Programme of study for Applied Science Diploma Year 13 2024-2025

Autumn (1st and 2nd term) Teacher 1, 2 and 3	Spring (1st and 2nd term) Summer (1st and 2nd term) Teacher 1	Spring (1st and 2nd term) Summer (1st and 2nd term) Teacher 2	Spring (1st and 2nd term) Summer (1st and 2nd term) Teacher 3
Other timescale: From: September 2024 To: January 2025	**Other timescale:** From: End of January 2024 To: May 2024	**Other timescale:** From: End of January 2024 To: May 2024	**Other timescale**: From: End of January 2024 To: May 2024
Topic: **Unit 5:** Principals of Applications of Science II. 120 marks with a total time of 2.5 hours, undertaken in three timed sessions of 50 minutes for each of Biology, Chemistry and Physics. First exam to be sat in January 2025. Diploma students to take this unit. **Skills (students should be able to do):** • Researching, reading, essay writing, exam practice. Personal learning thinking skills including: • independent enquirers, • creative thinkers, • reflective learners, • team workers, • self-managers, • effective participants	**Topic:** **Unit 4:** Laboratory techniques and their applications. Coursework based. Diploma students only to take this unit. **Skills (students should be able to do):** • Researching, reading, essay writing, exam practice. Personal learning thinking skills including: • independent enquirers, • creative thinkers, • reflective learners, • team workers, • self-managers, effective participants.	**Topic:** **Unit 6:** Investigative Project. Coursework based. Diploma students only to take this unit. **Skills (students should be able to do):** • Reading, revising, essay writing, exam practice. Personal learning thinking skills including • independent enquirers, • creative thinkers, • reflective learners, • team workers, • self-managers, • effective participants. Students will carry out a scientific literature search and review, considering the project's aims and objectives, then produce a realistic plan and carry out the project safely using your scientific investigation skills, project management skills and what you have learnt from the other units. Finally, students will prepare an evaluative report that will consider the project outcomes and suggest amendments that may have improved those outcomes. To complete the assessment task for within this unit,	**Topic:** **Unit 12:** Diseases and Infection. Coursework based. Diploma and Extended Certificate students to take this unit. **Skills (students should be able to do):** Researching, reading, essay writing, exam practice. Personal learning thinking skills including: • independent enquirers, • creative thinkers, • reflective learners, • team workers, • self-managers

		students will need to draw on learning from across your programme. Completing an investigative project is an excellent way for you to develop an understanding of the science-related workplace. The skills developed in this unit will be of considerable benefit for progression to higher education in a variety of science and science-related courses and to employment in the science or applied science sector Time management and organisation. • Adhering to and following appropriate standards and protocols. • Taking responsibility for completing tasks/procedures. • Making judgements within defined parameters. • Application of safe working practice. • Give and receive constructive feedback. • Identify, organise and use resources effectively to complete tasks. • Utilising channels of communication. • Resourceful and using initiative.	
Key Learning Outcomes (students should know): **AO1:** Students should be able to demonstrate knowledge of scientific facts, terms, definitions, and scientific formulae. Command words: describe, draw, explain, identify, name, state Marks: ranges from 18 to 24 marks. **AO2:** Students should be able to demonstrate understanding of scientific	**Key Learning Outcomes (students should know):** **Assignment A:** Students to understand the importance of health and safety in scientific organisations. **Assignment B:** Students to be able to explore manufacturing techniques and testing methods for an organic liquid.	**Key Learning Outcomes (students should know):** **Assignment A:** Students to undertake a literature search and review to produce an investigative project proposal. **Assignment B:** Students to produce a plan for an investigative project based on the proposal.	**Key Learning Outcomes (students should know):** **Assignment A:** Students to investigate different types of diseases and infections that can affect humans. **Assignment B:** Students to examine the transmission of infectious diseases and how this can be prevented.

concepts, procedures, processes and techniques and their application Command words: calculate, describe, draw, explain, give, show, state. Marks: ranges from 51 to 60 marks **AO3:** Students should be able to analyse, interpret and evaluate scientific information to make judgements and reach conclusions Command words: analyse, comment, describe, explain, give, state Marks: ranges from 18 to 24 marks. **AO4:** Students should be able to make connections, use and integrate different scientific concepts, procedures, processes or techniques. Command words: calculate, comment, explain Marks: ranges from 12 to 15 marks	**Assignment C:** Students to explore manufacturing techniques and testing methods for an organic solid. **Assignment D:** Students to understand how scientific information may be stored and communicated in a workplace laboratory	**Assignment C:** Students to safely undertake the project, collecting, analysing and presenting the results. **Assignment D:** Students to review the investigative project using correct scientific principles.	**Assignment C:** Students to understand how infectious diseases can be treated and managed. **Assignment D:** Students to understand how the human body responds to diseases and infections.
End of term 1 assessment to cover: • End of chapter test on various Chemistry topics • End of chapter test on various Biology topics • End of chapter test on various Physics topics. • Mock exam to be sat in December 2025 before the real exams.	**No end of term assessment for this unit as coursework based.**	**No end of term assessment for this unit as coursework based.**	**No end of term assessment for this unit as coursework based.**
Building understanding: Rationale for your sequence of lessons: **Chemistry:** The sequence of lessons for Learning Aim A on the properties and uses of substances is structured to progressively build students' understanding of chemical properties, organic compounds, and energy changes in industrial contexts. The	**Building understanding: Rationale for your sequence of lessons:** **Assignment A:** The sequence of lessons for Learning Aim A focuses on a comprehensive understanding of health and safety in scientific organizations. The rationale behind this sequence is structured to progressively build students'	**Building understanding: Rationale for your sequence of lessons:** The sequence of lessons for undertaking an investigative project proposal is designed to guide students systematically through the stages of planning, executing, analysing, and reviewing a scientific investigation. The goal is to equip students with the skills to	**Building understanding: Rationale for your sequence of lessons:** The sequence of lessons for investigating diseases and infections is designed to give students a structured understanding of the nature, transmission, prevention, treatment, and body responses to diseases. This progression builds a comprehensive

lessons are designed to cover both theoretical knowledge and practical applications, ensuring that students can relate chemical principles to real-world industrial processes. **A1. Introduction to Chemical Properties and Production of Substances** **Objective:** To introduce students to the chemical properties of substances, including amphoteric character, basicity of metal oxides, and the ease of electrolysis. **Why first?** Understanding chemical properties is foundational for comprehending how these substances are used and produced. This knowledge is critical for more complex topics, such as their industrial applications. **Skills/knowledge:** Students will learn to identify and explain the chemical properties of different substances, setting the stage for understanding their production and uses in industry. **Uses of Substances in Industrial Processes** **Objective:** To explore the specific uses of substances like $Ca(OH)_2$ in effluent treatment and transition metals as catalysts in key industrial processes. **Why here?** Once students have a basic understanding of chemical properties, they can move on to learning how these	knowledge and understanding, ensuring they can appreciate the critical nature of health and safety in scientific contexts. **Introduction to Health and Safety Legislation** **Objectives**: Introduce students to the fundamental principles of health and safety legislation. This foundational lesson will cover the management of health and safety, the importance of personal protective equipment (PPE), and the use of hazardous substances. **Rationale**: Understanding the legal framework is essential for grasping the responsibilities of organizations and individuals in maintaining safety. This lesson sets the groundwork for more detailed discussions on specific policies and procedures. **In-depth Analysis of Health and Safety Policies** **Objectives**: Scrutinize real-world health and safety or health, safety, and environmental policies from various scientific organizations. **Rationale**: Applying theoretical knowledge to actual policies helps students see the relevance of legislation in practice. Analyzing examples fosters critical thinking and allows students to identify best practices.	independently conduct research projects with a foundation in scientific principles, ethical considerations, and effective data handling. **Learning Aim A: Literature Search and Project Proposal** **Identifying Criteria for Literature Review** **Establishing Search Parameters**: This first lesson focuses on defining search criteria, which is essential for developing a focused literature review. By setting parameters (e.g., types of sources, publication dates, and relevance), students learn how to refine their search to gather accurate and reliable information. **Practical Application**: These skills are crucial for ensuring that the literature review is targeted and relevant, a foundation for building an evidence-based rationale. **Nature of Study and Sources of Information** **Choosing Research Methods and Sources**: This lesson covers selecting appropriate study types (fieldwork, lab work, etc.) and reliable sources of information (e.g., journal articles, textbooks, websites). Emphasis on sourcing from reputable publishers and organizations trains students in discerning high-quality information.	foundation on disease mechanisms, prevention strategies, and the human immune response, essential for careers in healthcare, biology, and public health. **Learning Aim A: Investigate Different Types of Diseases and Infections** **Pathogens and Infectious Diseases** **Lesson Focus**: Introduce the major pathogen types—bacteria, parasites, viruses, fungi, and protozoa—and how they invade and affect the body. Key characteristics of these pathogens and their life cycles lay the groundwork for understanding how they cause disease. **Rationale**: Recognizing pathogen types and their mechanisms of infection is crucial for understanding how different diseases manifest and for identifying effective prevention and treatment methods. **Infectious Diseases and Zoonotic Diseases** **Lesson Focus**: Explore specific infectious diseases, including HIV, malaria, hepatitis, and zoonotic diseases like rabies and avian flu. Students learn about diseases transmitted from animals to humans and how pathogens cross species barriers. **Rationale**: Awareness of zoonotic diseases provides insight into how diseases spread and mutate,

