| **AQA**  **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** | **Opportunities to link Careers to the Curriculum** |
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| Lesson 1 | Project Launch lesson | Students should have an understanding of the context of the project and driving question. | 1 | Summarise key roles and responsibilities of job opportunity within the STEM sector.  Read and annotate anchor text article on wind power. | Use the internet to obtain information on different job roles in STEM sector | Opportunity to bring employers in the classroom through launch event.  Students develop employability skills to develop a real-world project.  Research task to develop understanding of career opportunities in energy sector and individual skills audit. |
| Lesson 2  4.9.2.3 Global climate change | An increase in average global temperature is a major cause of climate change. There are several potential effects of global climate change. | Students should be able to: • describe briefly four potential effects of global climate change • discuss the scale, risk and environmental implications of global climate change. • evaluate the quality of evidence in a report about global climate change given appropriate information • describe uncertainties in the evidence base • recognise the importance of peer review of results and of communicating results to a wide range of audiences. | 1 | Develop glossary of new vocabulary.  Read and annotate scientific texts  Evaluate the use of models for predicting climate change. | Evaluate evidence and analyse data from reports on global climate change. | Link impact of global climate change to changing priorities and career opportunities within the energy sector. |
| Lesson 3  4.9.2.1 Greenhouse gases and  4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere and  4.9.2.4 The carbon footprint and its reduction | Greenhouse gases in the atmosphere maintain temperatures on Earth high enough to support life. Water vapour, carbon dioxide and methane are greenhouse gases.  Some human activities increase the amounts of greenhouse gases in the atmosphere. These include: • carbon dioxide • methane. Based on peer-reviewed evidence, many scientists believe that human activities will cause the temperature of the Earth’s atmosphere to increase at the surface and that this will result in global climate change. However, it is difficult to model such complex systems as global climate change. This leads to simplified models, speculation and opinions presented in the media that may be based on only parts of the evidence and which may be biased.  The carbon footprint is the total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event. The carbon footprint can be reduced by reducing emissions of carbon dioxide and methane. | Students should be able to describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter  Students should be able to recall two human activities that increase the amounts of each of the greenhouse gases carbon dioxide and methane.  Students should be able to: • describe actions to reduce emissions of carbon dioxide and methane • give reasons why actions may be limited | 1 | Describe how greenhouse gases are produced.  Describe the effect of greenhouse gases on wavelength. | Use the internet to obtain data for concentrations of greenhouse gases.  Evaluate the reliability of the data available on the internet. | Link impact of global climate change to changing priorities and career opportunities within the energy sector. |
| Lesson 4  4.9.3.1 Atmospheric pollutants from fuels and  4.9.3.2 Properties and effects of atmospheric pollutant | The combustion of fuels is a major source of atmospheric pollutants. Most fuels, including coal, contain carbon and/or hydrogen and may also contain some sulphur. The gases released into the atmosphere when a fuel is burned may include carbon dioxide, water vapour, carbon monoxide, sulphur dioxide and oxides of nitrogen. Solid particles and unburned hydrocarbons may also be released that form particulates in the atmosphere.  Carbon monoxide is a toxic gas. It is colourless and odourless and so is not easily detected. Sulphur dioxide and oxides of nitrogen cause respiratory problems in humans and cause acid rain. Particulates cause global dimming and health problems for humans | Students should be able to: • describe how carbon monoxide, soot (carbon particles), sulphur dioxide and oxides of nitrogen are produced by burning fuels • predict the products of combustion of a fuel given appropriate information about the composition of the fuel and the conditions in which it is used.  Students should be able to describe and explain the problems caused by increased amounts of these pollutants in the air. | 1 | Describe how common air pollutants are formed and their effects on human health and the environment.  Develop key scientific vocabulary. | Analyse data on air pollution and evaluate the impact of air pollution. | Connect learning to industry project and relevance of curriculum to a real-world context. |
| Lesson 5  and 6 | Project development | Opportunity for students to connect relevance of learning to driving question and begin to develop resources to include in their final product. | 2 | Students work collaboratively to summarise information in resources and develop presentation skills.  Students give written and verbal peer feedback. | Use the internet to research information on renewable energy. | Link skills used in project development in context of lessons and industry.  Link skills and team roles to jobs in industry.  Opportunity to bring employers into the classroom to give feedback on first drafts of resources. |
