ST. ANDREW'S COLLEGE
Cambridge

SCIENCE FOUNDATION SPECIFICATIONS

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ABOUT ST ANDREW'S COLLEGE CAMBRIDGE

St. Andrew's College, Cambridge is a co-educational independent Sixth Form College providing boarding and day places for up to 157 students each academic year.

St Andrew's College is a member of the Dukes Education family. Dukes is a family of schools, teachers, learners, and parents connected by our pursuit of an extraordinary life for every member of our community.

Our philosophy is to support everyone to live with purpose, to encourage a love of learning, and to act as a team. All of this is underpinned by a quality standard that runs through everything we do.

St. Andrew's College, Cambridge is "international" in nature and is characterised by exceptional levels of academic and pastoral support at all stages. We accept students aged 15-22 years old.

We believe that education is a journey to be enjoyed and shared at every stage of life, unlocking extraordinary possibilities for every student.
St Andrew's College offers the following courses.

- Pre A-Level (September and January start)
- 2-year A-Level (September start)
- 3-year A-Level (September start)
- 2.5 -year A- Level (January start)
- 1-year University Foundation course (September start)
- 2-year university foundation courses (September start)
- 18-month university foundation course (January start)

Many of our applicants will commence courses in September, although we have up to 20 students each year who join the January intake. There are cases where students request to join the course as late joiners. These applications are reviewed on a case-by-case basis by the Principal and the Curriculum Manager. Where possible, late joiners are integrated into appropriate groups and receive additional tuition to make up for any time missed.

ADMISSIONS CRITERIA

Subject to real limits on student numbers imposed by boarding places, the availability of homestay hosts and resources, the college will admit applicants who have the potential to be successful on the course they've applied for.

Applicants must:

- Demonstrate a strong commitment to their studies
- Meet the entry requirements for the course applied for – Entrance exams & interview
- Agree to adhere to the college code of practice

The college aims to welcome students from all backgrounds, irrespective of nationality, race, religion, gender, sexual orientation, or disability.

SELECTION PROCESS AT A GLANCE

Our applicants go through a strict selection process based on three elements:

1. Application: in liaison with UKVI regulations (qualifications, Visa and language requirements)

2. Interview. Interviews are conducted by the Admissions Department with the purpose of:

- Explaining the academic, pastoral, and extracurricular provision available at the college and provide advice on courses appropriate to the student's age and academic ability
- Assess the suitability of the student for the course they have applied for (Entry criteria for courses are given at the end of this document)
- Provide an opportunity for a prospective student and parents / guardians / agents to look around the college.
- Provide advice about entry into Higher Education.
- Answer any questions about the college.

3. Testing and assessment. The college will request that prospective students take entry tests in Maths and English in order to determine if their proposed course for them.

REGISTRATION & ENROLMENT

OFFERS AND ENROLMENT

We will review a student's application once the stages above have been completed. If a student's application is successful a conditional or unconditional offer will be made.

ENGLISH REQUIREMENT

Those students enrolled on Foundation courses and for who English is not a first language, will be required to achieve a minimum IELTS score of 5 for September and 5.5 for January. Students who cannot provide satisfactory evidence of a pass at this level or proof of English level by means of an internal test and interview will not be allowed to join St. Andrew's College, Cambridge.

FOUNDATION COURSE REQUIREMENTS

ONE-YEAR FOUNDATION PROGRAMME

The one-year Foundation programme is an intensive, fast-track programme and is suitable for students who have already completed one or more years of A-Level study, or who have graduated with good grades from a high school system abroad. Applicants will have to demonstrate a good level of academic ability. A pass at Grade A*-C in GCSE/IGCSE English Language, IELTS 5.5 or a result of 5.5 or above on our internal English test is required for students whose first language is not English.

The Foundation program is accredited by the NCFE

SCIENCE FOUNDATION

SUBJECTS AND HOURS OF STUDY PER WEEK

Biology – Chemistry – Physics – Maths

SUBJECT	NUMBER OF HOURS PER WEEK
	One-year course (34)
Subject 1	6
Subject 2	6
Subject 3	6
Tutor / UCAS	3
Total Hours	**21**
Hours over the duration of the course.	**714**

THE ASSESSMENT STRUCTURE FOR THE COURSE

DECEMBER EXAM

All students will take an exam in each of the core subjects (Chemistry, Biology / Human Biology and Maths) in December of each course. This exam is to gather an understanding of the performance to date. On completion of the results transcript the student will be spoken to by his/her tutor and an Individual Learning Plan (ILP) will put together if applicable. The first exam is to monitor performance in the first term it will not be used for the overall results of the course.

