

Year 12 TERMLY CURRICULUM

Physics

Chemistry

Biology

Mathematics

Further Mathematics

Computer Science

Term 1

Module 1: Development of practical skills in physics. This module covers planning and evaluating experiments, significant figures, plotting and interpreting graphs. Module 2: Foundations in physics. Covering physical quantities and units, nature of quantities and making measurements.

Elements of Life: This chapter explores the elements and compounds in the universe, the human body and in salt deposits. Some of the chemical ideas included in this module are: atomic structure, chemical equations and the mole, isotopes, the periodic table, Group 2 chemistry, bonding and the shapes of molecules.

Module 2: Covering; Cell structure, Biological Membranes and Biological molecules

Students will master the essential algebra and number skills needed for the course, including but not limited to simultaneous equations, inequalities, quadratics and surds. They will use these skills to draw quadratic equations and interpret their properties. In Mechanics, they will construct models and work with vectors for the start of their Applied Mathematics course. They will draw and interpret Displacement and Velocity-Time graphs.

Students will multiply matrices and use the determinant to find the inverse of a matrix. Students will also explore imaginary numbers. They will study momentum in one direction and the conservation of momentum. They will then move onto work, energy and power.

Systems Architecture and Databases - Students revisit Systems Architecture with added detail on the architecture of the CPU. Students gain a detailed insight into the Fetch/Decode and Execute cycle as well as learning about different processor architectures including Von Neumann, Harvard and Complex/Reduced instruction set computers. Students will also learn the key theoretical database concepts and have an introduction to the SQL language for creating, editing and querying databases. As part of their programming curriculum, students will learn how to create Graphical User Interfaces using the Tkinter module in Python.

Term 2

Module 3: Forces and motion: Covering motion graphs, constant acceleration, free fall and acceleration, determining acceleration due to gravity, stopping distances, Newton's laws of motion, turning forces, centre of mass, density, pressure, work, energy, power, materials, deformation and Newton's laws of motion.

Developing Fuels: This chapter explores fuels, what they consist of, how energy involved in their combustion is measured and the contributions that chemists make to the development of better fuels. Some of the chemical ideas included in this module are: thermochemistry, catalysis, alkanes, alkenes, addition polymers, isomerism and dealing with polluting gases. Elements from the Sea: The extraction of halogens from minerals in the sea, together with a study of the properties and uses of these elements and their compounds. Some of the chemical ideas included in this module are: halogen chemistry, redox chemistry and equilibrium.

Module 2: Covering; Enzymes, Nucleotide and nucleic acids and cell division, cell diversity and cellular organisation.

Work will focus on straight-line graphs and equations of circles. Students will be able to find gradients, midpoints and lengths of line segment and use this to find equations of normals & tangents as well as solve geometrical problems involving area. They will also connect their GCSE work on circle theorems to geometric problem involving circles on coordinate axes. In Mechanics, they will study motion in two dimensions, connected particles and pulleys.

Students will study the transformations of matrices and study Argand diagrams. They will study elastic strings and springs studying Hooke's Law and elastic energy.

Web Technologies, Application Generation, Software Development and Networks - Students spend much of term 2 learning about the various technologies involved in the creation of software applications, as well as the methodologies used in industry for the successful development of software projects. This provides early and intrinsic practise in preparation for the student's programming projects which will begin in Term 5 on Year 12. Students will further their knowledge of Networks and gain an advanced insight into how computers communicate with each other. As part of the programming curriculum, students will spend the term putting their database theory into practice through the creation of software which includes SQLite3 databases.

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Term 3

Module 4: Electrons, waves and Photons. Covering current, charge, energy, power and resistance.

Elements from the Sea: The extraction of halogens from minerals in the sea, together with a study of the properties and uses of these elements and their compounds. Some of the chemical ideas included in this module are: halogen chemistry, redox chemistry and equilibrium. The Ozone Story: This chapter explores the important processes occurring in the ozone layer of the atmosphere. Some of the chemical ideas included in this module are: rates of reaction, radical reactions, intermolecular bonding, haloalkanes and the ozone layer.

Module 3: Covering; Exchanging surfaces, Transport in animals and transport in plants.

