Wd in moving an object in gravitational field across r	**close to the surface of the Earth.** • **AO1, AO2** Students sketch graphs to show the variation of g and V with r. Students led to need for a zero value of potential at infinity. Significance of area under *g -r* graph and gradient of *V-r* graph. Discuss similarities of contour maps and equipotential surfaces. Rehearse calculations and problem solving using Exampro questions. • **AO1, MS3.8, 3.9**		
W12	18-11-24	3.7.2.4	• 8.4 Orbits		• Describe how the speed and orbital period of a satellite are affected by the radius of its orbit • State the relation between the KE and GPE of satellite, the know the total energy of a satellite remain	Students supported through derivation of $T^2 \propto r^3$ Discuss the concept of escape velocity. Discussion of the meaning of the term escape velocity. Students rehearse problem solving		***Q: Is it better to launch a rocket from the poles or the equator?*** Escape Velocity Resources from the Beacon Learning Centre

					constant and able to calculate the escape velocity of the satellite • Know what a geosynchronous satellite is and the application Geostationary satellite	Discussion of synchronous orbits and the use of satellites in low orbits and geostationary orbits, including plane and radius of geostationary orbit. Rehearse problem solving using Exampro questions. • **AO1, AO2**		
		3.7.3.1 3.7.3.2 3.7.3.3	• 8.5 Electric Fields		• State what is Coulomb's law and able to calculate force between two charges using coulomb's law • Know what is electric field, able to define electric field strength and able to sketch radial and uniform field, ***E*** as fn of r • able to calculate field strength for a radial and uniform field	Discuss similarities of the equations for electric and gravitational fields. Demonstration of trajectory of a moving charged particle in an electric field using electron deflection tube. Students sketch electric field lines and equipotential lines. Discussion of forces between point charges and Coulomb's law including ε_0. Students rehearse calculation of electric forces between point charges. • **AO2, ATf**		Electric field lines with oil and semolina from IOP. Antonine Education Electric Field questions

		3.7.3.2 3.7.3.3	• 8.6 Electric Potential		• Quick research on the history and time-line of discovery of electricity • Know the definition of electric potential, know that the electric potential is zero at infinity and able to sketch ***V*** as a function of ***r*** and calculate V in radial field • State the definition of electric potential difference and able to calculate the Wd & derive the Wd in moving a charged object through an electric potential difference.	Prior reading and research on the history of the discovery of electricity and writing an extended article-**Big Write** Discussion of absolute potential including concept of work and significance of infinity. Sketch and use equipotential diagrams. Recognise and use the idea that no work is done by a moving charge on an equipotential surface. • **AO2, ATf**		Equipotential lines student experiments from IOP IOP questions
W13	25-11-24	3.7.3.1 3.7.3.2 3.7.3.3 3.7.3.4	• 8.7 Comparing Electric and Gravitational Fields		• A brief review of the whole topic (addressing some misconception) -and then we discuss the similarities and differences of electric and gravitational field as groups	Discussion of forces as a fn of r for both gravitational & electric forces. Discussion of field strength as a fn of r for both for gravitational & electric fields.		

			• Review & EOU Test • FD and gap analysis	☐ ☐	• Go over the check-list and revise the topic briefly • Attempt all the tasks	Discussion of potential as a fn of r for both gravitational & electric potentials. Discussion of potential difference & Wd as a fn of r for both gravitational & electric fields. All students recognise and able to sketch ***F, E, V as* fn *of r*** Rehearsal of exam type questions • **AO1, AO2, ATf, MS3.8, 3.9**		BIG Write EOU Test
9. Electromagnetism **(spec_ref: 3.7.5.1 to 3.7.5.6)**								
W14	02-12-24	3.7.5.1	• 9.1 Magnetic flux density	☐	• State what is magnetic field and describe how a wire carrying current produces magnetic field in a solenoid • State what is magnetic flux density, describe how a current-carrying wire in a magnetic field experiences force and calculate the magnitude of the force.	Demonstration of 'kicking wire' experiment. Students apply knowledge of magnetic fields and Flemings left hand rule to explain and predict the direction of the force on the wire. Students complete problems on forces on conductors in magnetic fields.		*How can we change electrical energy into kinetic energy or how can change KE into electrical energy?* Kicking wire simulation Force on Conductors in Magnetic Field Questions from IOP