PRACTICAL

Students will carry out 6 practical assessments during the spring term. The collated results of these tests will give them an overall result, which will count for 40% of the overall mark.

FINAL EXAM

The final assessment of the course will take place in the penultimate week. Each of the core subjects (Chemistry, Biology / Human Biology and Maths) will be examined twice (2 hours per paper). The final exams will carry 60% of the total grade.

ATTENDANCE

Students must have an attendance rate 95% or above in all subjects to pass the course.

COMPLETION OF WORK

Students must complete all work on time.

NCFE ACCREDITATION & CERTIFICATION

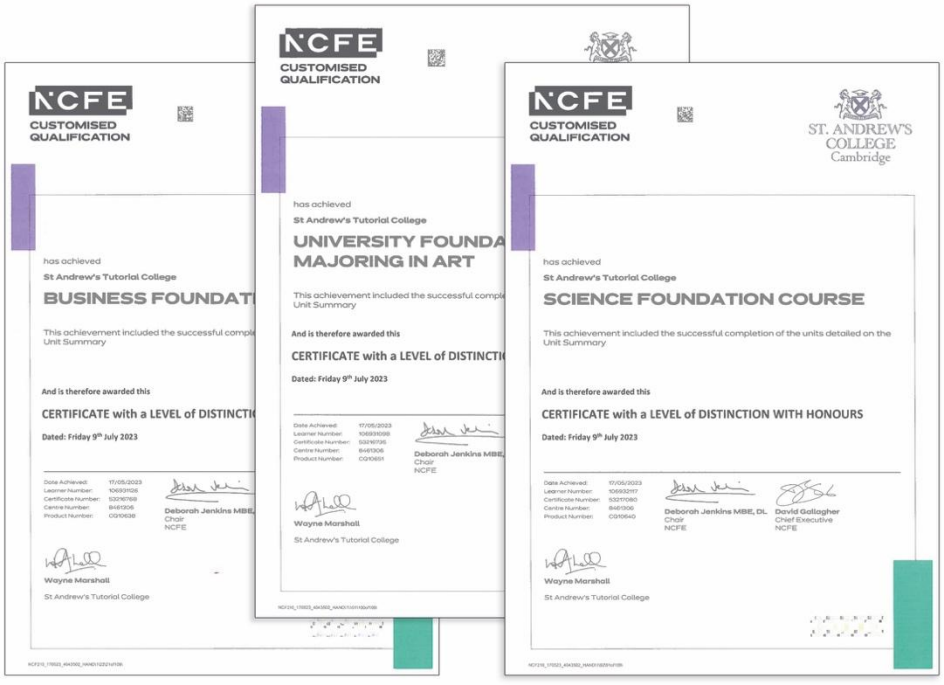
Our course has been accredited by NCFE, an awarding organisation recognised by the qualification regulators for England and Wales. NCFE's regulators are the Office of Qualifications and Examinations Regulation (Ofqual) in England, and the Welsh Government in Wales. This course isn't regulated by Ofqual but has been accredited by NCFE under our IIQ License.

St. Andrew's College provides the students with a Level 3 Diploma, and they will also receive a certificate and a transcript from the awarding body NCFE. (SEE SAMPLE BELOW)

Awards of Pass, Merit, Distinction and Distinction with Honours are only awarded when students meet the following criteria:

ACHIEVEMENT

Fail / Resubmit	**0-49%**
Pass	**50-59%**
Merit	**60-69%**
Distinction	**70-79%**
Distinction with Honours	**80% and above**



SUMMARY OF SYLLABUS CONTENT FOR EACH SUBJECT:

CHEMISTRY – SPECIFICATION SUMMARY

Term 1	Term 2	Term 3
Introduction Atomic Structure / Amount of Substance Bonding / Periodicity Redox Reactions / Group 7, the Halogens Redox Reactions / Group 2, the Alkaline Earth Metals / Metal Extraction Coursework reports	Redox Reactions / Group 2, the Alkaline Earth Metals / Metal Extraction Energetics / Kinetics / Equilibria Collision Theory, Maxwell-Boltzmann Distribution, Le Chatelier's Principle, etc. Introduction to Organic Chemistry / Alkanes Coursework reports	The Haloalkanes, Alkanes / Alcohols / Analytical Techniques Presentations

SPECIFICATION DETAIL

PART A

Physical Chemistry

- Atomic structure
- Understand the importance of fundamental particles in the structure of the atom
- Mass number and isotopes
- Know the electron configurations of atoms and ions

Amount of substance

- Be able to define relative atomic mass and relative molecular mass
- Understand the concept of a mole and Avogadro's constant
- Be able to recall the ideal gas equation
- Understand the concept and relationship between empirical and molecular formulae
- Balanced equations and associated calculations

Bonding

- Nature of ionic, covalent, metallic, and dative bonds
- Learn about bond polarity

- What are the forces acting between molecules?
- Recognise the different states of matter
- Shapes of molecules and ions

Energetics

- Learn about and calculate enthalpy change (calorimetry)
- Be able to apply Hess's Law
- Understand bond enthalpies and calculations

Kinetics

- Understand collision theory
- Qualitatively understand the Maxwell-Boltzmann distribution
- Effect of temperature, concentration, and particle size on reaction rate
- Understand how catalysts work

Equilibria

- Understand the dynamic nature of equilibria including effects of changes in pressure, temperature, and concentration on a system in equilibrium (Le Chatelier's principle)
- Importance of equilibria in industrial processes

Analytical techniques

- Understand the basic principles of mass spectrometry

PART B

Inorganic Chemistry

Periodicity

- Be able to classify elements in *s*, *p,* and *d* blocks
- Properties of Period 3 elements as an example of periodic trends
- Understand redox reactions, oxidation states and redox equations
- Group 2 (alkaline earth metals)
- trends in physical and chemical properties
- flame tests
- Group 7 (halogens)
- trends in physical properties, and oxidizing and reducing abilities

- identification of halide ions using AgNO3
- uses of chlorine and chlorate (I)

PART C

Organic Chemistry

- Nomenclature
- Structural isomerism
- Alkanes
  - structure and properties
  - fractional distillation of crude oils
  - modification by cracking
  - combustion
  - structure, bonding and reactivity
  - addition reactions
  - polymerization
- Haloalkanes
  - Synthesis
  - nucleophilic substitution
  - substitution reactions
- Alcohols
  - nomenclature
  - ethanol production
  - classification of reactions
  - elimination
- Organic mechanisms

BIOLOGY – SPECIFICATION SUMMARY

Term 1	Term 2	Term 3
Introduction Cell Biology (Building Blocks of Life, Chemical Basis, Substances passing in and out of Cells, Prokaryotic and Eukaryotic Cells, Respiration, Photosynthesis) Organs at Work (Digestive System, Breathing System, Diseases of the Breathing System, Heart, etc.) Exchange and Transport (Blood Vessels, Gaseous Exchange, Transpiration, etc.) Coursework reports	Cells: Control and Adaptation Adaptations and Functions, Cell Cycle, Cancer Disease (Lifestyle Diseases, Pathogens) Fighting Disease (Immune System and Vaccines) Molecular Structure and Function DNA, Genes and Chromosomes Coursework reports	Ecology Classification and evolution Presentation

SPECIFICATION DETAIL

PART A

Cell Biology

- Understand that cells are the building blocks of life
- Studying cells
- Different substances are the chemical basis of cells
- Different substances pass into and out of cells
- What are the differences between prokaryotic cells and eukaryotic cells?
- Respiration
- Photosynthesis

Organs at Work

- Learn about the different parts of the digestive system
- Understand that enzymes catalyse the digestion of food
- Learn about the different parts of the breathing system
- How do different diseases affect the breathing system?
- Learn about the different parts of the heart
- What are the causes of heart disease?
- Reducing risks

Exchange and Transport

- Surface area to volume ratios affect the rate of exchange of substances across surfaces
- Understand how blood vessels work and link up with lymph vessels
- Learn about gaseous exchange
- How does water and nutrients reach the tops of the tallest trees?

