Science Subject Audit 2022-23  
Secondary Subject-Knowledge Development

 **Self-Audit** **page 2**Complete the following audit of your skills and understanding in this  
subject area. Rate yourself against each criterion by colour-coding the  
relevant box (None, Expected, Expected +, Good or Excellent):

**g 4 None** No knowledge /confidence in this area and/or no experience.   
**(only grade yourself grey if you have no experience  
whatsoever of a particular aspect)**

**g 3 Expected** Some knowledge in this area and/or limited experience and  
in need of further development

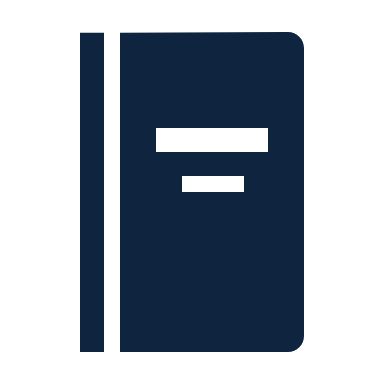
**g 2.5 Expected+** Developing knowledge / growing experience in this area

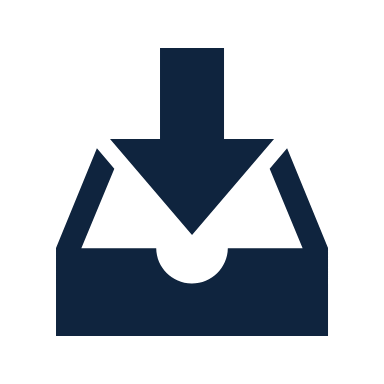
**g 2 Good** Good knowledge in this area and /or some experience

**g 1 Excellent** Totally confident in my knowledge of this area and/or lots  
of experience

The completed audits will be reviewed with your Mentor and used to create your Individual Training Plan  
**NB:** In addition to the content of this audit there will be specific content that will need to be known prior to the teaching of specific qualifications. This audit is **not** exhaustive and there will be specific skills and capabilities that will need to be addressed in addition to this.

**Subject Knowledge Development**

 **SK Days Compulsory Reading**  **page 26**This is the list of reading to complete before and after each Subject Knowledge Day. Reflect on  
the reading as part of the weekly Academic Reading Reflection in your Reflective Journal.

 **SK Development Task Bank** **page 27**Once you have completed the Baseline self-assessment, please select and complete one of the tasks from the Subject Knowledge Development Task Bank.As you review your knowledge each term, continue identifying and completing relevant tasks from the Task Bank.

 **Evidence of SK Development** **page 36**Keep a record of your Subject-Knowledge Development in the evidence summary. This will be signed off by your mentor and SK tutor.

