EZY SCIENCE

FOR STUDENTS STUDYING
FOR EXAMINATIONS
BY THE **EDEXCEL**
EXAM BOARD

EDEXCEL REQUIRED PRACTICALS GUIDE

Developed by EZY edtech

SUMMER 2018 REPRESENTS THE FIRST SITTING OF THE NEWLY REFORMED 9-1 SCIENCE GCSE EXAMINATIONS.

WITHIN THESE, THERE IS AN OFQUAL REQUIREMENT FOR AT LEAST 15% OF AVAILABLE MARKS TO BE BASED UPON STUDENTS' UNDERSTANDING OF DESIGNATED PRACTICAL WORK AND THEIR INVESTIGATIVE SKILLS.

EDEXCEL specifies 24 core practicals (18 for combined science students), which students are required to understand and be able to answer questions on within the exam setting.

To support students and teachers with this enhanced emphasis upon the core practicals, EzyScience offers a comprehensive collection of digital resources based upon each individual experiment.

EZYSCIENCE **RESOURCES**

Each required practical enjoys its own unit of resources within the main EzyScience course.

Every unit contains comprehensive lecture videos, which take students through the experimental method, allow students to watch the experiment take place, and showcase how to analyse the experiment's results effectively.

These lecture videos are followed by formative automated assessments. The assessments challenge students to go through the process of collecting the results of an experiment, analyse the results they have collected and interrogates their understanding of the important factors which might affect the experiment.

A lot of care has been taken to carefully structure the assessments to assist students' understanding. Many of the questions require the students to watch a video clip of a part of an experiment and record the results or analyse the experimental method. Each question is followed by a bespoke feedback video.

USE CASES

There are a variety of ways a school might wish to utilise EzyScience's required practical resources. Here we suggest a few examples.

FLIPPED CLASSROOM PREPARATION

Teachers require their students to access and work through EzyScience's unit on the experiment that is planned for class the following lesson. The teacher uses the reporting functionality to ensure students complete the unit. Students arrive for the lesson with prior exposure to the experimental method and an understanding of what they should be looking out for.

ALTERNATIVE TO CLASS DEMO

Rather than spending time at the beginning of the lesson showcasing the experiment to students, the teacher directs them to use the class tablets to watch an EzyScience Lecture Video, before attempting the experiment themselves.

POST-EXPERIMENT ASSESSMENT

Following the completion of an experiment in-class, the teacher directs their students to complete the appropriate assessments within EzyScience, with the lecture videos available to support students if required.

REVISION OF EXPERIMENTS

In the lead-up to examinations, teachers may integrate EzyScience's required practical units into a structured revision timetable. This provides students with access to comprehensive resources for all required practicals for their revision, and teachers with the ability to monitor revision progress and provide informed additional support where required.

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EZY BIOLOGY

CORE PRACTICAL 1
USING A LIGHT MICROSCOPE

SPECIFICATION STATEMENT	EzyBiology Code
1.6 Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations.	KC1.2

KC1.2:
Microscopy
(Lecture Video)

In this video Mark begins by detailing the different components of a microscope, before narrating as Katherine conducts an experiment to view onion cells through a microscope. Katherine shows students how to prepare a slide of onion cells, before demonstrating how to focus a microscope. Students are shown actual onion slide images under different magnifications. These images are then used to estimate the size of an onion cell. Mark finishes the video by outlining how an electron microscope works and uses an image of a dust mite to calculate its magnification.

KC1.2a:
Microscopy
(Assessment)

Q1	Microscope Power and Adjustment
Q2	Microscope Power and Adjustment
Q3	Scaffolded Calculation of Cell Size
Q4	Scaffolded Calculation of Cell Size
Q5	Scaffolded Calculation of Cell Size
Q6	Calculation of Cell Size
Q7	Calculation of Cell Size
Q8	Calculation of Magnification
Q9	Calculation of Magnification
Q10	Calculation of Cell Size

CORE PRACTICAL 2
pH AND ENZYMES

SPECIFICATION STATEMENT	EzyBiology Code
1.10 Investigate the effect of pH on enzyme activity.	KC2.2

KC2.2.1:
The Effect of pH on Enzymes
(Theory and Method) **(Lecture Video)**

In this video Mark explains the effect of amylase on starch, and introduces the method that will be used in the practical. The continuous sampling technique is explained. He finishes by considering the different variables involved in the experiment.