properties make substances suitable for industrial applications. This lesson provides context for the relevance of the properties covered in the previous lesson. **Skills/knowledge:** Students will explore how substances are chosen for industrial processes based on their chemical properties, such as alumina in refractories and catalysts in the Haber process. **Purification, Extraction, and Manufacture of Key Industrial Substances** **Objective:** To understand the extraction and manufacture of key industrial substances, such as alumina from bauxite and titanium from its ore. **Why now?** After understanding how chemical properties are used in industry, students are ready to explore the processes used to extract and purify substances. This lesson focuses on real-world applications of their chemical knowledge. **Skills/knowledge:** Students will learn about different methods of extraction and purification, comparing production techniques like the Hall–Héroult process and the electrolysis of brine. **Relating Properties of Substances to Their Uses and Production**	**Consequences of Non-compliance** **Objectives**: Discuss the implications of failing to comply with health and safety legislation, including legal, financial, and ethical consequences. **Rationale**: Highlighting real-life consequences emphasizes the importance of adhering to health and safety standards. This lesson aims to instil a sense of responsibility and awareness among students. **Identifying Hazards in Scientific Organizations** **Objectives**: Introduce various hazards commonly found in scientific settings, including chemical, physical, and environmental hazards. **Rationale**: Understanding different types of hazards prepares students to recognize potential risks in their environments. This lesson serves as a bridge to more specific hazard categories, such as COMAH sites and explosive atmospheres. **Exploration of Specific Hazards** **Objectives**: Delve into specific hazards like electrical risks, working at height, lone working, and noise. **Rationale**: By focusing on individual hazards, students can gain a more detailed understanding of how these risks are managed in scientific	**Developing Research Skills**: Knowing where and how to gather information is critical to constructing an accurate literature review and establishing the basis of their project. **Referencing and Harvard Referencing System** **Referencing Skills**: Proper citation using the Harvard referencing system is vital for academic integrity and transparency. This lesson helps students understand referencing protocols, ensuring they give credit to original authors and avoid plagiarism. **Professional Research Practice**: Learning this skill early prepares students for the professional standards expected in academia and industry. **Investigative Project Proposal Development** **Creating a Proposal**: With foundational research in place, students develop their project proposal, focusing on background, hypothesis, aims, objectives, and anticipated limitations. This encourages them to articulate their research ideas clearly and assess project feasibility. **Establishing Research Focus**: Crafting a clear proposal builds students' ability to conduct structured research and identify potential challenges early.	highlighting the importance of prevention, particularly in areas where animal-human contact is frequent. **Dietary and Environmental Diseases** **Lesson Focus**: This lesson covers diseases related to diet (e.g., diabetes, obesity) and environmental factors (e.g., pollutants and radiation). Students examine how lifestyle and surroundings can contribute to disease risk. **Rationale**: Emphasizing the impact of diet and environment on health promotes a holistic understanding of disease prevention and management, especially relevant to public health and preventive medicine. **Genetic and Degenerative Diseases** **Lesson Focus**: Introduction to genetic diseases (e.g., cystic fibrosis) and degenerative diseases (e.g., Alzheimer's) explores how genetic mutations and aging processes can lead to disease. **Rationale**: Understanding genetic and degenerative diseases builds knowledge about non-infectious diseases, preparing students to differentiate between types of diseases and consider inherited or age-related risks. **Progression of Disease Over Time** **Lesson Focus**: Students learn about disease stages, such as asymptomatic

Objective: To connect the properties of substances to their production methods and industrial uses. **Why here?** Having explored the extraction and manufacture of substances, students can now focus on how the properties of substances dictate their production processes and applications. **Skills/knowledge:** Students will analyse and compare different production methods, evaluating how chemical properties such as amphoterism or basicity influence industrial choices. **A2: Introduction to Organic Compounds and Hydrocarbon Structures** **Objective:** To introduce students to the structures, formulae, and nomenclature of alkanes, alkenes, and their isomers. **Why now?** After mastering the properties and production of inorganic substances, students are ready to explore the structures and reactions of organic compounds, particularly hydrocarbons, which are of commercial importance. **Skills/knowledge:** Students will learn to represent and name organic compounds according to IUPAC nomenclature, understand the differences between straight chain, branched, and cyclic compounds, and	environments. This helps them to connect theory with practical applications in safety management. **Working Environments and Safety Protocols** **Objectives**: Analyse working environments in scientific settings, such as laboratories and educational institutions, emphasizing relevant safety protocols. **Rationale**: This lesson integrates knowledge of hazards with practical safety measures tailored to different environments. Understanding how to implement safety measures in varied settings is crucial for future scientific professionals. **Conclusion** This structured sequence is designed to provide a comprehensive understanding of health and safety in scientific organizations. Starting with legislation and progressing through policies, consequences, hazard identification, and specific safety protocols ensures that students not only learn about health and safety but also understand its application in real-world scenarios. By the end of the series, students will be equipped with the knowledge and skills necessary to navigate and contribute to a safe scientific working environment.	**Learning Aim B: Project Planning** **Scheduling and Timeline** **Project Timeline**: Planning a project timeline with milestones introduces time management skills. Setting specific dates for the project start, completion, and milestones helps students stay organized and adhere to deadlines. **Managing Long-Term Projects**: Developing a realistic schedule trains students to anticipate and manage time, critical skills for independent research. **Research Methods and Resources** **Designing the Experiment**: Lessons on selecting relevant methods, participants, equipment, and materials teach students to match methodologies with research objectives. Understanding resources and contingency planning further prepares students for smooth project execution. **Practical and Resource Management**: Effective planning of methods and resources is essential in both research and industry for ensuring accuracy, cost-efficiency, and feasibility. **Health, Safety, and Ethical Considerations** **Risk and Ethical Assessments**: Introducing health and safety requirements (hazard identification, PPE, COSHH) alongside ethical considerations ensures students conduct safe and ethical	periods, latency, and how diseases can impact everyday life. **Rationale**: This lesson introduces the concept of disease progression, which is vital for understanding disease management and the importance of early detection. **Learning Aim B: Examine the Transmission of Infectious Diseases and Prevention Methods** **Methods of Disease Transmission** **Lesson Focus**: The modes of transmission (direct, indirect, vectors) for diseases are explored, with examples like body fluids, contaminated surfaces, and vectors like mosquitoes. **Rationale**: Knowing transmission methods allows students to understand risk factors for infection and the importance of controlling the spread of pathogens. **Prevention Methods for Infectious Diseases** **Lesson Focus**: Preventative approaches, such as prophylaxis, PPE, safe practices, and environmental controls (e.g., eliminating standing water to reduce mosquito populations). **Rationale**: This lesson teaches essential public health strategies that are fundamental in disease prevention and

begin exploring the bonding in these molecules. **Bonding, Reactions, and Properties of Alkanes and Alkenes** **Objective:** To explore the bonding in alkanes and alkenes, including sigma and pi bonding, hybridisation, and the effect of these bonds on properties like boiling points. **Why here?** Once students understand hydrocarbon structures, they need to explore the bonding within these molecules to understand how it affects their physical properties and reactivity. **Skills/knowledge:** Students will learn about hybridisation, bond angles, and intermolecular forces, and how these factors affect the boiling points and stability of hydrocarbons. This prepares them for understanding the reactions and industrial uses of hydrocarbons. **Hydrocarbon Reactions and Their Commercial Importance** **Objective:** To study important reactions of hydrocarbons, including free radical substitution and electrophilic addition, as well as their commercial applications like polymerisation and cracking. **Why now?** After understanding the bonding in hydrocarbons, students are ready to explore their reactivity and	**Assignment B** The sequence of lessons for Learning Aim B is designed to provide a comprehensive exploration of manufacturing techniques and testing methods for organic liquids. This structured approach ensures students acquire both theoretical knowledge and practical skills, enabling them to understand and apply key concepts in organic chemistry. **Introduction to Manufacturing Techniques** **Objectives**: Introduce students to various manufacturing techniques used for organic liquids, with an emphasis on reflux, distillation, and solvent extraction. **Rationale**: Starting with the foundational principles of these techniques establishes a solid base. Understanding the principles behind each method allows students to appreciate their significance in organic synthesis. **Reflux and Its Applications** **Objectives**: Discuss the principles of reflux and examine laboratory and industrial equipment used. **Rationale**: Reflux is a critical technique in organic synthesis, and exploring its applications helps students see its importance in ensuring complete reactions while	research. Performing a risk assessment also prepares them for professional standards in laboratories. **Prioritizing Safety and Ethics**: Understanding these aspects ensures that students conduct research responsibly and with awareness of their ethical and legal responsibilities. **Learning Aim C: Conducting the Project, Data Collection, and Analysis** **Experimental Procedures and Techniques** **Implementing Practical Skills**: Teaching proper equipment use, adherence to safety protocols, and efficient observation skills ensures students conduct their experiments with precision and consistency, foundational skills for reliable data collection. **Hands-On Research Skills**: These lessons are essential for developing accuracy in scientific investigation and following industry standards, like GLP and GMP. **Data Collection, Organization, and Analysis** **Data Handling and Analysis**: Lessons on data recording, logbook maintenance, and statistical analysis (standard deviation, t-test) provide students with tools for processing and analysing data accurately, essential for interpreting research outcomes.	control, a critical aspect of managing pandemics and outbreaks. **Vaccination and Herd Immunity** **Lesson Focus**: Detailed coverage of vaccination types (e.g., attenuated, live antigens), how vaccines stimulate immunity, and the concept of herd immunity. **Rationale**: Understanding vaccination's role in preventing disease spread is key to appreciating public health initiatives, vaccine development, and the science behind immunization programs. **Management of Infectious Diseases by Organizations** **Lesson Focus**: Examines the roles of WHO, NHS, and NGOs (e.g., Médecins Sans Frontières) in controlling and managing disease outbreaks. **Rationale**: Familiarity with organizational roles in health crisis management provides students with a broader view of global health infrastructure and response protocols. **Learning Aim C: Understanding the Treatment and Management of Infectious Diseases** **Methods of Treatment** **Lesson Focus**: Covers various treatments for infectious diseases, including antibiotics, antivirals,