PART B

Cells: control and adaptation

- Different adaptations enable cells to carry out different functions
- The cell cycle refers to events during the life cycle of a cell
- Cancer is a result of the cell cycle running out of control

Disease

- Lifestyle diseases
- Some diseases are caused by pathogens

Fighting disease

- Why does our immune system help us to stay healthy?
- How do vaccines protect us from disease?

PART C

Ecology

- Populations and ecosystems
- Investigating ecosystems

Energy transfer in ecosystems

- Food chains, food webs and ecological pyramids
- Energy transfer through ecosystems
- Energy and food production

Classification and the species concept

What are species?

- How many species are there?
- How are species maintained?
- How many species will be compared?

MATHEMATICS

This mathematics programme has been reviewed to reflect and cater for the actual mathematical requirements of students as they progress towards their university courses. It's designed to lay the foundation for developing and consolidating effective reasoning and a methodical approach while building a good set of mathematical skills relevant to most science and humanities studies. The programme aims to provide students with a valuable range of tools and techniques for analysing, modelling, formulating, and solving general mathematical problems that can arise in their further studies or future practice.

MATHEMATICS – SPECIFICATION SUMMARY

Term 1	Term 2	Term 3
• Elementary Algebra • Coordinate Geometry • Functions and their graphs • Differentiation • Integration	• Exponential and Logarithm functions • Sequences and Series • Probability and Statistics • Numerical methods • Linear programming	• Financial Mathematics • Composite functions • Inverse function • Further Differentiation

NB: To keep the same standard for assessment purpose, effort should be made to cover the material for each term in the term indicated. However, within each term the content may be covered in any suitable order and some components may be exceptionally moved from one term to another to respond to the students' level of attainment or if required for use by other subjects.

SPECIFICATION DETAIL

TERM 1

Elementary Algebra

- Types of number: Natural, integer, decimal, rational, irrational, and real numbers
- Common sets of numbers **N**, **Z**, **D**, **Q** and **R**, together with the correct use of related set notations such as {}, ∈, ∪, ∩ …etc.
- Working with forms of number such as reciprocals, indices (or powers), fractions and surds. Students should learn the properties and know how to work with fractions, indices and surds including how to rationalise the denominator
- Working with ratios and percentages to express or find shares from a whole quantity
- Algebraic expressions and related operations including determining the degree and coefficients of a polynomial, addition, subtraction, multiplication, simplification, expansion, factorisation and completing the square for trinomials

- Algebraic fractions and related operations including simplification, long division by a linear term, the remainder theorem, and the factor theorem
- Equations: differentiating between, expressions, equations, identities, and functions. Solving quadratic and simple cubic equations using factorisation, completing the square or the discriminant method for quadratic equations. Solving simultaneous linear equations using elimination or substitution as appropriate. Solving simultaneous mixed equations (linear and non-linear) and presenting the solutions in a suitable form
- Inequalities: solving linear, quadratic, and simultaneous inequalities. For quadratic inequalities, the curve can be used along the sign inspection methods

Coordinate Geometry

- Recognising common 2D shapes and recalling their basic properties with focus on quadrilateral shapes including Trapeziums, Parallelograms, Rectangles, Squares, and triangular shapes including Isosceles, Right-angled, and Equilateral triangles
- Determining and using the Cartesian equation of a straight line in a system of axes (Ox, Oy) in different forms such as Y= mX+c, aX+bY+c = 0 or Y – Y1 = m(X-X1)
- Parallel and perpendicular straight lines
- Intersection of 2 or more straight lines
- Coordinates of the midpoint of a segment AB
- Distance between two points A and B
- Cartesian equation of a circle in a system of axes in different forms such as $(x – a)^2 + (y – b)^2 = r^2$ and $x^2 + y^2 + px + qy + r = 0$
- Circle properties and their use in solving problems
- Solving general problems involving straight lines and other common shapes

