2021-22 CURRICULUM MAP FOR SCIENCE YEAR 11

HALF TERM 1:

Forces

1. Define and give examples of scalar and vector quantities.
2. Weight is the force acting on an object due to gravity. The force of gravity close to the Earth is due to the gravitational field around the Earth. W=mg.
3. Use free body diagrams to describe qualitatively examples where several forces lead to a resultant force on an object, including balanced forces when the resultant force is zero.
4. A single force can be resolved into two components acting at right angles to each other. Use vector diagrams to illustrate resolution of forces (HT)
5. The work done by a force on an object can be calculated using the equation: work done = force x distance. Describe the energy transfer involved when work is done.
6. Explain why, to change the shape of an object (by stretching, bending or compressing), more than one force must be applied – limited to stationary objects only. Calculate force = spring constant x extension and elastic potential energy = 0.5 x spring constant x $(\text{extension})^2$
7. Draw distance–time and velocity-time graphs from measurements and extract and interpret lines and slopes of graphs, translating information between graphical and numerical form.
8. Describe the forces affecting a falling object.
9. Explain Newtons' Laws.
10. Describe factors that affect thinking distance, braking distance and stopping distance.
11. Estimate the forces involved in the deceleration of road vehicles. (HT)
12. Use the concept of momentum as a model to describe and explain examples of momentum in an event, such as a collision. (HT)

Ecology

1. The Sun is a source of energy that passes through ecosystems- describe different levels of organisation in an ecosystem
2. Materials including carbon and water are continually recycled by the living world. Being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis.
3. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to conditions, both abiotic and biotic.
4. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way.
5. Explore how humans are threatening biodiversity as well as the natural systems that support it. Consider some actions we need to take to ensure our future health, prosperity and well-being.
6. A range of experimental methods (such as transects and quadrats) are used by ecologists to determine the distribution and abundance of species in an ecosystem.

Read the Clean Air Act.
Read articles about the causes and effects of the greenhouse effect.
Read about programmes that could help to maintain biodiversity and sustainability.

Required practical activity 7: Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.

Required practical activity 18: investigate the relationship between force and extension for a spring.

Required practical activity 19: investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force.

Class survey of characteristics – collate results in a table and produce a display of the results in appropriate format.
Research methods used by the police/council to determine whether motorists are speeding.
How can police investigators determine the speed of vehicles before a crash?
Explain why areas of tropical rain forest are being cleared. Present a bias of choice to suit the article for or against deforestation.
Prepare a newspaper article for either: a scientific journal, tabloid newspaper or environmental news.

Georgaphy- global warming, climate change, air pollution. Sustainable resources. Reduce Reuse Recycle.
Maths –Recall and apply equation. Recognise and be able to use the symbol for proportionality $\propto$. Paralleogram of force- Use angular measures in degrees. Interpret data from an investigation of the relationship between force. Gradients and tangents. Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Appropriate number of significant figures.

2020-21 CURRICULUM MAP FOR SCIENCE YEAR 11

HALF TERM 2:

Organic Chemistry

1. Describe what crude oil is and how it forms.
2. Explain how fractional distillation works in terms of evaporation and condensation.
3. Explain how the properties of hydrocarbons depend on the size of their molecules, including boiling point, viscosity and flammability. These properties influence how hydrocarbons are used as fuels.
4. Describe the complete and incomplete combustion of hydrocarbon fuels.
5. Hydrocarbons can be broken down (cracked) to produce smaller, more useful molecules. Cracking can be done by various methods including catalytic cracking and steam cracking.
6. Alkenes are more reactive than alkanes and react with bromine water, which is used as a test for alkenes. Alkenes are used to produce polymers and as starting materials for the production of many other chemicals.

Chemical analysis

1. Describe how melting point and boiling point data can be used to distinguish pure substances from mixtures.
2. Describe purpose of a formulation and give examples.
3. Explain how chromatography can be used to separate mixtures and calculate the Rf value.
4. Describe the test for hydrogen, oxygen, carbon dioxide and chlorine.

Inheritance, Variation & Evolution

1. Compare sexual and asexual reproduction.
2. Describe the composition of the genetic material in the nucleus. The genome of an organism is the entire genetic material of that organism.
3. Most characteristics are a result of multiple genes interacting, rather than a single gene. Complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees.
4. Some disorders are inherited. Polydactyly (having extra fingers or toes) is caused by a dominant allele. Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele.
5. 22 chromosome pairs control characteristics only, but one of the pairs carries the genes that determine sex. In females the sex chromosomes are the same (XX). In males the chromosomes are different (XY).
6. Describe how variation generated by mutations/ sexual reproduction is the basis for natural selection and how species evolve. Describe Darwin's theory.
7. Explain the impact of selective breeding of food plants and domesticated animals.
8. Describe the main steps in the process of genetic engineering. Explain the potential benefits and risks of genetic engineering (HT).
9. Describe the evidence for evolution including fossils and antibiotic resistance in bacteria. Explain how mutations of bacterial pathogens produce new strains.
5. Describe factors which may contribute to the extinction of a species.

Read articles about crimes scenes using chromatography as an analytical technique. Reading and extracting key information on the selective breeding, genetic engineering, designer babies, extinction and evolution.

