

Essential SCIENCE

SECOND
EDITION

Junior Cycle Science Yearly Schemes of Work: Units of Work

We are aware that Science teachers have different allocations of time available to teach Science depending on local arrangements in each school. Hence, instead of devising yearly schemes of work based on number of weeks, we have divided the entire Science curriculum specification (syllabus) into **Units of Work**, as detailed in the schemes of work summarised in the form of tables for Years 1, 2 and 3 of Junior Cycle Science. Each unit is based on two hours of class contact time.

The order in which the Units of Work is presented is based on the teaching experience of the authors. However, teachers may prefer to adapt the table below to their own preferred sequence of topics from each of the five strands of the Junior Cycle Science specification.

The suggested student practical work included in the yearly schemes is based on the experiments described in the *Essential Science* textbook and Laboratory Notebook. These experiments have been chosen to help students achieve the learning outcomes in the specification and to ensure that students acquire fundamental laboratory skills. Teachers may wish to carry out additional investigations that utilise these fundamental laboratory skills.

Teachers who wish to teach Science by following a thematic approach (rather than following the structure of the five strands in the specification) can rearrange the units of work in whatever order they wish.

We hope that you will find these yearly schemes of work and Units of Work helpful in planning your teaching of the Junior Cycle Science curriculum (syllabus).

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YEAR 1

Unit no.	Unit of work (2 hours' class contact time)	Topic	<i>Essential Science</i> 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
1	Introduction to science	<ul style="list-style-type: none"> • Lab safety • Lab rules • Safety symbols • Lab equipment 	Introduction (pp. viii–x)	<ul style="list-style-type: none"> • Select suitable equipment • Safety in the lab 	
2	The cell – part 1	<ul style="list-style-type: none"> • Cells • The characteristics of life • The microscope • The animal cell • The plant cell 	Chapter 3 (pp. 20–25)		To use a light microscope
3	The cell – part 2	<ul style="list-style-type: none"> • Preparing and viewing slides with aid of microscope 	Chapter 3 (pp. 23–24)	<ul style="list-style-type: none"> • How to write up a laboratory experiment: Apparatus, Procedure, Observation, Conclusion • Labelled diagram 	<ul style="list-style-type: none"> • To prepare a sample of cheek cells • To prepare a sample of onion cells
4	The nature of science	<ul style="list-style-type: none"> • The scientific method • Science in society • Communicating in science 	Chapter 1 (pp. 2–7)	<ul style="list-style-type: none"> • How scientists work • The scientific method • Science in society • Communicating in science 	
5	Measurement in science – part 1	<ul style="list-style-type: none"> • Measurement of length • Measurement of length of a curved line • Measuring larger distances • Measuring area 	Chapter 29 (pp. 276–280)	<ul style="list-style-type: none"> • Selection of suitable equipment • Data collection and recording in a table • Showing calculations 	<ul style="list-style-type: none"> • To measure the length of a curved line • To estimate the area of an irregular shape
6	Measurement in science – part 2	<ul style="list-style-type: none"> • Measurement of volume, time, mass and temperature • Units • Accuracy and precision 	Chapter 29 (pp. 281–288)	<ul style="list-style-type: none"> • Accuracy and precision • Units used in measurement 	
7	Density	<ul style="list-style-type: none"> • Density • Calculating density • Measuring density • Density and flotation 	Chapter 30 (pp. 292–297)	<ul style="list-style-type: none"> • Select suitable equipment • Produce and record data • Select data from a table to predict flotation 	To measure the density of regular- and irregular-shaped objects and liquids