how this leads to commercially significant reactions. **Skills/knowledge:** Students will analyse reaction mechanisms, such as free radical substitution in alkanes and electrophilic addition in alkenes, and their application in processes like the cracking of hydrocarbons and the production of polymers. **A3: Introduction to Energy Changes in Industrial Reactions** **Objective:** To introduce students to the concepts of enthalpy change, standard conditions, and exothermic and endothermic reactions. **Why here?** Having studied the structure and reactions of substances, students need to understand the energy changes associated with these reactions, particularly in industrial contexts. **Skills/knowledge:** Students will learn to calculate enthalpy changes under standard conditions, interpret reaction profiles, and understand the importance of energy efficiency in industrial processes. **9. Calculating Enthalpy Changes and Their Industrial Relevance** **Objective:** To teach students how to measure and calculate enthalpy changes using specific heat capacity,	preventing loss of volatile components. This lesson prepares students for more complex techniques. **Distillation Techniques** **Objectives**: Cover both simple and fractional distillation, including laboratory equipment and industrial distillation towers. **Rationale**: Distillation is a fundamental separation technique in organic chemistry. Understanding the differences between simple and fractional distillation enhances students' ability to choose appropriate methods for purifying organic liquids. **Solvent Extraction and Impurity Removal** **Objectives**: Introduce solvent extraction and discuss various chemicals used to remove impurities. **Rationale**: Solvent extraction is crucial for isolating organic compounds. This lesson not only explains the process but also emphasizes the importance of purity in organic synthesis, linking back to the previous lessons on distillation. **Synthesis of Organic Compounds** **Objectives**: Examine the manufacture of ethyl ethanoate or 3-methylbut-1-yl	**Analytical Skills Development**: These skills empower students to derive meaningful insights from their data, validate their methods, and assess experimental accuracy and reliability. **Data Presentation** **Communicating Findings**: Teaching appropriate methods for data presentation (e.g., tables, graphs) enables students to communicate findings clearly. Choosing the correct format for data representation also helps ensure information is accessible to various audiences. **Professional Data Reporting**: Learning to present data accurately and thoughtfully is critical for academic and industry-based research, where clear communication of results is essential. **Learning Aim D: Project Review and Scientific Reporting** **Scientific Report Writing** **Report Structure and Scientific Terminology**: Lessons on the structure, style, and language of scientific reports prepare students for presenting research formally. Emphasizing correct terminology, past tense, and third-person language teaches students the conventions of professional scientific writing. **Building Reporting Skills**: Writing a clear, concise, and accurate report with	antifungals, and supportive therapies like rehydration and immunoglobulins. **Rationale**: Learning about treatment types and their mechanisms equips students with knowledge of how infections are controlled and the importance of using targeted therapies to prevent resistance. **Access to and Acceptance of Treatment** **Lesson Focus**: Factors influencing treatment access, such as stigma, cultural beliefs, and accessibility, are discussed, as well as adverse reactions and contraindications. **Rationale**: Exploring barriers to treatment highlights the social and economic factors affecting healthcare, fostering awareness of health equity and patient-centred care approaches. **Learning Aim D: Understanding the Body's Response to Diseases and Infections** **Non-Specific Défense Mechanisms** **Lesson Focus**: This lesson introduces the body's immediate defences, including physical barriers (skin), chemical barriers (stomach acid), and phagocytosis. **Rationale**: Non-specific defences form the first line of immunity; understanding them is crucial for

heat transfer equations, and data from industrial processes. **Why now?** After understanding the theoretical concepts of energy changes, students need to apply this knowledge in practical calculations that are relevant to industrial applications. **Skills/knowledge:** Students will learn to use the equation Q=mcΔtQ = mc\Delta tQ=mcΔt to calculate heat changes in reactions, relate these calculations to industrial energy needs, and analyze data from real-world processes. **<u>Review and Synthesis: Properties, Reactions, and Energy Changes in Industry (A1, A2, A3)</u>** **Objective:** To review the properties and uses of substances, focusing on how chemical and physical properties, reactions, and energy changes interrelate in industrial contexts. **Why now?** This final lesson synthesizes all previous content, allowing students to connect their knowledge of chemical properties, organic reactions, and energy changes in industrial applications. **Skills/knowledge:** Students will apply their knowledge in a comprehensive review, integrating their understanding of the industrial production, use, and energy changes of both inorganic and organic substances.	ethanoate, comparing laboratory and industrial scales. **Rationale**: This hands-on approach solidifies understanding of the discussed techniques. By applying knowledge to real-world examples, students gain insight into both laboratory practices and industrial applications. **Introduction to Testing Methods** **Objectives**: Shift focus to testing methods for assessing purity, starting with boiling point measurement. **Rationale**: Understanding how to assess the purity of organic compounds is essential. This lesson bridges manufacturing techniques with quality control, highlighting the significance of boiling point in characterizing organic liquids. **Infrared Spectroscopy** **Objectives**: Explore infrared spectroscopy, including how to compare spectra with pure samples. **Rationale**: Infrared spectroscopy is a powerful tool in organic chemistry. By teaching students how to interpret IR spectra, this lesson enhances their analytical skills and reinforces the importance of purity assessment. **Advanced Testing Methods**	references is crucial for academic integrity and scientific communication. **Scientific Evaluation of Findings** **Evaluating Research Outcomes**: Lessons on evaluating findings, limitations, and hypothesis assessment help students critically review their work, identify areas for improvement, and suggest further research. This encourages reflection and continuous improvement in scientific practice. **Developing Critical Thinking**: Learning to evaluate results and processes promotes scientific rigor and prepares students to assess research outcomes objectively. **Skill Development and Reflection** **Project and Skill Reflection**: Lessons on reflecting on skill development, such as time management, safe practices, and communication, foster self-awareness. Emphasizing initiative, judgment, and resourcefulness helps students assess their strengths and areas for future growth. **Building Independent Research Skills**: Reflecting on project work develops students' ability to learn from experiences, improving their confidence and preparedness for future scientific challenges. **Summary:** The sequence progresses from foundational research and proposal development to planning, execution, data	knowing how the body protects itself from initial pathogen invasions. **Specific defence Mechanisms – Cell-Mediated and Humoral Responses** **Lesson Focus**: Differentiates between cell-mediated (T-lymphocytes) and humoral responses (B-lymphocytes), highlighting how the body targets specific pathogens. **Rationale**: Knowing the differences between immune responses and how they combat pathogens is foundational for understanding immunology, vaccination, and autoimmune conditions. **The Immune Response and Memory Cells** **Lesson Focus**: Focuses on memory cells and secondary immune responses, illustrating how the body remembers pathogens for faster future responses. **Rationale**: This concept is essential for grasping long-term immunity and the principles of booster vaccinations. **Summary:** This sequence of lessons progressively builds from understanding different diseases and pathogens to examining the immune response. This structured approach equips students with a comprehensive understanding of disease mechanisms, transmission, prevention, and the body's defence. These lessons foster a strong

Overall Structure and Flow: **Building Foundational Knowledge First:** The sequence begins with lessons on the basic chemical properties of substances before moving to their industrial uses, ensuring that students have a strong foundation in chemical principles. **Progression from Theory to Application:** Each lesson builds on the last, moving from understanding the properties and extraction of substances to their commercial uses and energy changes in industrial contexts. **Practical Application of Knowledge:** Throughout the sequence, there is a focus on industrial processes and the real-world applications of chemical principles, helping students relate their theoretical knowledge to practical and industrial contexts. **Integration of Organic and Inorganic Chemistry:** The lessons cover both organic and inorganic substances, ensuring that students have a comprehensive understanding of chemistry as it relates to industry, from hydrocarbons to metal oxides. This sequence ensures that students gain a thorough understanding of the properties and uses of substances, along with the energy changes involved in their production and application in industry, preparing them for both	**Objectives**: Introduce advanced methods used in industry, including high-performance liquid chromatography (HPLC) and gas chromatography (GC). **Rationale**: Providing knowledge of advanced testing techniques prepares students for real-world applications in quality control and research settings. This final lesson synthesizes previous knowledge while emphasizing modern analytical methods. **Conclusion** This structured sequence ensures that students gain a comprehensive understanding of both manufacturing techniques and testing methods for organic liquids. By progressing from fundamental concepts to specific applications and analytical techniques, students develop the knowledge and skills necessary for successful careers in chemistry and related fields. The integration of theory and practical application throughout the lessons fosters a deeper understanding of organic processes and enhances students' preparedness for future challenges in the scientific community. **Assignment C** The sequence of lessons for Learning Aim C is designed to provide a thorough exploration of manufacturing techniques and testing methods for organic solids. This structured approach ensures that students gain both theoretical	analysis, and review. This comprehensive structure supports students in developing independence and rigor in scientific investigation, equipping them with valuable skills for future studies or professional research environments.	foundation for careers in healthcare, scientific research, or public health by focusing on both technical knowledge and social considerations.