**Appendix**

**Appendix A: SK in the Carter Review and the ITT CCF**  **page 37**

|  |  |  |  |  |  |  |  |  |  |
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| **Subject Area:** | | **Biology** | **Baseline** | | **Autumn** | | **Spring** | | **Summer** |
| **Subject Knowledge & Understanding** | | | | | | | | | |
| **KS3 Subject Content** | | | | | | | | | |
| Structure and function of living organisms | | | | | | | | | |
| Cells and organisation | | | | | | | | | |
| BKS3.1 | cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope | | |  |  |  | |  | |
| BKS3.2 | the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts | | |  |  |  | |  | |
| BKS3.3 | the similarities and differences between plant and animal cells | | |  |  |  | |  | |
| BKS3.4 | the role of diffusion in the movement of materials in and between cells | | |  |  |  | |  | |
| BKS3.5 | the structural adaptations of some unicellular organisms | | |  |  |  | |  | |
| BKS3.6 | the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms | | |  |  |  | |  | |
| Skeletal and muscular systems | | | | | | | | | |
| BKS3.7 | the structure and functions of the human skeleton, to include support, protection, movement and making blood cells | | |  |  |  | |  | |
| BKS3.8 | biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles | | |  |  |  | |  | |
| BKS3.9 | the function of muscles and examples of antagonistic muscles | | |  |  |  | |  | |
| Nutrition and digestion | | | | | | | | | |
| BKS3.10 | the content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed | | |  |  |  | |  | |
| BKS3.11 | calculations of energy requirements in a healthy daily diet | | |  |  |  | |  | |
| BKS3.12 | the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases | | |  |  |  | |  | |
| BKS3.13 | the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) | | |  |  |  | |  | |
| BKS3.14 | the importance of bacteria in the human digestive system | | |  |  |  | |  | |
| Gas exchange systems | | | | | | | | | |
| BKS3.15 | the structure and functions of the gas exchange system in humans, including adaptations to function | | |  |  |  | |  | |
| BKS3.16 | the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume | | |  |  |  | |  | |
| BKS3.17 | the impact of exercise, asthma and smoking on the human gas exchange system | | |  |  |  | |  | |
| BKS3.18 | the role of leaf stomata in gas exchange in plants | | |  |  |  | |  | |
| Reproduction | | | | | | | | | |
| BKS3.19 | reproduction in humans, including the structure and function of the male and female reproductive systems, menstrual cycle, gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta | | |  |  |  | |  | |
| BKS3.20 | reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms | | |  |  |  | |  | |
| Health | | | | | | | | | |
| BKS3.21 | the effects of recreational drugs (including substance misuse) on behaviour, health and life processes | | |  |  |  | |  | |
| Material cycles and energy | | | | | | | | | |
| Photosynthesis | | | | | | | | | |
| BKS3.22 | the reactants in, and products of, photosynthesis, and a word summary for photosynthesis | | |  |  |  | |  | |
| BKS3.23 | the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere | | |  |  |  | |  | |
| BKS3.24 | the adaptations of leaves for photosynthesis | | |  |  |  | |  | |
| Cellular respiration | | | | | | | | | |
| BKS3.25 | aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life | | |  |  |  | |  | |
| BKS3.26 | a word summary for aerobic respiration | | |  |  |  | |  | |
| BKS3.27 | the process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration | | |  |  |  | |  | |
| BKS3.28 | the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism | | |  |  |  | |  | |
| Interactions and interdependencies | | | | | | | | | |
| Relationships in an ecosystem | | | | | | | | | |
| BKS3.29 | the interdependence of organisms in an ecosystem, including food webs and insect-pollinated crops | | |  |  |  | |  | |
| BKS3.30 | the importance of plant reproduction through insect pollination in human food security | | |  |  |  | |  | |
| BKS3.31 | how organisms affect, and are affected by, their environment, including the accumulation of toxic materials | | |  |  |  | |  | |
| Genetics and evolution | | | | | | | | | |
| Inheritance, chromosomes DNA and genes | | | | | | | | | |
| BKS3.32 | heredity as the process by which genetic information is transmitted from one generation to the next | | |  |  |  | |  | |
| BKS3.33 | a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model | | |  |  |  | |  | |
| BKS3.34 | differences between species | | |  |  |  | |  | |
| BKS3.35 | the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation | | |  |  |  | |  | |
| BKS3.36 | the variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection | | |  |  |  | |  | |
| BKS3.37 | changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction | | |  |  |  | |  | |
| BKS3.38 | heredity as the process by which genetic information is transmitted from one generation to the next | | |  |  |  | |  | |
| BKS3.39 | a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model | | |  |  |  | |  | |
| BKS3.40 | differences between species | | |  |  |  | |  | |
| BKS3.41 | the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation | | |  |  |  | |  | |
| BKS3.42 | the variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection | | |  |  |  | |  | |
| BKS3.43 | changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction | | |  |  |  | |  | |
| **KS4 Biology Subject Content** | | | | | | | | | |
| Cell biology | | | | | | | | | |
| BKS4.1 | cells as the basic structural unit of all organisms; adaptations of cells related to their functions; the main sub-cellular structures of eukaryotic and prokaryotic cells | | |  |  |  | |  | |
| BKS4.2 | stem cells in animals and meristems in plants | | |  |  |  | |  | |
| BKS4.3 | enzymes | | |  |  |  | |  | |
| BKS4.4 | factors affecting the rate of enzymatic reactions | | |  |  |  | |  | |
| BKS4.5 | the importance of cellular respiration; the processes of aerobic and anaerobic respiration | | |  |  |  | |  | |
| BKS4.6 | carbohydrates, proteins, nucleic acids and lipids as key biological molecules | | |  |  |  | |  | |
| Transport systems | | | | | | | | | |
| BKS4.7 | the need for transport systems in multicellular organisms, including plants | | |  |  |  | |  | |
| BKS4.8 | the relationship between the structure and functions of the human circulatory system | | |  |  |  | |  | |
| Health, disease and the development of medicines | | | | | | | | | |
| BKS4.9 | the relationship between health and disease | | |  |  |  | |  | |
| BKS4.10 | communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) | | |  |  |  | |  | |
| BKS4.11 | non-communicable diseases | | |  |  |  | |  | |
| BKS4.12 | bacteria, viruses and fungi as pathogens in animals and plants | | |  |  |  | |  | |
| BKS4.13 | body defences against pathogens and the role of the immune system against disease | | |  |  |  | |  | |
| BKS4.14 | reducing and preventing the spread of infectious diseases in animals and plants | | |  |  |  | |  | |
| BKS4.15 | the process of discovery and development of new medicines | | |  |  |  | |  | |
| BKS4.16 | the impact of lifestyle factors on the incidence of non-communicable diseases | | |  |  |  | |  | |
| Coordination and control | | | | | | | | | |
| BKS4.17 | principles of nervous coordination and control in humans | | |  |  |  | |  | |
| BKS4.18 | the relationship between the structure and function of the human nervous system | | |  |  |  | |  | |
| BKS4.19 | the relationship between structure and function in a reflex arc | | |  |  |  | |  | |
| BKS4.20 | principles of hormonal coordination and control in humans | | |  |  |  | |  | |
| BKS4.21 | hormones in human reproduction, hormonal and non-hormonal methods of contraception | | |  |  |  | |  | |
| BKS4.22 | homeostasis | | |  |  |  | |  | |
| Photosynthesis | | | | | | | | | |
| BKS4.23 | photosynthesis as the key process for food production and therefore biomass for life | | |  |  |  | |  | |
| BKS4.24 | the process of photosynthesis | | |  |  |  | |  | |
| BKS4.25 | factors affecting the rate of photosynthesis | | |  |  |  | |  | |
| Ecosystems | | | | | | | | | |
| BKS4.26 | levels of organisation within an ecosystem | | |  |  |  | |  | |
| BKS4.27 | some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community | | |  |  |  | |  | |
| BKS4.28 | how materials cycle through abiotic and biotic components of ecosystems | | |  |  |  | |  | |
| BKS4.29 | the role of microorganisms (decomposers) in the cycling of materials through an ecosystem | | |  |  |  | |  | |
| BKS4.30 | organisms are interdependent and are adapted to their environment | | |  |  |  | |  | |
| BKS4.31 | the importance of biodiversity | | |  |  |  | |  | |
| BKS4.32 | methods of identifying species and measuring distribution, frequency and abundance of species within a habitat | | |  |  |  | |  | |
| BKS4.33 | positive and negative human interactions with ecosystems | | |  |  |  | |  | |
| Evolution, inheritance and variation | | | | | | | | | |
| BKS4.34 | the genome as the entire genetic material of an organism | | |  |  |  | |  | |
| BKS4.35 | how the genome, and its interaction with the environment, influence the development of the phenotype of an organism | | |  |  |  | |  | |
| BKS4.36 | the potential impact of genomics on medicine | | |  |  |  | |  | |
| BKS4.37 | most phenotypic features being the result of multiple, rather than single, genes | | |  |  |  | |  | |
| BKS4.38 | single gene inheritance and single gene crosses with dominant and recessive phenotypes | | |  |  |  | |  | |
| BKS4.39 | sex determination in humans | | |  |  |  | |  | |
| BKS4.40 | genetic variation in populations of a species | | |  |  |  | |  | |
| BKS4.41 | the process of natural selection leading to evolution | | |  |  |  | |  | |
| BKS4.42 | the evidence for evolution | | |  |  |  | |  | |
| BKS4.43 | developments in biology affecting classification | | |  |  |  | |  | |
| BKS4.44 | the importance of selective breeding of plants and animals in agriculture | | |  |  |  | |  | |
| BKS4.45 | the uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology | | |  |  |  | |  | |