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
8	Materials	<ul style="list-style-type: none"> States of matter Particle theory Properties of states of matter Change of state 	Chapter 16 (pp. 150–159)	<ul style="list-style-type: none"> Scientific models How the particle theory explains properties of solids, liquids and gases 	<ul style="list-style-type: none"> To measure the melting point of benzoic acid To measure the boiling point of a liquid
9	Elements, compounds and mixtures	<ul style="list-style-type: none"> Elements Compounds Mixtures 	Chapter 17 (pp. 160–168)	Evaluating evidence to justify the conclusion that a compound has been formed	To change a mixture of iron and sulfur into iron sulfide
10	Drawing graphs – part 1	<ul style="list-style-type: none"> Drawing axes. Labelling axes Choosing scales on both axes Plotting data Joining points Inserting title 	Chapter 2 (pp. 8–13)	<ul style="list-style-type: none"> Communicating in science Identifying anomalous data 	
11	Speed and displacement	<ul style="list-style-type: none"> Speed Displacement Velocity Distance–time graphs 	Chapter 31	Apply skills to solving problems in unfamiliar contexts	
12	Digestive system – part 1	<ul style="list-style-type: none"> Human nutrition Organisation of multicellular organisms Why do we need a digestive system? The digestive system 	Chapter 4 (pp. 28–31)	A control experiment for comparison, i.e. testing water for glucose	<ul style="list-style-type: none"> To test food for the presence of starch To test food for the presence of glucose
13	Digestive system – part 2	<ul style="list-style-type: none"> Five steps to provide the body with nutrition The teeth Enzymes How the organs of the digestive system interact with each other 	Chapter 4 (pp. 32–33)	<ul style="list-style-type: none"> Use of a fair test Variables: Dependent and independent variables 	To investigate the digestion of starch by the enzyme amylase
14	Circulatory system – part 1	<ul style="list-style-type: none"> Why do we need a circulatory system? Blood Blood vessels 	Chapter 5 (pp. 37–40)	How scientists' ideas are modified over time	
15	Circulatory system – part 2	<ul style="list-style-type: none"> The heart Blood circulation How the organs of the circulatory system interact with each other 	Chapter 5 (pp. 40–43)	<ul style="list-style-type: none"> Hypothesis: If exercise levels are increased it will ___ heart rate Justify hypothesis with results of experiment 	To investigate the effect of rest and exercise on heart rate

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
16	Respiratory system	<ul style="list-style-type: none"> Why do we need a respiratory system? The respiratory system Breathing What is a ventilator? Gaseous exchange How the organs of the respiratory system interact with each other Interactions between the digestive, circulatory and respiratory systems 	Chapter 6 (pp. 46–51)	<ul style="list-style-type: none"> Social and global importance of science in society (example: the ventilator) A fair test 	To investigate carbon dioxide in inhaled air and exhaled air
17	Solutions, crystals and solubility curves – part 1	<ul style="list-style-type: none"> Water as a solvent Dilute and concentrated solutions Crystal formation 	Chapter 18 (pp. 169–172)	<ul style="list-style-type: none"> Select suitable equipment Conduct an investigation 	To grow crystals of copper sulfate
18	Solutions, crystals and solubility curves – part 2	<ul style="list-style-type: none"> Solubility and solubility curves Electrical conductivity 	Chapter 18 (pp. 172–177)	Apply skills to solving problems in unfamiliar contexts (i.e. solubility curves)	<ul style="list-style-type: none"> To investigate the effect of temperature on solubility Plot and interpret solubility curves
19	Separating mixtures – part 1	<ul style="list-style-type: none"> Filtration Evaporation 	Chapter 19 (pp. 178–180)	<ul style="list-style-type: none"> Selection of suitable equipment Design, plan and conduct an experiment 	<ul style="list-style-type: none"> To separate a mixture of water and soil To separate sodium chloride from sodium chloride solution To separate salt from a mixture of sand and salt
20	Separating mixtures – part 2	<ul style="list-style-type: none"> Distillation Chromatography 	Chapter 19 (pp. 180–185)	<ul style="list-style-type: none"> Selection of suitable equipment Design, plan and conduct an experiment 	<ul style="list-style-type: none"> To separate pure water from sea water To separate dyes in ink
TOTAL TIME = 40 hours minimum + time for revision + assessment time + contingency for lost teaching time					

