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| **AQA TRILOGY Chemistry (8464) from 2016 Topics T5.6 The rate and extent of chemical change** | | | | |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **5.6.1 Rate of reaction** | Calculate the rate of a chemical reaction over time, using either the quantity of reactant used or the quantity of product formed, measured in g/s, cm3/s or mol/s |  |  |  |
| Draw and interpret graphs showing the quantity of product formed or reactant used up against time and use the tangent to the graph as a measure of the rate of reaction |  |  |  |
| **HT ONLY: Calculate the gradient of a tangent to the curve on the graph of the quantity of product formed or reactant used against time and use this as a measure of the rate of reaction** |  |  |  |
| Describe how different factors affect the rate of a chemical reaction, including the concentration, pressure, surface area, temperature and presence of catalysts |  |  |  |
| ***Required practical 11:*** *investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced, change in colour or turbidity* |  |  |  |
| Use collision theory to explain changes in the rate of reaction, including discussing activation energy |  |  |  |
| Describe the role of a catalyst in a chemical reaction and state that enzymes are catalysts in biological systems |  |  |  |
| Draw and interpret reaction profiles for catalysed reactions |  |  |  |
| **5.6.2 Reversible reactions and dynamic equilibrium** | Explain what a reversible reaction is, including how the direction can be changed and represent it using symbols: A + B ⇌ C + D |  |  |  |
| Explain that, for reversible reactions, if a reaction is endothermic in one direction, it is exothermic in the other direction |  |  |  |
| Describe the State of dynamic equilibrium of a reaction as the point when the forward and reverse reactions occur at exactly the same rate |  |  |  |
| **HT ONLY: Explain that the position of equilibrium depends on the conditions of the reaction and the equilibrium will change to counteract any changes to conditions** |  |  |  |
| **HT ONLY: Explain and predict the effect of a change in concentration of reactants or products, temperature, or pressure of gases on the equilibrium position of a reaction** |  |  |  |

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| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **5.7.1 Carbon compounds as fuels and feedstock** | Describe what crude oil is and where it comes from, including the basic composition of crude oil and the general chemical formula for the alkanes |  |  |  |
| State the names of the first four members of the alkanes and recognise substances as alkanes from their formulae |  |  |  |
| Describe the process of fractional distillation, state the names and uses of fuels that are produced from crude oil by fractional distillation |  |  |  |
| Describe trends in the properties of hydrocarbons, including boiling point, viscosity and flammability and explain how their properties influence how they are used as fuels |  |  |  |
| Describe and write balanced chemical equations for the complete combustion of hydrocarbon fuels |  |  |  |
| Describe the process of cracking and state that the products of cracking include alkanes and alkenes and describe the test for alkenes |  |  |  |
| Balance chemical equations as examples of cracking when given the formulae of the reactants and products |  |  |  |
| Explain why cracking is useful and why modern life depends on the uses of hydrocarbons |  |  |  |

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| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **5.7.1 Carbon compounds as fuels and feedstock** | Describe what crude oil is and where it comes from, including the basic composition of crude oil and the general chemical formula for the alkanes |  |  |  |
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| Describe trends in the properties of hydrocarbons, including boiling point, viscosity and flammability and explain how their properties influence how they are used as fuels |  |  |  |
| Describe and write balanced chemical equations for the complete combustion of hydrocarbon fuels |  |  |  |
| Describe the process of cracking and state that the products of cracking include alkanes and alkenes and describe the test for alkenes |  |  |  |
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| **Crude Oil** | | | | |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **5.7.1 Carbon compounds as fuels and feedstock** | Describe what crude oil is and where it comes from, including the basic composition of crude oil and the general chemical formula for the alkanes |  |  |  |
| State the names of the first four members of the alkanes and recognise substances as alkanes from their formulae |  |  |  |
| Describe the process of fractional distillation, state the names and uses of fuels that are produced from crude oil by fractional distillation |  |  |  |
| Describe trends in the properties of hydrocarbons, including boiling point, viscosity and flammability and explain how their properties influence how they are used as fuels |  |  |  |
| Describe and write balanced chemical equations for the complete combustion of hydrocarbon fuels |  |  |  |
| Describe the process of cracking and state that the products of cracking include alkanes and alkenes and describe the test for alkenes |  |  |  |
| Balance chemical equations as examples of cracking when given the formulae of the reactants and products |  |  |  |
| Explain why cracking is useful and why modern life depends on the uses of hydrocarbons |  |  |  |