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| **Subject Area:** | | **Chemistry** | **Baseline** | **Autumn** | **Spring** | **Summer** |
| **Subject Knowledge & Understanding** | | | | | | |
| **KS3 Chemistry Subject Content** | | | | | | |
| The particulate nature of matter | | | | | | |
| CKS3.1 | differences between species | |  |  |  |  |
| CKS3.2 | the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation | |  |  |  |  |
| CKS3.3 | the variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection | |  |  |  |  |
| CKS3.4 | changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction | |  |  |  |  |
| Atoms, elements and compounds | | | | | | |
| CKS3.5 | a simple (Dalton) atomic model | |  |  |  |  |
| CKS3.6 | differences between atoms, elements and compounds | |  |  |  |  |
| CKS3.7 | chemical symbols and formulae for elements and compounds | |  |  |  |  |
| CKS3.8 | conservation of mass | |  |  |  |  |
| CKS3.9 | changes of state and chemical reactions | |  |  |  |  |
| Pure and impure substances | | | | | | |
| CKS3.10 | the concept of a pure substance | |  |  |  |  |
| CKS3.11 | mixtures, including dissolving | |  |  |  |  |
| CKS3.12 | diffusion in terms of the particle model | |  |  |  |  |
| CKS3.13 | simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography | |  |  |  |  |
| CKS3.14 | the identification of pure substances | |  |  |  |  |
| Chemical reactions | | | | | | |
| CKS3.15 | chemical reactions as the rearrangement of atoms | |  |  |  |  |
| CKS3.16 | representing chemical reactions using formulae and using equations | |  |  |  |  |
| CKS3.17 | combustion, thermal decomposition, oxidation and displacement reactions | |  |  |  |  |
| CKS3.18 | defining acids and alkalis in terms of neutralisation reactions | |  |  |  |  |
| CKS3.19 | the pH scale for measuring acidity/alkalinity; and indicators | |  |  |  |  |
| CKS3.20 | reactions of acids with metals to produce a salt plus hydrogen | |  |  |  |  |
| CKS3.21 | reactions of acids with alkalis to produce a salt plus water | |  |  |  |  |
| CKS3.22 | what catalysts do | |  |  |  |  |
| Energetics | | | | | | |
| CKS3.23 | energy changes on changes of state (qualitative) | |  |  |  |  |
| CKS3.24 | exothermic and endothermic chemical reactions (qualitative) | |  |  |  |  |
| The periodic table | | | | | | |
| CKS3.25 | the varying physical and chemical properties of different elements | |  |  |  |  |
| CKS3.26 | the principles underpinning the Mendeleev periodic table | |  |  |  |  |
| CKS3.27 | the periodic table: periods and groups; metals and non-metals | |  |  |  |  |
| CKS3.28 | how patterns in reactions can be predicted with reference to the periodic table | |  |  |  |  |
| CKS3.29 | the properties of metals and non-metals | |  |  |  |  |
| CKS3.30 | the chemical properties of metal and non-metal oxides with respect to acidity | |  |  |  |  |
| Materials | | | | | | |
| CKS3.31 | the order of metals and carbon in the reactivity series | |  |  |  |  |
| CKS3.32 | the use of carbon in obtaining metals from metal oxides | |  |  |  |  |
| CKS3.33 | properties of ceramics, polymers and composites (qualitative) | |  |  |  |  |
| Earth and atmosphere | | | | | | |
| CKS3.34 | the composition of the Earth | |  |  |  |  |
| CKS3.35 | the structure of the Earth | |  |  |  |  |
| CKS3.36 | the rock cycle and the formation of igneous, sedimentary and metamorphic rocks | |  |  |  |  |
| CKS3.37 | Earth as a source of limited resources and the efficacy of recycling | |  |  |  |  |
| CKS3.38 | the composition of the atmosphere | |  |  |  |  |
| CKS3.39 | the production of carbon dioxide by human activity and the impact on climate | |  |  |  |  |
| **KS4 Chemistry Subject Content** | | | | | | |
| Atomic structure and the Periodic Table | | | | | | |
| CKS4.1 | a simple model of the atom consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes | |  |  |  |  |
| CKS4.2 | the number of particles in a given mass of a substance | |  |  |  |  |
| CKS4.3 | he modern Periodic Table, showing elements arranged in order of atomic number | |  |  |  |  |
| CKS4.4 | position of elements in the Periodic Table in relation to their atomic structure and arrangement of outer electrons | |  |  |  |  |
| CKS4.5 | properties and trends in properties of elements in the same group | |  |  |  |  |
| CKS4.6 | characteristic properties of metals and non-metals | |  |  |  |  |
| CKS4.7 | chemical reactivity of elements in relation to their position in the Periodic Table | |  |  |  |  |
| Structure, bonding and the properties of matter | | | | | | |
| CKS4.8 | changes of state of matter in terms of particle kinetics, energy transfers and the relative strength of chemical bonds and intermolecular forces | |  |  |  |  |
| CKS4.9 | types of chemical bonding: ionic, covalent, and metallic | |  |  |  |  |
| CKS4.10 | bulk properties of materials related to bonding and intermolecular forces | |  |  |  |  |
| CKS4.11 | bonding of carbon leading to the vast array of natural and synthetic organic compounds that occur due to the ability of carbon to form families of similar compounds, chains and rings | |  |  |  |  |
| CKS4.12 | structures, bonding and properties of diamond, graphite, fullerenes and graphene | |  |  |  |  |
| Chemical changes | | | | | | |
| CKS4.13 | determination of empirical formulae from the ratio of atoms of different kinds | |  |  |  |  |
| CKS4.14 | balanced chemical equations, ionic equations and state symbols | |  |  |  |  |
| CKS4.15 | identification of common gases | |  |  |  |  |
| CKS4.16 | the chemistry of acids; reactions with some metals and carbonates | |  |  |  |  |
| CKS4.17 | pH as a measure of hydrogen ion concentration and its numerical scale | |  |  |  |  |
| CKS4.18 | electrolysis of molten ionic liquids and aqueous ionic solutions | |  |  |  |  |
| CKS4.19 | reduction and oxidation in terms of loss or gain of oxygen. | |  |  |  |  |
| Energy changes in chemistry | | | | | | |
| CKS4.20 | Measurement of energy changes in chemical reactions (qualitative) | |  |  |  |  |
| CKS4.21 | Bond breaking, bond making, activation energy and reaction profiles (qualitative) | |  |  |  |  |
| Rate and extent of chemical change | | | | | | |
| CKS4.22 | factors that influence the rate of reaction: varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst | |  |  |  |  |
| CKS4.23 | factors affecting reversible reactions | |  |  |  |  |
| Chemical analysis | | | | | | |
| CKS4.24 | distinguishing between pure and impure substances | |  |  |  |  |
| CKS4.25 | separation techniques for mixtures of substances: filtration, crystallisation, chromatography, simple and fractional distillation | |  |  |  |  |
| CKS4.26 | quantitative interpretation of balanced equations | |  |  |  |  |
| CKS4.27 | concentrations of solutions in relation to mass of solute and volume of solvent | |  |  |  |  |
| Chemical and allied industries | | | | | | |
| CKS4.28 | life cycle assessment and recycling to assess environmental impacts associated with all the stages of a product’s life | |  |  |  |  |
| CKS4.29 | the viability of recycling of certain materials | |  |  |  |  |
| CKS4.30 | carbon compounds, both as fuels and feedstock, and the competing demands for limited resources | |  |  |  |  |
| CKS4.31 | fractional distillation of crude oil and cracking to make more useful materials | |  |  |  |  |
| CKS4.32 | extraction and purification of metals related to the position of carbon in a reactivity series | |  |  |  |  |
| Earth and atmospheric science | | | | | | |
| CKS4.33 | evidence for composition and evolution of the Earth’s atmosphere since its formation | |  |  |  |  |
| CKS4.34 | evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change | |  |  |  |  |
| CKS4.35 | potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth’s climate | |  |  |  |  |
| CKS4.36 | common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources | |  |  |  |  |
| CKS4.37 | the Earth’s water resources and obtaining potable water | |  |  |  |  |