YEAR 2

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
1	Respiration – part 1	<ul style="list-style-type: none"> • Energy • Respiration as a chemical process • Aerobic and anaerobic respiration • Respiration as a biological process 	Chapter 7 (pp. 54–56)		
2	Respiration – part 2	<ul style="list-style-type: none"> • Factors that affect respiration 	Chapter 7 (pp. 56–57)	<ul style="list-style-type: none"> • Hypothesis: The rate of respiration will be optimal at temperature X • Using experimental results, state whether hypothesis is correct or needs modification • Justify conclusion with data 	To investigate how temperature affects the rate of respiration
3	Photosynthesis – part 1	<ul style="list-style-type: none"> • How Earth is dependent on photosynthesis • What is photosynthesis? • How do plants photosynthesise? 	Chapter 8 (pp. 60–62)		
4	Photosynthesis – part 2	<ul style="list-style-type: none"> • The carbon cycle • Factors affecting photosynthesis • Knowledge of photosynthesis and plant yields 	Chapter 8 (pp. 62–66)	<ul style="list-style-type: none"> • Fair test • Control experiment • Global importance of research into plant science to increase food yields 	<ul style="list-style-type: none"> • To show that light is a factor that affects photosynthesis • To show that light intensity affects the rate of photosynthesis
5	Interpreting graphs	<ul style="list-style-type: none"> • Interpreting graphs • Graphs as a source of data 	Chapter 2 (pp. 14–15)	Communicating in science using relevant scientific terminology, e.g. proportional	
6	Acceleration	<ul style="list-style-type: none"> • Acceleration • Measuring acceleration of an object • Acceleration due to gravity 	Chapter 31 (pp. 308–311)	Apply skills to solving problems in unfamiliar contexts	To measure the acceleration of an object
7	Forces – part 1	<ul style="list-style-type: none"> • Measuring forces • Balanced and unbalanced forces • Friction • Weight and gravity • Elastic objects 	Chapter 32 (pp. 315–322)		

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
8	Forces – part 2	<ul style="list-style-type: none"> Elastic objects Hooke's Law 	Chapter 32 (pp. 323–325)	<ul style="list-style-type: none"> Data analysis Identify patterns between data, identify anomalies and draw and justify conclusions Scientific terminology – proportionality 	To investigate the relationship between the extension of a spiral spring and the force applied to it
9	Acids and bases	<ul style="list-style-type: none"> Acids and bases Acid–base indicators pH scale 	Chapter 20 (pp. 186–193)	<ul style="list-style-type: none"> Design, plan and conduct an investigation to show which substances are acids or bases Qualitative data 	To investigate the pH of a variety of materials
10	Chemical reactions – part 1	<ul style="list-style-type: none"> Physical and chemical changes Writing equations Balancing chemical equations 	Chapter 21 (pp. 194–196)	<ul style="list-style-type: none"> Solving problems in unfamiliar contexts Classify a change as physical or chemical 	To investigate if mass is conserved when a physical change occurs
11	Chemical reactions – part 2	<ul style="list-style-type: none"> Law of conservation of mass 	Chapter 21 (pp. 197–203)	<ul style="list-style-type: none"> Making evidence-based conclusions Primary and secondary data Conservation of mass 	To investigate if mass is conserved when a chemical change occurs
12	Energy – part 1	<ul style="list-style-type: none"> Forms of energy Energy conversions Renewable and non-renewable sources of energy 	Chapter 33 (pp. 330–338)	Conduct research; evaluate different sources and secondary data for bias, reliability and relevance	
13	Energy – part 2	<ul style="list-style-type: none"> Sustainable energy use Ethical use of energy Energy efficiency 	Chapter 33 (pp. 339–343)	<ul style="list-style-type: none"> Design, plan and conduct an investigation Select appropriate equipment Review and reflect on skills and thinking used. State how it could be improved 	To build and test a device that converts energy from one form to another
14	Space and the origin of the universe – part 1	<ul style="list-style-type: none"> Identify some celestial bodies 	Chapter 37 (pp. 378–380)		