academic assessments and practical industrial challenges. **<u>Biology:</u>** This sequence of lessons on the cardiovascular system is structured to introduce students to essential anatomical and physiological concepts before progressively incorporating more complex functions and real-world applications. The organization prioritizes foundational knowledge, such as heart structure and function, before layering on circulatory mechanics, diagnostic tools, disease factors, and treatments, ensuring a cohesive and comprehensive understanding of cardiovascular health. **B1: Heart Structure and Function** **Foundation of Cardiovascular System**: Starting with the heart's anatomy (atria, ventricles, septum, valves, major blood vessels) gives students a solid grounding in the organ at the centre of the system. Understanding these parts and their functions provides essential knowledge needed to comprehend the entire cardiovascular system. **Myogenic Muscle and Conduction System**: The introduction of myogenic muscle tissue and the heart’s conduction system (SAN, AVN, Bundle of His, Purkinje fibres) follows logically, as students can now relate the structure of the heart to its autonomic contractions. This also prepares	knowledge and practical skills essential for understanding the production and characterization of organic solid compounds. **Lesson Sequence Overview** **Introduction to Manufacturing Techniques for Solids** **Objectives**: Introduce key concepts related to crystallization and recrystallization, including saturated and supersaturated solutions. **Rationale**: Establishing a foundational understanding of solubility principles sets the stage for deeper exploration of crystallization techniques. This knowledge is crucial for later discussions on purification methods. **Crystallization Techniques** **Objectives**: Explore the processes of crystallization and recrystallization, focusing on factors that influence crystal growth and purity. **Rationale**: Emphasizing the significance of temperature and solvent polarity enhances students’ understanding of how to achieve optimal crystallization results. This lesson also connects theory with practical application in purifying organic solids. **Filtration Methods**		

students to later interpret the cardiac cycle and ECG. **Cardiac Output Calculation**: Once students grasp the heart's anatomy and conduction system, calculating cardiac output offers a hands-on application, bridging the structural knowledge with a practical physiological concept that reinforces the heart's role in circulation. **Blood Vessel Structure and Function** **Characteristics and Pressure Differences**: Introducing blood vessel types and pressure changes explains how blood circulates through different parts of the body. Students can compare arteries, veins, and capillaries to understand how their structure enables specific functions (e.g., arteries withstand high pressure, veins prevent backflow with valves). **Linking with Heart Function**: This knowledge helps students appreciate the interdependent nature of the cardiovascular system, as blood vessels work alongside the heart to maintain homeostasis and efficient blood flow. **Cardiac Cycle** **Systole, Diastole, and Blood Flow**: Covering the cardiac cycle next (atrial systole, ventricular systole, cardiac diastole) helps students understand the rhythmic nature of heartbeats. Learning the roles of major vessels and the timing of valve openings and closings	**Objectives**: Cover various filtration techniques, including gravity filtration, hot filtration, and vacuum filtration. **Rationale**: Understanding different filtration methods is essential for isolating crystals from solutions. This lesson prepares students to select appropriate techniques based on the specific requirements of their experiments. **Evaporation and Drying Techniques** **Objectives**: Discuss methods for evaporation and drying, including the use of desiccators and rotary evaporation. **Rationale**: Learning about these techniques is vital for the final stages of organic solid preparation. Students gain insight into how to effectively remove solvents while preserving the integrity of the product. **Industrial Manufacturing Techniques** **Objectives**: Introduce advanced manufacturing methods like spray drying and freeze drying, along with the use of filter presses. **Rationale**: Expanding knowledge to industrial-scale techniques helps students understand how laboratory principles are applied in real-world production. This prepares them for careers in industrial settings.		

reinforces how the heart maintains unidirectional blood flow. **Integrating Concepts**: This segment integrates previous lessons on heart structure, valve function, and vessel characteristics, supporting students in grasping the cycle's effect on blood pressure and cardiac output. **Electrocardiograms (ECG)** **ECG Interpretation**: With the cardiac cycle as background, students can now analyze ECG traces, learning the significance of PQRST points and identifying different arrhythmias (e.g., tachycardia, bradycardia). This real-world diagnostic skill allows them to connect their theoretical knowledge with clinical applications. **Relevance to Disease**: Learning to interpret arrhythmias introduces the importance of diagnostics in preventing and managing cardiovascular disease (CVD), setting up the rationale for later discussions on CVD risk factors and treatments. **Risk Factors for Cardiovascular Disease** **Understanding Risk Factors**: Now that students have an understanding of normal cardiovascular function, discussing factors like genetics, age, diet, high blood pressure, and lifestyle introduces CVD risk factors. This builds awareness of preventive health	**Synthesis of Aspirin or Paracetamol** **Objectives**: Explore the laboratory and industrial-scale manufacture of common organic solids like aspirin or paracetamol. **Rationale**: Applying theoretical concepts to the synthesis of well-known compounds helps students connect their learning to practical applications. This lesson also emphasizes the importance of quality control throughout the manufacturing process. **Estimation of Purity** **Objectives**: Discuss methods for assessing purity, starting with the appearance of crystals, and moving to melting point measurements. **Rationale**: Understanding purity assessment is crucial for evaluating the quality of synthesized compounds. This lesson provides foundational skills for later analytical techniques. **Melting Point Analysis** **Objectives**: Cover techniques for measuring melting points, including simple cooling curves and mixed-melting-point techniques. **Rationale**: Melting point determination is a key indicator of purity. By learning about various methods and their reliability, students		

measures and how lifestyle choices impact cardiovascular health. **Contextual Application**: Examining CVD risk factors contextualizes the cardiovascular system in daily life, enhancing the relevance of lessons and fostering a more holistic understanding of heart health. **Practical Investigation: Effect of Caffeine on Heart Rate in Daphnia** **Hands-On Experimentation**: Investigating caffeine's effect on heart rate in Daphnia provides an interactive way to study physiological responses and reinforces the importance of the cardiovascular system's adaptability. This experiment also develops students' research skills and understanding of factors influencing heart rate. **CVD Treatments: Benefits and Risks** **Treatment Options**: Concluding with an exploration of CVD treatments (antihypertensives, statins, transplantation) connects previous lessons on risk factors, diagnostics, and prevention to therapeutic options. Students can now critically evaluate the effectiveness and trade-offs of each treatment, rounding out their understanding of the cardiovascular system in both health and disease.	gain practical skills relevant to their future work in chemistry. **Thin-Layer Chromatography (TLC) and Other Analytical Methods** **Objectives**: Introduce thin-layer chromatography as a method for purity assessment, along with infrared spectroscopy. **Rationale**: These analytical techniques are widely used in both academic and industrial settings. Providing knowledge on TLC and IR spectroscopy equips students with essential skills for characterizing organic solids. **Conclusion** This carefully structured sequence builds a comprehensive understanding of manufacturing techniques and testing methods for organic solids. By progressing from foundational concepts to advanced techniques, students develop a robust skill set that integrates theory and practical application. This approach not only enhances their knowledge of organic solid production but also prepares them for successful careers in scientific and industrial fields. **<u>Assignment D</u>** The sequence of lessons for Learning Aim D is designed to provide a comprehensive understanding of how scientific information is stored and communicated within a workplace		

Summary: This sequence gradually builds from basic structure and function, enabling students to develop a deep understanding of cardiovascular physiology. By the end, students can connect anatomical knowledge with real-world implications, diagnostics, and treatment decisions, giving them a comprehensive perspective on cardiovascular health. This sequence of lessons on the human lung and the ventilation system is structured to progress from understanding core anatomical structures to integrating functional mechanics, principles of gas exchange, diagnostic tools, and the effects of physiological demands, such as exercise, on respiratory function. Here's the rationale for each part of the sequence: **B2: Structure of the Human Lung and Ventilation System** **Foundational Knowledge**: Beginning with the structure of the lung (trachea, bronchi, bronchioles, alveoli, capillary network) gives students a foundation in anatomy that is essential for understanding how air moves through the respiratory system and where gas exchange occurs. **Supporting Structures**: The intercostal muscles, diaphragm, and pleural membranes are then introduced to show how these structures support breathing mechanics. Students can	laboratory. This structured approach ensures that students grasp both the theoretical and practical aspects of laboratory information management, enhancing their ability to operate effectively in scientific environments. **Lesson Sequence Overview** **Introduction to Laboratory Information Management** **Objectives**: Introduce the concept of traceability in laboratory settings, including the use of signatures or unique computer logins. **Rationale**: Understanding traceability is fundamental for ensuring accountability and integrity in laboratory work. This lesson establishes a foundation for the importance of accurate record-keeping. **Records Associated with Laboratory Work** **Objectives**: Explore the various records associated with laboratory activities, including sample booking, unique identification numbers, analysis records, and reporting formats. **Rationale**: This lesson highlights the critical role of documentation in maintaining quality and compliance in laboratory settings. It emphasizes how		

