KS5 Curriculum Overview: Environmental Science year 13 paper 1						
Term / Length of Unit	**Outline**	**Assessment**	**Home Learning**	**Communication skills**	**Numeracy**	**End Points**
Autumn 1 Paper 1 Research methods	Research methods include details of the methods used to investigate a wide range of environmental issues. It is not expected that students will have first hand experience of all of these although, where this is possible, it will enhance their learning experience. The required practical skills are detailed in Appendix A: Working scientifically and opportunities for developing these skills are signposted throughout the subject content. Students must understand the general principles of scientific methodology and be able to apply these to a wide range of environmental situations and techniques. Preliminary studies may be used to ensure the study will produce representative data. Practical activities should be carried out with	**Mid and End of unit assessments, year 13 and final exam at A level**	**Each student is provided with a booklets of pass paper exam questions to be completed weekly Addition reading up and addition notes and research on each topic covered in class**	Wider Reading and Models • Guided Reading using curriculum press, academic magazines and books to support wider knowledge • Academic texts from curriculum press and Google Scholar used for analysis • Key term list for topic • Extended writing • Essay annotations (past student work)	Students could estimate mean percentage vegetation cover using data from a range of quadrats. Students could use appropriate numbers of significant figures in calculations of population, soil composition and reservoir mass in biogeochemical cycles. Students could calculate mean population densities of ground flora from quadrat survey data. Students could represent a range of variables collected along a transect in a table, eg population density, % cover, biodiversity, light levels, humidity. Students could assess the probability of a link between changes in an abiotic factor and species distribution. The principles of sampling and data collection are fundamental to all the practical skills. Students could calculate mean values wherever multiple samples are collected and use standard deviation to assess the degree of scatter of values and the	Knowledge **Sampling techniques** **Standard environmental techniques** **Fieldwork and laboratory activities** **Specialist techniques** **Working scientifically** Where appropriate, the research methods included in Section 3.7 can be incorporated into the required methodologies and sampling techniques included in Appendix A: Working scientifically, of which students must have first hand experience. The methodologies and sampling techniques of which students must have experience should not be carried out in isolation. They should be set in a clear environmental context, as exemplified throughout the other sections of the specification.

	consideration of their environmental impacts and how these can be minimised. Students must undertake experimental and investigative activities, including appropriate risk management, in a range of environmental contexts. They must also know how to safely and correctly use a range of practical equipment and materials. Students must carry out practical activities using the best contemporary practices for risk assessment and safe working in the laboratory and during fieldwork.				significance of difference between means. Students could construct and interpret a scatter graph Students could use the t-test to assess the effect of different tree planting densities on abiotic factors, e.g. humidity, wind velocity. Students could use a preliminary study to establish an appropriate sample size for a specific level of sample variability. Students could use ecological algebraic formulae, eg Simpson's index of biodiversity or the Lincoln index. Students could construct kite diagrams of abundance along a transect. Students could use data tables from field studies to construct line graphs of changing variables along a transect. Students could construct a line graph of mean seed germination rates for a range of pHs.	

Autumn 1 and 2 Paper 1 Energy	The importance of energy resources in both past and future developments in society should be analysed. The impact of future energy supply problems should be evaluated. Students should understand how improvements in technology can provide increasing amounts of energy from sustainable sources. Quantitative data should be used to compare and evaluate new and existing technologies.	**Mid and End of unit assessments, year 13 and final exam at A level**	**Each student is provided with a booklets of pass paper exam questions to be completed weekly Addition reading up and addition notes and research on each topic covered in class**	Wider Reading and Models • Guided Reading using curriculum press, academic magazines and books to support wider knowledge • Academic texts from curriculum press and Google Scholar used for analysis • Key term list for topic • Extended writing • Essay annotations (past student work)	Students could convert between joules, watts, kWh and MWh when carrying out calculations. Students could carry out calculations using numbers in standard and ordinary form, eg when comparing production of different energy resources. Students could calculate surface area to volume ratios and relate this to heat loss. Students could use V^3 in wind power calculations. Students could find the mean of a range of data, eg mean power output of a wind farm. Students could represent a range of data in a table with clear headings, units and consistent decimal places, eg to compare the energy density, production cost, carbon intensity and mean load factor for a range of energy resources. Students could interpret data from a variety of graphs, eg change in electricity cost from renewable energy sources, industrial output and level of financial incentives/tax over a number of years. Students could construct a scatter graph of per capita energy use and mean GDP.	<u>Knowledge</u> **The importance of energy supplies in the development of society** **The impact of the features of energy resources on their use** Students should understand that each energy resource has its own features which make it applicable to particular uses. Technologies in current use often developed to match them to the available energy resources. New energy technologies may need additional technologies to be fully usable, eg storage. **Strategies to secure future energy supplies** Students should analyse and evaluate key issues and quantitative data to evaluate the potential future contribution of each energy resource. Evaluation of improved extraction/harnessing/processing technologies related to a range of energy technologies Students should understand how specific technologies increase the usability of each energy resource. New energy conservation technologies

