Scheme of work: Environment, evolution and inheritance

This resource provides guidance for teaching component 2: Environment, evolution and inheritance from our new Entry Level Certificate Science. It is based on the specification (5960).
The scheme of work is designed to be a flexible medium term plan for teaching content and development of the skills that will be assessed. We have provided it in Word format to help you create your own teaching plan – you can edit and customise it according to your needs. This scheme of work is not exhaustive; it only suggests activities and resources you could find useful in your teaching.

3.2 Component 2 – Biology: Environment, evolution and inheritance

Spec ref.	Summary of the specification content	Learning outcomes *What most students should be able to do*	Suggested timing (hours)	Opportunities to develop Scientific Communication skills	Opportunities to develop and apply practical and enquiry skills	Resources
3.2.1 **O1**	The Sun as the source of energy and the role of plants in photosynthesis.	Recall that the sun is the source of energy for living organisms. Describe how green plants and algae trap sunlight energy and use it to make glucose. Recall that this makes them producers. Recall the word equation for photosynthesis.	1-2	Use scientific vocabulary correctly. Watch BBC clip about photosynthesis - discuss the chemicals involved. Card sort the word equation for photosynthesis Photosynthesis (teachitscience.co.uk)	TDA (Teacher-devised assignment) opportunity: Investigate the rate of photosynthesis in pond weed eg how light intensity affects oxygen production in *Cabomba* (by measuring the volume of gas or by counting O_2 bubbles)	What is photosynthesis? - BBC Bitesize How to measure photosynthesis - BBC Bitesize
O2	Animals and plants may be adapted for survival in the conditions where they normally live	Explain how different organisms are adapted when shown an image or description.	2	Use scientific vocabulary correctly. Use the clip to identify different adaptations to environments to for hot and cold-adapted plant and animals.	TDA opportunity: Investigate the use of choice chambers eg using woodlice or maggots.	https://www.bbc.co.uk/bitesize/clips/z8sjxnb

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				Identify three features from pictures of adapted organisms with an explanation for the advantage eg seal - blubber = insulation	Research a selection of heat/cold adapted organisms.	
O3	Food chains and webs	Recall the stages of a simple food chain starting with a producer. Describe the food chains in a food web and the links between species in the web.	1	Use scientific vocabulary correctly. Draw simple food chains for selected habitats on whiteboards using BBC clip as source material. Card sort stages of food chains into the correct order and then construct simple food webs as a group. Use AQA Teachit KS4: *Predator, Prey and Populations* to demonstrate interdependence.		Food chains - Food chains and food webs - KS3 Biology Revision - BBC Bitesize Food chains and food webs - KS3 Biology - BBC Bitesize Predator, prey and populations (teachitscience.co.uk)

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O4	Decomp-osition and recycling	Recall that decay is a stage in the food chain/web process. Explain that microorganisms are responsible for decay and return carbon to the atmosphere to be used by plants in photosynthesis.	2 (plus time for TDA task(s) results)	Use scientific vocabulary correctly. Time lapse film of decaying fruit: list ways in which decay could be slowed/avoided. Complete the Teachit Carbon Cycle jigsaw	TDA opportunity: Investigating the temperature change as grass clippings decay. TDA opportunity: Investigate the conditions in which bread goes mouldy.	Time lapse film of decaying fruit Carbon cycle jigsaw

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3.2.2 **O5**	Competition	Recall that plants often compete with each other for light, space, water and nutrients. Recall that animals often compete with each other for food, mates and territory.	1	Use scientific vocabulary correctly. Group plan a TDA and discuss predictions and results. Use Bitesize to discuss the competition between red and grey squirrels in the UK over time. Produce a poster to record the research activity	TDA opportunity: Compare the growth of plants at different planting densities Research competition between animals for a mate eg stags, peacock.	Biotic factors - data - Adaptations, interdependence and competition - AQA - GCSE Combined Science Revision - AQA Trilogy - BBC Bitesize
O6	Environment-al changes	Describe how animals and plants are affected by living and non-living factors that alter their environments. Recall a living and non-living factor that could alter an environment eg rainfall, average temperature, competitors and predators	1	Discuss the kinds of pressures that environments put upon their inhabitants (and vice-versa). Brainstorm different living and non-living factors. Card match factor and consequences.	TDA opportunity: Compare the distribution of plants in trodden/non trodden areas (using a quadrat and transect) eg football field	Experimental methods using quadrats and transects - Organisation of an ecosystem - AQA - GCSE Combined Science Revision - AQA Trilogy - BBC Bitesize

