

**Programme of study for Applied Science Extended Certificate Year 13 2023-2024**

<p align="center"><b>Autumn (1<sup>st</sup> and 2<sup>nd</sup> term) Teacher 1</b></p>	<p align="center"><b>Autumn (1<sup>st</sup> and 2<sup>nd</sup> term) Teacher 2 and 3</b></p>	<p align="center"><b>Spring (1<sup>st</sup> and 2<sup>nd</sup> term) Summer (1<sup>st</sup> and 2<sup>nd</sup> term) Teacher 2 and 3</b></p>
<p><b>Other timescale:</b> From: September 2023 To: May 2024</p>	<p><b>Other timescale:</b> From: September 2023 To: January 2024</p>	<p><b>Other timescale:</b> From: January 2024 To: May 2024</p>
<p><b>Topic:</b> <b>Unit 8:</b> Physiology of human body systems. Coursework based. Diploma students only to take this unit.</p> <p><b>Skills (students should be able to do):</b></p> <ul style="list-style-type: none"> <li>• Reading, revising, essay writing, exam practice. Personal learning thinking skills including</li> <li>• independent enquirers,</li> <li>• creative thinkers,</li> <li>• reflective learners,</li> <li>• team workers,</li> <li>• self-managers,</li> <li>• effective participants.</li> </ul>	<p><b>Topic:</b> <b>Unit 3:</b> Scientific Investigative skills. Exam based. 2 parts: practical then written exam.</p> <p><b>Skills (students should be able to do):</b></p> <ul style="list-style-type: none"> <li>• Researching, reading, essay writing, exam practice. Personal learning thinking skills including:</li> <li>• independent enquirers,</li> <li>• creative thinkers,</li> <li>• reflective learners,</li> <li>• team workers,</li> <li>• self-managers,</li> <li>• effective participants</li> </ul>	<p><b>Topic:</b> <b>Unit 2:</b> Practical Scientific Procedure and Techniques. Coursework based. Diploma and Extended Certificate students to take this unit.</p> <p><b>Skills (students should be able to do):</b></p> <ul style="list-style-type: none"> <li>• Researching, reading, essay writing, exam practice. Personal learning thinking skills including:</li> <li>• independent enquirers,</li> <li>• creative thinkers,</li> <li>• reflective learners,</li> <li>• team workers,</li> <li>• self-managers,</li> <li>• effective participants.</li> </ul> <p>The fundamental knowledge, practical skills, transferable skills – for example, organisation, self-assessment and problem-solving, and the ability to interpret data – all developed in this unit will give students confidence when they undertake the more complex practical techniques involved in higher education science courses such as biochemistry, chemistry,</p>

		forensic science and environmental science.
<p><b>Key Learning Outcomes (students should know):</b></p> <p><b>Assignment A:</b> Students to understand the impact of disorders of the musculoskeletal system and their associated corrective treatments.</p> <p><b>Assignment B:</b> Students to understand the impact of disorders on the physiology of the lymphatic system and the associated corrective treatments.</p> <p><b>Assignment C:</b> Students to explore the physiology of the digestive system and the use of corrective treatments for dietary-related diseases</p>	<p><b>Key Learning Outcomes (students should know):</b></p> <p><b>AO1:</b> Students should be able to demonstrate knowledge and understanding of scientific concepts, procedures, processes and techniques and their application in a practical investigative context.</p> <p><b>AO2:</b> Students should be able to interpret and analyse qualitative and quantitative scientific information to make reasoned judgements and draw conclusions based on evidence in a practical investigative context</p> <p><b>AO3:</b> Students should be able to evaluate practical investigative procedures used and their effect on the qualitative and quantitative scientific information obtained to make reasoned judgements</p> <p><b>AO4:</b> Students should be able to make connections between different scientific concepts, procedures, processes and techniques to make a hypothesis and write a plan for a practical investigation.</p>	<p><b>Key Learning Outcomes (students should know):</b></p> <p><b>Assignment A:</b> Students to undertake titration and colorimetry to determine the concentration of solutions.</p> <p><b>Assignment B:</b> Students to undertake calorimetry to study cooling curves.</p> <p><b>Assignment C:</b> Students to undertake chromatographic techniques to identify components in mixtures.</p> <p><b>Assignment D:</b> Students to review personal development of scientific skills for laboratory work.</p>