KC2.2.2:
The Effect of pH on Enzymes
(Doing the Experiment) **(Lecture Video)**

Mark begins by introducing all the equipment needed to carry out the practical. He then narrates as Katherine sets up a water bath before carrying out the test. He also discusses how to determine the results of each test.

KC2.2.3:
The Effect of pH on Enzymes
(Analysing the Results) **(Lecture Video)**

In the final video Mark uses the results obtained in the experiment in KC2.2.2 to construct a graph. He then makes a conclusion based on these results, before discussing how confident we can be with this based on limitations of the test.

KC2.2a:
The Effect of pH on Enzymes
(Assessment)

Q1	Identifying the Experimental Variables
Q2	Determining the Results of a Test
Q3	Determining the Results of Tests
Q4	Identifying the Correctly Plotted Graph
Q5	Interpreting Results from a Graph
Q6	Interpreting Results
Q7	Identifying Uncertainties about the Method
Q8	Comparing and Interpreting Different People's Results
Q9	Scaffolded Calculations of Rate of Digestion
Q10	Calculating Rates of Digestion

CORE PRACTICAL 3
FOOD TESTS (BIOLOGY ONLY)

SPECIFICATION STATEMENT	EzyBiology Code
1.13 Investigate the use of chemical reagents to identify starch, reducing sugars, proteins and fats.	KC2.3

KC2.3:
Food Tests
(Lecture Video)

Mark begins by explaining how each different food test is carried out whilst each is demonstrated by Katherine. The tests for starch, sugars, proteins and lipids are covered, and the positive result for each is explained. The video then moves on to test for each of these in two different food products, puffed rice and cottage cheese.

KC2.3a:
Food Tests
(Assessment)

Q1	Video Q – Observing the Outcome of a Test
Q2	Video Q – Observing the Outcome of a Test
Q3	Video Q – Observing the Outcome of a Test
Q4	Video Q – Observing the Outcome of a Test
Q5	Video Q – Observing the Outcome of a Test
Q6	Video Q – Observing the Outcome of a Test
Q7	Video Q – Observing the Outcome of a Test
Q8	Video Q – Observing the Outcome of a Test
Q9	Identifying Reagents Used, and the Result of Tests
Q10	Identifying the Test Used, and the Result of Tests

CORE PRACTICAL 4
OSMOSIS

SPECIFICATION STATEMENT	EzyBiology Code
1.16 Investigate osmosis in potatoes.	KC3.2

KC3.2.1:
Investigating Osmosis (Doing the Experiment)
(Lecture Video)

This lecture video starts with an explanation of the process of osmosis. Mark then outlines the equipment required for the experiment and narrates as Katherine prepares her potato cylinders, records her initial measurements and places them in different concentrations of sugar solutions. The final results are collected and recorded within a results table.

KC3.2.2:
Investigating Osmosis (Analysing the Results)
(Lecture Video)

This lecture video uses the results table produced by the end of the KC3.2.1 lecture video and begins by calculating the changes and percentages of the lengths and masses of the different potato cylinders. Mark then showcases how to use these results to plot a graph. The video finishes by using this graph to estimate the sugar concentration of the potato used in the experiment.