Functions and their graphs

- Precise definition of a function and the related concepts of domain and range. One-to-one functions
- Basic combinations of 2 or more functions using addition, subtraction, multiplication, and division
- Sketching graphs of simple functions including linear, quadratic, cubic and simple homographic functions $(y = c\ X)$
- The concepts of limits and continuity are not in the scope of this specification, but the vertical or horizontal asymptotes and infinite branches must be determined and used where required
- Transformation of curves: y = f(x + a), y= f(x) + a, y = f(ax), y= af(x), y=-f(x) and y =f(- x). Students should be able to correctly describe each transformation and apply it to sketch the corresponding curve based on the curve y=f(x)

Differentiation

- Basic rules of differentiation for polynomials and algebraic functions with rational Indices
- Second derivative
- Equation of the tangent and equation of the normal at a given point on the curve Y = f(X)
- General problems involving differentiation and coordinate geometry
- Use of differentiation to determine the set of values for which a differentiable function is increasing or decreasing
- Use of differentiation to find stationary points and determine their nature
- Use of differentiation to solve simple optimisation problems

Integration

- Indefinite integration as the reverse process of differentiation
- Basic rules of integration for polynomials and algebraic functions with rational Indices
- Finding the constant of integration given the initial conditions
- Definite integral
- Area under a curve, area between a curve and a straight line

TERM 2

Exponential functions and Logarithm functions

- The function a^x and its graph and properties
- Graph of logarithm function with base a
- Logarithm laws including the formula for changing the base
- Solving logarithm and exponential equations and simple inequalities
- Use of exponential and logarithm functions to model growth and decay in a population

Sequences and Series

- General concepts of a sequence and series: 1^{st} term, general term, recurrence relation, sum of first n terms, the use of Sigma notation
- Arithmetic sequences and series
- Geometric sequences and series including sum to infinity where defined
- General problems involving sequences and series

Probability and Statistics

- Purpose and uses of statistical methods and statistical models
- Types of data, qualitative, quantitative, discrete, and continuous data

- Data representation and summary (for both discrete and continuous data): the use of frequency, cumulative frequency, mode, median and quartiles, inter-quartile range, mean and standard deviation. Stem and leaf diagrams, box plots, bar charts, pie charts and histograms
- Bivariate data: scatter diagrams, types of correlation, product moment correlation coefficient, explanatory and response variable and linear regression
- Probability concepts and probability tools: trial, outcome, sample space, event, complementary event, compound events, mutually exclusive events, independent events,
- Representation of events using multidimensional tables, Venn diagrams and tree diagrams
- Probability Laws
- Conditional probability
- Discrete random variables: probability distribution, expectation, and variance
- Particular discrete distributions: Uniform Discrete distribution and Binomial distribution
- Populations and Samples: making the distinction between a population and a sample, knowing some advantages and disadvantages of using a sample for a survey compared to using a census. Statistics and sample statistics

Numerical methods

- Approximate solution to the equation $f(x) = 0$
- Finding an interval in which the equation $f(x) = 0$ has a solution, by checking for a change in the sign of $f(x)$
- Interval bisection method
- Finding an approximation to $\int^{b} f(x)dx$ using the trapezium rule

Linear Programming

- Standard form of a linear problem: the variables, the constraints, and the objective function
- Modelling a variety of problems using linear programming: examples can be drawn from business, transport, manufacturing, and other sectors
- Graphical representation of the feasible region
- Finding a solution graphically using the objective-line method
- Finding a solution using the vertex inspection method

TERM 3

Financial Mathematics

- Simple interest
- Compound interest: interest compounded annually, semi-annually, monthly or n times per year on regular intervals
- Continuously compound interest
- Annual percentage rate
- Future and Present values

- Debt repayment
- Annuities

Composite functions and Inverse function

- Composite function of 2 or more functions where it's defined
- Solving equations involving the composite function such as gf(x) = c where c is a given value
- Finding the inverse function of a one-to-one function
- Domain and range of the inverse function
- Inverse of simple functions such as linear, quadratic, cubic, exponential and logarithm functions. The domain and range will have to be restricted as required to ensure the initial function is one-to-one

Further differentiation

- Differentiating the exponential function $f(x) = e^x$
- Differentiating logarithm functions $f(x) = \ln(x)$ and $f(x) = log_a(x)$
- The chain rule
- The product rule
- The quotient rule

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St Andrew's College Cambridge is part of Dukes Education. Together we're extraordinary