| Lesson 7  4.10.1.1  Using the Earth's resources and sustainable development | Finite resources from the Earth, oceans and atmosphere are processed to provide energy and materials. Chemistry plays an important role in improving agricultural and industrial processes to provide new products and in sustainable development, which is development that meets the needs of current generations without compromising the ability of future generations to meet their own needs. | Students should be able to  • distinguish between finite and renewable resources given appropriate information  • extract and interpret information about resources from charts, graphs and tables | 1 | Define the terms:   * finite * renewable.   Explain the differences between the two terms using suitable examples. | Use the internet to obtain information on different job roles in STEM sector.  Analyse data on Earth’s resources to inform scientific conclusions. | Connect learning to industry project and relevance of curriculum to a real-world context.  Link skills and team roles to jobs in industry.  Develop understanding of career opportunities within STEM industries. |
| Lesson 7a  4.10.3.1 Corrosion and its prevention and 4.10.3.3 Ceramics, polymers and composites | Corrosion is the destruction of materials by chemical reactions with substances in the environment. Rusting is an example of corrosion. Both air and water are necessary for iron to rust. Corrosion can be prevented by applying a coating that acts as a barrier, such as greasing, painting or electroplating.  Most composites are made of two materials, a matrix or binder surrounding and binding together fibres or fragments of the other material, which is called the reinforcement. | Students should be able to: • Describe conditions which cause rusting and prevention methods.  -Name examples of common alloys.  Describe experiments and interpret results to show that both air and water are necessary for rusting  Students should be able to recall some examples of composites.  explain how the properties of materials are related to their uses and select appropriate materials. | 1 | Comprehension task to summarise key properties and uses for different materials | Research task to inform selection of materials.  Optional rusting practical experiment. | Connect learning to industry project and relevance of curriculum to a real-world context and STEM Careers. |
| Lesson 7b (Chemistry only)  4.10.3.3 Ceramics, polymers and composites | The properties of polymers depend on what monomers they are made from and the conditions under which they are made. For example, low density (LD) and high density (HD) poly(ethene) are produced from ethene. Thermosoftening polymers melt when they are heated. Thermosetting polymers do not melt when they are heated. | Students should be able to: • explain how low density and high density poly(ethene) are both produced from ethene • explain the difference between thermosoftening and thermosetting polymers in terms of their structures. | 1 | Using diagrams, describe the structure of the following polymers:   * thermosoftening * thermosetting.   Use these diagrams and descriptions to explain why the following happens when heated:   * thermosoftening polymers melt   thermosetting polymers do not melt. |  | Connect learning to industry project and relevance of curriculum to a real-world context. |
| Lesson 8  4.10.2.1 Life cycle assessment and 4.10.2.2 Ways of reducing the use of resources | The reduction in use, reuse and recycling of materials by end users reduces the use of limited resources, use of energy sources, waste and environmental impacts. Metals, glass, building materials, clay ceramics and most plastics are produced from limited raw materials. Much of the energy for the processes comes from limited resources. Obtaining raw materials from the Earth by quarrying and mining causes environmental impacts. Some products, such as glass bottles, can be reused. Other products cannot be reused and so are recycled for a different use. | Students should be able to evaluate ways of reducing the use of limited resources, given appropriate information | 1 | Describe what a LCA is using a suitable example.  Use information to interpret the LCA of a given material or product.  Discuss the negative issues relating to LCAs and why caution should be used when using them.  Discuss the issues relating to using limited resources to generate energy. | Use internet and scientific texts to develop a LCA | Connect learning to industry project and relevance of curriculum to a real-world context.  Link finite resources to changing priorities and career opportunities within the energy sector. |
| Lesson 9 | Final Project development | Student should complete their final product to answer the driving question. | 1 | Students work collaboratively to summarise information in resources and develop presentation skills. | Use the internet to research information on renewable energy | Students develop employability skills to develop a real-world project. |
| Lesson 10 celebration event. |  | Student present their project presentation to an external audience. | 1 | Develop presentation skills. | Opportunity to evaluate other student projects. | Opportunity to bring employers in the classroom for celebration event.  Students develop employability skills to develop a real-world project. |
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