		3.7.5.2 3.7.5.3	• 9.2 Forces on charge particles • 9.3 Electromagnetic induction	☐ ☐		• **AO2, MS4.2, ATf**		
W15	09-12-24	3.7.5.1	• 9.4 Faraday's and Len's law • RP10 Investigating Force on a Current-carrying Wire	☐ ☐	• Investigate how the force on a wire varies with flux density, current and length of wire using a top pan balance: to determine the magnetic flux density of a magnet.	***Developing following AT's*** *ATa: Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.* **ATb :** *Use appropriate digital instruments, including electrical multimeters, to obtain a range of measurements (to include time, current, voltage, resistance, mass).* **ATc:** *Use methods to increase accuracy of measurements, such as timing over multiple oscillations, or use of fiduciary marker, set square or plumb line.* **ATa**: *Use appropriate analogue apparatus to*		Blended learning: Friday 13th ***CPAC to be assessed*** *CPAC 1a, CPAC 2c, CPAC 3a, CPAC 4b and CPAC 5b.*

			• RP11 Investigating Flux Linkage with a Search Coil		• Investigate, using a search coil and oscilloscope, the effect on magnetic flux linkage of varying the angle between a search coil and magnetic field direction: The objective of this experiment is to determine how the magnetic flux linkage varies with the angle of rotation of a search coil.	*record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.* **ATh**: *Use signal generator and oscilloscope, including volts/division and time-base*		***CPAC to be assessed*** *CPAC 1a, CPAC 2c, CPAC 3a, CPAC 4b.*
W16	16-12-24	3.7.5.5 3.7.5.6	• 9.5 AC • 9.6 Transformers		• State the two basic parameters of an OCS and describe the basic function of an OSC • State what is AC & able to calculate Peak, P-P and RMS values of sinusoidal voltage & current • Describe what is mains electricity and able to calculate Peak, P-P and RMS values of main electricity • State what is a transformer and use Faraday's law to	Students to use an oscilloscope to compare dc and ac signals. Use oscilloscope to determine period of output from a signal generator (hence *f*). Practice questions on oscilloscope from IOP. **AO1, AO3, MS3.1, ATh**		Q: What range of voltage does the mains supply? Use and questions on an oscilloscope from the IOP AC questions and resources from IOP

			• Review & EOU		calculate Voltage across the transformers • Describe what causes inefficiency in transformers • Describe how transformers are used in the National Grid and why electrical power is transmitted at high voltage	Demonstration of the construction and operation of a transformer. Students sketch the parts of a transformer and explain it operation using their knowledge of induction. Video resource available. Calculation practice: transformer equations using Antonin website. **AO1, AO3, MS0.3, PS2.3**		Q: What factors would need to be considered when designing a transformer? Q:Why is the mains ac and not dc? Video : How Transformers work from Learn Engineering End of the Unit test
W17	HT (23-12-24)							**Winter break:** BANK holiday Monday 25th and Tuesday 26th
W18	HT (30-12-24)							BANK holiday Monday 1st
		10. Capacitors (Spec_ref: 3.7.4.1 to 3.7.4.4)						
W19	06-01-25	3.7.4.1 3.7.4.3	• FD and gap analysis • 10.1 Capacitors		• State what capacitor is and able to calculate the capacitance • Describe the method of Investigating how Pd varies w.r.t and Q across a capacitor • Describe various application of capacitors	Demonstration of a 'super-capacitor' and capacitors in everyday life. Student experiment: Investigate the relationship between Q and V for a capacitor in order to define capacitance and the farad.	***Maths Edexcel 9MA0*** **Section 1.6: Exponentials and logarithms**	**Schools opens Tuesday 6th of Jan** Q: What features are desirable in the design of a capacitor? Super-Capacitor and capacitors in everyday life from IOP

