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**Knowledge Rich Curriculum Plan**

Btec Forensic Science – Unit 2 Practical Scientific Procedures and Techniques – Learning Aim A – Undertake titration and colorimetry to determine the concentration of solutions



| **Lesson/Learning Sequence** | **Intended Knowledge:**  *Students will know that…* | **Prior Knowledge:**  *In order to know this, students need to already know that…* | **Working Scientifically** | **Tiered Vocabulary and Reading Activity** | **Assessment** | **Support** |
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| **Lesson 1:**  **Learning Aim A1**  **Calibration of a pH meter and electronic balances** | * Students will be able to explain why it is important to calibrate a Ph meter and electronic balance * Students will be able to compare the two types of electronic balance: a rough balance and an analytical balance * Students will be able to state the importance of having standard calibration documentation for the equipment we are calibrating * Students will be able to explain why a pH meter and probe has a higher degree of accuracy than a colour changing indicator | * ***Students will already know that the Ph scale is a measure of an acid and alkalis strength*** * ***Students will already know how to measure mass on an electronic balance*** * ***Students will already know the units of mass*** | Analyse – Be able to discuss limitations of colour changing indicators and rough balances  Analyse – Present data on calibrated pH meters and electronic devices  *Learners’ work draws on varied information,*  *themes or concepts to consider aspects such*  *as:*  *• strengths or weaknesses*  *• advantages or disadvantages*  *• relevance or significance.*  *Learners’ enquiries should lead to a supported*  *judgement showing relationship to its context.*  *This will often be in a conclusion.* | *Calibrate - correlate the readings of (an instrument) with those of a standard in order to check the instrument's accuracy.* | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 2:**  **Learning Aim A1**  **Calibrating pipettes and biurets** | * Students will be able to explain why it is important to calibrate volumetric equipment such as pipettes and biurets * Students will be to apply the density equation p=m/v (density = mass/volume) * Measure (calibrate) 25cm3 of water using a graduated pipette * Measure (calibrate) 50cm3 of water using a biuret * Compare experimental results to published data and evaluate their findings | * ***Students will already know how to measure volumes of liquids using a measuring cylinder*** * ***Students will already know the equation for density and a description of density*** * ***Students will already know how to convert units*** | Determine - Learners use quantitative and/or qualitative  information to help analyse and compare findings from published data |  | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 3:**  **Learning Aim A1**  **Calibrating volumetric equipment** | * Students will be able to explain why it is important to calibrate volumetric equipment * Students will be able to identify volumetric equipment * Students will be able to state and apply the density equation p= m/v * Students will be able to measure the mass of 25cm3 of water using a 2 d.p balance * Compare experimental results to published data and evaluate their data | * ***Students will already know how to measure volumes of liquids using a measuring cylinder*** * ***Students will already know the equation for density and a description of density*** * ***Students will already know how to calibrate equipment.*** | Determine - Learners use quantitative and/or qualitative  information to help analyse and compare findings from published data |  | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 4:**  **Learning Aim A1**  **Errors in procedures** | * Students will be able to calculate percent error for volumetric equipment * Students will be able to calculate range, Standard Deviation and standard error | * ***Students will already know how volumetric equipment is calibrated*** * ***Students will already know about different errors that occur in practical investigations e.g. Systematic errors – Zero errors, random errors*** * ***Students will already know how to determine the mean from a set a data*** | *Determine - Learners use quantitative and/or qualitative*  *information to help analyse and compare*  *findings.* | 1. *Standard Deviation - a quantity expressing by how much the members of a group differ from the mean value for the group.* | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 5:**  **Learning Aim A2**  **Titration part 1** | * Students will be able to explain the role of a lab book and accurate recording of methods and calculations used during an investigation. * Students will be able to state the role of primary and secondary trimetric standards * Students will be able to prepare a primary standard * Students will be able to describe the role of titrations. * Students will be able to demonstrate a titration E.g. 0.1 mol dm 3 HCl with 0.1 mol dm 3 of NaOH * Students will be able to demonstrate safe working practice | * ***Students will already know how to measure volumes of liquids using a biuret*** * ***Students will already know the symbol equations for hydrochloric acid and sodium hydroxide*** * ***Students will already know how to calculate moles using = conc x volume*** * ***Students will be able to calculate RAM for given compounds*** * ***Students will already know how to balance chemical equations*** | *Demonstrate - Learners’ work, performance or practice evidences the ability to carry out and apply knowledge, understanding and/or skills in a practical situation.