connect each structure's role in maintaining the overall integrity and function of the lungs, setting the stage for understanding ventilation. **Interconnected Components**: This section also emphasizes the close relationship between the lung's structures, like the proximity of alveoli to capillaries, which becomes essential when discussing gas exchange efficiency. **Mechanics of Ventilation** **Inspiration and Expiration Processes**: Moving to ventilation mechanics next (inspiration, expiration, action of intercostal muscles, and diaphragm) allows students to apply their structural knowledge to dynamic breathing processes. Understanding changes in thoracic volume and air pressure introduces core concepts in respiratory physiology, such as how air moves into and out of the lungs. **Assisted Breathing**: Introducing the use of ventilators at this stage links physiology to medical applications, enabling students to see how respiratory support works in cases where natural breathing is compromised. **Principles of Efficient Gas Exchange** **Adaptations for Gas Exchange**: Discussing principles of gas exchange in the alveoli (large surface area, moisture,	thorough record-keeping contributes to effective data management. **Laboratory Information Management Systems (LIMS)** **Objectives**: Introduce LIMS and its role in managing laboratory data efficiently. **Rationale**: LIMS is a vital tool for modern laboratories. Understanding its functionalities helps students appreciate the integration of technology in data management and its impact on laboratory operations. **Types of Information in Scientific Organizations** **Objectives**: Discuss the various types of information used in scientific organizations, such as customer and product details, manufacturing data, and standard operating procedures. **Rationale**: This lesson provides an overview of the breadth of information that needs to be managed in a scientific setting, highlighting the interconnectedness of different data types in laboratory operations. **Communication Channels in Scientific Organizations** **Objectives**: Explore the channels of communication within and outside the		

thin capillary walls, and diffusion gradients) builds on students' structural knowledge and demonstrates how anatomy is optimized for function. This section also underscores the importance of gas exchange in maintaining oxygen supply for cellular respiration and ATP production. **Biological Relevance**: Understanding gas exchange efficiency connects lung function to cellular processes, giving students a systems-level view of respiration that is foundational for understanding how oxygen and carbon dioxide are managed in the body. **Spirometer Readings and Lung Volumes** **Measuring Lung Function**: After exploring how gas exchange occurs, introducing spirometer readings and lung volumes (tidal volume, inspiratory reserve, residual volume, etc.) allows students to quantify lung function. This links structure and function with practical measurements, reinforcing concepts of lung capacity and the role of different lung volumes. **Application to Respiratory Health**: Understanding lung volumes prepares students for more in-depth discussions of respiratory health and helps them see how lung capacity reflects lung health and efficiency.	organization, including intranets, emails, and reports. **Rationale**: Effective communication is crucial in scientific organizations. This lesson emphasizes the importance of clear communication for collaboration, compliance, and sharing of research findings. **Introduction to Informatics in Science** **Objectives**: Introduce the concept of informatics and its application in storing and retrieving scientific information. **Rationale**: Understanding the role of informatics is essential in today's data-driven scientific landscape. This lesson sets the stage for discussions on large databases and their uses. **Examples of Scientific Data in Large Databases** **Objectives**: Explore specific examples of data stored in large databases, such as DNA sequencing and healthcare records. **Rationale**: This lesson illustrates the practical applications of informatics in various scientific fields. By examining real-world examples, students can see the relevance of data management in advancing scientific knowledge.		

Measurement Methods for Respiratory Conditions **Diagnostic Tools**: Moving to diagnostic methods (peak expiratory flow, forced vital capacity) shows students how respiratory conditions are assessed. These tools are essential for detecting and managing conditions like asthma and chronic obstructive pulmonary disease (COPD). **Linking Diagnostics with Anatomy and Physiology**: This section integrates anatomical and physiological knowledge with real-world applications, as students can see how various measurements provide insights into lung function and potential impairments. **Effects of Exercise on Respiratory Parameters** **Exercise Physiology**: Concluding with the effects of exercise on respiratory parameters (tidal volume, breathing rate, respiratory minute ventilation, oxygen consumption) allows students to apply their knowledge dynamically. Examining spirometer data from exercise experiments helps students appreciate how the respiratory system adapts to increased demand, enhancing understanding of respiratory efficiency and endurance. **Real-World Application and System Interconnectedness**: This final section reinforces the interconnected nature of	**Uses of Information from Large Databases** **Objectives**: Discuss the applications of information retrieved from large databases, including personalized healthcare and genetic engineering. **Rationale**: Highlighting practical uses of data demonstrates its impact on society and research. This lesson reinforces the importance of effective data management in achieving scientific advancements. **Advantages and Issues of Data Management** **Objectives**: Explore the benefits of large-scale data storage and retrieval, as well as ethical considerations and confidentiality issues. **Rationale**: Understanding both the advantages and challenges of data management prepares students for real-world scenarios where ethical considerations play a significant role in scientific work. **Effective Use of Software for Data Management** **Objectives**: Emphasize the need to use appropriate software effectively for managing scientific data.		

the respiratory and muscular systems and highlights how respiration adapts to meet energy demands during physical activity, bringing full circle the relationship between respiratory anatomy, physiology, and overall body function. **Summary:** This sequence gradually builds from understanding respiratory structures and breathing mechanics to the physiological principles that enable gas exchange, measuring lung volumes, and applying diagnostics. The final emphasis on exercise provides a real-world application of these concepts, allowing students to appreciate the dynamic nature of respiratory function and its role in supporting overall health and physical performance. **B3:** The sequence of lessons on the urinary system is designed to build a comprehensive understanding of kidney function, from basic anatomical and physiological concepts to complex regulatory mechanisms, disease states, and treatments. By beginning with foundational concepts and progressively layering in detailed functions and clinical applications, students can develop a well-rounded understanding of renal health and disease management. **B3. Roles of the Kidney: Excretion and Osmoregulation** **Foundational Functions**: Starting with the roles of the kidney in excretion and	**Rationale**: Proficiency in relevant software tools is essential for efficient data management. This final lesson equips students with practical skills that will be vital in their future careers. **Conclusion:** This structured sequence provides a comprehensive overview of how scientific information is stored and communicated in laboratory settings. By progressing from foundational concepts to practical applications and ethical considerations, students develop a robust understanding of laboratory information management. This knowledge not only prepares them for successful careers in scientific fields but also emphasizes the importance of accuracy, communication, and ethics in the responsible handling of scientific data.		

osmoregulation provides essential background on why the kidney is vital for maintaining homeostasis. Students learn that excretion (waste removal) and osmoregulation (water balance) are the kidney's primary functions, setting a strong foundation for understanding how these processes support overall health. **Context for Future Topics**: This introduction frames the kidney as a major regulatory organ, preparing students to appreciate the complexity of nephron function and hormonal regulation in later lessons. **Function of the Urinary System and Key Structures** **Introduction to System Components**: Exploring the urinary system structures (ureter, bladder, renal artery, and vein) provides an overview of the anatomy and pathways involved in urine formation and excretion. **Integration with Kidney Functions**: This section allows students to connect the kidney's internal processes to the broader system, seeing how urine formed in the kidneys is transported and stored before elimination. **Structure and Function of a Kidney Nephron** **Detailed Nephron Anatomy**: Diving into the nephron (glomerulus, Bowman's capsule, proximal convoluted tubule,			

loop of Henle, distal convoluted tubule, collecting duct) provides a close-up view of kidney function, as the nephron is the site of filtration, reabsorption, and secretion. Understanding nephron structure lays the groundwork for explaining ultrafiltration, selective reabsorption, and waste removal. **Processes and Mechanisms**: Students learn how specific nephron segments contribute to osmoregulation and waste removal, helping them appreciate the intricacies of kidney function at the cellular level. **Role of Hormonal Regulation**: Discussing anti-diuretic hormone (ADH) and the renin-angiotensin-aldosterone system (RAAS) here introduces essential regulatory mechanisms for maintaining blood pressure, electrolyte, and fluid balance, which are central to understanding renal physiology. **Kidney's Role in Water, Electrolyte, and Acid-Base Balances** **Core Homeostatic Functions**: This lesson extends students' understanding of osmoregulation by incorporating electrolyte and acid-base balance. These concepts are crucial as they highlight how kidneys maintain the body's internal environment under various physiological conditions. **Interconnected Mechanisms**: By now, students can understand how water, electrolytes, and pH are regulated			

simultaneously, deepening their appreciation for the kidney's role in maintaining overall physiological balance. **Kidney disease and Treatment** **Clinical Applications**: Once students grasp normal kidney function, introducing kidney disease and treatments like dialysis and transplantation provides real-world relevance. Students can contrast healthy kidney function with impaired states and explore how medical interventions support kidney function in chronic disease. **Treatment Rationale and Methodology**: Understanding dialysis and transplantation processes allows students to appreciate how these treatments mimic or replace kidney functions, rounding out their knowledge with a focus on practical, life-saving applications. **Summary:** This sequence builds from fundamental concepts to complex regulatory processes, emphasizing the kidney's multifaceted role in homeostasis. By exploring both normal function and disease states, students gain a complete view of the urinary system’s importance in health, preparing them for further studies in human physiology or healthcare fields. **B4:** The sequence of lessons on cell transport mechanisms is designed to			

provide students with a foundational understanding of membrane structure and transport processes, progressing from basic concepts to more complex mechanisms. This structured approach builds a strong theoretical framework, enabling students to grasp the practical implications of cell transport in biological systems. **B4: Structure of the Cell Surface Membrane and the Fluid Mosaic Model** **Foundation of Cell Transport**: Beginning with the cell surface membrane's structure, particularly the fluid mosaic model, establishes a foundational understanding of how cell membranes function as selectively permeable barriers. Understanding this model (phospholipid bilayer, embedded proteins) is essential as it sets the stage for comprehending how different molecules are transported. **Visualizing Membrane Dynamics**: The fluid mosaic model also introduces the dynamic nature of the membrane, helping students appreciate how transport processes rely on membrane flexibility and the distribution of proteins. **Passive Transport Mechanisms** **Diffusion and Facilitated Diffusion**: Starting with passive transport (diffusion, facilitated diffusion) provides an intuitive approach to understanding how molecules move across			

membranes without energy input. Learning about diffusion and facilitated diffusion through carrier proteins and channels introduces students to the various ways cells utilize membrane proteins. **Osmosis**: Introducing osmosis as a form of passive transport emphasizes the unique role of water movement across the membrane. Although water potential is not covered, students still gain a conceptual understanding of how water balance is maintained in cells, which is crucial for cell stability and function. **Active Transport and the Role of ATP** **Energy-Dependent Transport**: After understanding passive processes, active transport introduces students to transport that requires cellular energy. Discussing ATP as an immediate energy source clarifies how cells move molecules against concentration gradients and the significance of this process in maintaining cellular function. **Comparing Passive and Active Transport**: Teaching active transport after passive mechanisms allows students to compare and contrast energy-dependent and energy-independent processes, reinforcing their understanding of why different types of transport are essential for cellular health.			

