Contents

Science curriculum vision and rationale:

The aim of our Science curriculum is to provide young scientists with opportunities to learn in a creative and diverse way about relevant and real life science in our evolving world. We want our children to become young scientists, who are curious and ask questions; discuss their ideas and findings; have opportunities to learn through a creative and hands on approach; plan, carry out and evaluate relevant experiments and investigations that link to real life; are inspired by a diverse mix of past and present scientists from the real world.

Children's version: Science at St George's provides young scientists with opportunities to learn in a creative and diverse way about relevant and real life science in our evolving world…

Quality mark: As subject leaders, we are working towards achieving the Primary Science Quality Mark (PSQM).

Curriculum Drivers:

1. Reading, Language and Vocabulary development at heart of the curriculum

A range of non-fiction resources and science texts are used to generate questions and give vocabulary in context enabling children to communicate scientifically: orally and in writing. Every lesson should include relevant core science vocabulary (displayed and used) that links to the five enquiry types. Vocabulary is available visually across the school e.g. in displays and all classrooms have a science working wall for this purpose.

2.Experiential learning opportunities, to excite, enthuse and engage. Raising Aspirations.

Every year each year group will take part in at least one science-focused field trip. It is really important that learning is hands-on. All science topics should begin with enquiry based investigations; children generate questions to be explored. All learning objectives are enquiry-based with key questions posed every lesson. Science is regularly and explicitly linked to real world, STEM news/events to develop enthusiasm about the relevance and context of the subject in the real world.

3. Creativity and Innovation. Developing independence, thinking and questioning.

Children are encouraged to be creative, innovative and take risks, while appreciating the importance of trial and error when working scientifically. In science lessons, we aim to develop children's resilience, thinking skills and independent learners who are capable of making informed choices (in their everyday life e.g. healthy eating) and carrying out investigations independently or communicating effectively and scientifically in a group. In science children will learn to hypothesise, test and to draw conclusions and make generalisations from what they have observed and measured. Every year each year group will focus on and learn about a relevant famous scientist (past or present) and consider how their research and work had an impact on modern society. Children will explore and learn about scientists and scientific innovations from different cultures.

4. **Children as teachers,** sharing knowledge. Knowing more and remembering more.

We recognise that when children explain or teach a skill, they have learnt they are more likely to retain it. In science, regular opportunities are provided for children to develop their own scientific knowledge and understanding by sharing what they have learnt, with teachers, parents and peers. This encourages children to question and be questioned, supporting a depth of knowledge and the ability to make connections. Each term there will be a whole-school, science themed event to work towards e.g science week, science fair and 'stay and investigate' (share knowledge/skills with parents).

5. **Valuing each other.** Promoting respect, responsibility tolerance and understanding

Science develops respect for the world, particularly through learning about real life scientists from a range of cultural backgrounds. Children develop respect for themselves and others when learning about nutrition and using practical equipment safely in lessons. Children the importance of science in protecting the environment and fighting against climate change.

All lessons will:

- Have clear objectives
- Over time implement the five enquiry types through F.O.R.I.P
    - **F**air testing
    - **O**bservation over time
    - **R**esearch
    - **I**dentifying and classifying
    - **P**attern seeking
- Pose a question to investigate
- Have vocabulary at the heart
- Include modelling (where appropriate)
- Encourage active learning and gamification
- Will provide opportunities for children to apply skills independently
- Provide rich and useful resources

Science Knowledge and Skills: Foundation Stage

Science Learning					
	Area of Learning	**Exploring the natural and physical world around them**	**Skills and Knowledge we want the children to have at end of EYFS**	**ELG The Natural World**	**FS vocabulary**
FS	Understanding the World Understanding the world involves guiding children to make sense of their physical world and their community. **The frequency and range of children's personal experiences increases their knowledge and sense of the world around them –** from visiting parks, libraries and museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, technologically and **ecologically diverse world.** As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension.	**FS1** Notice changes in weather and wear appropriate clothing. Begin to understand the need to respect and care for the natural environment and all living things. Talk about the differences between materials and changes they notice. **FS2** **Autumn Term** Explore the natural world around them. Describe what they see, hear and feel whilst outside. Changing season **Spring Term** Draw and make observation of the plants and animals Forces they can feel (magnets, water) Changing season Changing matter **Summer Term** Draw and make observation of the plants and animals Changing season Contrasting environments	We want the children to know for Understanding of the World by the time they leave EYFS and enter Y1: 1. Know the town and country they live in (THIS IS GEOGRAPHY) 2. **Know the parts of a plant or animal (Science)** 3. Know the chronology of their life (HISTORY) 4. Know about a celebration in this country and another country (RE)	**.ELG: The Natural World Children at the expected level of development will: - Explore the natural world around them, making observations and drawing pictures of animals and plants; 15 - Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.**	weather seasons trees branches trunk bark alive dead minibeasts plant leaves bulb water sun stem root flower soil fruit blossom Magnets Attract and repel Materials - texture, appearance, change and strengths float/sink Water pressure