<p><b>No end of term assessment for this unit as coursework based.</b></p>	<p><b>End of term 1 assessment to cover:</b></p> <ul style="list-style-type: none"> <li>• Unit 3 only: various practical exams and then practical write-ups will be assessed. January mock exam on one practical exam and write up will also be given just before the actual exam.</li> </ul>	<p><b>No end of term assessment for this unit as coursework based.</b></p>
<p><b>Building understanding: Rationale for your sequence of lessons:</b></p> <p>Lessons before <b>assignment A</b> given to help prepare students for this assignment to address:</p> <p><b>1) Pass</b>, lessons will explain how the structure of the human skeleton, muscles and joints form an essential system in the functioning of the human body by providing support, protection, movement and storage/production of minerals and blood cells. Lessons will prepare the students to identify and name six major joints in the human musculoskeletal system and fully explain the importance of their structure and role in the human body in terms of normal movement. Lessons will prepare the students to name one disorder of musculoskeletal system and outline how it impacts normal function of the human body. Lessons will prepare students to reference specific muscles or muscle groups and joints affected by the disorder and give an overview of the corrective treatment(s) associated with it.</p> <p><b>2) Merit</b>, lessons will prepare students to provide a detailed comparison of</p>	<p><b>Building understanding: Rationale for your sequence of lessons:</b></p> <p>Lessons have been broken down so it is preparing students to demonstrate a sound knowledge and understanding of scientific concepts, procedures, processes and techniques and their application within a practical context.</p> <p>Lessons will prepare learners to interpret and analyse their own data and secondary data, leading to reasoned judgements on the qualitative and quantitative data they have collected during their investigation. The lessons prepare students to be able to draw links between different scientific concepts, procedures, processes and techniques to make a hypothesis and plan an investigation.</p> <p>Lessons help prepare learners to be able to make evaluative judgements on scientific data, processes and procedures that make reference to scientific reasoning.</p> <p>Lessons also prepare students to demonstrate a thorough</p>	<p><b>Building understanding: Rationale for your sequence of lessons:</b></p> <p>Lessons before <b>assignment A</b> given to help prepare students for this assignment to address:</p> <p><b>1) Pass</b>, lessons will prepare learners to follow instructions to safely undertake titration and colorimetry. These must be performed correctly to obtain reliable and valid outcomes. Lessons will prepare learners to correctly carry out calculations of concentration. For titration, lessons will prepare learners to check the calibration of equipment used to ensure the validity of outcomes obtained (for example the calibration of a pipette, balances and a pH meter using buffer solutions.) Lesson will prepare learners to safely and correctly calibrate and use a colorimeter or visible spectrometer to determine the concentration of a coloured solution.</p> <p><b>2) Merit</b>, lessons will prepare learners to undertake quantitative analytical procedures and techniques with minimal supervision, and perform to a high degree of accuracy and precision</p>