Endocytosis and Exocytosis for Large Molecule Transport **Bulk Transport**: Introducing endocytosis and exocytosis provides a comprehensive understanding of how cells manage large molecule transport, complementing the earlier focus on small molecule transport. Teaching vesicle formation and movement across the membrane highlights the cell's ability to manage larger structures and materials. **Application to Cellular Processes**: Endocytosis and exocytosis allow students to explore how these processes are integral in nutrient uptake, waste removal, and cellular communication, reinforcing the membrane's role in complex cellular interactions. **Surface Area to Volume Ratio and Its Impact on Transport** **Relating Structure to Efficiency**: Concluding with the impact of surface area to volume ratio connects cell size and shape to the efficiency of transport. This lesson emphasizes why certain cell adaptations (like microvilli) are necessary for optimal nutrient and gas exchange, especially in large or specialized cells. **Connecting to Multicellular Organisms**: Understanding surface area to volume ratio also helps students appreciate why multicellular organisms have specialized			

transport systems, creating a foundation for further study in physiology. **Summary:** This sequence builds logically from understanding membrane structure to exploring various transport methods and their practical significance. By concluding with the role of surface area to volume ratio, students can appreciate the broader implications of transport mechanisms in cells and organisms, preparing them for more advanced topics in cell biology and physiology. **Physics:** The sequence of lessons on thermal physics in domestic and industrial applications is structured to progress from foundational concepts and units to complex calculations and thermodynamic principles. This approach builds from basic knowledge, such as units and fundamental laws, to applying these concepts to practical applications in everyday devices and industrial processes. **C1: Quantities, Units, and Conversions** **Establishing Foundational Skills**: Starting with units (power in watts, kilowatts, megawatts, gigawatts) and conversions between °C and K is essential for accurate calculation and interpretation in thermal physics. Pressure units (Pascals, Nm^{-2}) introduce students to the measurement standards			

they will need to apply throughout the unit. **Building Fluency with Units**: By introducing these units first, students gain confidence with the basic language of thermal physics, preparing them to tackle more complex concepts with a solid grasp of measurement fundamentals. **Key Definitions of Work Done** **Understanding Work and Energy Transfer**: Introducing definitions of work done as energy transfer ($W = F \times \Delta x$ for force and distance, and $W = p \times \Delta V$ for gases) provides a foundation for understanding energy flow in physical systems. This is essential for making sense of processes in engines, refrigerators, and other practical systems. **Linking Concepts to Real-World Processes**: Students begin to see how work, energy, and pressure relate to physical and mechanical processes, setting the groundwork for exploring energy efficiency and transformations in subsequent lessons. **Calculating Efficiency and Heat Engine Relationships** **Practical Application of Energy Concepts**: Efficiency calculations help students understand energy conservation in practical terms. By learning the formulas for efficiency and			

maximum theoretical efficiency, students can appreciate the limitations of real-world systems compared to idealized models. **Building Toward Heat Engine Principles**: Introducing efficiency before covering engines gives students a basis to explore how real systems convert heat to work, including the concept of unavoidable energy losses, reinforcing the practical importance of energy efficiency in both domestic and industrial contexts. **Thermodynamic Laws and Equations** **Core Thermodynamic Principles**: Covering the conservation of energy, ideal gas law, internal energy, and the first law of thermodynamics ($Q = \Delta U + W$) at this stage provides the backbone of thermal physics. These principles introduce the concept of energy balance and give students a framework for understanding various thermal processes. **Ideal Gas Processes and Engine Cycles**: Teaching isothermal and adiabatic processes along with idealized engine cycles (Carnot cycle) helps students grasp specific heat and energy exchange mechanisms under controlled conditions. **Second Law of Thermodynamics and COP**: Understanding the second law of thermodynamics, heat engines, refrigerators, and heat pumps at this			

point allows students to see how thermal energy is limited by entropy considerations, setting the foundation for exploring maximum theoretical efficiencies and limitations in energy transformations. **Changes of State and Energy Transfer in Processes** **Linking Thermal Concepts to Practical Changes of State**: Teaching changes of state and energy transfer (such as thermal capacity, thermal equilibrium, and specific heat capacity) helps students connect the theoretical aspects of thermodynamics with physical transformations of materials, such as heating, cooling, melting, and boiling. **Specific Latent Heat Calculations**: Introducing specific latent heat ($\Delta Q = \Delta mL$) reinforces concepts of energy and phase changes, which are fundamental for applications like refrigeration, steam engines, and heat pumps. **Summary:** This sequence progresses from foundational quantities and definitions to practical applications and calculations, culminating in real-world processes that involve energy transfer, temperature change, and phase changes. By moving from basic concepts to practical applications in heat engines, refrigerators, and phase transitions, this sequence builds a well-rounded understanding of thermal physics, preparing students to appreciate its role			

in both every day and industrial processes. **C2:** The sequence of lessons on materials in domestic and industrial applications is structured to develop students' understanding of material properties, from fundamental concepts to practical applications in stress, strain, and elasticity. This progression helps students relate the mechanical properties of materials to real-world uses, building an understanding of how materials are chosen and used in various applications. **C2: Introduction to Material Properties: Elasticity, Strength, and Deformation** **Basic Concepts**: Starting with fundamental properties like elasticity, strength, yield point, and plastic deformation introduces students to key concepts that define material behaviour under different forces. Understanding elasticity and the difference between elastic and plastic deformation provides a foundation for exploring material response to stress. **Real-World Relevance**: By introducing these properties first, students gain insight into why materials in both domestic and industrial settings need to withstand specific types of forces and stress.			

Stress-Strain Curves and Material Behaviour **Understanding Material Response**: Teaching stress-strain curves, elastic limit, and other characteristics like creep, fatigue, ductility, brittleness, malleability, and elastic hysteresis gives students a visual and quantitative understanding of how materials behave under various conditions. This provides a basis for analysing material suitability for specific applications. **Identifying Key Points on Curves**: Focusing on points like the yield point and elastic limit helps students understand thresholds where materials undergo permanent changes, which is crucial when selecting materials for structural or mechanical applications. **Quantities, Units, and Definitions** **Core Measurements**: Introducing quantities like density (kg/m^3), tensile/compressive stress (Nm^{-2}), and strain, alongside definitions and formulas, gives students the tools to quantify material properties. These measurements are fundamental to analysing materials under force, and they will be applied in calculations in later lessons. **Young's Modulus and Hooke's Law**: Young's modulus, as the ratio of stress to strain, is critical for understanding stiffness and elasticity, while Hooke's law ($F = k\Delta x$) provides a practical			

framework for calculating the behaviour of materials in the elastic region. These concepts enable students to analyse material resistance and behaviour in terms of proportionality, setting the stage for more detailed applications. **Calculating Material Properties and Energy** **Practical Calculations**: Calculating work done in stretching or compressing a wire/spring and determining elastic strain energy ($\Delta E(el) = ½F\Delta x = ½k(\Delta x)^2$) enables students to quantify energy in terms of material deformation. This provides a practical understanding of how materials absorb and release energy, an essential factor in material selection for applications that involve repeated stress, like springs and structural supports. **Application in Domestic and Industrial Contexts**: Students can apply these calculations to real-world situations, such as understanding why certain materials are chosen for load-bearing structures, shock absorbers, or products that experience repeated stress cycles. **Applying Material Properties in Domestic and Industrial Applications** **Connecting Theory to Practice**: With a foundation in material behaviour and quantitative analysis, students explore specific applications of materials in everyday and industrial contexts, considering how properties like			

elasticity, ductility, brittleness, and tensile strength affect material selection and performance. **Evaluating Material Suitability**: This stage allows students to analyse and make decisions based on material characteristics, such as why metals are used in construction, polymers in insulation, or specific alloys in machinery. This comprehensive understanding prepares students for further studies in materials science and engineering. **Summary:** The sequence progresses from basic concepts and characteristics of materials to detailed calculations and real-world applications. By first understanding material behaviour, followed by quantitative analysis and practical applications, students develop a robust understanding of materials' mechanical properties and their importance in domestic and industrial applications. This structured approach not only prepares students for problem-solving in real-life contexts but also lays the groundwork for advanced studies in engineering and material sciences. **C3:** The sequence of lessons on "Fluids in Motion" is structured to build students' understanding of fluid dynamics from foundational concepts to complex applications. This approach helps them apply principles of fluid flow, pressure, and viscosity in both industrial and domestic contexts,			