Science Knowledge Progression: KS1 - KS2

Strands		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
BIOLOGY	Plants	• identify and name a variety of common wild and garden plants, including deciduous and evergreen trees; • identify and describe the basic structure of a variety of common flowering plants, including trees.	• observe and describe how seeds and bulbs grow into mature plants; • find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	• identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers; • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant; • investigate the way in which water is transported within plants; • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.			
	Animals inc humans	• identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals; • identify and name a variety of common animals that are carnivores, herbivores and omnivores; • describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets); • identify, name, draw and label the basic parts of the human	• notice that animals, including humans, have offspring which grow into adults; • find out about and describe the basic needs of animals, including humans, for survival (water, food and air); • describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	• identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; • identify that humans and some other animals have skeletons and muscles for support, protection and movement.	• describe the simple functions of the basic parts of the digestive system in humans; • identify the different types of teeth in humans and their simple functions; • construct and interpret a variety of food chains, identifying producers, predators and prey.	• describe the changes as humans develop to old age.	• identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood; • recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function; • describe the ways in which nutrients and water are transported within animals, including humans.

Strands		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
		body and say which part of the body is associated with each sense.					
	Living things and their habitats		• explore and compare the differences between things that are living, dead, and things that have never been alive; • identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • identify and name a variety of plants and animals in their habitats, including microhabitats; • describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.		• recognise that living things can be grouped in a variety of ways; • explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment; • recognise that environments can change and that this can sometimes pose dangers to living things.	• describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird; • describe the life process of reproduction in some plants and animals.	• describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals; • give reasons for classifying plants and animals based on specific characteristics.
	Evolution and inheritance						• recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago; • recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents; • identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Strands		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
PHYSICS	Electricity				• identify common appliances that run on electricity; • construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers; • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery; • recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit; • recognise some common conductors and insulators, and associate metals with being good conductors.		• associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit; • compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches; • use recognised symbols when representing a simple circuit in a diagram.
	Forces			• compare how things move on different surfaces; • notice that some forces need contact between 2 objects, but magnetic forces can act at a distance; • observe how magnets attract or repel each other and attract some materials and not others; • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials; • describe magnets as having 2 poles; • predict whether 2 magnets will attract or repel each other,		• explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object; • identify the effects of air resistance, water resistance and friction, that act between moving surfaces; • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.	

Strands		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
				depending on which poles are facing.			
	Seasonal changes	• observe changes across the 4 seasons; • observe and describe weather associated with the seasons and how day length varies.					
	Light			• recognise that they need light in order to see things and that dark is the absence of light; • notice that light is reflected from surfaces; • recognise that light from the sun can be dangerous and that there are ways to protect their eyes; • recognise that shadows are formed when the light from a light source is blocked by an opaque object; • find patterns in the way that the size of shadows change.			• recognise that light appears to travel in straight lines; • use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye; • explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes; • use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
	Sound				• identify how sounds are made, associating some of them with something vibrating; • recognise that vibrations from sounds travel through a medium to the ear; • find patterns between the pitch of a sound and features of the object that produced it; • find patterns between the volume of a sound and the strength of the vibrations that produced it; • recognise that sounds get fainter as the distance from the sound source increases.		