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| **AQA TRILOGY Chemistry (8464) from 2016 Topics T5.8 Chemical analysis** | | | | |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **5.8.1 Purity, formulations and chromatograph & 5.8.2 ID of gases** | Define a pure substance and identify pure substances and mixtures from data about melting and boiling points |  |  |  |
| Describe a formulation and identify formulations given appropriate information |  |  |  |
| Describe chromatography, including the terms stationary phase and mobile phase and identify pure substances using paper chromatography |  |  |  |
| Explain what the Rf value of a compound represents, how the Rf value differs in different solvents and interpret and determine Rf values from chromatograms |  |  |  |
| ***Required practical 12:*** *investigate how paper chromatography can be used to separate and tell the difference between coloured substances (inc calculation of Rf values)* |  |  |  |
| Explain how to test for the presence of hydrogen, oxygen, carbon dioxide and chlorine |  |  |  |

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| **AQA TRILOGY Chemistry (8464) from 2016 Topics T5.8 Chemical analysis** | | | | |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **5.8.1 Purity, formulations and chromatograph & 5.8.2 ID of gases** | Define a pure substance and identify pure substances and mixtures from data about melting and boiling points |  |  |  |
| Describe a formulation and identify formulations given appropriate information |  |  |  |
| Describe chromatography, including the terms stationary phase and mobile phase and identify pure substances using paper chromatography |  |  |  |
| Explain what the Rf value of a compound represents, how the Rf value differs in different solvents and interpret and determine Rf values from chromatograms |  |  |  |
| ***Required practical 12:*** *investigate how paper chromatography can be used to separate and tell the difference between coloured substances (inc calculation of Rf values)* |  |  |  |
| Explain how to test for the presence of hydrogen, oxygen, carbon dioxide and chlorine |  |  |  |

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| **AQA Chemistry (8462) from 2016 Topics C4.9 Chemistry of the atmosphere** | | | | |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **4.9.1 The composition and evolution of the Earth's atmosphere** | Describe the composition of gases in the Earth's atmosphere using percentages, fractions or ratios |  |  |  |
| Describe how early intense volcanic activity may have helped form the early atmosphere and how the oceans formed |  |  |  |
| Explain why the levels of carbon dioxide in the atmosphere changes as the oceans were formed |  |  |  |
| State the approximate time in Earth's history when algae started producing oxygen and describe the effects of a gradually increasing oxygen level |  |  |  |
| Explain the ways that atmospheric carbon dioxide levels decreased |  |  |  |
| **4.9.2 Carbon dioxide and methane as greenhouse gases** | Name some greenhouse gases and describe how they cause an increase in Earth's temperature |  |  |  |
| List some human activities that produce greenhouse gases |  |  |  |
| Evaluate arguments for and against the idea that human activities cause a rise in temperature that results in global climate change |  |  |  |
| State some potential side effects of global climate change, including discussing scale, risk and environmental implications |  |  |  |
| Define the term carbon footprint and list some actions that could reduce the carbon footprint |  |  |  |
| **4.9.3 Common atmospheric pollutants and their sources** | Describe the combustion of fuels as a major source of atmospheric pollutants and name the different gases that are released when a fuel is burned |  |  |  |
| 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 |  |  |  |
| Describe the properties and effects of carbon monoxide, sulfur dioxide and particulates in the atmosphere |  |  |  |
| Describe and explain the problems caused by increased amounts of these pollutants in the air |  |  |  |

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| **AQA Chemistry (8462) from 2016 Topics C4.10 Using resources** | | | | |
| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **4.10.1 Using the Earth's resources and obtaining potable water** | State what humans use Earth's resources for, give some examples of natural resources that they use |  |  |  |
| Define the term finite and distinguish between finite and renewable resources |  |  |  |
| Explain what sustainable development is and discuss the role chemistry plays in sustainable development, including improving agricultural and industrial processes |  |  |  |
| State examples of natural products that are supplemented or replaced by agricultural and synthetic products |  |  |  |
| Discuss the importance of water quality for human life, including defining potable water |  |  |  |
| Describe methods to produce potable water, including desalination of salty water or sea water and the potential problems of desalination |  |  |  |
| ***Required practical 13:*** *analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.* |  |  |  |
| Describe waste water as a product of urban lifestyles and industrial processes that includes organic matter, harmful microbes and harmful chemicals |  |  |  |
| Describe the process of sewage treatment and compare the ease of obtaining potable water from waste water as opposed to ground or salt water |  |  |  |
| **HT ONLY: Name and describe alternative biological methods for extracting metals, including phytomining and bioleaching** |  |  |  |
| **HT ONLY: Evaluate alternative methods for extracting metals** |  |  |  |
| **4.10.2 Life cycle assessment and recycling** | Describe, carry out and interpret a simple comparative life cycle assessment (LCA) of materials or products |  |  |  |
| Discuss the advantages and disadvantages of LCAs |  |  |  |
| Carry out simple comparative LCAs for shopping bags made from plastic and paper |  |  |  |
| Discuss how to reduce the consumption of raw resources and explain how reusing and recycling reduces energy use (inc environmental impacts) |  |  |  |