Required practical activity 11: Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity.

Required practical activity 12: Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.

The impact on fuels, feedstocks and petrochemicals of the depleting stocks of crude oil.
Class discussion- Would you want to know if you had a genetic predisposition to illness that could be linked to environment? Eg, high cholesterol levels in family.
Debate: Should people be allowed to breed dogs?
Role play: life without antibiotics

Technology – link to advances in new technology used in extracting materials.
Consider the social, economic and environmental implications of advances in technology over the centuries.
Industry- catalysts and their uses in industry.
Cultural and environmental impact of the oil industry around the world.
History- Research the work of Le Chatelier or the life of Fritz Haber. Highlight the moral ambiguity of Haber's work.
Geography- human migration patterns and fossil records.
Health and social care – antibiotic resistance and cleaning practices in Britain's hospitals.
Religious Studies- evolution, genetic engineering, designer babies.
Health & social care- IVF, genetic screenign and disorders. Economic, social and ethical issues concerning embryo screening.
Maths- Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction.

2020-21 CURRICULUM MAP FOR SCIENCE YEAR 11

6. Describe Linnaeus and Carl Woese classification system of living. 7. Describe how evolutionary trees are a method used by scientists to show how they believe organisms are related.		Understand the terms mean, mode and median and calculate arithmetic means.
HALF TERM 3: Chemistry of atmosphere 1. Describe the Earth's early atmosphere - how the atmosphere was formed, changed and developed over time. 2. Describe the greenhouse effect and the interactions of short and long wavelength radiation with matter. 3. Describe the scale, risk and environmental implications of global climate change and population. Develop solutions that help to reduce the impact of human activity. The Earth's resources 1. Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, need to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. 2. Describe the process to make water potable. 3. Phytomining uses plants to absorb metal compounds. The plants are harvested and then burned to produce ash that contains metal compounds. Bioleaching uses bacteria to produce leachate solutions that contain metal compounds. (HT) 4. Develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment. 5. Life cycle assessments (LCAs) are carried out to assess the environmental impact of products in each of these stages 6. Study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised. Waves 1.Waves may be either transverse or longitudinal- describe how they travel. 2. Define amplitude, wavelength and frequency. 3. Describe methods to measure the speed of sound waves in air, and the speed of ripples on a water surface. 4. Electromagnetic (transverse) waves form a continuous spectrum and all electromagnetic wave travel at the same velocity through a vacuum or air. Describe how waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency. 5. Construct ray diagrams to illustrate the refraction of a wave. 6. Different wavelengths of electromagnetic waves are reflected, refracted, absorbed or transmitted differently by different substances and types of surface. (HT). Use wave front diagrams to explain refraction in terms of the change of speed that happens when a wave travels from one medium to a different medium. (HT) 7. Ultra-violet waves, X-rays and gamma rays can have hazardous effects on human body tissue. The effects depend on the type of radiation and the size of the dose. Radiation dose (in Sieverts) is a measure of the damage caused by the radiation in the body.	   	Reports about climate change global warming, initiatives that encourage the population to reuse and recycling, Role of charities in providing potable water to third world countries. Required practical activity 13: analysis and purification of water samples from different sources, including pH, dissolved solids and distillation. Required practical activity 20: Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements. Research the process of peer review in reporting results/data. Evaluate the use of models for predicting climate change. Evaluate the reliability of the data available on the internet. Why can I get TV signal at home but not a mobile phone signal? Research the first radio communication sent across the Atlantic. Does sunbathing cause cancer? Are sunbeds safer than sunbathing? Georgaphy- evolution of atmopshere, global warming, climate change, air pollution. Sustainable resources. Reduce Reuse Recycle. Maths - Balancing equations. Recall and apply equation. Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Appropriate number of significant figures. Extract and interpret information about resources from charts, graphs and tables. Use orders of magnitude to evaluate the significance of data. Music- pitch / frequency of sound Media/communication/ security- use of waves

2020-21 CURRICULUM MAP FOR SCIENCE YEAR 11

10. Describe the applications of electromagnetic waves have many practical applications. Explain why each type of electromagnetic wave is suitable for the practical application. (HT)		
HALF TERM 4: Biology – Paper 1 1. Cell biology 2. Organisation 3. Infection and response 4. Bioenergetics Chemistry – paper 1 1. Atomic structure and the periodic table 2. Bonding, structure, and the properties of matter 3. Quantitative chemistry 4. Chemical changes 5. Energy changes Physics – Paper 1 1. Energy 2. Electricity 3. Particle model of matter 4. Atomic structure Biology – Paper 2 1. Homeostasis and response 2. Inheritance, variation and evolution 3. Ecology	   	• Written exam: 1 hour 15 minutes • Foundation and Higher Tier • 70 marks • 16.7% of GCSE
HALF TERM 5: Chemistry – paper 2 1. The rate and extent of chemical change 2. Organic chemistry 3. Chemical analysis 4. Chemistry of the atmosphere 5. Using resources Physics – Paper 2 1. Forces 2. Waves 3. Magnetism and electromagnetism	   	• Written exam: 1 hour 15 minutes • Foundation and Higher Tier • 70 marks • 16.7% of GCSE