<p>three disorders affecting different aspects of the musculoskeletal system and how normal movement is affected. Lessons will prepare learners to use the correct scientific and technical terms to clearly outline the type of joint, muscle movement at the joint, muscle attachment and the groups of muscles that are involved in bringing about normal movement. Lessons will also explain the importance of the movement to the normal functioning of the human body and how each disorder differs in terms of its effect on normal function. Lessons will prepare students to compare corrective treatments for each disorder, and the scientific rationale for using that particular treatment over others.</p> <p><b>3) Distinction,</b> lessons will prepare students to research disorders/dysfunctions of the musculoskeletal system. Lessons will prepare learners to reach conclusions based on referenced evidence they have produced from research on the impact on health of one named disorder/dysfunction and its corrective treatment(s). Lessons will prepare learners to then establish how the disorder impacts the normal functioning/movement in the human body. Lessons will prepare students to evaluate how the work of the medical professional uses corrective mechanisms and treatments in order to improve the functioning of the skeleton and its physical, physiological and social impact on human health.</p>	<p>understanding of how scientific concepts, procedures, processes and techniques can be integrated and applied within a practical context.</p> <p>Lessons will prepare students to interpret, analyse and evaluate their own collected data and secondary data to support judgements and conclusions drawn.</p> <p>Lessons will prepare learners to use and integrate knowledge and understanding of scientific concepts, procedures, processes and techniques to make a hypothesis and plan an investigation that is fully supported by scientific reasoning.</p> <p>Lessons will also prepare learners to be able to provide rationalised evaluative judgements on scientific data, processes and procedures that are fully supported by scientific reasoning.</p>	<p>in order to obtain reliable and valid outcomes, with consideration for health and safety. Lesson will prepare learners to demonstrate skills and fluency in a number of areas, such as: calibrating pipettes transferring solids, measuring volumes, mixing solutions, carrying out titrations and making the dilutions for colorimetry standards.</p> <p><b>3) Distinction,</b> lessons will prepare learners to interpret outcomes of their quantitative analytical procedures and techniques to make sound judgements on the accuracy of them. Lessons will prepare learners to be able to coherently discuss problems/issues with the quantitative procedures and techniques used and develop a strong rationale for suggestions made to improve accuracy and precision in order to obtain reliable and valid outcomes (or for justifying the appropriate steps already taken should no problems be identified).</p> <p>Lessons before <b>assignment B</b> given to help prepare students for this assignment to address:</p> <p><b>1) Pass</b> lessons will prepare learners to safely check the calibration of a given thermometer, following instructions. Lessons will prepare learners to also explore the accuracy of the temperature measurements obtained from thermometers and other equipment by comparing their readings in water that is being heated. Lessons will prepare learners to use a</p>
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Lessons before **assignment B** given to help prepare students for this assignment to address:

**1) Pass**, lessons prepare learners to describe the gross anatomy of the organs and associated structures that form the lymphatic system. Lessons allow learners to describe how lymph is formed and its role in the health of the body. Lessons will prepare learners to describe a named disorder and its effect on the normal function of the lymphatic system, including the symptoms present in the human body and give an overview of the corrective treatment(s) associated with the disorder

**2) Merit**, lessons will prepare learners to demonstrate a detailed understanding of the anatomy and function of the lymphatic system, using correct scientific terminology to explain the rationale for use of corrective treatment for the effects of a named disorder of the lymphatic system. Lessons will prepare learners to give detailed explanations of the disorder affecting the normal functioning of the lymphatic system and the associated corrective treatment.

**3) Distinction**, lessons will prepare learners to use the skill of evaluation on one named disorder. The lessons will prepare students to analyse the effect of the disease on the lymphatic system, the normal functioning of which will be explicitly explained. The implications of the disease on the health status of an

table of their own design for recording their readings. Lessons will prepare learners to demonstrate key practical competencies in calorimetry, including being able to set up a vessel containing a solid, heating it to above its melting point, cooling it and measuring its temperature as a function of time, following a standard procedure. Lessons will prepare learners to plot graphs for a substance undergoing freezing.

**2) Merit**, lessons will prepare learners to demonstrate a selection of an appropriate amount of solid; selection of a suitable vessel for heating the solid, setting up the equipment to enable heating and cooling of the vessel in an appropriate way and monitoring temperature as a function of time in a safe way. Lessons will prepare learners to demonstrate numerical skills in graph plotting when constructing their cooling curve.

**3) Distinction**, lessons will prepare learners to interpret outcomes of their calorimetry to make sound judgements on accuracy. Lessons will prepare learners to be able to use appropriate mathematical terminology (for example rapid increase, decrease, approximately constant, etc.) to describe the patterns and trends in the shapes of cooling curves. Lessons will prepare learners to discuss the way in which the substance was cooled and the resulting changes to the curve and to

individual suffering from the disorder will be addressed within the context of a patient case study in the lessons. Lessons will prepare learners to be able to evaluate the physiological basis of any treatment and discuss the impact of this on the restoration of normal lymphatic function.