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| **Subject Area:** | | **Physics** | **Baseline** | | **Autumn** | | **Spring** | **Summer** | |
| **Subject Knowledge & Understanding** | | | | | | | | | |
| **KS3 Physics Subject Content** | | | | | | | | | |
| Energy | | | | | | | | | |
| Calculation of fuel uses and costs in the domestic context | | | | | | | | | |
| PKS3.1 | comparing energy values of different foods (from labels) (kJ) | |  |  | |  | | |  |
| PKS3.2 | comparing power ratings of appliances in watts (W, kW) | |  |  | |  | | |  |
| PKS3.3 | comparing amounts of energy transferred (J, kJ, kW hour) | |  |  | |  | | |  |
| PKS3.4 | domestic fuel bills, fuel use and costs | |  |  | |  | | |  |
| PKS3.5 | fuels and energy resources | |  |  | |  | | |  |
| Energy changes and transfers | | | | | | | | | |
| PKS3.6 | simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged | |  |  | |  | | |  |
| PKS3.7 | heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators | |  |  | |  | | |  |
| PKS3.8 | other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels | |  |  | |  | | |  |
| Changes in systems | | | | | | | | | |
| PKS3.9 | energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change | |  |  | |  | | |  |
| PKS3.10 | comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions | |  |  | |  | | |  |
| PKS3.11 | using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes | |  |  | |  | | |  |
| Motion and forces | | | | | | | | | |
| Describing motion | | | | | | | | | |
| PKS3.12 | speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) | |  |  | |  | | |  |
| PKS3.13 | the representation of a journey on a distance-time graph | |  |  | |  | | |  |
| PKS3.14 | relative motion: trains and cars passing one another | |  |  | |  | | |  |
| Forces | | | | | | | | | |
| PKS3.15 | forces as pushes or pulls, arising from the interaction between 2 objects | |  |  | |  | | |  |
| PKS3.16 | using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces | |  |  | |  | | |  |
| PKS3.17 | moment as the turning effect of a force | |  |  | |  | | |  |
| PKS3.18 | forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water | |  |  | |  | | |  |
| PKS3.19 | forces measured in newtons, measurements of stretch or compression as force is changed | |  |  | |  | | |  |
| PKS3.20 | force-extension linear relation; Hooke’s Law as a special case | |  |  | |  | | |  |
| PKS3.21 | work done and energy changes on deformation | |  |  | |  | | |  |
| PKS3.22 | non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets, and forces due to static electricity | |  |  | |  | | |  |
| Pressure in fluids | | | | | | | | | |
| PKS3.23 | atmospheric pressure, decreases with increase of height as weight of air above decreases with height | |  |  | |  | | |  |
| PKS3.24 | pressure in liquids, increasing with depth; upthrust effects, floating and sinking | |  |  | |  | | |  |
| PKS3.25 | pressure measured by ratio of force over area – acting normal to any surface | |  |  | |  | | |  |
| Balanced forces | | | | | | | | | |
| PKS3.26 | opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface | |  |  | |  | | |  |
| Forces and motion | | | | | | | | | |
| PKS3.27 | forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) | |  |  | |  | | |  |
| PKS3.28 | change depending on direction of force and its size | |  |  | |  | | |  |
| Waves | | | | | | | | | |
| Observed waves | | | | | | | | | |
| PKS3.29 | waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition | |  |  | |  | | |  |
| Sound waves | | | | | | | | | |
| PKS3.30 | frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound  sound needs a medium to travel, the speed of sound in air, in water, in solids | |  |  | |  | | |  |
| PKS3.31 | sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal | |  |  | |  | | |  |
| PKS3.32 | the auditory range of humans and animals | |  |  | |  | | |  |
| Energy and waves | | | | | | | | | |
| PKS3.33 | pressure waves transferring energy; use for cleaning and physiotherapy by ultrasound; waves transferring information for conversion to electrical signals by microphone | |  |  | |  | | |  |
| Light waves | | | | | | | | | |
| PKS3.34 | the similarities and differences between light waves and waves in matter | |  |  | |  | | |  |
| PKS3.35 | light waves travelling through a vacuum; speed of light | |  |  | |  | | |  |
| PKS3.36 | the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface | |  |  | |  | | |  |
| PKS3.37 | use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye | |  |  | |  | | |  |
| PKS3.38 | light transferring energy from source to absorber, leading to chemical and electrical effects; photosensitive material in the retina and in cameras | |  |  | |  | | |  |
| PKS3.39 | colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection | |  |  | |  | | |  |
| Electricity and electromagnetism | | | | | | | | | |
| Current electricity | | | | | | | | | |
| PKS3.40 | electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge | |  |  | |  | | |  |
| PKS3.41 | potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current | |  |  | |  | | |  |
| PKS3.42 | differences in resistance between conducting and insulating components (quantitative) | |  |  | |  | | |  |
| Static electricity | | | | | | | | | |
| PKS3.43 | separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects | |  |  | |  | | |  |
| PKS3.44 | the idea of electric field, forces acting across the space between objects not in contact | |  |  | |  | | |  |
| Magnetism | | | | | | | | | |
| PKS3.45 | magnetic poles, attraction and repulsion | |  |  | |  | | |  |
| PKS3.46 | magnetic fields by plotting with compass, representation by field lines | |  |  | |  | | |  |
| PKS3.47 | Earth’s magnetism, compass and navigation | |  |  | |  | | |  |
| PKS3.48 | the magnetic effect of a current, electromagnets, DC motors (principles only) | |  |  | |  | | |  |
| Matter | | | | | | | | | |
| Physical changes | | | | | | | | | |
| PKS3.49 | conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving | |  |  | |  | | |  |
| PKS3.50 | similarities and differences, including density differences, between solids, liquids and gases | |  |  | |  | | |  |
