Science Curriculum Guide

The Intentions of the Science Curriculum

"The most important discoveries will provide answers to questions that we do not yet know how to ask and will concern objects we have not yet imagined" John Bahcall

Scientific discovery has expanded our knowledge and understanding of the world around us faster than any other discipline but there is still more to be discovered. The science curriculum at Nova Hreod Academy will develop curious and enthusiastic students that will become the scientists of tomorrow, making the most important discoveries of the future and driving our understanding ever onwards.

In KS3, students will follow the United Learning curriculum, studying the three core disciplines of biology, chemistry and physics in all years. Our first priority is building a strong knowledge foundation for the students. The curriculum is carefully sequenced allowing us to build from fundamental principles such as what particles are and how they behave, how a cell works, energy and motion to more complex ideas such as structure and bonding in all kinds of chemicals, genetics and inheritance and how forces act. Biology, chemistry and physics topics are interleaved to promote an appreciation of the links between the subjects and to strengthen the students understanding. Practical investigation and scientific methodology play an important role in our teaching, equipping students with critical thinking, problem solving and analytical skills that go beyond the science classroom.

In KS4, students choose either to follow the combined science or separate science route. Both pathways allow students to develop further their understanding and interest in science whilst delving both into the history of scientific discovery and some more modern considerations. For example, what has led us to our current understanding of the atom; are stem cells really going to help us cure diseases?

As part of our co-curricular offer, KS3 students can attend science after school clubs and all students are also given the opportunity to take part in at least one science trip every year. Visiting places such as the Natural History Museum and the Big Bang Fair encourages students to consider science in a wider context and strengthens their everyday science learning. By the end of their time studying science at Nova Hreod Academy, students will be confident in their understanding of the science continually happening around them and eager to find out even more. They will be well prepared for A-level sciences or related subjects in other Post-16 routes.

The Learning Sequence in Science

Academic Year	Autumn Term	SPR1 Assessments	Spring Term and Summer Term 1	SPR2 Assessments	Summer Term 2
Year 7	1. Particles How particles behave in different states of matter 2. Motion How speed and acceleration are calculated and how motion is represented 3. Energy How energy is stored and transferred 4. Cells How cells are organized and how to view them 5. Structure & function How plants and animals are organised 6. Fundamental chemistry How the periodic table is organized and the structure of atoms	Tests on year 7 topics 1-5	7. Separation How mixtures can be separated 8. Reproduction How plants and animals reproduce 9. Chemical reactions How chemicals are represented and how chemical changes occur 10. Forces How interactions between objects cause forces and how forces cause changes 11. Variation How species differ from each other and how this helps them to survive 12. Power & Resources How energy and power are related and how we use energy resources 13. Pressure How pressure is caused in fluids and how this can be used 14. Acids & Bases How acids and bases are classified and their reactions	Synoptic tests on year 7 topics 1-14	15. The solar system How our solar system is organized and the objects that exist within it
Year 8	1. The Periodic Table How atoms, elements and compounds are defined and the history of the periodic table 2. Acids & Bases How acids and bases are classified and their reactions 3. Digestion How the human digestive system works 4. Electricity & Magnetism How charges lead electricity and the usefulness of magnets and electricity together 5. Nutrition How our bodies require different foods to remain healthy 6. Light How light interacts with different objects including the eye and cameras	Tests on year 8 topics 1-5	7. Geology How the Earth is structured and how rocks are formed 8. Ecological Relationships How organisms interact with each other and their environments 9. Space How the Earth is affected by other objects in space and how the solar system formed 10. Atmosphere How carbon is cycled in the atmosphere and the impacts of human activity 11. Conservation How species may become extinct and how we can stop this happening 12. Practical bootcamp How we carry out practical investigations and analyse data 13. Classification How and why we classify organisms 14. Diseases A study of communicable and non-communicable diseases	Synoptic tests on year 7 topics 1-14 and year 8 topics 1-11	15. Chemical Tests How we can use tests to identify different substances 16. Careers in Science How science is involved in a wide range of careers