Lessons before **assignment C** given to help prepare students for this assignment to address:

**1) Pass**, lessons will prepare students to perform analytical tests to identify the nutrients present in dietary sources of macronutrients as listed in the unit content, they must also give detailed descriptions of nutrient-deficiency symptoms. Lessons will prepare learners to describe the gross anatomy of the different areas of the digestive system as listed in the unit content. Lessons will prepare students to label each of the areas of the digestive system and describe, in brief, the role of the component labelled.

**2) Merit**, lessons will prepare students to analyse the mode of action of digestive enzymes as applied to each of the macronutrients listed in the unit content. This will include named enzymes, the location of enzyme secretion, the location of enzyme action (if different), substrates and products of each nutrient broken down with enzymatic assistance. This will be linked to the analysis of nutrients in foods. Lessons will prepare learners to consider how nutrient deficiency can be

explain why it may be necessary to make changes to procedures in order to reduce levels of uncertainty

Lessons before **assignment C** given to help prepare students for this assignment to address:

**1) Pass**, lessons will prepare students to follow instructions, demonstrating safe working practices and a good level of ability when carrying out paper and TLC. Lessons will prepare learners to comment on the suitability of the techniques for separation and the chromatogram produced for each technique (TLC and paper chromatography).

**2) Merit**, lessons will prepare students to demonstrate safe working practices and a high level of proficiency when carrying out paper- and thin-layer chromatography (TLC) with minimal supervision. Lessons will prepare students to produce chromatograms showing clear separation of spots, repeating the separations if they are not satisfied with the quality of the separation obtained. Lessons will prepare learners to comment on the suitability of the techniques for separation and to use appropriately calculated R<sub>f</sub> values and consider factors that influence separation to justify conclusions drawn about the identification of components in a mixture (for example the polarity of the components of the mixtures and the polarity of the solvents and effect

<p>tackled in terms of corrective treatments.</p> <p><b>3) Distinction</b>, lessons will prepare students to research dietary-related disorders of the digestive system. Lessons will allow learners to choose a named digestive system-related disease that affects the normal functioning of the body. Lessons will allow learners to consider the effects on the person that is suffering from the disease and how medical intervention seeks to treat the effects of disease. Lessons will prepare students to produce evaluations that cover the implications to the health status of the individual and compare this with the healthy functioning of the digestive system.</p>		<p>of the size of a molecule on its mobility).</p> <p><b>3) Distinction</b>, lessons will prepare learners to articulate strong links between outcomes and techniques used in order to give a rationale for specific improvements that could be made to the chromatographic techniques. Lessons will prepare learners to demonstrate awareness that some chromatograms may show the spots rising at an angle or have spots that are too big or smeared out rather than being distinct.</p> <p>Lessons before <b>assignment D</b> given to help prepare students for this assignment to address:</p> <p><b>1) Pass</b>, lessons will prepare students to identify areas of scientific skills developed in relation to the learning aims and will help prepare them to draw on scientific skills they have previously acquired and use them to illustrate the transferability and development of skills.</p> <p><b>2) Merit</b>, lessons will prepare learners to make judgements on their skill development and level in relation to their peer group and to recognise the improvements that need to be made and how they will take steps to achieve them.</p> <p><b>3) Distinction</b>, lessons will prepare learners to draw upon all areas of practical work carried out to critically reflect on strengths and weaknesses</p>
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		<p>of their own performance and skill development drawing on feedback, for example from peers, teachers and industry. Drawing on others' feedback is crucial for developing balanced progression goals.</p>
<p><b>Home – Learning:</b> Students to produce a report and use information gained from research, visits, dissections/videos, models and simulations to produce an illustrated report explaining and analysing the structure and function of the musculoskeletal system. An evaluation of a related disorder/dysfunction of the system and associated treatments must be included.</p> <p><b>Assignment B:</b> Students to research work using the internet and TV documentaries to help learners to create a report that describes and explains the structure and function of the lymphatic system in promoting a healthy body. An evaluative case study of the effect of a disorder/dysfunction of the system and possible treatments must be included.</p> <p><b>Assignment C:</b></p> <ul style="list-style-type: none"> <li>• A lab book/record of investigations modelling the functioning of the various parts of the digestive system. Photographs and information from the investigations will be used to create an information leaflet that explains the role and location of organs and evaluates dietary disorder in the system and possible treatments. Observation records of practical</li> </ul>	<p><b>Home – Learning:</b></p> <ul style="list-style-type: none"> <li>• Knowledge (flipped learning)</li> <li>• Pupils are to read extracts prior to the lessons.</li> <li>• Exam Papers</li> </ul>	<p><b>Home – Learning:</b> <b>Assignment A:</b> <b>A report containing:</b> Results for checking the calibration of a pipette and balance(s) and calibration of a pH meter. A report on the use of Na<sub>2</sub>CO<sub>3</sub> to standardise HCl, used in turn to standardise NaOH. pH curve from the titration plus a differential plot. Results, calculations and calibration graph for the determination of the concentration of a coloured solution using colorimetry. Explanations of how the accuracy, precision and safety of the quantitative techniques may be optimised. Observation checklist, completed by the teacher, including safety.</p> <p><b>Assignment B:</b> A report containing: Results from checking the calibration of at least two types of thermometer. A table of time/temperature data and a graph of temperature against time for a substance cooling. Calculations of the rate of cooling at points on the graph. An analysis of how the rate of cooling is related to intermolecular forces and the state of the substance.</p>