		3.7.4.4	• 10.2 Energy stored by capacitors • 10.3 Charging and Discharging	☐ ☐	• Describe how a capacitor stores energy • Able to derive the energy equation • Able to calculate the energy stored in a capacitor • Able to describe how charge builds on capacitor plates and able to represent graphically how capacitors charge • Know the equation for discharging and able to calculate the discharge, Q for any given time and represent discharge graphically • Able change non- linear graph to linear graph using 'log-linear' graphs	Student experiment: Energy stored in a capacitor to lift a mass. Rehearse problems on capacitors using Exampro **AO2, ATf, ATg** Discussion of RC to include dimensional analysis of unit as time and comparison to half-life. Rehearsal of problem solving using problems from IOP and Exam Q's. **Discussion of RP9:** Investigation of the charge and discharge of capacitors. **AO1**		Student experiments : Investigating Q and V for a capacitor and investigating a parallel plate capacitor Student experiment : energy stored in a capacitor IOP charge and discharge of a capacitor experiment, and other resources and questions.
W20	13-01-25	3.7.4.4	• 10.4 Time constant,	☐	• State what is time constant (τ) and able to calculate τ	$\tau = RC$ Calculation of time constants including their		Q: Outline the similarities and differences between radioactive decay and

			time half and dielectric • Buffer • N/A		• State what is time to halve ($t_{\frac{1}{2}}$)) and able to calculate $t_{\frac{1}{2}}$. • State what is relative permittivity and explain how dielectric is used to increase the capacitance.	determination from graphical data. $T½ = 0.69RC.$ Able to describe and **sketch** the action of a simple polar molecule that rotates in the presence of an electric field. **AO1, AO2**		capacitor charge and discharge. Blended learning: Friday 17th
W21	20-01-25		• RP9 Investigating Capacitors Discharging • Summary & review		• Investigation of the charge and discharge of capacitors. Analysis techniques should include log-linear plotting leading to a determination of the time constant RC: **the objective of the experiment is to calculate the capacitance of a capacitor.**	**Ata**: *Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings* **ATb**: *Use appropriate digital instruments, including electrical multimeters, to obtain a range of measurements (to include time, current, voltage, resistance, mass)* **ATd:** *Use stopwatch or light gates for timing* **ATf :** *Correctly construct circuits from circuit diagrams using DC power supplies, cells, and a range of circuit components, including those where polarity is important* **ATg:** *Design, construct and check circuits using DC power supplies, cells, and a range of circuit components* **ATh:** *Use signal generator and oscilloscope, including volts/division and time-base*		***CPAC to be assessed*** *CPAC 1a, CPAC 2c, CPAC 3a, CPAC 4b, CPAC 5b.* *End of the Unit test*

			• **EOU test**					
11. Nuclear physics (Spec_ref: 3.8.1.1 to 3.8.1.8)								
W22	27-01-25	3.8.1.1 3.8.1.5	• **11.1 The Atomic Nucleus**		• Able to describe the Rutherford experiment and able to explain the existence of nucleus using a-particle scattering • Using the close approach method to **estimate** the diameter of nucleus • Using the electron diffraction method to **estimate** the diameter of nucleus	*Investigate Rutherford Scattering results using animation/simulation.* *Students research models of the atom and construct a timeline to show how it has changed.* **AO1. AO3**		Q:What evidence do we have for atomic structure? Q:Is the nuclear model of the atom viable? Rutherford Scattering simulation from PHET Colliding Balls and Chinese hat analogies from IOP
		3.8.1.5	• 11.2 Nuclear Radius and Density		• Able to describe why nucleus size increases with nucleons and to calculate r from its nucleon number • Able to calculate the density of nucleolus	*Students become familiar (know) typical nuclear size and density and relate this to neutron stars and its approximate dimension with respect typical town/cities* **AO1. AO3**		Prior knowledge: Recall the nuclear dimension from Section 1 (Year 12)
		3.8.1.2	• 11.3 Properties of Nuclear Radiation		• Able to state different type of radiation and their properties • Able to identify the different types of radiation • Able to describe the application of radiation in industry/everyday life	***Demonstration of*** *background radiation and the penetration properties of α, β and γ radiation.* *Develop knowledge and understanding of properties of radiation and inverse square law to explain safe handling of radioactive sources.*		Prior knowledge: Recall the properties of α, β and γ radiation. Q:What is the nature of radiation? Q:Which is the most dangerous type of radiation?