					Students could calculate national energy use from population and individual use data. Students could use and manipulate equations, eg energy conversion efficiency. Students could use data on wind velocities in the formula used to calculate kinetic energy available to an aerogenerator. Students could calculate the power outputs of HEP stations with different flow rates and head of water. Students could construct a Sankey diagram to represent energy resources, uses and efficiency for a country. Students could construct a radar diagram to show variations in wind direction. Students could predict/sketch the shape of a graph with a linear relationship, e.g. the relationship between isolation and solar panel output. Students could use a tangent to measure the gradient of a point on a curve, e.g. rate of heat loss through double glazing with varying gaps.	Improvements in the efficiency of energy use enable the same activities to be carried out with less energy. **Transport energy conservation** **Building energy conservation** **Industrial energy conservation**

					Students could calculate the surface area and volume of cylinders or spheres, eg to estimate rates of heat loss in energy conservation programmes.	
Spring 1 and 2 Pollution	Students should understand how the properties of materials and energy forms interact to result in environmental change. They should apply this knowledge to suggest solutions to minimise current pollution problems and prevent future problems. Students should apply their understanding through a range of different historic and contemporary pollution events.	**Mid and End of unit assessments, year 13 and final exam at A level**	**Each student is provided with a booklets of pass paper exam questions to be completed weekly Addition reading up and addition notes and research on each topic covered in class**	Wider Reading and Models • Guided Reading using curriculum press, academic magazines and books to support wider knowledge • Academic texts from curriculum press and Google Scholar used for analysis • Key term list for topic • Extended writing • Essay annotations (past student work)	Students could calculate percentage yields, e.g. in pollution control. Students could use a calculator to find and use logarithmic values for noise levels. Students could use the term probability appropriately when investigating casual relationships such as the link between human health problems and urban pollutants. Students could analyse data collected using random or systematic sampling, e.g. Simpson's index of diversity to compare the biodiversity of habitats exposed to different pollution types. Students could use the chi-squared test to assess the impacts of different pesticides on non-target insect species. Students could calculate the standard deviation of tropospheric ozone levels in a city.	<u>Knowledge</u> **The properties of pollutants** Students should consider how the properties of pollutants affect behaviour in the environment, their harmful impacts and the strategies that can be used to minimise problems. **How environmental features affect the severity of pollution** Students should use examples to explain how environmental features affect the behaviour of pollutants and the severity of pollution caused. **Factors that affect dispersal** Students should understand the effect of point and diffuse sources on the dispersal and concentration of pollutants.

					Students could convert between the logarithmic dB scale and linear scales of relative sound pressure. Students could interpret a 3-D graph of fish mortality at different concentrations of a toxic metal and different pHs. Students could demonstrate their understanding that data may be presented in a number of formats and be able to use these data, eg dissolved oxygen levels expressed numerically as percentage saturation or mg l^{-1} and in table or graphical form. Students could select an appropriate format for presenting data, bar charts, histograms, graphs and scatter graphs, e.g. organic matter and oxygen depletion in water. Students could read the intercept point from a graph to find the temperature at which oxygen levels fall too low to support particular aquatic species. Students could calculate rates of temperature change with altitude in the atmosphere, in the context of photochemical smogs.	**Environmental factors that affect rates of degradation** Students should understand how environmental features can affect the chemical changes to pollutants, including the changes that convert primary pollutants to secondary pollutants. **Strategies to control pollutants based on their properties and features of the environment** **Principles of control** Selection of control technologies: to reduce production, reduce release and mitigate damage caused Students should consider the following pollutants to identify their properties to analyse their environmental impacts and to plan control strategies Students should understand the properties of pollutants and environmental features so they can analyse and evaluate the changes in human activities and strategies that can be used to minimize pollution. ***Smoke/PM10 (Particulate matter less than 10 microns in diameter)***

						Acid precipitation Oxides of nitrogen (NO x) Hydrocarbons Carbon monoxide Thermal pollution Oil pollution Pesticides **<u>Nutrient pollution</u>** Inorganic nutrients: nitrates and phosphates Organic nutrient pollutants **<u>Acid mine drainage</u>** *Heavy metals* Lead Mercury Solid wastes **<u>Noise</u>** **The sources and control of noise** Students should be able to explain how different control methods can be used to control noise in a wide range of situations. **Aircraft noise** **Railway noise** Road traffic noise Industrial noise Domestic noise ***Ionising radiation*** The use of scientific knowledge to develop new pollution control technologies

						Students should understand that a wide range of new technologies is available to provide better control of pollution.
Summer 1 Revision and exam	Revision on physical environment, energy and pollution topics	**Exam question practice and revision note checking Mid and End of unit assessments, year 13 and final exam at A level**	**Each student is provided with a booklets of pass paper exam questions to be completed weekly Addition reading up and addition notes and research on each topic covered in class**	Wider Reading and Models • Guided Reading using curriculum press, academic magazines and books to support wider knowledge • Academic texts from curriculum press and Google Scholar used for analysis • Key term list for topic • Extended writing • Essay annotations (past student work)	Revision of maths skills and exam questions ready for the A level	<u>Knowledge</u> Recap over the content of the course and revisit any areas that students require further understanding
Summer 2 EXAM						