KC3.2a:
Investigating Osmosis
(Assessment)

Q1	Video Q – Types of Variable
Q2	Control Variable
Q3	Recording Results
Q4	Recording Results
Q5	Calculating Changes and % Changes
Q6	Calculating Changes and % Changes
Q7	Calculating Changes and % Changes
Q8	Plotting Graph
Q9	Analysing Graph
Q10	Analysing Results

EZY BIOLOGY

CORE PRACTICAL 5
ANTISEPTICS/ANTIBIOTICS (BIOLOGY ONLY)

SPECIFICATION STATEMENT	EzyBiology Code
5.18 Investigate the effects of antiseptics, antibiotics or plant extracts on microbial cultures.	HD4.2

HD4.2:
Investigating Antiseptics and Antibiotics
(Lecture Video)

Mark begins by discussing effective aseptic experimental techniques and detailing the process that should be followed in this experiment to avoid bacterial contamination. He then demonstrates the process for using an agar plate to test the effectiveness of different antiseptics, before analysing some results. Mark finishes the video by discussing some important safety considerations.

HD4.2a:
Investigating Antiseptics and Antibiotics
(Assessment)

Q1	Aseptic Techniques
Q2	Aseptic Techniques
Q3	Scaffolded Zone of Inhibition Calculation
Q4	Analysing Results
Q5	Experimental Process
Q6	Zone of Inhibition Calculation
Q7	Definitions
Q8	Bacterial Growth Calculations
Q9	Analysing Bacterial Growth Graph
Q10	Bacterial Growth Calculations

CORE PRACTICAL 6
RATE OF PHOTOSYNTHESIS

SPECIFICATION STATEMENT	EzyBiology Code
6.5 Investigate the effect of light intensity on the rate of photosynthesis.	PS1.3

PS1.3.1:
Photosynthesis and Light Intensity
(Doing the Experiment) **(Lecture Video)**

In this video Mark begins by discussing what photosynthesis is, and introduces a hypothesis of how light intensity will affect rate of photosynthesis. He then introduces the equipment and method that will be used to test this, and narrates as Matt caries the various stages of the experiment. Two attempts at a distance of 10 cm are covered in the video. Results are collected in a tally chart, and Mark finishes by calculating averages to complete the table of results.

PS1.3.2:
Photosynthesis and Light Intensity
(Analysing the Results) **(Lecture Video)**

In this second video Mark briefly recaps the method carried out before discussing how to construct a graph of results obtained from the experiment carried out in PS1.3.1. He then compares the results from the experiment to the hypothesis that was made in PS1.3.1.

PS1.3a:
Photosynthesis and Light Intensity
(Assessment)

Q1	Explaining the Experimental Method
Q2	Video Q – Collecting Results from a Test
Q3	Calculating Averages of Results
Q4	Identifying the Correctly Plotted Graph
Q5	Calculating Rate of Photosynthesis
Q6	Interpreting Result and Calculating Rate of Photosynthesis
Q7	Interpreting Result and Calculating Rate of Photosynthesis
Q8	Calculating Rates of Photosynthesis
Q9	Interpreting Graph of Results
Q10	Calculating Rate of Photosynthesis Using Inverse Square Relationship

CORE PRACTICAL 7
RATE OF RESPIRATION

SPECIFICATION STATEMENT	EzyBiology Code
8.11 Investigate the rate of respiration in living organisms.	EX1.6

EX1.6.1: Investigating the Rate of Respiration in Living Organisms (Doing the Experiment)
(Lecture Video)

In this video Mark begins by introducing a hypothesis that temperature will affect the rate an organism respires. He then introduces an experiment that will be used to test this hypothesis; investigating the effect of changing temperature on the respiration of maggots. Mark explains a simple respirometer that will be used in the practical, and the theory behind it. Mark then introduces the equipment that is used in the experiment before narrating as Katherine sets up and carries out the experiment. Results for five different temperatures are recorded.

EX1.6.2: Investigating the Rate of Respiration in Living Organisms (Analysing the Results)
(Lecture Video)

In this second video Mark begins with a brief recap of the method used in the first video. He then explains how a graph of results obtained in EX1.6.1 can be plotted, including line of best fit. A conclusion of results is then made, before a discussion of how confident we can be. Mark finishes with a brief discussion of how we could improve confidence by repeating the test at temperatures in a narrower temperature range to find the optimum temperature.