| PKS3.51 | Brownian motion in gases | |  |  | |  | | |  |
| PKS3.52 | diffusion in liquids and gases driven by differences in concentration | |  |  | |  | | |  |
| PKS3.53 | the difference between chemical and physical changes | |  |  | |  | | |  |
| Particle model | | | | | | | | | |
| PKS3.54 | the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density; the anomaly of ice-water transition | |  |  | |  | | |  |
| PKS3.55 | atoms and molecules as particles | |  |  | |  | | |  |
| Energy in matter | | | | | | | | | |
| PKS3.56 | changes with temperature in motion and spacing of particles | |  |  | |  | | |  |
| PKS3.57 | internal energy stored in materials | |  |  | |  | | |  |
| Space physics | | | | | | | | | |
| PKS3.58 | gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and sun (qualitative only) | |  |  | |  | | |  |
| PKS3.59 | our sun as a star, other stars in our galaxy, other galaxies | |  |  | |  | | |  |
| PKS3.60 | the seasons and the Earth’s tilt, day length at different times of year, in different hemispheres | |  |  | |  | | |  |
| PKS3.61 | the light year as a unit of astronomical distance | |  |  | |  | | |  |
| **KS4 Physics Subject Content** | | | | | | | | | |
| Energy | | | | | | | | | |
| PKS4.1 | energy changes in a system involving heating, doing work using forces, or doing work using an electric current: calculating the stored energies and energy changes involved | |  |  | |  | | |  |
| PKS4.2 | power as the rate of transfer of energy | |  |  | |  | | |  |
| PKS4.3 | conservation of energy in a closed system, dissipation | |  |  | |  | | |  |
| PKS4.4 | calculating energy efficiency for any energy transfers | |  |  | |  | | |  |
| PKS4.5 | renewable and non-renewable energy sources used on Earth, changes in how these are used | |  |  | |  | | |  |
| Forces | | | | | | | | | |
| PKS4.6 | forces and fields: electrostatic, magnetic, gravity | |  |  | |  | | |  |
| PKS4.7 | forces as vectors | |  |  | |  | | |  |
| PKS4.8 | calculating work done as force x distance; elastic and inelastic stretching | |  |  | |  | | |  |
| PKS4.9 | pressure in fluids acts in all directions: variation in Earth’s atmosphere with height, with depth for liquids, up-thrust force (qualitative) | |  |  | |  | | |  |
| Forces and motion | | | | | | | | | |
| PKS4.10 | speed of sound, estimating speeds and accelerations in everyday contexts | |  |  | |  | | |  |
| PKS4.11 | interpreting quantitatively graphs of distance, time, and speed | |  |  | |  | | |  |
| PKS4.12 | acceleration caused by forces; Newton’s First Law | |  |  | |  | | |  |
| PKS4.13 | weight and gravitational field strength | |  |  | |  | | |  |
| PKS4.14 | decelerations and braking distances involved on roads, safety | |  |  | |  | | |  |
| Wave motion | | | | | | | | | |
| PKS4.15 | amplitude, wavelength, frequency, relating velocity to frequency and wavelength | |  |  | |  | | |  |
| PKS4.16 | transverse and longitudinal waves | |  |  | |  | | |  |
| PKS4.17 | electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays | |  |  | |  | | |  |
| PKS4.18 | velocities differing between media: absorption, reflection, refraction effects | |  |  | |  | | |  |
| PKS4.19 | production and detection, by electrical circuits, or by changes in atoms and nuclei | |  |  | |  | | |  |
| PKS4.20 | uses in the radio, microwave, infra-red, visible, ultra-violet, X-ray and gamma-ray regions, hazardous effects on bodily tissues | |  |  | |  | | |  |
| Electricity | | | | | | | | | |
| PKS4.21 | measuring resistance using p.d. and current measurements | |  |  | |  | | |  |
| PKS4.22 | exploring current, resistance and voltage | |  |  | |  | | |  |
| PKS4.23 | relationships for different circuit elements; including their graphical representations | |  |  | |  | | |  |
| PKS4.24 | quantity of charge flowing as the product of current and time | |  |  | |  | | |  |
| PKS4.25 | drawing circuit diagrams; exploring equivalent resistance for resistors in series | |  |  | |  | | |  |
| PKS4.26 | the domestic a.c. supply; live, neutral and earth mains wires, safety measures | |  |  | |  | | |  |
| PKS4.27 | power transfer related to p.d. and current, or current and resistance | |  |  | |  | | |  |
| Magnetism and electromagnetism | | | | | | | | | |
| PKS4.28 | exploring the magnetic fields of permanent and induced magnets, and the Earth’s magnetic field, using a compass | |  |  | |  | | |  |
| PKS4.29 | magnetic effects of currents, how solenoids enhance the effect | |  |  | |  | | |  |
| PKS4.30 | how transformers are used in the national grid and the reasons for their use | |  |  | |  | | |  |
| The structure of matter | | | | | | | | | |
| PKS4.31 | relating models of arrangements and motions of the molecules in solid, liquid and gas phases to their densities | |  |  | |  | | |  |
| PKS4.32 | melting, evaporation, and sublimation as reversible changes | |  |  | |  | | |  |
| PKS4.33 | calculating energy changes involved on heating, using specific heat capacity; and those involved in changes of state, using specific latent heat | |  |  | |  | | |  |
| PKS4.34 | links between pressure and temperature of a gas at constant volume, related to the motion of its particles (qualitative) | |  |  | |  | | |  |
| Atomic structure | | | | | | | | | |
| PKS4.35 | the nuclear model and its development in the light of changing evidence | |  |  | |  | | |  |
| PKS4.36 | masses and sizes of nuclei, atoms and small molecules | |  |  | |  | | |  |
| PKS4.37 | differences in numbers of protons, and neutrons related to masses and identities of nuclei, isotope characteristics and equations to represent changes | |  |  | |  | | |  |
| PKS4.38 | ionisation; absorption or emission of radiation related to changes in electron orbits | |  |  | |  | | |  |
| PKS4.39 | radioactive nuclei: emission of alpha or beta particles, neutrons, or gamma-rays, related to changes in the nuclear mass and/or charge  radioactive materials, half-life, irradiation, contamination and their associated hazardous effects, waste disposal | |  |  | |  | | |  |
| PKS4.40 | nuclear fission, nuclear fusion and our sun’s energy | |  |  | |  | | |  |
| Space physics | | | | | | | | | |
| PKS4.41 | the main features of the solar system. | |  |  | |  | | |  |