Strands		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
	Earth and Space					• describe the movement of the Earth and other planets relative to the sun in the solar system; • describe the movement of the moon relative to the Earth; • describe the sun, Earth and moon as approximately spherical bodies; • use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	
CHEMISTRY	**Materials**	• distinguish between an object and the material from which it is made; • identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock; • describe the simple physical properties of a variety of everyday materials; • compare and group together a variety of everyday materials on the basis of their simple physical properties.	• identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses; • find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.			• compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets; • know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution; • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating; • give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic; • demonstrate that dissolving, mixing and changes of state are reversible changes;	

Strands		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
						• explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	
	Rocks			• compare and group together different kinds of rocks on the basis of their appearance and simple physical properties; • describe in simple terms how fossils are formed when things that have lived are trapped within rock; • recognise that soils are made from rocks and organic matter.			
	States of matter				• compare and group materials together, according to whether they are solids, liquids or gases; • observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C); • identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.		

Science Skills Progression: KS1 - KS2

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
Predict	Show curiosity about what might happen	Ask and answer simple questions about what might happen (e.g. get hotter, faster) Show understanding of 'fair testing'	Start to frame predictions in scientific language & concepts Start to apply concepts of 'fair testing'	Frame predictions in scientific language & concepts; start to select information to inform these predictions	Draw on other evidence to inform their predictions (e.g. own experience, reading, media) Start to refer to concepts like reliability, significance, replicability	Predict, using evidence, and with reference to concepts like reliability, significance, replicability
Research	Children access simple books, websites, photos, videos and other sources that are given to them	Start to select and use a range of books, websites,photos and other sources to learn about science	Independently select and use sources to satisfy their curiosity about science	Select and use sources to construct their own opinions about science	Select, organise and use information from more than one source to construct an informed response and/or opinion. Explain the usefulness and reliability of different sources	Thoughtfully select, organise and use relevant information from a range of sources to inform responses, justify their opinions, and politely point out the limitations of other people's ideas
Investigate	Make comments about what they are going to explore/ investigate, in a context given to them	Give a brief overview of their plans, in a context given tothem, using some science vocabulary	Verbally explain their plans, in a context given to them,using technical vocabulary and starting to link to different types of scientific enquiry	In a given context they explain their plans in detail, verbally and in writing, using technical vocabulary and linking to types of scientific enquiry Start to link the planning and evaluation stages	Plans make links to previous investigations, and consider the relative merits of different types of scientific enquiry in a context that is given to them (e.g. explaining which might be useful)	Plan scientific enquiries to answer questions of their own, linking to what they have studied, and referring to previous and future investigations
Observe	Begin to use first-hand observation using senses (e.g. qualitative comments, some measurements) Use common words and phrases to talk about science	Use first-hand observations with some simple equipment (e.g. magnifying glass) Use everyday words but in a more precise way; occasionally use scientific vocabulary (see vocabulary section)	Use a range of observation equipment, e.g. microscope, data logging Start choosing simple scientific vocabulary (see below) instead of everyday words	Evaluate own observations and compare them with others' Use scientific vocabulary (see vocabulary section), often appropriately	Work collaboratively by building on others' observations Use scientific vocabulary, explaining how it differs from everyday usage, or from near-synonyms	Start to apply vocabulary in sophisticated ways, for instance in different areas of science, or in other subjects
Ask questions	Ask and answer simple questions about what they have seen/heard	Show curiosity, e.g. voluntarily ask questions about what they have heard, read or observed	Start to frame questions/answers in scientifically valid ways (e.g. about change, difference)	Ask and answer scientifically valid questions (e.g. about contrast, cause and effect, reliability)	Ask/answer valid questions (e.g. significance, confidence, replicability)	Ask/answer perceptive questions (e.g. hypothetical, extrapolatory)