<p>work undertaken to assess the nutrient content of food will be required. Evidence and conclusions from the investigations will be incorporated into the report.</p>		<p>A report evaluating the accuracy of the cooling curve experiment. An observation report with a checklist, completed by the teacher, including safety</p> <p><b>Assignment C:</b> A report containing: Results from the paper chromatography and TLC of extracted plant pigments from paper chromatography of amino acids. An explanation of the principles behind the chromatographic separations. Suggestions for improvements to the chromatographic procedures carried out and full justification of these suggestions. An observation report with a checklist, completed by the teacher, including safety.</p> <p><b>Assignment D:</b> A report containing: that focuses on the evaluation of learners' performance and skill development across all scientific procedures and techniques carried out in learning aims A, B and C.</p>
<p><b>Reading and literacy:</b></p> <p>Students will research through the internet and Applied Science textbook 1 the human body including its complex mix of organs and organ systems. Knowledge of how they function to maintain human life is an essential part of the study of human physiology and</p>	<p><b>Reading and literacy:</b></p> <p>Unit 3 revision guide students to read and make notes.</p> <p>Unit 3 Applied science textbook</p> <p>Unit 3 PowerPoints for Biology, Chemistry and Physics.</p>	<p><b>Reading and literacy:</b></p> <p>Unit 2 Applied science textbook 1</p> <p>Unit 2 PowerPoints</p> <p>Students will discuss results which will allow them to understand the progress in relation to that of others</p>

students will research this. In this unit, student's research will focus on three body systems: musculoskeletal, lymphatic and digestive. Students will research and examine each of the systems as a functioning unit, identifying their structure and function. By exploring the anatomy of these systems, through experimentation and articles, students will develop their knowledge and understanding of the role in the human body. Students will also give attention to understanding the implications of what happens when the systems fail to work properly and the available treatments again through research and reading various articles.

#### **Planning a scientific investigation**

Developing a hypothesis for an investigation

- Be able to formulate a hypothesis or a null hypothesis based on relevant scientific ideas. Selection of appropriate equipment, techniques and standard procedures
- Be able to select and justify the use of equipment/techniques/standard procedures for quantitative and/or qualitative investigations.

#### **Health and safety associated with the investigation**

- Understand risks and hazards associated with the investigation.

#### **Variables in the investigation**

- Independent.
- Dependent.
- Control.

#### **Method for data collection and analysis**

- Be able to produce a clear, logically ordered method to obtain results.
- Be able to select relevant measurements and the range of measurements to be recorded.
  - Understand the importance of obtaining data accurately/reliably and to appropriate levels of precision.
  - Understand how variables can be controlled/measured/monitored.
  - Understand how the data/information can be analysed.

#### **Evaluation**

and also to gain an understanding key words such as reliability, repeatability and reproducibility of various procedures and techniques.

Students will follow written scientific procedures in order to ensure accuracy by using techniques correctly and by checking that equipment – for example, pipettes, balances, pH meters and thermometers – is calibrated correctly and that appropriate standard calibration documentation has been completed.

