Unit 3- Practical Investigations PLC-Planning

Learning Objectives:	**Confidence**		
Learning Aim A- Planning a Scientific Investigation			
Be able to formulate a hypothesis or a null hypothesis based on relevant scientific ideas			
Be able to select and justify the use of equipment/techniques/standard procedures for quantitative and/or qualitative investigations			
Understand risks and hazards associated with the investigation.			
Identify/Select different variables (independent, dependent, control)			
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.			
Learning Aim B- Data collection, processing and analysis/interpretation			
Be able to collect data accurately/reliably and to appropriate levels of precision			
Be able to tabulate data in a clear and logical format using correct headings with units where appropriate.			
Be able to identify anomalous data and take appropriate action.			
Be able to recognise when it is appropriate to take repeats.			
Be able to make qualitative observations and draw inferences.			
Be able to carry out relevant calculations where appropriate, involving: • mean and standard deviation • use and interpretation of error bars • measuring gradients of a line and/or curve • use of statistical tests, including t-test, chi-squared and correlation analysis • use of formulae • transposition of formulae • conversion of units o use of standard form • percentage error of measuring equipment.			
Be able to display data in an appropriate format, including: • choosing an appropriate graph/chart/tables • correct plotting/labelling/scales.			
Learning Aim C- Drawing Conclusions and Evaluations			
Be able to identify trends/patterns in data.			
Be able to compare primary and secondary data.			

Be able to use data to draw conclusions that are valid and relevant to the purpose of the investigation.			
Interpretation of statistical tests using tables of critical values and a 5% significance level, with reference to the null hypothesis.			
Be able to make any recommendations for improvements to the investigation			
Be able to explain anomalous data.			
Be able to determine quantitative and discuss qualitative sources of error			
Be able to discuss evidence of the reliability of the data collected during the investigation.			
Be able to identify strengths and weaknesses within method/techniques/standard procedures/equipment used.			
Be able to suggest improvements to an investigation.			

Unit 3- Practical Investigations PLC-Practicals

Learning Objectives:	Confidence		
Learning Aim D-Enzymes in Action			
Understand protein structure in terms of • Peptide linkage. • Active sites. • Denaturation.			
Understand enzymes as biological catalysts in chemical reactions, explaining; • Collision theory. • Formation of enzyme-substrate complex. • Specificity of enzymes • Lowering of activation energy. • Importance of measuring initial rates of reaction.			
Understanding factors that affect enzyme activity, such as; • Temperature. • pH. • Substrate and enzyme concentration.			
Learning Aim E- Diffusion of molecules			
Understand the different factors that affect the rate of diffusion, such as; • Concentration gradient. • Temperature. • Diffusion distance. • Surface area – surface area to volume ratio. • Energy of molecules. • Membranes and barriers.			
Understand the arrangement and movement of molecules. • Random movement of molecules in liquids and gases. • Little movement of molecules in solids. • Diffusion down a concentration gradient until dynamic equilibrium is reached.			
Learning Aim F- Plants and their environment			
Understand the factors that affect plant growth and/or distribution • Human effects – trampling, pollution, deforestation. • Soil pH and aeration. • Light intensity – shaded and unshaded areas. • Temperature. • Presence of water – moisture and rainfall. • Mineral ions. • Competition – intraspecific and interspecific.			
Understand the importance of random sampling in collecting reliable and valid data for analysis.			
Select appropriate ecological sampling techniques to investigate the effect of abiotic factors on plant populations, including: • transects • quadrats (open and gridded) • point frames.			
Select sample sizes for investigation with regards to practical constraints and the need to collect sufficient data to make valid conclusions.			

Learning Aim G- Energy content of fuels			
Understand the different sources of fuels, such as; • Alcohols – methanol, ethanol, propanol, butanol, pentanol. • Foods – carbohydrates, lipids, protein. • Hydrocarbons – petrol, paraffin, wax			
Understand the different hazards surrounding fuels, such as; • Flammability – risk of explosion. • Toxicity – harmful effects of products of incomplete combustion. • Pollution from sulfur impurities.			
Understand the different units of energy and the calculations surrounding them, such as; • Define – joules, kilojoules, calories, kilocalories. • Heat capacity of water (will be given if required) • Calculate heat energy supplied by a fuel to water using: heat energy = mass of water × specific heat capacity of water × temperature rise of water. • Calculate heat energy released from a fuel in kJ mol^{-1}.			
Learning Aim H- Electrical circuits			
Understand the use of electrical components in series and in parallel, such as, • Cells, batteries, power packs. • Ammeter. • Voltmeter. • Lamps. • Resistors – thermistors, LDRs. • Diodes – photodiodes, LEDs.			
Understand the different equations used in electrical circuits, such as; • Power = voltage × current (P = I × V). • Voltage = current × resistance (V = I × R) • Power = work done/time (P = E/t) • Energy = voltage × current × time (E = V × I × t).			
Consider different domestic appliances to calculate energy usage.			
Relate fuse size to current.			
Energy transferred = power in kilowatts × time in hours (kWh = kW × h).			