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
Identify, classify and group	Make simple scientific comparisons (e.g. spot the difference between pictures)	Identify differences and similarities in what they observe (perhaps with a given focus)	Start categorising (i.e. suggesting umbrella terms) Start to comment on scientific changes, includingsuggestions about cause and effect	Categorise terms and observations Relate contrasts, changes and trends to scientific content	Make more complex links between the differences and changes they see and the scientific content they have learnt	Make links between what they see and a range of scientific content (e.g. including content from all years)
Measure	Measure to nearest 10cm e.g. with a metre rule painted in 5cm blocks	Measure to nearest cm (and equivalents)	Start to take accurate measurements (e.g. nearest mm,gram, degree) Use simple data-logging equipment	Make estimations and (with help) take systematic and careful measurements (e.g. clear clutter that might affect measurements) Use data loggers	Start to make comments about levels of accuracy (e.g. not measuring a ball throw in mm) Take repeat readings if appropriate	Understand and explain why different levels of accuracy are appropriate
Record and present	Start to make simple recordings during the enquiry process (e.g. lists, tallies) Recount what they've seen or found, or draw a picture	Make more sophisticated recordings during the enquiry process (e.g. frequency tables where the template is given) Explain their findings verbally, through writing, and in age-appropriate graphic form (block diagrams, pictograms, simple tables)	Take simple notes (i.e. abbreviations, simplified grammar) but start to include scientific language. Use jotted tables and diagrams, subdivided lists etc. Explain observations, results and conclusions verbally and in writing, and in age-appropriate graphic form (e.g. bar charts instead of blocks) Use IT to create more complex graphs (e.g. line graph, pie chart)	Take quantitative and qualitative notes that include scientific language Start to make simple calculations during the enquiry process Make selections to present relevant data, observations and conclusions in a variety of ways (e.g. slideshow, vlog, graphic formats) Use age-appropriate graph skills (e.g. time graphs, discrete vs continuous data)	Make clear records of observations and other aspects of the enquiry process (e.g. sketched but labelled diagrams, on-the-cuff calculations) Include relevant background information and evaluation (e.g. evidence base, measurement accuracy, reliability, usefulness) Use labelled diagrams, tables, classification keys, simple scatter graphs)	Explain their choices about where, when and how to record an enquiry. Group and redraft into useful formats like tables, diagrams, flow-charts etc Use a range of presentation forms to show discernment in selection, awareness of audience, and perceptive conclusions Show an awareness of scientific ethics, and display a sensitivity when critiquing others
Interpret and conclude	Using their observations and ideas to suggest answers to questions	Answer questions about their predictions and results (e.g. were they right?)	Start to link results to scientific language and subject knowledge Start to suggest further enquiry questions	Include comments about causal relationships and link these to scientific content	Justify their interpretations with evidence, from their own enquiry but also external sources (e.g. from famous experiments in the past, or from other curriculum areas)	Make comments about reliability of results, replicability, methodology Link their experience to a range of scientific content (i.e. from previous years)

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
Evaluate	Make simple comments about their enquiry experience	Make comments about the method (e.g. were there unforeseen variables?)	Using technical vocabulary, make basic evaluations about their prediction (e.g. was it reasonable?) and methodology (e.g. was it difficult to measure?)	Suggest improvements to their methodology, linking this to scientific knowledge	Start to organise evaluations (e.g. breaking it down into manageable steps) Show some sensitivity/selection in their evaluations (e.g. when critiquing others, or by considering scientific ethics)	Organise evaluations carefully, selecting by relevance and linking to scientific knowledge Show an awareness of scientific ethics, and display a sensitivity when critiquing others

Key Vocabulary

Year 1							
Working scientifically	**Skills**	**Presentation**	**Equipment**	**Plants**	**Animals including humans**	**Seasonal changes**	**Materials**
up/down near close to old(er) new(er) far further high(er) above centre low(er) underneath below equal to	guess explore test see/sight smell hear touch feel senses	list tally table template notes sketch	(egg) timer clock ruler tape measure metre stick/rule beaker scissors magnifying glass mirror	leaf/leaves flower/blossom trunk branch stem stalk petal root soil fruit berry seed bulb food	common animals wild tame pets fish bird reptile baby cub pup nest family egg mouth	weather hot cold wind rain snow ice seasons (autumn winter spring summer) day length month year	object material wood plastic glass metal water rock rough smooth bright/shiny cloudy dull/dim strong/weak

more/less than larger/smaller most/least half whole area same/different point group nearly roughly position direction clockwise distant pattern research non-fiction event question/answer					neck eyes teeth wing claw tail beak fur feather fin scales		waterproof bendy/stiff soft/hard see-through melt freeze boil burn