enabling them to understand how fluids behave in various systems. **C3: Fluid Flow Patterns: Streamline and Turbulent Flow** **Foundation of Fluid Motion**: Starting with streamline (laminar) and turbulent flow introduces students to the two primary types of fluid behaviour. Understanding these flow patterns provides the base for analysing fluid movement in pipes, air ducts, and other flow systems. **Real-World Applications**: This knowledge helps students differentiate between efficient (streamlined) and chaotic (turbulent) flow, which is essential for applications like pipeline design, aerodynamics, and water management systems. **Viscosity and Viscous Drag** **Understanding Fluid Resistance**: Introducing viscosity and viscous drag next helps students understand how different fluids resist flow based on their internal friction. This concept is fundamental to analysing how fluids move through pipes, interact with surfaces, and affect the efficiency of mechanical systems. **Practical Implications**: Viscosity is critical in selecting fluids for specific applications, such as oils in machinery, hydraulic fluids, or cooling systems,			

where minimizing or maximizing flow resistance is desired. **Mass Flow Rate Continuity** **Conservation of Mass in Fluids**: Teaching that the mass of fluid flow per second remains constant at all points along a pipe or stream tube (continuity equation) introduces students to a key conservation principle in fluid dynamics. Understanding this concept helps students see how fluid speed changes with cross-sectional area, which is essential in systems that need precise control of flow rates. **Application in Flow Management**: This principle is directly applicable in designing systems where consistent flow is critical, such as water distribution networks, fuel pipelines, and medical devices like IV drips. **Non-Newtonian Fluid Flow** **Exploring Complex Fluids**: Introducing non-Newtonian fluids, whose viscosity changes with applied stress or shear rate, allows students to understand more complex fluid behaviours. Non-Newtonian fluids are common in various industrial applications, such as in the manufacture of paints, polymers, and foods. **Real-Life Relevance**: Non-Newtonian fluids challenge the traditional assumptions of fluid dynamics, preparing students to analyse systems			

where fluid behaviour may not follow conventional patterns, which is crucial in industries dealing with specialized materials. **Rate of Fluid Flow and Pressure** **Linking Flow Rate to Pressure**: Introducing the relationship between fluid flow rate and pressure reinforces students' understanding of how pressure influences flow speed. This relationship is essential in pumps, air conditioners, and even blood flow within the human body. **Control and Design of Flow Systems**: Understanding how to manage flow rate by adjusting pressure allows students to appreciate the design of systems that require controlled flow, such as in irrigation systems, hydraulic lifts, and ventilation systems. **Bernoulli's Principle** **Energy Conservation in Fluids**: Bernoulli's principle, which relates the speed of fluid flow to pressure and height, ties together many of the previous concepts. This principle allows students to understand energy distribution in fluid systems, which is vital for analysing how fluids behave under different flow conditions. **Application to Real-World Scenarios**: Bernoulli's principle is crucial in understanding the lift on airplane wings, the operation of spray nozzles,			

the behaviour of fluids in closed and open channels, and even the flow of blood in arteries. This knowledge provides a comprehensive understanding of fluid motion, enabling students to analyse and solve practical problems in both domestic and industrial applications. **Summary:** This sequence progresses from basic flow concepts to complex fluid dynamics principles, culminating with Bernoulli's principle, which brings together energy, pressure, and flow speed. By following this structured approach, students gain an understanding of fluid motion applicable to engineering, environmental science, and many other fields. This solid foundation allows them to analyse and optimize systems involving fluid flow, preparing them for advanced studies and real-world problem-solving.			
Home – Learning: • Knowledge (flipped learning) • -6 Mark essays to be set when appropriate. • -Exam Practice	**Home – Learning:** **Assignment A:** A report describing health and safety legislation relevant to an organisation, describing the hazards and discussing	**Home – Learning:** **Assignment A:** Students to produce a report or present a project plan proposal supported by a logbook.	**Home – Learning:** **Assignment A:** Students produce a report having researched a variety of infectious and non-infectious diseases, relating to their

• -Pupils are to read extracts prior to the lessons. • -Revision for end of topic tests.	aspects of health and safety management. **Assignment B:** A report containing: • notes and results from making and testing an organic liquid • a description of the principles behind the preparative methods and tests used • analysis of ways to improve yield and purity and the reliability of testing methods as a guide to purity • an explanation of the principles behind the industrial manufacture and testing of the liquid • an observation report by the teacher of making and testing the liquid safely. **Assignment C:** A report containing: • notes and results from making and testing an organic solid • a description of the principles of preparative methods and tests used • analysis of ways to improve yield and purity and of the reliability of testing methods as a guide to purity • an explanation of the principles behind the industrial manufacture and solid • an observation report by teacher of making and testing the solid safely. **Assignment D:** A report containing: • a description of the information stored and used in the laboratory	**Assignment B:** Students to produce a report or present a project plan proposal supported by a logbook. **Assignment C and D:** Students to present an evaluative report of the final project outcomes. Outcomes could then be presented to a class and observation sheets could also be used to assess element of self-reflection. Alternatively, this could be an additional written piece alongside the report	chosen diseases. The report would detail the cause and the effect the disease can have on body systems over time. The effect on the quality of life of the individual suffering from the disease must also be evaluated. **Assignment B:** In addition to research work, practical work and simulations should be used to ensure that learners are familiar with the methods by which infectious diseases can be transmitted. Prevention of transmission at a personal level and by organisations must be researched. A report can be produced as evidence. **Assignment C:** Research will need to be undertaken on the different methods of treating diseases. The mode of action of the treatments will need to be analysed. The accessibility or appropriateness of treatments for some people will be evaluated and reported. **Assignment D:** Reports detailing and comparing the components of the two defence mechanisms and their mode of action could be produced.

	• a description of how useful information can be obtained from large data sets • analysis of the communication channels in the organisation • evaluation of the benefits and issues involved in making large volumes of data available to others.		
Reading and literacy: Unit 5 revision guide students to read and make notes. Unit 5 Applied science textbook 2 Unit 5 PowerPoints for Biology, Chemistry and Physics. **Literacy: Key terms which all students will need to understand for the exam:** Understand these definitions in order to understand the question: **Add/label:** Learners label or add to a stimulus material given in the question, for example labelling a diagram or adding units to a table. **Assess:** Learners give careful consideration to all the factors or events that apply and identify which are the most important or relevant. Make a judgement on the importance of something and come to a conclusion where needed. **Calculate:** Learners obtain a numerical answer, showing relevant working. If the answer has a unit, this must be included.	**Reading and literacy:** Students will investigate a scientific organisation to gain an understanding of how it operates by conducting internet-based research. Students will investigate again by reading articles and Applied Science textbook 1 health and safety practices in the organisation's laboratories and consider related primary and secondary legislation. Researching management of data/information as well as researching how data/information within the organisation is stored, used and communicated. Large amounts of data are available for others to use for research purposes, for example by organisations interested in DNA sequencing or in healthcare. Students will research how these data may be used and consider the benefits and issues associated with accessing and with making large quantities of data available for research.	**Reading and literacy:** Literature review • Identification of criteria, e.g., how many sources, what is the oldest date that will be looked at, which types of sources will be excluded. • Nature of study, which could include field work, laboratory-based work, sports facility, workshop. • Sources of information: o identification and location of relevant and reliable sources of information, e.g. journal articles, textbooks, websites o extraction – how to obtain the information from libraries, resource centres, organisations, government organisations, charities o recognising and using protocol for referencing of information sources, to include use of the Harvard referencing system. Review the investigative project using correct scientific principles: o structure and format o use of correct scientific terminology o past tense, including third person. • References and bibliography: o correctly written	**Reading and literacy:** Unit 12 PowerPoints Students conduct a lot of research and reading of articles especially medical articles in order to produce a report to understand what a disease is and the causes of diseases and infections that affect humans. While non-infectious diseases caused by dietary, environmental, genetic and degenerative factors. The main focus will be on causes of infectious diseases, and their transmission, prevention and treatment. There will be the opportunity to research and understand through reading these articles the different types of pathogens and diseases they cause.

Comment on: Learners synthesise a number of variables from data/ information to form a judgement. More than two factors need to be synthesised. **Compare:** Learners look for the similarities and differences of two (or more) things. Should not require the drawing of a conclusion. Answer must relate to both (or all) things mentioned in the question. The answer must include at least one similarity and one difference. **Complete:** Learners complete a table/diagram. **Criticise:** Learners inspect a set of data, an experimental plan or a scientific statement and consider the elements. Look at the merits and/or faults of the information presented and back up judgements made. **Deduce:** Learners draw/reach conclusion(s) from the information provided. **Derive:** Learners combine two or more equations or principles to develop a new equation. **Describe:** Learners give an account of something. Statements in the response need to be developed as they are often linked but do not need to include a justification or reason.		o included in appendix o correct use of the Harvard referencing system. Scientific evaluation of findings • Evaluation of statistical results. • Conclusions drawn from primary and secondary data using scientific principles. • Limitations of investigative project and areas for improvement. • Assessment of information sources used and relevance to investigation experimental and literature investigations. • Evaluation of proof, or otherwise, of hypothesis stated. • Recommendations for further research. Lessons will prepare students to be informed that when they are carrying out their search on the scientific topic, they are expected to give a comprehensive bibliography and list of references using a standard protocol, such as the Harvard system. Lessons will prepare learners to produce an appropriate research project proposal for an investigation. Lessons will prepare students to show that they can use the material to help them plan their work and indicate its relevance to the investigative work they have in mind. Lessons will prepare learners to understand what a hypothesis is and to come up with a research project proposal. Lessons will prepare learners to include any potential limitations of the project proposal, such as the accuracy of any graduated apparatus or limitations of instruments/sensors.	

