**C1.1 - Fundamentals**

1. **Explain why the group 1 metals (Lithium, Sodium and Potassium) all have similar properties. Compare this to group 0 elements (the noble gases) and explain their lack of reactivity.**

*The group 1 metals all have one electron in their outermost electron shell. This makes all of the group 1 metals reactive; all of the group 1 metals want to lose an electron to have a full outer shell. The outermost electron shell is closer in lithium than potassium, so it’s easier to lose the outermost electron from the potassium atom and potassium is therefore more reactive. Group 0 elements already have a full outer shell and so don't need to lose or gain electrons. Because they already have a full outer electron shell they are unreactive.*

**C1.2 – Rocks and their uses**

1. **Evaluate the social, economic and environmental impacts of quarrying limestone.**

*Social aspects: Quarrying limestone can be a good thing because the hole afterwards could be filled with water and used for watersports. However, the local roads will be filled with heavy goods lorries, and the quarry would be an eyesore. Economic aspects: Selling the limestone would bring money to the area, people would gain jobs and workers would spend money in the local area. A disadvantage would be that some businesses would have to close because of the building, and property prices would fall as nobody would want to live by a quarry. The environmental advantages include that as you are producing building materials close to where they are needed, you are reducing the amount of pollution created in transporting the material. The disadvantages include the dust production (causing asthma) and the huge energy requirement meaning lots of fossil fuels will be burnt, which will increase carbon dioxide emissions which would cause acid rain.*

**C1.3 – Metals and their uses**

1. **What is a metal ore, and what are the advantages and disadvantages of extracting metals from metal ores compared to recycling?**

*A metal ore is a rock deposit with enough of a metal compound in it to make it economically worthwhile to extract. Extracting metals from their ore needs a lot of electricity (meaning lots of fossil fuels need to be burnt, resulting in greater carbon dioxide emissions and more global warming), quarrying can create dust pollution and create an eyesore, and the process is much more expensive than recycling. Recycling is environmentally cleaner and needs far less energy. Extracting metal from ores creates jobs and is an effective way of dealing with growing demand for some metals, such as copper, titanium and aluminium.*

**C1.4 – Crude oil**

1. **Explain how crude oil is separated and describe the negative effects burning of fossil fuels.**

*Crude oil is separated by fractional distillation. This method heats the crude oil and different length hydrocarbon chains evaporate and can be collected at different temperatures. The smallest fractions evaporate at the lowest temperatures. Burning fossil fuels causes global warming, global dimming and acid rain. Combustion of fossil fuels produces carbon dioxide. Carbon dioxide contributes to the global warming effect. As there is a small amount of sulphur in fossil fuels, burning them produces sulphur dioxide gas. Sulphur dioxide gas dissolves in rain water to produce sulphuric acid, which falls as acid rain. Acid rain can cause the destruction of buildings and create acidic soil which plants can't grow in. Finally, the unburnt carbon in fossil fuels is released into the atmosphere as black soot and causes global dimming as well as asthma.*

**C1.5 – Products from oil**

1. **Ethanol can be produced by the continuous process (hydration of ethene) or the batch process (fermentation of sugar). Evaluate the two methods of ethanol production.**

*The continuous process is very quick, cheap once you've built a production plant, and you don't have to stop the process at any stage - it can run for 24 hours a day. The disadvantages are that the production plant is expensive to start up, meaning only some countries can afford it, and the raw material is ethene which comes from crude oil, a non-renewable raw material. The batch process uses a renewable energy resource (sugar) and it is very cheap to set-up. However, the process is slow, expensive to run in the long term, has to be stopped once a batch is completed to remove the alcohol and add fresh yeast, and the product is not 100% pure as CO2 is also produced.*

**C1.6 – Plant oils**

1. **Describe how a mixture of oil and water can be made into an emulsion.**

*Oil and water are immiscible liquids, they do not mix. To allow them to mix you add an emulsifier, such as mustard, egg yolk or washing liquid. An emulsifier molecule has a water loving (hydrophilic) head and a water hating (hydrophobic) tail. The hydrophilic head dissolves in the water and the hydrophobic tail dissolves in the oil. This allows molecules of oil and water are allowed to mix, which is called an emulsion.*

**C1.7 – Changing Earth**

1. **The Earth is approximately 4.5 billion years old. Describe and explain how the Earth’s atmosphere has changed since the Earth was only a few million years old.**

*The early atmosphere had a high content of water vapour, carbon dioxide and ammonia. Over millions of years, trees and plants evolved to convert the carbon dioxide to oxygen in photosynthesis. So, over time the carbon dioxide level has decreased and the oxygen level has increased. Nitrifying bacteria and lightening strikes have fixed the ammonia into elemental nitrogen. So, over time the ammonia level has decreased and the nitrogen level has increased. Over the past 4.5 billion years the earth has cooled, and the water vapour has condensed to form seas and lakes.*