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
15	Space and the origin of the universe – part 2	<ul style="list-style-type: none"> Describe how celestial bodies are related in solar systems and galaxies The Big Bang as the origin of space and the celestial bodies Evidence behind the Big Bang Comparing the Earth to other planets and moons in the solar system 	Chapter 37 (pp. 381–387)	<ul style="list-style-type: none"> How scientific ideas are modified over time As more information and evidence is gathered, our understanding may need to be modified Select quantitative data from a table and identify patterns and relationships 	
16	Human reproduction – part 1	<ul style="list-style-type: none"> Reproduction The human male reproductive system The human female reproductive system The menstrual cycle The fertile period 	Chapter 9 (pp. 70–74)		
17	Human reproduction – part 2	<ul style="list-style-type: none"> Sexual intercourse and fertilisation Implantation and the development of the baby Birth Breastfeeding Contraception <i>In vitro</i> fertilisation Ethical, medical and societal issues in human reproduction 	Chapter 9 (pp. 74–79)	<ul style="list-style-type: none"> Ethical issues that may arise: contraception, IVF, etc. Societal/ ethical issues with cost of IVF 	
18	Inheritance and variation – part 1	<ul style="list-style-type: none"> Asexual and sexual reproduction DNA Variation 	Chapter 10 (pp. 82–85)		To extract DNA from kiwi fruit
19	Inheritance and variation – part 2	<ul style="list-style-type: none"> Chromosomes and genes Mendelian inheritance Mendelian crosses Pedigree charts/family trees 	Chapter 10 (pp. 86–91)	<ul style="list-style-type: none"> Ethical issues with genetic screening Using pedigree charts 	
20	Rates of reaction – part 1	<ul style="list-style-type: none"> Rates of reactions Factors affecting rate of a reaction Types of reactants 	Chapter 22 (pp. 204–208)	<ul style="list-style-type: none"> Dependent variables and independent variables A fair test 	To investigate the effect of type of reactants on the rate of a reaction

Unit no.	Unit of work (2 hours' class contact time)	Topic	<i>Essential Science</i> 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
21	Rates of reaction – part 2	<ul style="list-style-type: none"> Effect of particle size Effect of concentration 	Chapter 22 (pp. 208–211)	Select quantitative data from a table or a graph and identify patterns and relationships	<ul style="list-style-type: none"> To investigate the effect of particle size on the rate of reaction To investigate the effect of concentration on the rate of reaction
22	Rates of reaction – part 3	<ul style="list-style-type: none"> Effect of temperature Effect of catalyst Rates of biochemical reactions 	Chapter 22 (pp. 212–219)	<ul style="list-style-type: none"> Draw evidence-based conclusions (justify conclusions using data) 	<ul style="list-style-type: none"> To investigate the effect of temperature on the rate of a reaction To investigate the effect of a catalyst on the rate of a reaction
23–25	Extended Experimental Investigations (EEI) – CBA1	<ul style="list-style-type: none"> Meaning of an Extended Experimental Investigation Variables, controls, hypothesis, fair test 	Chapter 41 (pp. 422–428) and online Folens resources	The EEI is designed to synthesise many of the learning outcomes in the NoS strand – in particular, learning outcomes 1, 2, 3, 4, 5 and 7	To carry out an Extended Experimental Investigation (CBA1)
TOTAL TIME = 50 hours' minimum + time for revision + assessment time + contingency for lost time					

Note: Flexibility in the sequencing of the three weeks of the Extended Experimental Investigation (EEI) has been allowed in the above to take account of individual arrangements at school level in terms of when the EEI is carried out. In addition, aspects of the terminology used when carrying out the EEI (e.g. independent variable, dependent variable, control variable, fair test, etc.) may be covered in First Year or early in Second Year according to the type of investigation being carried out by pupils.