	<ul style="list-style-type: none"> <li>• Be able to make any recommendations for improvements to the investigation.</li> <li>• Be able to explain anomalous data.</li> <li>• Be able to determine quantitative and discuss qualitative sources of error.</li> <li>• Be able to discuss evidence of the reliability of the data collected during the investigation.</li> <li>• Be able to identify strengths and weaknesses within method/techniques/standard procedures/equipment used.</li> <li>• Be able to suggest improvements to an investigation.</li> </ul>	
<p><b>Numeracy:</b></p> <p><b>Assignment C:</b> Chemical tests for the presence of macro-nutrients found in foods: starch, proteins, lipids, reducing and non-reducing sugars, vitamin C content.</p>	<p><b>Numeracy:</b></p> <p><b>Physics:</b> Equations</p> <ul style="list-style-type: none"> <li>• Power = VI (voltage × current).</li> <li>• Power = work done time</li> <li>• Work done = energy supplied or transformed.</li> <li>• Define – joules, kJ, calories (1 g by 1 oC), kilocalories, kWh.</li> <li>• The heat capacity of water will be given if required.</li> <li>• Calculate heat energy supplied by a fuel to water using: o heat energy = mass of water × specific heat capacity of water × temperature rise of water.</li> <li>• Calculate heat energy released from a fuel in kJ mol<sup>-1</sup>.</li> </ul> <p><b>Biology:</b> Sampling sizes</p> <ul style="list-style-type: none"> <li>• Select sample sizes for investigation with regards to practical constraints</li> </ul>	<p><b>Numeracy:</b></p> <p>Students will have the opportunity to use problem-solving skills when they undertake calorimetry work.</p> <p>Students will follow written scientific procedures in order to ensure accuracy by using techniques correctly and by checking that equipment – for example, pipettes, balances, pH meters and thermometers – is calibrated correctly and that appropriate standard calibration documentation has been completed.</p> <p><b>Assignment A:</b></p> <ul style="list-style-type: none"> <li>• Use of pH meters and probes: o calibration according to the manufacturer’s instructions.</li> <li>• Use of balances and weighing:</li> </ul>