Year 9	1. Matter How energy is stored in particles and how they behave 2. Structure & bonding How particles are arranged in different substances and how this leads to their properties 3. Genetics How DNA is inherited and the impact of the human genome project 4. Waves How waves are produced, how they behave and their uses 5. Energetics How energy is key to chemical reactions 6. Plant structure & photosynthesis How plants are organized and adapted for survival	Tests on year 9 topics 1-4	7. The periodic table and reactivity How the reactivity of different elements effects how they are extracted and how they behave 8. Respiration How energy is transferred in plant, yeast and animal cells 9. Forces in action How laws apply to forces and how we can put forces to use 10. Rates of reaction How rate of reaction is measured and its importance in industry 11. Organ systems How many individual organ systems work together to support life	Synoptic tests on year 7 topics 1-14, year 8 topics 1-11 and year 9 topics 1-11	12. Practical bootcamp How we carry out practical investigations and analyse data 13. Electricity How circuits are constructed and the factors that affect current
Year 10 Combined Science	1. Physics Threshold Concepts How we represent forces and the effects they have 2. Chemistry Threshold Concepts How atoms are organised and how we represent them 3. Biology Threshold Concepts How cells differ and how multicellular organisms are organised 4. Potential Energy & Elasticity How work is done when energy is transferred between stores 5. Periodic Table Patterns in the periodic table and how substances are either pure or impure and how they can be separated 6. Organisms How organisms form and how they can be classified 7. Staying Alive How plants and animals are organised and respond to their environments	Test on topics 1-5	8. Particle Model How energy causes changes in particle behaviour 9. Materials, Structure, Bonding & Reactions How elements behave in different materials and the importance of this in relation to their useful properties 10. Energy for Life How the key processes of photosynthesis and respiration support life 11. Waves How waves behave and how this relates to their uses 12. Resources & the Environment How we collect and use resources from the Earth and the impact this has	Biology paper on topics 3, 6, 7 and 10 Chemistry paper on topics 2, 5, 9 and 12 Physics Paper on topics 1, 4, 8 and 11	13. Disease How organisms get sick and what can be done to prevent this

Year 10 Triple Science	1. Physics Threshold Concepts How we represent forces and the effects they have 2. Chemistry Threshold Concepts How atoms are organised and how we represent them 3. Biology Threshold Concepts How cells differ and how multicellular organisms are organised 4. Potential Energy & Elasticity How work is done when energy is transferred between stores 5. Periodic Table How substances are either pure or impure and how they can be separated 6. Organisms How organisms form and how they can be classified 7. Staying Alive How plants and animals are organised and respond to their environments 8. Particle Model How energy causes changes in particle behaviour	Test on topics 1-5	9. Materials, Structure, Bonding & Reactions How elements behave in different materials and the importance of this in relation to their useful properties 10. Energy for Life How the key processes of photosynthesis and respiration support life 11. Waves How waves behave and how this relates to their uses 12. Resources & the Environment How we collect and use resources from the Earth and the impact this has 13. Space How the universe formed and the objects within it	Biology paper on topics 3, 6, 7 and 10 Chemistry paper on topics 2, 5, 9 and 12 Physics Paper on topics 1, 4, 8, 11 and 13	14. Disease How organisms get sick and what can be done to prevent this
Year 11 Combined Science	14. Ecology How organisms interact with each other and their habitats including human impact 15. Electricity How moving charges lead to current and how this behaves in different situations 16. Quantitative Chemistry & Electrolysis How calculations allow us to make reactions are efficient as possible and how elements can be extracted for useful purposes 17. Nuclear Physics How the model of the atom was developed and the implications of nuclear radiation 18. Energetics How chemical reactions involve energy changes	Biology paper on topics 3, 7, 10 and 13 Chemistry paper on topics 2, 5, 9, 16 and 18 Physics Paper on topics 4, 8, 15 and 17	19. Rates of Reaction How understanding and controlling the rate of a reaction is important 20. Equilibrium How many reactions are reversible and the implications of altering this 21. Reproduction How and why organisms reproduce and how evolution occurs 22. Electromagnetism How electromagnetism works and how many important items rely on it 23. Advanced Mechanics How motion is important in everyday situations	Biology paper on topics 6, 7, 14 and 21 Chemistry paper on topics 5, 12, 19 and 20 Physics Paper on topics 1, 4, 11, 22 and 23	

Year 11 Triple Science	15. Ecology How organisms interact with each other and their habitats including human impact 16. Electricity How moving charges lead to current and how this behaves in different situations 17. Quantitative Chemistry & Electrolysis How calculations allow us to make reactions are efficient as possible and how elements can be extracted for useful purposes 18. Nuclear Physics How the model of the atom was developed and the implications of nuclear radiation 19. Energetics How chemical reactions involve energy changes	Biology paper on topics 3, 7, 10 and 14 Chemistry paper on topics 2, 5, 9, 17 and 19 Physics Paper on topics 4, 8, 16 and 18	20. Rates of Reaction How understanding and controlling the rate of a reaction is important 21. Equilibrium How many reactions are reversible and the implications of altering this 22. Reproduction How and why organisms reproduce and how evolution occurs 23. Electromagnetism How electromagnetism works and how many important items rely on it 24. Advanced Mechanics How motion is important in everyday situations	Biology paper on topics 6, 7, 15 and 22 Chemistry paper on topics 5, 12, 20 and 21 Physics Paper on topics 1, 4, 11, 13, 23 and 24	

Formal Assessment of the Science Curriculum

In KS3, multiple choice question papers are used at the end of each topic throughout the year. School-produced exam papers are used for SPR1 assessment whilst United Learning exam papers are used for SPR2 assessment.

In Year 10 exam question-based end of topic tests are used throughout the year. A school-produced tiered exam paper covering biology, chemistry and physics is used for SPR1 whilst in SPR2 there are three school produced tiered exams papers (one biology, one chemistry and one physics).

In Year 11 exam question-based end of topic tests are used throughout the year. Mock exam papers from AQA are used at all assessment points in year 11 (one biology, one chemistry and one physics paper at each assessment).