YEAR 3

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
1	Ecology and habitat study – part 1	<ul style="list-style-type: none"> • What is ecology? • Populations, communities, habitats and ecosystems • Energy flow in an ecosystem • Flow of matter in an ecosystem 	Chapter 14 (pp. 127–131)		
2	Ecology and habitat study – part 2	<ul style="list-style-type: none"> • Habitat study • Steps in a habitat study • Adaptation, competition and interdependence • Counting populations 	Chapter 14 (pp. 131–138)	The role of science in society; personal, social and global importance	To investigate the frequency of a particular plant species in a habitat
3	Conservation of ecological biodiversity	<ul style="list-style-type: none"> • Species biodiversity and ecological biodiversity • Benefits people get from ecosystems • Loss of ecological biodiversity • Conserving ecological biodiversity • Sustainable global food production 	Chapter 15 (pp. 142–147)	How society influences scientific research	
4	Current electricity – part 1	<ul style="list-style-type: none"> • Current electricity • Conductors and insulators • Circuit diagrams 	Chapter 34 (pp. 348–350)	Analysing qualitative data to classify materials as insulators or conductors	To classify substances into electrical conductors and insulators
5	Current electricity – part 2	<ul style="list-style-type: none"> • Measuring current • Series and parallel • Measuring voltage • Resistance 	Chapter 34 (pp. 351–357)	Analysing qualitatively the relationship between current, voltage and resistance in unfamiliar contexts	<ul style="list-style-type: none"> • To measure current in a circuit • To measure current and voltage at the same time • To measure resistance • To investigate the resistance of a variable resistor
6	Constructing electrical circuits – part 1	<ul style="list-style-type: none"> • Ohms Law 	Chapter 35 (pp. 360–363)	Solving problems in unfamiliar contexts on the relationship between resistance, voltage and current, both quantitatively and qualitatively	To investigate how voltage affects current and to measure resistance
7	Constructing electrical circuits – part 2	<ul style="list-style-type: none"> • Diodes, LDRs Thermistors • Electrical power 	Chapter 35 (pp. 364–367)	Describe qualitatively how changing resistance on LDRs and thermistor affects current flow in a circuit	To investigate the operation of a diode, a light-emitting diode, a light-dependent resistor and a thermistor

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
8	Reactions between acids and bases	<ul style="list-style-type: none"> Common lab acids and bases Neutralisation Acid rain 	Chapter 23 (pp. 220–227)	<ul style="list-style-type: none"> Selecting appropriate instruments to produce more accurate data Precision between results after repeating an experiment 	To titrate hydrochloric acid against sodium hydroxide and prepare a sample of sodium chloride
9	Energy in chemical reactions	<ul style="list-style-type: none"> Heat changes in chemical reactions Activation energy Energy profile diagrams 	Chapter 24 (pp. 228–235)	Analysis of secondary data from a graph or a table	
10	The Earth, sun and moon – part 1	<ul style="list-style-type: none"> Days and seasons Phases of the moon 	Chapter 38 (pp. 392–395)	How scientists' ideas are changed over time due to further research	
11	The Earth, sun and moon – part 2	<ul style="list-style-type: none"> Eclipses Space exploration – benefits and hazards The future of space research 	Chapter 38 (pp. 396–399)	Ethical issues concerning the cost and risk of space research compared with the benefits received	
12	The water cycle, carbon cycle and climate change	<ul style="list-style-type: none"> Water cycle Carbon cycle Global warming 	Chapter 39 (pp. 404–412)	Society influences scientific research	To investigate transpiration in a plant
13	Evolution	<ul style="list-style-type: none"> Variation and diversity Evolution Charles Darwin Natural selection New species 	Chapter 11 (pp. 95–99)	With evidence, scientists' ideas change over time	
14	Human health – part 1	<ul style="list-style-type: none"> Human health Inherited factors Environmental factors A balanced diet and the food pyramid Functions of water in the body 	Chapter 12 (pp. 104–108)	The personal, societal and global importance of science in society	
15	Human health – part 2	<ul style="list-style-type: none"> Food and energy Lifestyle choices 	Chapter 12 (pp. 109–112)	Qualitative analysis of the energy and food types from a food label (critical analysis)	<ul style="list-style-type: none"> To test food for presence of protein To test food for presence of fat