						Case study on applications of radiation in medicine and industry to consolidate knowledge and understanding. **AO2, AO3, ATk, ATl**		Radiation lab simulation
W23	03-02-25	3.8.1.2 3.8.1.3	• 11.4 Background radiation and intensity • 11.5 Exponential Law of Decay	☐ ☐	• State what is background radiation (BG), the origins of BG and describe how to eliminate BG from experimental results • Explain the variation of Intensity of gamma radiation as a function distance & the inverse square Law • Investigate the inverse square law of gamma radiation • State what is exponential decay, know Radioactive decay is a stochastic process, thus, describe why radioactive decay is a random process • Able to calculate activity and decay constant of a sample of radioactive material • Be able to calculate molar mass & age of radioactive materials	*Demonstration of background radiation.. Students record count data, correct for background radiation and make conclusions on nature of radiation from different sources.* *Demonstrating inverse square law or use a computer simulation. Students - measure background count rate and one count rate with a source in place taking all necessary precautions to satisfy **ATj.*** **AO2, AO3, ATl** (Use ionising radiation, including detectors) Discussion of definition of the decay constant and activity. Modelling radioactive behaviour with dice. Rehearsal of radioactive decay equations.		**INSET day Thursday 8th and Friday 9th** All students recognise and understand the random nature of radioactive decay and able to use following equations by the end of lesson to solve radioactive decay problems in a variety of contexts: $\frac{\Delta N}{\Delta t} = -\lambda N$ $N = N_o e^{-\lambda t}$ $A = \lambda N$ $T_{½} = \frac{\ln 2}{\lambda}$

					in radioactive decay calculation.	**AO2, AO3, MS1.3**		$A = A_o e^{-\lambda t}$
		3.8.1.3	• 11.6 Half-life and its Applications		• Able to deduce half-life from decay curves & log graphs. • Able to derive $T_{1/2}$ and calculate of $T_{1/2}$ • Describe how half-life is used in different applications and its relevance to storage of radioactive wastes.	*Determination of half-life from graphical data.* *Apply knowledge and understanding of half-life to explain the safe storage of radioactive waste and radioactive dating of rocks.* **AO2, AO3, MS1.3, MS2.1, MS3.1**		Q: **What are parallels between the mathematics of radioactive decay, capacitor discharge and damped harmonic motion.**
W24	10-02-25	3.8.1.4 3.8.1.6	• 11.7Nuclear Decay • 11.8 Mass defect and the binding energy		• Able to sketch the N-Z graph of stable nuclei and identify the regions where particles will undergo α or β decay • Describe the possible decay modes of unstable nuclei • Able to apply the conservation rules in nuclear equations and sketch the nuclear energy levels diagrams. • State what is mass defect and binding energy. • Able to calculate average binding energy	*Discussion of nuclear stability graph.* *In a peer discussion group students allocate decay processes to correct regions of stability graph and explain.* *Rehearsal of decay equations.* ***Read and summarise article on nuclear excited states and technetium-99m in medicine.*** **AO1, AO2** *Understand that $E = mc^2$ applies to all energy changes.*		**INSET day Thursday 8th and Friday 9th** Q: What aspects of radioactive decay are predictable? Decay processes from IOP Q: Is a mug of hot coffee more massive than a mug of cold coffee?