EX1.6a: Investigating the Rate of Respiration in Living Organisms
(Assessment)

Q1	Understanding Apparatus
Q2	Identifying Variables
Q3	Identifying the Correct Graph and Interpreting Results
Q4	Interpreting Results from a Graph
Q5	Calculating Rate of Change
Q6	Identifying Anomalies
Q7	Calculating Mean Values
Q8	Calculating Uncertainties
Q9	Comparing Results for Repeatability and Reproducibility
Q10	Comparing Results for Precision and Accuracy

CORE PRACTICAL 8
POPULATION SIZE

SPECIFICATION STATEMENT	EzyBiology Code
9.5 Investigate the relationship between organisms and their environment using field-work techniques, including quadrats and belt transects.	EC1.2

EC1.2.1:
Measuring a Population
(Lecture Video)

In this video Mark explains how random placement of a quadrat can be used to estimate population size in a given area. Mark then narrates as Katherine and Jacob carry out the method to estimate the population size of daisies in half a football pitch, including the calculation of the test area. To conclude, Mark explains how to calculate the estimated number of daisies in the area.

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EC1.2.2:
The Effect of Trees on a Daisy Population
(Lecture Video)

This second video uses a sampling technique to investigate the effect of a factor on the distribution of a species. Mark begins with a hypothesis for how the proximity of trees affects daisy populations. He then introduces the method of using a belt transect to investigate this, before narrating as Katherine follows the method. Results along the transect are recorded and then compared to the hypothesis.

EC2.1a:
Measuring the Sizes of Populations
(Assessment)

Q1	Recording Results
Q2	Scaffolded Calculation of Estimated Population Size
Q3	Recording Results and Calculating Estimated Population Size
Q4	Recording Results and Identifying the Correctly Plotted Graph
Q5	Recording Results and Calculating Estimated Population Size
Q6	Calculating Estimated Population Size
Q7	Calculating Mean and Interpreting Results
Q8	Calculating Mean and Calculating Estimated Population Size
Q9	Calculating Mean and Interpreting Results
Q10	Calculating Estimated Population Size

EZY CHEMISTRY

CORE PRACTICAL 1 **CHROMATOGRAPHY**

SPECIFICATION STATEMENT	EzyChemistry Code
2.1.1 Investigate the composition of inks using simple distillation and paper chromatography.	**ST1.3**

ST1.3.1:
Chromatography
(Lecture Video)

In this video, Mark begins by describing the equipment used during the practical and narrates as Matt uses chromatography to separate the dyes present in a black ink, showing that the black ink is a mixture of several different dyes. Mark summarises the method and what we see during the chromatography process. He then describes the theory behind chromatography and how we can calculate Rf values of dyes from the chromatogram. Mark finishes by calculating the Rf values for a range of chromatograms.

ST1.3.2:
Distillation
(Lecture Video)

In this video Mark discusses and explains the equipment that Matt will use to separate out a mixture of food colouring and water and then narrates as Matt carries out the experiment.

ST1.3a:
Chromotography and Distillation
(Assessment)

Q1	Definitions and Interpreting Results
Q2	Scaffolded Calculation of Rf Values
Q3	Calculating Rf Values
Q4	Explanation of Distillation Process
Q5	Comparing Chromatograms
Q6	Scaffolded Calculation of Mean Rf Values
Q7	Calculating Mean Rf Values
Q8	Calculating Mean Rf Values
Q9	Calculating and Using Rf Values
Q10	Using and Calculating Rf Values

CORE PRACTICAL 2 **NEUTRALISATION**

SPECIFICATION STATEMENT	EzyChemistry Code
3.6 Investigate the change in pH on adding powdered calcium hydroxide or calcium oxide to a fixed volume of dilute hydrochloric acid.	**CC1.3**

CC1.3:
Investigating Neutralisation
(Lecture Video)

In this video, Mark starts by describing the reactions that occur when calcium oxide reacts with hydrochloric acid and what happens to the pH as calcium oxide is added to the acid. He then outlines the general procedure behind this practical before narrating as Matt weighs the calcium oxide. Matt neutralises the acid solution with calcium oxide with Mark describing the pH changes that occur with each subsequent addition of base. Mark plots Matt's results and uses a line of best fit to determine the mass of calcium oxide describing to neutralise the acid. Mark summarises the experiment before discussing issues with the procedure and how we can improve the method to obtain better results. Mark finishes by describing the safety precautions required for this practical.

