

**GCSE Science**



**Module C2 – Material Choices**

**What you should know**

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|  **Name:** **Science Group:** **Teacher:** |

**R.A.G. each of the statements to help focus your revision:**

*R = Red: I don’t know this A = Amber: I partly know this G = Green: I know this*

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| **C2.1 How do we measure the properties of materials and why are the results useful?** | **R.A.G.** |
| I can interpret information about how solid materials can differ with respect to properties such as melting point, strength (in tension or compression), stiffness, hardness and density |  |
| I can relate properties to the uses of materials such as plastics, rubbers and fibres |  |
| I can relate the effectiveness and durability of a product to the materials used to make it |  |
| I can interpret information about the properties of materials such as plastics, rubbers and fibres to assess the suitability of these materials for particular purposes. |  |

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| **C2.2 Why is crude oil important as a source of new materials such as plastics and fibres?** | **R.A.G.** |
| I can recall that the materials we use are chemicals or mixtures of chemicals, and include metals, ceramics and polymers |  |
| I can recall that materials can be obtained or made from living things, and give examples such as cotton, paper, silk and wool |  |
| I can recall that there are synthetic materials that are alternatives to materials from living things |  |
| I can recall that raw materials from the Earth’s crust can be used to make synthetic materials |  |
| I can interpret representations of rearrangements of atoms during a chemical reaction |  |
| I understand that in a chemical reaction the numbers of atoms of each element must be the same in the products as in the reactants |  |
| I can recall that crude oil consists mainly of hydrocarbons, which are chain molecules of varying lengths made from carbon and hydrogen atoms only |  |
| I can recall that only a small percentage of crude oil is used for chemical synthesis and that most is used as fuels |  |
| I understand that the petrochemical industry refines crude oil by fractional distillation; hydrocarbons are separated into fractions of different boiling points, to produce fuels, lubricants and the raw materials for chemical synthesis |  |
| I can relate the size of the forces between hydrocarbon molecules to the size of the molecules |  |

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| **C2.2 Why is crude oil important as a source of new materials such as plastics and fibres? *Continued*** | **R.A.G.** |
| I can relate the strength of the forces between hydrocarbon molecules in crude oil to the amount of energy needed for them to break out of a liquid and form a gas, and to the temperature at which the liquid boils |  |
| I understand that some small molecules called monomers can join together to make very long molecules called polymers, and that the process is called polymerisation |  |
| I can recall two examples of materials that, because of their superior properties, have replaced materials used in the past. |  |

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| **C2.3 Why does it help to know about the molecular structure of materials such as plastics and fibres?** | **R.A.G.** |
| I understand that it is possible to produce a wide range of different polymers with properties that make them each suited to a particular use |  |
| I understand how the properties of polymers depend on how their molecules are arranged and held together |  |
| I can relate the strength of the forces between the molecules in a polymer to the amount of energy needed to separate them from each other, and therefore to the strength, stiffness, hardness and melting point of the solid |  |
| I understand how modifications in polymers produce changes to their properties to include modifications such as:a. increased chain length |  |
| b. cross-linking |  |
| c. the use of plasticizers |  |
| **d. increased crystallinity** |  |

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| **C2.4 What is nanotechnology and why is it important?** | **R.A.G.** |
| I can recall that nanotechnology involves structures that are about the same size as some molecules |  |
| I understand that nanotechnology is the use and control of structures that are very small (1 to 100 nanometres in size) |  |
| I understand that nanoparticles can occur naturally (for example in seaspray), by accident (for example as the smallest particulates from combustion of fuels), and by design |  |
| I understand that nanoparticles of a material show different properties compared to larger particles of the same material, and that one of the reasons for this is the much larger surface area of the nanoparticles compared to their volume |  |
| I understand that nanoparticles can be used to modify the properties of materials, and give examples including:a. the use of silver nanoparticles to give fibres antibacterial properties |  |
| b. adding nanoparticles to plastics for sports equipment to make them stronger |  |
| I understand that some nanoparticles may have harmful effects on health, and that there is concern that products with nanoparticles are being introduced before these effects have been fully investigated |  |

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| **Grades A\* - C (Higher)** | All statements shown in **bold** as well as all statements shown in normal type. |
| **Grades C – G (Foundation)** | All statements shown in normal type. |