					per nucleon (aBE/n) and compare the aBE/n for different nuclides • Able to sketch graph of aBE/n with respect to nucleons	***Therefore,*** *students calculate mass of an atom from the mass of its constituent nucleons and check for consistency with published values. Discussion of mass difference and binding energy.* *Rehearsal of mass difference and binding energy calculations* AO1: Demonstrate knowledge and understanding of binding energy, fission and fusion. **AO1, AO2, MS0.1, MS3.1**		Q: Which element has the most stable nucleus? Mass difference and binding energy calculations from IOP Mass and Energy exam standard questions from Cyberphysics
		3.8.1.6	• 11.9 Nuclear Fission and fusion		• State what is fission reaction and able to calculate energy released in a fission reaction • State what is fusion reaction and describe the fusion reaction powering Sun • Know that large amount of energy is released in nuclear reactions due to increase BE and able to calculate energy released in nuclear reaction from nuclear masses	*Students review the Fission and Fusion video.* *Perform Simple calculations involving mass difference and binding energy.* *Atomic mass unit, u.* *Conversion of units;* $1\ u = 931.5\ MeV.$ Sketch the graph of average binding energy per nucleon against nucleons **AO1, AO2, MS0.1, MS3.1**		Fission and Fusion video from the Science Channel

W25	HT (17-02-25)							
W26	24-02-25	3.8.1.6 3.8.1.7 3.8.1.8	• 11. 10 Nuclear Fission Reactor • Buffer		• Know a brief history of nuclear fission and nuclear energy • Describe how a nuclear reactor generates energy, including function of a moderator, control rods, coolant and the safety producers in a nuclear power station.	***A brief research and write a chronical discovery of nuclear reaction and nuclear reactor.*** *Able to describe the safety considerations in nuclear power stations including the handling and storage of radioactive waste.* *Watch Nuclear Safety video and TED Do we need Nuclear Power debate.*		Nuclear Safety video clip from DW News – Tomorrow Today TED Nuclear Power Debate Revision of exam-type Q;s: Exampro
W27	03-03-25	•	• RP12 Investigating the inverse square law		Investigation of the inverse-square law for gamma radiation: *the objective of the experiment is to verify the inverse square law for gamma radiation of a known gamma-emitting source.*	**Ata**: *Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.* **ATk**: *Use ICT such as computer modelling, or data logger with a variety of sensors to collect data, or use of software to process data* **ATl:** *Use ionising radiation, including detectors*		***CPAC to be assessed*** *CPAC 1a, CPAC 2c, CPAC 3a, CPAC 3b, CPAC 4a, CPAC 5b.* **INSET day Friday 7th**

			• Buffer • EOU test					**End of the Unit test**
12. Thermal physics (Spec_ref: 3.6.2.1 to 3.6.2.3)								
W28	10-03-25	3.6.2.1 3.6.2.2 3.6.2.1 3.6.2.2	• 12.1 Thermal energy transfer • 12.2 The three gas laws		• Know the absolute temperature scale and describe what happens to the internal energy as KE or potential energy of a body changes • State what is specific heat capacity and able to calculate change in *T* when there is transfer of energy, including in continuous flow • State what is specific latent heat and able to calculate transfer of energy during the change of state of matter • **State Boyle's Law** and sketch PV graphs for fixed mass & temperature • **State Charles' & Gay-Lussac's Law**, sketch V/T graph for fixed mass & pressure and sketch PT graph for fixed mass & volume • Able to investigate Boyle's and Charles' law experimentally: RP8	*Discuss the difference between temperature and heat.* *Students measure the heat capacity of different substances.* Rehearsal of specific heat and latent heat examination questions. **AO1, AO2** *Discuss the Kelvin temperature scale and students practise converting between ^{o}C and K.* *Discussion of how to combine the gas law expressions to find the Ideal gas equation. Students to be familiar with all of the relevant terms: N, k, N_A, R, Molar Mass and molecular mass.*	Chemistry The ideal gas equation: 3.1.2.3	Prior knowledge: States of matter. Heat transfer mechanisms (conduction, convection and radiation). **Q:** You can put out a candle with moist fingers (800 ˚C) but putting your hand in boiling water is very dangerous (100 ˚C). Explain. Fire proof balloon demonstration and notes. Q: *What is the best scale for measuring temperature?* IOP questions on Ideal Gases.