Unit no.	Unit of work (2 hours' class contact time)	Topic	Essential Science 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
16	Microorganisms – part 1	<ul style="list-style-type: none"> • Microorganisms • Viruses including COVID-19 (2nd edition) • Vaccination 	Chapter 13 (pp. 116–120)	<ul style="list-style-type: none"> • How society influences scientific research • The personal, societal and global importance of science in society 	
17	Microorganisms – part 2	<ul style="list-style-type: none"> • Bacteria • Fungi • Food spoilage and avoiding it 	Chapter 13 (pp. 121–124)	Scientific knowledge of food preservation benefits society by reducing food waste	To show that microorganisms are present in air
18	Structure of the atom	<ul style="list-style-type: none"> • The atom • Particles inside atoms • Atomic structure of first 20 elements 	Chapter 25 (pp. 236–241)	The model of the atom changed over time with further research	
19	Periodic Table and writing chemical formulas – part 1	<ul style="list-style-type: none"> • The Periodic Table • Drawing Bohr structures of atoms 	Chapter 26 (pp. 242–246)	Qualitative patterns and relationships between elements on the Periodic Table	
20	Periodic Table and writing chemical formulas – part 2	<ul style="list-style-type: none"> • Using the Periodic Table to predict ratios of atoms in ionic and covalent compounds 	Chapter 26 (pp. 247–257)	Quantitative patterns and relationships between elements on the Periodic Table	
21	A technological application of physics	<ul style="list-style-type: none"> • Meaning of technology • Nuclear fission • Scientific, societal and environmental impact of fission 	Chapter 36 (pp. 371–374)	Research and present information on the contribution that scientists have made to a scientific discovery and invention and its impacts on society	
22	Metals and non-metals	<ul style="list-style-type: none"> • Metals and non-metals • Properties of metals • Properties of non-metals • Alloys 	Chapter 27 (pp. 258–265)	Using qualitative data to identify metals and non-metals	To investigate the conditions necessary for rusting to occur
23	Sustainability – part 1	<ul style="list-style-type: none"> • Meaning of sustainability • The three pillars of sustainability • Sustainability and fossil fuels 	Chapter 28 (pp. 266–270)	Discuss how scientists work and how scientific ideas are modified over time	
24	Sustainability – part 2	<ul style="list-style-type: none"> • Extraction and use of materials – implications for sustainability • Disposal and recycling of materials • Individual contribution to sustainability 	Chapter 28 (pp. 270–274)	<ul style="list-style-type: none"> • How society influences scientific research • The personal, societal and global importance of science in society 	

Unit no.	Unit of work (2 hours' class contact time)	Topic	<i>Essential Science</i> 2 nd edition (chapter & pages)	Link with Nature of Science	Suggested student lab practical work
25–28	Science in Society CBA2 and Science in Society Assessment Task	<ul style="list-style-type: none"> • The Science in Society Assessment Task • Primary and secondary data • Research question • Completing the SEC Science in Society Investigation Task booklet 	Chapter 40 (pp. 417–421) and online Folens resources	The Science in Society CBA2 and Assessment Task is designed to synthesise many of the learning outcomes in the NoS strand – in particular, learning outcomes 1, 2, 4, 6, 7, 8, 9 and 10	
TOTAL TIME = 56 hours' minimum + time for revision + assessment time + contingency for lost time					

Note that examination weeks and revision weeks are not included in the above, as these will occur at different times depending on individual school arrangements. Flexibility in the sequencing of the Science in Society CBA2 and the Science in Society Assessment Task has been allowed in the above to take account of individual arrangements at school level. Please refer to SEC website for closing dates for submission of the Science in Society Assessment Task.