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				Use AQA Teachit KS4: '*Plant Pops'* as an indoor substitute for quadrat sampling.		Teachit Science - 'plant pops'
O7 ***cf 3.4.4 O9*** ***3.4.5 O10***	Pollution and the effects of human population growth	Recall that water can be polluted by sewage, fertiliser or toxic chemicals. Recall that air can be polluted by smoke and gases such as sulfur dioxide which can cause acid rain. Recall that landfill and toxic chemicals such as pesticides and herbicides contribute to land and water pollution. Describe how rapid human population growth leads to more resource use and more waste.	2	Work as a group to produce poster presentations about the major sources of pollution. Use film clips and presentations as basis for discussion about what humans need to do to reduce their impact on the environment. Compare images of pollution around the world and match the cause with the result. Role play activity where some students are big business and others are environmentalists trying to prevent pollution in an area eg Limestone enquiry role-play (SATIS).	Research one of acid rain, eutrophication, sea pollution etc TDA opportunity: Compare water samples from the inner city and the countryside. TDA opportunity: Compare the quality of water from different sources eg running and still water.	BBC Bitesize - Fossil fuels and the environment BBC Bitesize - How oil spills damage wildlife and the environment BBC Bitesize - Pollution, acid rain and the environment BBC Bitesize - Water pollution and deforestation Science and Technology in Society 6 | STEM

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3.2.3 **O8**	Evolution, natural and artificial selection	Recall Darwin's theory that all living things evolved from simple life forms. Describe how the fossil record is evidence for this. Describe how fossils form. Recall that in natural selection, individuals with characteristics most suited to their environment are most likely to survive and breed. Recall that artificial selection is the process by which humans breed plants and animals for particular traits. Describe examples of animals and plants artificially selected for human requirements.	2	Use scientific vocabulary correctly. Brainstorm facts about Darwin and evolution then watch film clip Examine and discuss a selection of fossils and pictures of fossils. Use AQA Teachit KS4: *Beak Shape* to carry out the beak shapes investigation Produce a mock newspaper article to describe the changes in population of the peppered moth. Produce an information leaflet about the pros and cons of selective breeding. Images of different dogs.	Make fossil casts from plaster of Paris Distribute coloured/ camouflaged 'butterflies' around classroom to demonstrate adaptation/mutation and survival. Research the distribution of the	Evolution of life on Earth - KS3 Biology - BBC Bitesize Evidence of evolution - rock fossils - Evolution - AQA - GCSE Combined Science Revision - AQA Trilogy - BBC Bitesize Teachit Science - Beak shapes investigation Natural selection and survival of the fittest - KS3 Biology - BBC Bitesize BBC Bitesize -

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				Students 'breed' and name a new dog from selecting any 2 – draw a picture of their new breed. Debate: Should people artificially select which animals/plants can breed?	peppered moth and write about it. Research selective breeding of eg racehorses, cattle or food plants.	Lemurs and evolution Natural and artificial selection in racehorses - KS3 Biology - BBC Bitesize
O9	Sexual and asexual reproduction	Recall that sexual reproduction involves the joining of male and female sex cells. Recall that sexual reproduction involves the mixing of genetic information and so variation in the offspring. Recall that asexual reproduction involves only one parent. Recall that, in asexual reproduction, there is only one set of genetic information. Recall that these identical offspring are called clones.	2	Compare the details of human fertilisation versus plant fertilisation (discussion/table) Produce table to compare sexual and asexual reproduction. Discuss advantages of asexual reproduction in producing crops eg potatoes.	Produce new plants asexually by leaf or stem cuttings/ runners/bulbs etc. Microscope observations of yeast budding/amoeba splitting.	BBC Bitesize - Human fertilisation BBC - Pollination and transportation Asexual and Sexual Reproduction - Bing video

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					TDA opportunity: Compare plants grown from runners with their parent plant and each other eg mint, strawberries.	
O10	Human genetics	Recall that a cell has cytoplasm and a nucleus that controls the actions of the cell. Recall that the genetic material in the nucleus of a cell is DNA. Recall that DNA is contained in chromosomes. Recall that chromosomes carry genes that control the characteristics of the human body.	2	Use scientific vocabulary correctly; carry out 'close' activity and matching task worksheet. Recap the structure of a cell (cytoplasm, nucleus). Use AQA Teachit KS3: *Chromosomes, genes and DNA* to illustrate the nucleus and genetic material inside. Use AQA Teachit KS3: *Characteristics snap* to illustrate variation. Compare pictures of male and female chromosome pairs and spot the difference.	Extract DNA from fruits or fish eggs. TDA opportunity: Investigate whether or not two characteristics are linked, eg. Finger length and height. Research the use of genetic engineering in treatment of diabetes and cystic fibrosis(see clip)	Teachit Science - chromosomes, genes and DNA Nuffield Foundation - Extracting DNA from living things Teachit Science - characteristics snap BBC Bitesize - sex chromosomes BBC Bitesize - Global warming resistant GM crops

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		Recall that humans have 23 pairs of chromosomes. One pair determines sex, XX for female and XY for male. Recall that in genetic engineering, genes can be cut from chromosomes and transferred into the cells of other organisms. Recognise that there are risks and benefits in genetic engineering.		Card game to look at probability of which sex. Debate/produce poster to show arguments for and against use of genetic engineering. Use AQA Teachit KS3: *Reproduction and inheritance – question hunt* to consolidate understanding.		https://www.bbc.co.uk/bitesize/clips/z69n34j Teachit Science - Reproduction and inheritance