						Students investigate Boyle's Law and Charles's Law. Students extrapolate their results to find absolute zero and evaluate the experiment. **AO1, AO3, MS3.12**		
		3.6.2.2	• 12.3 The ideal gas equation		• Background knowledge: know Molar mass, N_A, moles, *R* and *K* • Able to derive Ideal gas Equation from the three gas equation and perform calculation for ideal gas • Able to derive the equation for work done (on/by a gas)	*Students to be familiar with all of the relevant terms: N, k, N_A, R, Molar Mass and molecular mass. Write a science dictionary entry for each.* *Discussion of how to combine the gas law expressions to find the Ideal gas equation.* *With support students derive the equation for the work done on/by a gas: $Work\ done = p\,\Delta\,V$.* Rehearsal of calculations **AO1, AO3,**		
W29	17-03-25	3.6.2.3	• 12.4 Kinetic theory and the pressure of an ideal gas		• State the assumption made about ideal gas and Kinetic theory • **Derivation of ideal gas law using conservation of momentum** • Explain Charles' and Gay-Lussac's law using Kinetic theory.	*Students should understand that the gas laws are empirical in nature whereas the kinetic theory model arises from theory.* *Observe Brownian motion through a microscope or a video clip. Students explain the observation and discussion of correct explanation.* *A algebraic approach involving conservation of momentum to derive the ideal gas Eq., students practice the derivation of:* $pV = \frac{1}{3} N\, m\, (c_{rms})^2$		Q: Suggest and explain conditions under which the kinetic theory would fail to describe the behaviour of a gas? YouTube video clip of Brownian motion Brownian motion simulator

		3.6.2.3	• 12.5 Kinetic energy of gas molecule • Summary and review		• **Able to derivation the for average KE of gas molecule** • State what is total internal energy (TIE) and calculate TIE of a gas • Recap of all ideal gas equation and start "Thermal physics" booklet	**AO1, AO2** *Use the equations of the kinetic theory to solve problems and perform calculation.* *Students write a short essay on the development of the gas laws from an experimental and theoretical perspective.* **AO1, AO2**		
W30	24-03-25	•	• RP8: Experimental Investigation of Boyle's Law, and Investigation of Charles Law •		Investigation of Boyle's (constant temperature) law and Charles' (constant pressure) law for a gas	**Ata:** *Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings* **Ate:** *Use calipers and micrometers for small distances, using digital or vernier scales* **ATk:** *Use ICT such as computer modelling, or data logger with a variety of sensors to collect data, or use of software to process data*	Chemistry Relative atomic mass and relative molecular mass: 3.1.2.1 The mole and the Avogadro constant: 3.1.2.2	***CPAC to be assessed*** ***CPAC 1a, CPAC 2a, CPAC 2b, CPAC 2c, CPAC 3a CPAC 3b CPAC 4b CPAC 5b.***
W31	31-04-25	•	• EOU test • FD and gap analysis EOU test					

			• FD and gap analysis					
W32	HT (07-04-25)							**Easter break:**
W33	HT (14-04-25)	•	• Revision and catch-up: 3 days					Bank holiday 18th
W34	21-04-25	•	• Paper 2 test • FD and gap analysis • Buffer					Bank holiday 21st
W35	28-04-25	•	• Revision • Revision • Revision					
W36	05-05-25	•	• Revision • Revision • Revision					BANK holiday Monday 5th
W37	12-05-25	15 May Non-exam assessment submission deadline for A-level Physics (7408/C) June 2023 series Schools and colleges may set their own internal deadlines.						
W38	19-05-25	•	• Revision • Revision • Revision					
W39	HT (26-05-25)							BANK holiday Monday 27th

W40	02-06-25					
W41	09-06-25		**Paper 1**			
W42	16-06-25					
W43	23-06-25					
W44	30-06-25		**Paper 2**			
W45	07-07-25					
W46	14-07-25		**Paper 3**			

W47-W52	**END of the academic Year**		**Summer break:** ***School breaks Friday 19th***