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| **Subject Area:** | | | **Science** | **Baseline** | | | | **Autumn** | | | **Spring** | | | **Summer** | |
| **Subject-Specific Pedagogy** | | | | | | | | | | | | | | | |
| **Knowledge of Subject Specific Pedagogy** | | | | | | | | | | | | | | | |
| SSP.1 | | Understanding the importance for a Science department to have a clear curriculum intent | | | |  | | | |  | |  | | |  |
| SSP.2 | | How to ensure precise and correct use of scientific language | | | |  | | | |  | |  | | |  |
| SSP.3 | | How to lead a class discussion around key scientific concepts | | | |  | | | |  | |  | | |  |
| SSP.4 | | How to build on prior knowledge, encouraging students to make links and connections | | | |  | | | |  | |  | | |  |
| SSP.5 | | How to break down complex Science content/skills/tasks into smaller steps | | | |  | | | |  | |  | | |  |
| SSP.6 | | How to sequence a Science lesson / series of lessons to move from foundational knowledge to more complex content? | | | |  | | | |  | |  | | |  |
| SSP.7 | | How to anticipate and address misconceptions in Science / How to answer students’ questions | | | |  | | | |  | |  | | |  |
| SSP.8 | | How to scaffold Science activities to make new knowledge more accessible / How to differentiate complex topics to higher and lower-ability students | | | |  | | | |  | |  | | |  |
| SSP.9 | | How to present, model, give examples / clear explanations for and clarify key scientific concepts | | | |  | | | |  | |  | | |  |
| SSP.10 | | How to advise a group or individual on how to improve their skill level in your subject | | | |  | | | |  | |  | | |  |
| SSP.11 | | How to extend 'general knowledge' about subject, including cross-curricular links historical and multi-cultural aspects | | | |  | | | |  | |  | | |  |
| **Knowledge of Subject Assessment & Development** | | | | | | | | | | | | | | | |
| SAD.1 | | How confident would you be in assessing students’ knowledge and understanding of Science? | | | |  | | | |  | |  | | |  |
| SAD.2 | | How confident would you be in assessing students’ skill development in Science? | | | |  | | | |  | |  | | |  |
| SAD.3 | | How confident are you in deploying formative assessment strategies linked to lesson objectives during lessons (incl. hinge questions to pinpoint knowledge gaps, self and peer-assessment, etc.)? | | | |  | | | |  | |  | | |  |
| SAD.4 | | How confident would you be to write a Science summative assessment on a topic chosen by the subject mentor, choosing, where possible, externally validated materials? | | | |  | | | |  | |  | | |  |
| SAD.5 | | How confident are you in using data (assessment, homework, etc.) to inform your planning? | | | |  | | | |  | |  | | |  |
| SAD.6 | | How confident are you in using data to set appropriate targets? | | | |  | | | |  | |  | | |  |
| SAD.7 | | How confident are you in planning for progression (short, medium and long-term)? | | | |  | | | |  | |  | | |  |
| SAD.8 | | Some schools teach Science in mixed ability groups. How confident are you that you can involve every pupil in the learning process? | | | |  | | | |  | |  | | |  |
| SAD.9 | | How confident are you in checking prior knowledge to identify knowledge gaps and misconceptions? | | | |  | | | |  | |  | | |  |
| SAD.10 | | How confident are you in drawing conclusions about what pupils have learned by looking at patterns of performance over a number of assessments to inform future planning? | | | |  | | | |  | |  | | |  |
| SAD.11 | | How confident are you in assessing written answers to questions and identifying ways of improving the answer given through high-quality feedback and specific actions? | | | |  | | | |  | |  | | |  |
| SAD.12 | | How confident are you in making marking manageable and effective? (incl. use of verbal feedback, whole-class feedback, abbreviations, codes, peer-self-assessment, error highlighting, etc.) | | | |  | | | |  | |  | | |  |
| SAD.13 | | How secure is your knowledge of the Science A-Level Content and Assessment Objectives? | | | |  | | | |  | |  | | |  |
| SAD.14 | | How secure is your knowledge of the Science GCSE Content and Assessment Objectives? | | | |  | | | |  | |  | | |  |
| SAD.15 | | How would you rate your understanding of the 9-1 grades in Science? | | | |  | | | |  | |  | | |  |
| SAD.16 | | How confident would you be in assessing students’ soft skills such as resilience, teamwork, empathy, fairness and collaboration in your subject? | | | |  | | | |  | |  | | |  |
| **Child & Adolescent Development within your Subject** | | | | | | | | | | | | | | | |
| CAD.1 | | How do you feel about creating effective learning environments? | | | | |  | | |  | |  | | |  |
| CAD.2 | | How do you feel about securing all pupils’ motivation and concentration? | | | | |  | | |  | |  | | |  |
| CAD.3 | | How confident are you creating challenging learning opportunities and promoting high aspirations for all learners, especially those from a disadvantaged background? | | | | |  | | |  | |  | | |  |
| CAD.4 | | How confident are you implementing effective strategies to engage students with behavioural, mental health or SEN within Science? | | | | |  | | |  | |  | | |  |
| CAD.5 | | How confident are you working with pupils who may be disaffected in Science lessons and raising their level of engagement and motivation? | | | | |  | | |  | |  | | |  |
| CAD.6 | | How confident are you building pupils’ confidence to attempt more complex tasks / multi-step problems. | | | | |  | | |  | |  | | |  |
| CAD.7 | | How confident are you at creating competitive and celebratory opportunities for students in your subject? | | | | |  | | |  | |  | | |  |
| CAD.8 | | How confident are you supporting out-of-classroom Science learning (e.g. through your extra-curricular involvement) to increase participation in your subject and contribute to the holistic development of your students? | | | | |  | | |  | |  | | |  |
| CAD.9 | | How confident are you promoting effective behaviour for learning from students? | | | | |  | | |  | |  | | |  |
| CAD.10 | | How confident are you engaging parents in your students’ learning? | | | | |  | | |  | |  | | |  |
| **Professional Skills (Literacy & Numeracy)** | | | | | | | | | | | | | | | |
| PS.1 | | Own literacy skills *(see detail of requirements on CTTP Teams VLE >> Library >> Professional Skills)* | | |  | | | |  | | | |  |  | |
| PS.2 | | Ability to support the development of students’ literacy within Science. | | |  | | | |  | | | |  |  | |
| PS.3 | | Own numeracy skills *(see detail of requirements on CTTP Teams VLE >> Library >> Professional Skills)* | | |  | | | |  | | | |  |  | |
| PS.4 | | Ability to support the development of students’ numeracy within Science. | | |  | | | |  | | | |  |  | |
| **Effective Use of ICT** | | | | | | | | | | | | | | | |
| ICT.1 | Word | | | |  | | | |  | | | |  |  | |
| ICT.2 | Excel | | | |  | | | |  | | | |  |  | |
| ICT.3 | PowerPoint | | | |  | | | |  | | | |  |  | |
| ICT.4 | Interactive Whiteboard | | | |  | | | |  | | | |  |  | |
| ICT.5 | School’s Online Learning Platform (Teams, Google Classroom, SharePoint, etc.) | | | |  | | | |  | | | |  |  | |
| ICT.6 | School’s Systems (SIMS, CPOMS, Class Charts, etc.) | | | |  | | | |  | | | |  |  | |
| ICT.7 | Understanding of e-Safety and how to support it | | | |  | | | |  | | | |  |  | |
| ICT.8 | How to use ICT in the classroom to raise engagement and support the individual? | | | |  | | | |  | | | |  |  | |
| ICT.9 | How to use ICT and online resources to help manage your workload? | | | |  | | | |  | | | |  |  | |
| ICT.10 | How to deliver an effective remote lesson / blended lesson? | | | |  | | | |  | | | |  |  | |

