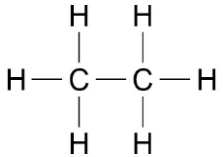
Meden School Curriculum Planning							
Subject	Chemistry	**Year Group**	10	**Sequence No.**	5	**Topic**	Energy Changes and Organic Chemistry (C5&C7)

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
C5 KS3 – Year 8- Applications of chemistry. Introduced to exothermic and endothermic reactions. Examples and uses of these reactions. Introduced to activation energy as the energy required for a reaction to progress.	**C5** **L1: Exothermic and Endothermic reactions** Energy is conserved in chemical reactions. The amount of energy in the universe at the end of a chemical reaction is the same as before the reaction takes place. If a reaction transfers energy to the surroundings the **product** molecules must have less energy than the **reactants**, by the amount transferred. An **exothermic** reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases. Exothermic reactions include **combustion**, many **oxidation** reactions and **neutralisation**. Everyday uses of exothermic reactions include self-heating cans and hand warmers. An **endothermic** reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases. Endothermic reactions include **thermal decompositions** and the reaction of citric acid and sodium hydrogen carbonate. Some sports injury packs are based on endothermic reactions. Students should be able to: • distinguish between exothermic and endothermic reactions on the basis of the temperature change of the surroundings • evaluate uses and applications of exothermic and endothermic reactions given appropriate information.	Respiration is an exothermic reaction. This is why you heat up when you exercise, as your cells respire more. Photosynthesis is an endothermic reaction.

C7 KS3 – Year 9 – Using resources. Introduced to the formation of crude oil and the uses of crude oil for fuels and feedstock. Crude oil is made of hydrocarbons (compounds made of hydrogen and carbon only). Combustion is a reaction between fuel and oxygen. The combustion of alkanes produces water and carbon dioxide	**L2: Temperature change required practical** **Required practical activity 10**: investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals. AT skills covered by this practical activity: chemistry AT 1, 3, 5 and 6. **L3: Reaction profiles** Chemical reactions can occur only when reacting particles collide with each other and with sufficient energy. The minimum amount of energy that particles must have to react is called the **activation energy**. Reaction profiles can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction. Students should be able to: • draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions showing the relative energies of reactants and products, the activation energy and the overall energy change, with a curved line to show the energy as the reaction proceeds • use reaction profiles to identify reactions as exothermic or endothermic • explain that the activation energy is the energy needed for a reaction to occur. **L4 + 5: Bond energy (HT only)** During a chemical reaction: • energy must be supplied to break bonds in the reactants • energy is released when bonds in the products are formed. The energy needed to break bonds and the energy released when bonds are formed can be calculated from **bond energies**. The difference between the sum of the energy needed to break bonds in the reactants and the sum of the energy released when bonds in the products are formed is the overall energy change of the reaction. In an exothermic reaction, the energy released from forming new bonds is greater than the energy needed to break existing bonds. In an endothermic reaction, the energy needed to break existing bonds is greater than the energy released from forming new bonds. Students should be able to calculate the energy transferred in chemical reactions using bond energies supplied.	

	C7 **L6: Alkanes** Most of the hydrocarbons in crude oil are hydrocarbons called **alkanes**. The general formula for the **homologous series** of alkanes is C_nH_{2n+2} The first four members of the alkanes are methane, ethane, propane and butane. Alkane molecules can be represented in the following forms: C_2H_6 or  Students should be able to recognise substances as alkanes given their formulae in these forms. Students do not need to know the names of specific alkanes other than methane, ethane, propane and butane. **L7: Properties of alkanes** Some 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. Students should be able to recall how boiling point, viscosity and flammability change with increasing molecular size. The **combustion** of hydrocarbon fuels releases energy. During combustion, the carbon and hydrogen in the fuels are **oxidised**. The complete combustion of a hydrocarbon produces carbon dioxide and water. Students should be able to write balanced equations for the complete combustion of hydrocarbons with a given formula. Knowledge of trends in properties of hydrocarbons is limited to: • boiling points • viscosity • flammability. **L8: Crude oil** Crude oil is a **finite** resource found in rocks. Crude oil is the remains of an ancient **biomass** consisting mainly of **plankton** that was buried in mud. Crude oil is a **mixture** of a very large number of **compounds**. Most of the compounds in crude oil are **hydrocarbons**, which are molecules made up of hydrogen and carbon atoms only.	

	L9: Fractional distillation The many **hydrocarbons** in crude oil may be separated into **fractions**, each of which contains molecules with a similar number of carbon atoms, by **fractional distillation**. The fractions can be processed to produce fuels and **feedstock** for the petrochemical industry. Many of the fuels on which we depend for our modern lifestyle, such as petrol, diesel oil, kerosene, heavy fuel oil and liquefied petroleum gases, are produced from crude oil. Many useful materials on which modern life depends are produced by the petrochemical industry, such as solvents, lubricants, polymers, detergents. The vast array of natural and synthetic carbon compounds occur due to the ability of carbon atoms to form families of similar compounds. Students should be able to explain how fractional distillation works in terms of **evaporation** and **condensation**. Knowledge of the names of other specific fractions or fuels is not required. **L10 + 11: Cracking** 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. Students should be able to describe in general terms the conditions used for catalytic cracking and steam cracking. The products of cracking include alkanes and another type of hydrocarbon called **alkenes**. Alkenes are more reactive than alkanes and react with bromine water, which is used as a test for alkenes. Students should be able to recall the colour change when bromine water reacts with an alkene. There is a high demand for fuels with small molecules and so some of the products of cracking are useful as fuels. Alkenes are used to produce **polymers** and as starting materials for the production of many other chemicals. Students should be able to balance chemical equations as examples of cracking given the formulae of the reactants and products. Students should be able to give examples to illustrate the usefulness of cracking. They should also be able to explain how modern life depends on the uses of hydrocarbons. (Students do not need to know the formulae or names of individual alkenes.)	BP estimated the world had 1.7297 trillion barrels of crude oil remaining at the end of 2018. At the current usage rate, that is only enough oil to last another 47 years (from 2021). The fractional distillation of organic substances played an important role in the 9th-century works attributed to the Islamic alchemist Jabir ibn Hayyan Meden school blazers and ties are made of a polymer called polyester. The world now produces more than 380 million tonnes of plastic every year. As the demand for plastic increases so does the demand for crude oil and cracking.