	<p>and the need to collect sufficient data to make valid conclusions.</p> <p><b>Drawing conclusions and evaluation:</b>          Interpretation/analysis of data</p> <ul style="list-style-type: none"> <li>• Be able to identify trends/patterns in data.</li> <li>• Be able to compare primary and secondary data.</li> <li>• Be able to use data to draw conclusions that are valid and relevant to the purpose of the investigation.</li> <li>• Interpretation of statistical tests using tables of critical values and a 5% significance level, with reference to the null hypothesis.</li> </ul> <p><b>Collection of quantitative/qualitative data</b></p> <ul style="list-style-type: none"> <li>• Be able to collect data accurately/reliably and to appropriate levels of precision.</li> <li>• Be able to tabulate data in a clear and logical format using correct headings with units where appropriate.</li> <li>• Be able to identify anomalous data and take appropriate action.</li> <li>• Be able to recognise when it is appropriate to take repeats.</li> <li>• Be able to make qualitative observations and draw inferences.</li> </ul> <p><b>Processing data</b></p> <ul style="list-style-type: none"> <li>• Be able to carry out relevant calculations where appropriate, involving:             <ul style="list-style-type: none"> <li>o mean and standard deviation</li> <li>o use and interpretation of error bars</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>o electronic balances – rough balances (two decimal places), analytical balances (four decimal places)</li> <li>o checking calibration with certified weights</li> <li>o measurement of mass using increasingly accurate balances</li> <li>o suitable containers for weighing liquids and solids</li> <li>o density of water at different temperatures.</li> <li>• Safe use of volumetric glassware:             <ul style="list-style-type: none"> <li>o bulb, graduated, automated and teat pipettes</li> <li>o burettes</li> <li>o glass and plastic filter funnels</li> <li>o volumetric flasks</li> <li>o accurate dilution</li> <li>o use of water as a standard for calibrating volumetric glassware.</li> </ul> </li> </ul> <p>Preparation and standardisation of solutions using titration          Processes involved in the preparation and standardisation of solutions using titration.</p> <ul style="list-style-type: none"> <li>• Accurate determination of the end-point of titrations from:             <ul style="list-style-type: none"> <li>o the colour change of a suitable indicator</li> <li>o plots of pH versus volume</li> <li>o <math>\Delta\text{pH}/\Delta\text{volume}</math> versus volume.</li> </ul> </li> <li>• Calculation of concentrations:             <ul style="list-style-type: none"> <li>o use of molecular mass from periodic table.</li> </ul> </li> <li>• Use of primary and secondary titrimetric standards.</li> </ul> <p>Colorimetry</p> <ul style="list-style-type: none"> <li>• Measurement and use of absorbance readings.</li> </ul>
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	<ul style="list-style-type: none"> <li>o use of statistical tests, including t-test, chi-squared and correlation analysis</li> <li>o use of formulae</li> <li>o transposition of formulae</li> <li>o conversion of units</li> <li>o use of standard form</li> <li>o percentage error of measuring equipment.</li> <li>• Be able to display data in an appropriate format, including: <ul style="list-style-type: none"> <li>o choosing an appropriate graph/chart/tables</li> <li>o correct plotting/labelling/scales.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Use of Beer-Lambert law to determine the concentration of a transition metal ion solution.</li> <li>• Accurate dilution of stock solutions to prepare a range of calibration standards with absorbance in the range 0 to 1.</li> <li>• Use of blank solutions.</li> <li>• Calibration plot.</li> <li>• Determination of unknown solution concentration from reading from graph (graph paper) or from the equation of a linear trend line through the origin (Microsoft Excel).</li> </ul> <p><b>Assignment B:</b></p> <ul style="list-style-type: none"> <li>• The relationship between temperature and heat energy.</li> <li>• Types of thermometer and how they are used to gain accurate readings: <ul style="list-style-type: none"> <li>o electronic thermometers/temperature probes</li> <li>o liquid-filled thermometers.</li> </ul> </li> <li>• Checking the calibration of thermometers by using ice and boiling water.</li> <li>• Accuracy of thermometers and temperature probes at different temperatures. Construction and interpretation of cooling curves: <ul style="list-style-type: none"> <li>• temperature as a function of time</li> <li>• rate of cooling from the gradient of the tangent to the cooling curve</li> <li>• determination of melting point from the shape of a curve for a substance freezing</li> <li>• super cooling</li> <li>• shape of the curve and rate of cooling in relation to intermolecular</li> </ul> </li> </ul>
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		<p>forces and the state (solid or liquid) of the substance.</p> <p><b>Assignment C:</b> Calculation of Rf value.</p>
<p><b>Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):</b></p> <p>University sports science departments may be able to provide support and guidance and access to models of joints and a skeleton. Physiotherapy departments may be able to offer information and access to examples of replacement joints and exercises that will assist in treatment and recovery from musculoskeletal dysfunction. GP Surgeries may have specialist nurses who might be available to visit and provide information about management of digestive system disorders, such as coeliac disease, irritable bowel syndrome and colitis. This is done during Science week.</p>	<p><b>Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):</b></p> <p>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.</p> <p>Time management Individual working Group collaboration Verbal and electronic presentation Use of a variety of IT programs Research skills Teamwork Literacy and numeracy skills</p> <p>SMSC - Is health and safety still relevant in a modern laboratory? Discuss. - Why is precision vital as a scientific skill when linked to medical treatment? - How can applications of</p>	<p><b>Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):</b></p> <p>Centres may involve employers in the delivery of this unit if there are local opportunities. It would be beneficial for an industry representative to explain the importance of the routine calibration of equipment in ensuring the reliability of results.</p> <p>A visit to a local laboratory would reinforce the importance of calibration of equipment and health and safety. Even if the local organisations that use science only operate on a small scale, their representatives will be able to reinforce the importance of the transferable skills this unit develops. This is usually done during Science week.</p> <p>The fundamental knowledge, practical skills, transferable skills – for example, organisation, self-assessment and problem-solving, and the ability to interpret data – all developed in this unit will give students confidence when they undertake the more complex practical techniques involved in higher education science courses</p>

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