SK Development  
Subject Knowledge Day Compulsory Reading

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SK Day 1** |  | **Science programmes of study: key stage 3**, DfE, 2013 □□  <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/335174/SECONDARY_national_curriculum_-_Science_220714.pdf>  **Science programmes of study: key stage 4**, DfE, 2014 □□  <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/381380/Science_KS4_PoS_7_November_2014.pdf> |  | **AQA Glossaries** □□  *GCSE Command Words*  **\***<https://www.aqa.org.uk/resources/science/gcse/teach/command-words>  *GCSE Subject-Specific Vocabulary*  **\***<https://filestore.aqa.org.uk/resources/science/AQA-SCIENCE-GCSE-SUBJECT-VOCAB.PDF>  *AS and A-Level Command Words*  **\***<https://www.aqa.org.uk/resources/science/as-and-a-level/biology-7401-7402/teach/command-words>  *AS and A-Level Subject-Specific Vocabulary*  **\***https://www.aqa.org.uk/resources/science/as-and-a-level/teach/subject-specific-vocabulary |
| **SK Day 2** |  | **Combined science GCSE subject content**, DfE, 2015 □□  *These GCSE subject content criteria sets out the assessment objectives, knowledge, understanding and skills, for GCSE specifications in combined science, to ensure progression from key stage 3 national curriculum requirements and the possibility of development into A level. They provide the framework within which awarding organisations create the detail of the subject specifications.*  <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/800339/Combined_science_GCSE_updated_May_2019.pdf> |  | **GCE AS and A level subject content for biology, chemistry, physics and psychology**, DfE, 2014 □□  *AS and A level subject content sets out the knowledge, understanding and skills common to all AS and A level specifications in biology, chemistry, physics and psychology.*  <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/593849/Science_AS_and_level_formatted.pdf> |
| **SK Day 3** |  | **Including students with SEN and/or disabilities in secondary science**, TDA, 2009 □  *This booklet gives tutors and trainees information about subject-specific issues in the science curriculum for students with SEN and/or disabilities. It offers a straightforward introduction to planning inclusive science lessons.*  https://dera.ioe.ac.uk/13809/1/science.pdf |  | **Access and engagement in science Teaching pupils for whom English is an additional language**, Department for Education and Skills, 2002 □  *The guidance is in two parts. Sections 1 to 4 are intended for subject leaders of science and ethnic minority achievement (EMA) in secondary schools. These sections are designed to support a departmental meeting focused on reviewing the attainment of pupils learning English as an additional language (EAL), and should be read in conjunction with the later sections. Sections 5 to 8 are for all science teachers and their EMA colleagues. They aim to help teachers support pupils learning EAL in the classroom, particularly those working at levels 3 to 4 and who have been learning in English for a minimum of two years, in order to raise their attainment in science lessons.*  <http://www.naldic.org.uk/Resources/NALDIC/Teaching%20and%20Learning/0610-2002Science.pdf> |
| **SK Day 4** |  | **Refocusing Assessment science**, NFER, 2017 □  *SSAT, ASCL and NFER have worked together to produce Refocusing Assessment, which is a resource to support schools in developing and reviewing their assessment practice.*  <https://www.nfer.ac.uk/publications/GTGA01/science.pdf> |  | **Reading set by the SK Tutor**  Record details of the reading set below: |

SK Development  
Task Bank

|  |  |  |
| --- | --- | --- |
| **Subject Area:** | Science | **Knowledge and Understanding Development Tasks** |

**Task 1: KS3 & KS4 Areas for Development – Oak National Academy**

Identify areas of the subject that you wish to develop and find corresponding lessons at <https://www.thenational.academy/>

Record the lessons completed below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Topics** | **Quiz Score** | **Written Answers** | **Notes (New Knowledge)** |
|  |  |  |  |
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Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- |
| **Subject Area:** | Science | **Knowledge and Understanding  Development Tasks** |

**Task 2: KS3 & KS4 Areas for Development – Research & Mindmap**

Identify an area of the subject that you wish to develop and research it using a range of reliable sources.

Record your sources.

|  |
| --- |
|  |

Produce a mindmap of your findings including key facts, concepts, terminology, examples and skills (as relevant).

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Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- |
| **Subject Area:** | Science | **Subject-Specific Pedagogy  Development Tasks** |

**Task 3: KS3 & KS4 Areas for Development – Lesson Resources**

Identify an area of the subject that you wish to develop and research it using a range of reliable sources.

Record your sources.

|  |
| --- |
|  |

Produce a resource on the topic (worksheet, card sort activity, PowerPoint, movie, etc.).



Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

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| **Subject Area:** | Science | **Knowledge and Understanding  Development Tasks** |

**Task 4: GCSE Content**

Complete a Specimen or Past GCSE Paper and self-assess your answers using the mark scheme. You may refer to your Self-Directed Study Material booklet. Identify the following:

|  |  |  |
| --- | --- | --- |
|  | **Strengths** | **Areas for Development** |
| **Topic(s)** |  |  |
| **Skill(s)** |  |  |
| **Knowledge** |  |  |
| **Question Type(s)** |  |  |



Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Subject Area:** | Science | **Knowledge and Understanding  Development Tasks** |

**Task 5: A-Level Content**

Complete a Specimen or Past A-Level Paper and self-assess your answers using the mark scheme. You may refer to your Self-Directed Study Material booklet. Identify the following:

|  |  |  |
| --- | --- | --- |
|  | **Strengths** | **Areas for Development** |
| **Topic(s)** |  |  |
| **Skill(s)** |  |  |
| **Knowledge** |  |  |
| **Question Type(s)** |  |  |



Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Subject Area:** | Science | **Knowledge and Understanding  Development Tasks** |

**Task 6: National Curriculum & Departmental Scheme of Work**

Look at the National Curriculum for your subject as well as your department’s scheme of work. Reflect on how the Scheme of Work meet the requirements of the National Curriculum.

|  |  |  |
| --- | --- | --- |
|  | **National Curriculum**  **Programme of Study** | **Departmental**  **Scheme of Work** |
| Aims |  |  |
| Content |  |  |



Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Subject Area:** | Science | **Subject-Specific Pedagogy  Development Tasks** |

**Task 7: Academic Reading**

Select a book / article on an aspect of pedagogy that you wish to develop. You may refer to your Self-Directed Study Material booklet. Consider the following:

|  |
| --- |
| Title: |

**7.1.** What do you already know on the topic?

|  |
| --- |
|  |

**7.2.** What are the key ideas/concepts/terms introduced in the book / article?

|  |
| --- |
|  |

**7.3.** What are the key classroom strategies presented?

|  |
| --- |
|  |

**7.4.** How does it relate to your current experience in the classroom?

|  |
| --- |
|  |

**7.5.** How is this reading going to impact on your classroom practice?

|  |
| --- |
|  |



Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Subject Area:** | Science | **Subject-Specific Pedagogy  Development Tasks** |