Year 2							
Working scientifically	**Skills**	**Presentation**	**Equipment**	**Plants**	**Animals including humans**	**Living things and their habitats**	**Materials**
left right beyond represents stands for exact(ly) nearest distance contains	gather collect notice link describe predict result conclude contrast	record(ing) pictogram tally chart block diagram Venn diagram jottings plan	equipment stop-watch pipette beaker syringe weight thermometer measuring scales tube	growth seedling shoot mature healthy wither earth (i.e. soil) nutrients structure	amphibian mammal adult young toddler child teenager develop insect	(micro)habitat (and name some eg log, pond) microscopic environment surroundings conditions (and describe eg damp, dark)	man-made natural suitable useful function purpose property rust transparent

property appearance similarity difference symmetrical fractions amount scale fair test document strategy	order value rank sort		tweezer net insect viewer pooter	function germinate pollination seed dispersal	live young brain heart lungs skeleton bones eyebrows wrist ear lobe (etc)	life cycle food chain food source predator prey variety produce reproduce suited adapted	reflection rigid flexible solid liquid molten gas boiling point heat pressure

Year 3							
Working scientifically	**Skills**	**Presentation**	**Equipment**	**Plants**	**Animals including humans**	**Forces**	**Light**
corresponding equivalent group positive/negative quantity round up/down approximate(ly) remainder data logger obstacle outcome impact relationship necessary evidence fact/opinion	estimate observe organise identify assume compare interpret disprove infer clarify introduce	present findings abbreviations frequency table bar charts Carroll diagram flow chart grid database row column subdivisions	apparatus hand lens hour-glass microscope measuring protractor compass	absorb fertiliser transported pollination seed formation carpel stigma style ovary ovule stamen anther filament sepal pollen	(in)vertebrates offspring survival childhood/babyhood/ adulthood brain heart vein/artery skull ribs spine/backbone joints sockets bones muscles contraction tendons	force gravity friction spring air resistance streamlined force-meter Newton meter magnet(ic) attract repel compress North/South pole bar/ring/button/horse -shoe magnet iron copper	light source (and names e.g. torch) light wave reflect(ive) mirror block/absorb opaque transparent

data hypothesis theory case study primary/secondary source					windpipe	aluminium steel brass nickel	

Year 4							
Working scientifically	**Skills**	**Presentation**	**Equipment**	**Animals including humans**	**Living things and their habitats**	**Electricity**	**Sound**
increase/decrease factor negative numbers base spherical, cylindrical etc - i.e. 3D shape terminology for description concave convex translation rotation origin statistics typical exception unique intricate trend precise accurate comparative systematic	classify classify categorise hypothesise critique summarise	communicate time graphs 'and other graphs' quantitative/qualitative plot continuous/grouped and discrete data format	aquarium Pasteur pipette forceps	digestive system digestion saliva oesophagus stomach small/large intestine rectum anus faeces excrete chemical breakdown gastric juices reabsorb reabsorption endoskeleton exoskeleton	classification key (in)vertebrates mould fungus organism population deforestation pollution positive/negative human impact variation biome vegetation region dominant environmental anemometer barometer	electrical device appliances circuit components conductor resister symbol cell battery wire bulb switch buzzer motor connection complete/close/open circuit positive/negative crocodile clip alligator clip	sound source wave noise vibrate/vibration pollution pitch volume dynamic echo tuning fork tone muffle mute soundproof

convention reliability							

Year 6							
Working scientifically	**Skills**	**Presentation**	**Animals including humans**	**Living things and their habitats**	**Evolution and inheritance**	**Electricity**	**Light**
recurring proportion ratio radius diameter circumference concentric arc intersecting plane cross-section appropriate accuracy degree of trust robust authentic plausible controversy stance bias tertiary source	determine attribute analyse corroborate discern epitomise characterise extrapolate	pie charts mean four quadrants	circulatory system blood vessels capillaries red/white blood cells plasma haemoglobin clotting respiratory system respire carbon dioxide air sacs (de)oxygenated aerobic ventricles aorta trachea diaphragm bronchi bronchioles alveoli pulmonary vein/artery gaseous exchange	(micro)organism species	microbes evolution evolutionary change natural selection adaptation competition genes (dominant /recessive) DNA chromosomes inherit(ance) survival of the fittest fossil records	simple/series/parallel circuits terminal voltage power current resistance wire types (plain, nichrome, copper, fuse, florist's)	transmission optics refraction geocentric + heliocentric model of the universe