Students will be introduced to differentiation and integration, where they will be able to find gradients of non-linear graphs at specific points and use first and second derivatives to find stationary points along with equations of tangents and normals. More work will be done to improve students algebra skills this term including the revisiting of algebraic fractions but then onto the new content involving algebraic long division, factor theorem and remainder theorem. In Mechanics, they will apply differentiation to variable acceleration and begin their statistics course, beginning with data collection.

Students will use the calculus from the A Level course to calculate volumes of revolution around the x and y axes. They will study roots of polynomials for quadratic, cubic and quartic equations. In Mechanics, they will study elastic collisions in 1D and 2D.

Data Structures and Algorithms - Continuing to develop students understanding for both the programming project and Paper 2, students will spend term 3 learning about advanced data structures and algorithms used widely in the computer science industry. Students will learn the data structures for the storage of multiple pieces of data and the relative benefits of each data structure in different scenarios. Students will learn algorithms for sorting/searching data as well as "shortest path" algorithms for calculating the shortest path between two different nodes (as seen in satellite navigation systems and gaming). In addition, students will learn how to measure algorithmic efficiency and speed using Big O Notation. As part of the programming curriculum, students will use this time to program the various data structures and algorithms learned in theoretical lessons.

Term 4

Module 4: Electrons, waves and Photons. Covering electrical circuits, circuit analysis, potential dividers, series and parallel circuits, wave motion, electromagnetic waves, superposition and stationary waves.

What's in a medicine: This chapter explores medicines such as aspirin, leading to more functional group chemistry and methods of analysis. Some of the chemical ideas included in this module are: chemistry of the -OH group, carboxylic acids and esters, and analytical techniques (TLC, MS and IR).

Module 4: Covering; Communicable disease, disease prevention and the immune system and Biodiversity.

Students will use binomial expansion to expand larger binomial than seen at GCSE. They will cover trigonometry at a greater depth, introduced to trigonometric identities that they will use to solve trigonometric equations. They will also do problem solving with vectors. In Statistics, they will represent and interpret data using measures of location and spread.

Students will prove mathematical results by induction and study vectors to a greater depth, including scalar products and equations of lines and planes in 3D. In Decision, students will carry out algorithms and evaluate their effectiveness. They will be introduced to Graph Theory and will represent graphs and networks using matrices.

Data Types and Boolean Algebra - Students will learn a series of mathematical concepts in Computer Science including binary representations of decimal numbers which are negative or contain a decimal point. Students will also learn a number of boolean algebra methods to solve problems using boolean logic. In addition, students will learn the internal architecture and circuitry required for arithmetic to take place within the CPU. As part of the programming curriculum, students will spend Term 4 carrying out preparation for their programming project, including writing their project proposals for review by the exam board.

Term 5

Module 4: Electrons, waves and Photons. Covering photons, the photoelectric effect and wave-particle duality. The remaining time will be used to review the content of the year 12 course.

Polymers and Life: This chapter explores condensation polymers, proteins and enzymes. DNA and its use in synthesising proteins. Some of the chemical ideas included in this module are: enzyme catalysis, amino acid and protein chemistry, proton and carbon-13 NMR and the structure and function of DNA and RNA.

Module 4: Covering; Classification and evolution. Revision and preparation for end of year internal assessments. Starting Module 5; Communication and Homeostasis.

Students will study exponentials and logarithms. They will be able to solve exponential and logarithmic equations, draw their graphs and transformations and use logarithmic graphs to model non-linear problems. Students will also revise the key content of the year in preparation for their end of year mock examination. In Statistics, they will be introduced to statistical distributions and hypothesis testing.

Students will find shortest and most effective pathways using various algorithms, including Kruskal's, Prim's, Dijkstra's and Floyd's. Students will also study linear programming, critical path analysis and the simplex algorithm

Programming Project - Students will spend term 5 completing their Analysis and Design aspects of the programming project. The successful completion of these portions of the project are critical to success in the development, testing and evaluation sections which follow. Students must focus on the decomposition of the problem and how they will break down the development process into multiple parts which can be tested. Following the successful completion of this section - students will be ready to begin developing their software solution and will test their product iteratively throughout development.