**Task 8: Resource Analysis**

Select a lesson on a topic of your choice from your subject’s section at the Oak National Academy <https://www.thenational.academy/>. Consider the following:

|  |  |
| --- | --- |
| **Points for Consideration** | **Teaching Strategies** |
| **8.1.** How are the learning goals and expected outcomes of the lessons shared with the students? |  |
| **8.2.** How are success criteria shared with the students? |  |
| **8.3.** How is prior knowledge activated? |  |
| **8.4.** How is new content introduced? How much new information is introduced? |  |
| **8.5.** How are instructions made clear and explicit to the students? |  |
| **8.6.** How are explanations given and chunked? |  |
| **8.7.** How is the expected standard modelled? |  |
| **8.8.** How are tasks broken into sequential components? |  |
| **8.9.** How are independent practice opportunities built into the lessons? |  |
| **8.10.** How are time frames/word counts suggested to students? |  |
| **8.11.** How are tasks differentiated to cater for various abilities? |  |
| **8.12.** How are tasks scaffolded to allow all students to access the learning? |  |
| **8.13.** How is feedback given? |  |
| **8.14.** How do they anticipate and address students’ misconceptions? |  |
| **8.15.** How is self-assessment facilitated using success criteria? |  |
| **8.16.** How is the content of the following lessons introduced? |  |



Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Subject Area:** | Science | **Subject-Specific Pedagogy  Development Tasks** |

**Task 9: Lesson Observation & Subject/Curriculum Knowledge**

During your observation period in school, write a short reflection on each of the following.

|  |  |
| --- | --- |
| **Points for Consideration** | **Teaching Strategies** |
| **9.1.** How is students’ prior knowledge taken into account? |  |
| **9.2.** How is students’ attention focused on the content (e.g. complexity of the task kept to a minimum)? |  |
| **9.3.** How is complex material broken into smaller steps? |  |
| **9.4.** How is the lesson sequenced to move from foundational knowledge to more complex content? |  |
| **9.5.** How are misconceptions anticipated and addressed? |  |
| **9.6.** How are students allowed to review and practice key ideas and concepts over time? |  |
| **9.7.** How is learning scaffolded to make new knowledge more accessible? |  |
| **9.8.** How are modelling, examples and explanations used to structure new learning? |  |



Task completed:

**Signed**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Trainee) **Date**: \_\_\_\_\_\_\_\_\_\_\_

Evidence of SK Development  
Secondary Subject-Knowledge Development

**What work have you done to develop your subject knowledge?**Evidence what you did to improve your subject knowledge in the boxes below.

|  |  |  |
| --- | --- | --- |
| **Term 1** | September/ October | November/ December |
|  |  |

|  |  |  |
| --- | --- | --- |
| **Term 2** | January/ February | March/ April |
|  |  |

|  |  |  |
| --- | --- | --- |
| **Term 3** | May/ June | June/ July |
|  |  |

Notes:

Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Trainee) Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Mentor) Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Trainer) Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

Guidance Notes & Definitions  
Appendix A

**Subject Knowledge Development**

*Evidence suggests that a high level of subject expertise is a characteristic of good teaching (Sadler and others, 2013 and Hill and others, 2005)*.

The Carter Review of ITT (2014) believes that though many ITT entrants will begin their courses with sound subject knowledge, ITT must nevertheless systematically address gaps and misconceptions in core subject knowledge. They have found that in some cases, there can be a perception, often from trainees themselves, that they begin ITT with all of the content knowledge they will need and that ITT only needs to teach new teachers how to translate that knowledge effectively. For example, evaluations from subject knowledge enhancement courses show trainees begin courses believing they have a reasonable level of subject knowledge in their subject of study, but after the course recognise that they over-estimated their levels of understanding of their subject (Department for Education (DfE), 2013).

Addressing subject knowledge systematically is important across all subjects. For secondary teachers a degree will form an important basis but not a guarantee of good subject knowledge across the breadth of the national curriculum in their subject.

They have found that these challenges mean it is important for subject knowledge to be treated as a priority in ITT. They consider the following practices as characteristics of effective teaching to address subject knowledge development:

n **Subject knowledge development should be addressed systematically**, through a process of auditing and tracking with specific on-going input to address subject knowledge gaps. There is a range of online tools provided by subject associations as well as subject knowledge specifications that can support this process.

n **Subject knowledge development in ITT should be sharply focused on “subject knowledge for teaching”**; it should focus on the content knowledge and concepts required to deliver the national curriculum and exam syllabi where relevant, ensuring that content reflects any changes to these. Emphasis should also be put on exploration of the importance of the subject and why it matters to the learner now and in the future.

n **Trainees need access to high-quality subject expertise** – making systematic use of subject expertise in schools (such as Specialist Leaders in Education (SLEs)), and cross-phase expertise in some cases.

The Teachers’ Standards require trainees to demonstrate good subject knowledge. Subject knowledge is an area that all teachers must continue to review and develop throughout their career. As such, ITT providers should instil an expectation and appetite for on-going development of subject knowledge beyond ITT and throughout a teacher’s career. Directing trainees towards subject communities and networks, as well as resources from subject associations, is a helpful way of supporting this.

**Subject-Specific Pedagogy**

*There is evidence to suggest that teachers who understand how pupils think about subjects, including their common misconceptions, are more likely to have a positive impact on pupil outcomes (Sadler and others, 2013 and Hill and others, 2005).*

The Carter Review of ITT (2014) believe that ITT programmes should address subject-specific issues, including phases of progression within the subject, linkages between subjects as well as common misconceptions and how to address them, as well as develop confidence in practical issues relating to their subject (for example, experiments in science and use of equipment in Design and Technology).

Providers and schools have also told us that it is important that both trainers and mentors have a strong grasp of subject-specific pedagogy. This relates to the issues above about trainees having access to sufficient subject expertise.

**Subject Knowledge in the ITT Core Content Framework**

n **Trainees must learn that…**

* Secure subject knowledge helps teachers to motivate pupils and teach effectively.
* Anticipating common misconceptions within particular subjects is also an important aspect of curricular knowledge.
* Explicitly teaching pupils the knowledge and skills they need to succeed within particular subject areas is beneficial.
* In order for pupils to think critically, they must have a secure understanding of knowledge within the subject area they are being asked to think critically about.

n **Trainees must learn how to…**

* Identify essential concepts, knowledge, skills and principles of the subject.
* Ensure pupils’ thinking is focused on key ideas within the subject.
* Provide opportunity for all pupils to learn and master essential concepts, knowledge, skills and principles of the subject.
* Use resources and materials aligned with the school curriculum (e.g. textbooks or shared resources designed by expert colleagues that carefully sequence content).
* Extend subject and pedagogic knowledge as part of the lesson preparation process.