Determine: Learners' answers must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks there must be a quantitative element to the answer. **Devise:** Learners plan or invent a procedure from existing principles/ideas. **Discuss:** Learners identify the issue/situation/problem/argument that is being assessed in the question. Explore all aspects of an issue/situation/problem/argument. Investigate the issue/situation, etc. by reasoning or argument. **Draw:** Learners produce a diagram, either using a ruler or using freehand. **Evaluate:** Learners review information then bring it together to form a conclusion, drawing on evidence, including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's qualities and relation to its context. **Explain:** Learners' explanations require a justification/ exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations. **Give/state/name:** These generally require recall of one or more pieces of		Lessons will prepare students to show that they have considered in detail, more than one appropriate investigative method of approach to tackling the hypothesis and explain why their chosen approach is suitable. Lessons will prepare learners to justify their method of approach to the method used in their project proposal, using evidence from their literature review.	

information. Give a reason why When a statement has been made and the requirement is only to give the reasons why. **Identify:** Usually requires some key information to be selected from a given stimulus/resource. **Plot:** Learners produce a graph by marking points accurately on a grid from data that is provided and then drawing a line of best fit through these points. A suitable scale and appropriately labelled axes must be included if these are not provided in the question. **Predict:** Learners give an expected result. **Show that:** Learners prove that a numerical figure is as stated in the question. The answer must be to at least one more significant figure than the numerical figure in the question. **Sketch:** Learners produce a freehand drawing. For a graph this would need a line and labelled axes with important features indicated. The axes are not scaled. **State and justify/identify and justify:** When a selection is made and a justification has to be given for the selection. **State what is meant by:** When the meaning of a term is expected but there are different ways in which this meaning can be described.			

Write: When the question asks for an equation.			
Numeracy: **Chemistry:** Energy changes in industry • Know the Kelvin scale of temperature. • Know the definition of enthalpy change, ΔH = ΔU + pΔV, also called 'change in heat content'. • Know the standard conditions: o 1 × 105 Pa (100 kPa) o 298 K o per mole (mol-1). • Understand enthalpy change under standard conditions, ΔHo • Know the units of standard enthalpy change kJ mol-1. • Understand the system and surroundings. • Understand the sign convention. • Understand exothermic and endothermic reactions and processes. • Understand reaction profiles • Understand the measurement of enthalpy changes: o specific heat capacity of water o enthalpy change in water in contact with a reaction o heat Q = mcΔt • Calculate enthalpy changes from supplied data. **Physics:** Be able to use the following quantities and units: o power, watt (W), kilowatt (kW), megawatt (MW), gigawatt (GW) o convert °C to K	**Numeracy:** **Assignment B:** Manufacturing techniques • Reflux: o principles o equipment in the laboratory and in industry. • Distillation: o simple and fractional o laboratory distillation equipment o distillation towers used in industry. • Solvent extraction: o liquid to liquid. • Use of chemicals to remove impurities: o anhydrous sodium carbonate to react with unreacted acid o anhydrous calcium chloride to remove water o molecular sieves to remove water and other impurities (depending on pore size) o addition of water to remove impurities soluble in water. • Manufacture of either ethyl ethanoate or 3-methylbut-1-yl ethanoate (banana oil) – one method to be selected: o laboratory scale – from ethanol and ethanoic acid (for ethyl ethanoate) o industrial scale – from ethanol and ethanoic acid (for ethyl ethanoate) o other commercial methods. Testing methods and techniques • Measurement of boiling point:	**Numeracy:** **Assignment C:** Experimental procedures and techniques. Collect, collate and analyse data. Data presentation.	**Numeracy:** **Assignment A:** Genetic and degenerative disease • Genetic – inherited through DNA or DNA mutation, e.g. cystic fibrosis, sickle cell anaemia, Huntington's disease: o patterns of inheritance o recessive alleles o Punnett square

o pressure (Pascals (Pa), Newton per metre squared (Nm−2)). • Know the following definitions: o work done as energy transferred o work done as force × distance moved in direction of force ($W = F \times \Delta x$) o work done by a gas as pressure × change in volume of gas ($W = p \times \Delta V$) • Be able to calculate efficiency using the relationships: o efficiency = useful energy output / total energy input o for heat engines: efficiency = 1 out in Q o Maximum theoretical efficiency = 1 C H T T – • Understand the following concepts: o law of conservation of energy o ideal gas equation $pV = NkT$ o internal energy (U), first law of thermodynamics ($Q = \Delta U + W$) o isothermal and adiabatic processes o idealised engine cycles o second law of thermodynamics o heat engines, refrigerators and heat pumps o maximum theoretical coefficient of performance (COP). • Understand the changes of state of substances used in domestic and industrial processes: o transfer of energy producing temperature change or changes of state, thermal capacity, thermal equilibrium o specific heat capacity from ($\Delta Q = mc\Delta T$) o specific latent heat from ($\Delta Q = \Delta mL$), fusion, vapourisation, condensation	o relation of boiling point of pure substances to intermolecular forces o measurement of boiling point with distillation apparatus o Siwoloboff method for small quantities o reliability of boiling point as a measure of purity. • Infrared spectroscopy: o comparison of infrared spectrum with that of a pure sample. • Other methods used in industry: o high-performance liquid chromatography (HPLC) o gas chromatography (GC) **Assignment C:** Manufacturing techniques • Precipitation crystallisation and recrystallisation: o terms relating to saturated solutions and supersaturated solutions o influence of temperature on solubility o influence of polarity of solvent on solubility o crystallisation – supersaturation, nucleation, growth o recrystallisation used as a means of purifying solids, particularly organic solids – choice of solvent for recrystallization, the minimum amount of solvent is used, influence of rate of cooling on size of crystals and presence of impurities. Estimation of purity • Assessment of the appearance of crystals as an indicator of purity. • Measurement of melting point: o simple cooling curves		

• Be able to use the following quantities and units: o density kgm−3 o tensile/compressive stress (Newton per metre squared (Nm−2)) o tensile/compressive strain (no units) o Young's modulus (Newton per metre squared (Nm−2)). • Understand the following definitions: o Density m v ρ = o tensile/compressive stress = F A o tensile/compressive strain = x L Δ o Young's modulus E = stress strain o Hooke's law F = kΔx o work done in stretching/compressing a wire/spring, Elastic strain energy, ΔE(el) = 1 2 FΔx = 1 2 k(Δx)2 **Biology:** • Understand the use of electrocardiograms (ECG), to include: o significance of PQRST points on an ECG trace. • Understand the importance of spirometer readings of lung volumes, to include: o tidal volume o inspiratory reserve volume o residual volume o expiratory reserve volume o vital capacity o total lung capacity. • Understand the importance of the methods used to measure lung function for respiratory conditions, to include: o peak expiratory flow o forced vital capacity. • Understand the effects of exercise on the following using data from spirometer traces, to include: o tidal volume o breathing rate	o design of melting-point apparatus o choice of thermometer with an appropriate range o use of glass melting-point tubes o techniques for filling tubes o presence of an impurity lowering the melting point o identifying a substance by the mixed-melting-point technique o use of standard substances (benzoic acid) o commercial melting point apparatus o reliability of melting-point and mixed-melting-point measurements as an indicator of purity. • Thin-layer chromatography (TLC) using a locating agent. • Other methods used in industry: o infrared spectroscopy		

o respiratory minute ventilation o oxygen consumption.			
Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC): Centres may involve employers in the delivery of this unit if there are local opportunities. There is no specific guidance related to this unit. However we offer a chance during Science week and throughout the year for these students to go on visits to universities, companies visiting the school so that students can understand the purpose of this course and enhance practical skills. These visits and talks enable students to choose a career pathway for them too.	**Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):** Employer involvement: For this unit, students must have access to one or more scientific organisations to investigate, for example organisations involved in manufacturing, contract analysis or providing a technical service such as technician's lab. The organisation should have at least one laboratory with an established laboratory information and management system (paper based or electronic). Visits to, or speakers from, manufacturing industry will be invaluable when learners are researching health and safety practices in the laboratory and elsewhere in the organisation. Visits or speakers will also provide insight into data-management systems. Suitable companies could come from the following list of industries: pharmaceuticals, biopharmaceuticals, metals, printed circuits, bulk chemicals, paints and coatings, agrochemicals, food and drink, refractories, nuclear fuel or reprocessing, water treatment, polymers, textiles. Gas works in Southall.	**Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):** Completing an investigative project is an excellent way for students to develop an understanding of the science-related workplace. The skills developed in this unit will be of considerable benefit for progression to higher education in a variety of science and science-related courses and to employment in the science or applied science sector.	**Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):** A visit from the local Environmental Health Department may afford learners an opportunity to understand the role of the department in identifying pathogens and sources of infection and in preventing transmission of pathogens. They may also be able to provide information in relation to environmental diseases and their prevention. It may be possible to arrange a visit from a pharmacist/pharmacologist who will be able to discuss prophylaxis, vaccination and possible treatments for various types of pathogens. Local representatives of local and national organisations and charities may be available to provide information about initiatives in which their organisations are involved to help prevent the spread of disease. This is usually done during Science week.

	A speaker from the local NHS trust may explain how the organisation uses large data sets. This is usually done during Science week.		