*  *Prepare - Used with a standard to demonstrate*  *competence in preparation of testing materials* |  | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 6:**  **Learning Aim A2**  **Titration part 2** | * Students will be able to complete an individual titration and calculate the concentration of an unknown concentration * Students will be able to complete an individual titration and calculate the concentration of an unknown concentration using a standard solution * Students will be able to demonstrate safe working practice | * ***Students will already know how to take accurate measurements using a biuret*** * ***Students will already know how to calculate RMM*** * ***Students will already know how to calculate moles using = conc x volume*** * ***Students will already know how to balance chemical equations*** | *Demonstrate - Learners’ work, performance or practice evidences the ability to carry out and apply knowledge, understanding and/or skills in a practical situation.*  *Prepare - Used with a standard to demonstrate*  *competence in preparation of testing materials* |  | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 7:**  **Learning Aim A2**  **pH titration** | * Students will be able to state the colour change for different indicators * Students will be able to state what is meant by the end-point/equivalence point * Students will be able to state which indicator is used for which titration * Students will be able to demonstrate a titration E.g. 0.1 mol dm 3 HCl with 0.1 mol dm 3 of NaOH using a Ph meter/probe * Students will be able to use their data to construct a pH-titration graph | * ***Students will be able to carry out titrations*** * ***Students will know the role of an indicator in the identification of acids and alkalis*** * ***Students will be able to know how to plot a graph of pH vs volume added*** * ***Students will know how to extrapolate data from graph*** | *Demonstrate - Learners’ work, performance or practice evidences the ability to carry out and apply knowledge, understanding and/or skills in a practical situation.* | *Equivalence point - the point at which equal quantities of reactants are mixed chemically.* | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 8:**  **Learning Aim A3**  **Colourimetry** | * Students will be able to identify the seven colours of the visible light spectrum * Students will be able to describe how the wavelength and frequency of light waves change through the visible light spectrum * Students will be able to state that light can pass through translucent materials but some light is absorbed by semi-translucent materials. * Students will be able to differentiate between absorption and transmission of light * Students will be able to explain the role of light filters within colorimetry | * ***Students will already know the seven colours of the visible light spectrum*** * ***Students will already know that light travels as a transverse wave, in straight lines*** * ***Students will already know that visible light waves are part of the electromagnetic spectrum.*** | *Explain - Learners’ work shows clear details and gives*  *reasons and/or evidence to support an*  *opinion, view or argument. It could show how*  *conclusions are drawn (arrived at). Learners*  *show that they comprehend the origins,*  *functions and objectives of a subject, and its*  *suitability for purpose.* | *Absorption – the transfer of the energy of a wave to matter as the wave passes through it.* | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
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| **Lesson 9:**  **Learning Aim A3**  **Colorimetry investigating the concentration of copper sulphate solution** | * Students will be able to calibrate a colourimeter using a blank cuvette * Students will be able to determine the correct filter to use for determining the concentration of Copper Sulphate solution * Students will be able to carry out dilutions using a known concentration of solution in order to plot a calibration plot * Students will be able to determine the concentration of an unknown solution from their calibration plots | * ***Students will be able to carry out a colourimetry investigation using the correct colour filter*** * ***Students will know how to dilute solutions to produce different concentrations*** * ***Students will know how to extrapolate data*** * ***Students will know how to analyse their data e.g. Standard Deviation*** | Determine - Learners use quantitative and/or qualitative  information to help analyse and compare findings from published data  Explain - Learners’ work shows clear details and gives  reasons and/or evidence to support an  opinion, view or argument. It could show how  conclusions are drawn (arrived at). Learners  show that they comprehend the origins,  functions and objectives of a subject, and its  suitability for purpose. | *Calibrate - correlate the readings of (an instrument) with those of a standard in order to check the instrument's accuracy.* | Tracking assessment tasks  Unit A1 booklet | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 10:**  **Assignment Lesson Learning Aim A** | * Students use the intended knowledge from previous lessons to evaluate the accuracy of procedures and techniques used in titration and colorimetry in relation to outcomes and also to suggest improvements |  |  | See Tiered vocabulary from previous lessons | Completion of assessment booklets A1-3 and write-up of findings using various presentation methods | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |
| **Lesson 11:**  **Assignment Lesson Learning Aim A** | * Students use the intended knowledge from previous lessons to evaluate the accuracy of procedures and techniques used in titration and colorimetry in relation to outcomes and also to suggest improvements |  |  | See Tiered vocabulary from previous lessons | Completion of assessment booklets A1-3 and write-up of findings using various presentation methods | Refer to class booklets and logbooks  Ebooks on student drive  Lesson resources on Teams |