CC1.3a:
Investigating Neutralisation
(Assessment)

Q1	Video Q – Observing and Recording pH Changes
Q2	Interpreting Graph of Results
Q3	Refining Experimental Procedure
Q4	Interpreting Graph of Results
Q5	Interpreting Graph of Results
Q6	Extracting information from Graph of Results
Q7	Extrapolating from the Graph of Results to make a prediction
Q8	Extrapolating from the Graph of Results to make a prediction
Q9	Calculating the uncertainty in a set of results
Q10	Comparing sets of results in terms of accuracy and precision

CORE PRACTICAL 3
SOLUBLE SALTS

SPECIFICATION STATEMENT	EzyChemistry Code
3.17 Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including the use of a water bath.	CC1.6

CC1.6:
Producing Soluble Salts (Core Practical) **(Lecture Video)**

In this video, Mark begins by describing how we can make salts and how we can use this to produce copper sulfate using sulfuric acid and an excess of copper oxide. He identifies the equipment used and narrates as Katherine performs the various stages of the experiment: the reaction itself, removal of the copper oxide with filtration and isolating the copper sulfate through evaporation of the solvent. Mark finishes by summarises the experiment and discussing any safety precautions undertaken.

CC1.6a:
Producing Soluble Salts (Core Practical) **(Assessment)**

Q1	Purpose of Equipment and Reagent
Q2	Experimental Procedure
Q3	Experimental Procedure
Q4	Reasoning Behind Procedure
Q5	Experimental Procedure
Q6	Experimental Procedure
Q7	Explaining Experimental procedure
Q8	Interpreting Chemical Equation
Q9	Interpreting Chemical Equation
Q10	Defining Key Terms

CORE PRACTICAL 4
ELECTROLYSIS

SPECIFICATION STATEMENT	EzyChemistry Code
3.31 Investigate the electrolysis of copper sulfate solution with inert electrodes and copper electrodes	CC2.3

CC2.3.1:
Electrolysis of Aqueous Copper Sulfate with Inert Electrodes **(Lecture Video)**

In this video, Mark starts by discussing what electrolysis is and what ions we can find in an aqueous solution of copper sulfate. He follows this by outlining the rules governing which ions are discharged at each electrode before applying these rules to aqueous copper sulfate, generating a hypothesis about the products in the process. Mark narrates as Liam performs the electrolysis, using the results to validate the hypothesis.

CC2.3.2:
Electrolysis of Aqueous Copper Sulfate with Copper Electrodes **(Lecture Video)**

In this video, Mark begins by looking at what happens if we use metal electrodes made out of the same metal we have present in the electrolyte. He generates a hypothesis describing what would happen to the mass of each electrode during the electrolysis of $CuSO_4$(aq) using copper electrodes. He outlines the equipment that will be used in this experiment before narrating as Matt weighs the electrodes, performs the electrolysis and weighs the new mass of the electrodes. Mark summarises the procedure prior to narrating as Matt performs the experiment at various currents and records the results.

CC2.3.3:
Analysis of Electrolysis of Aqueous Copper Sulfate with Copper Electrodes **(Lecture Video)**

In this video, Mark takes the results obtained in the experiment (CC2.3.2) and uses them to validate his hypothesis. He starts by plotting the change in mass of the cathode against time and discusses the relationship between the two variables. He identifies the values are proportional to each other, helping to validate and elucidate his hypothesis.

CC3.3a:
Electrolysis of Aqueous Solutions **(Assessment)**

Q1	Labelling Equipment, Experimental Procedure
Q2	Identifying Variables
Q3	Interpreting Results
Q4	Predicting Results
Q5	Collecting Readings and Interpreting Results
Q6	Collecting Readings and Evaluating Results
Q7	Applying Knowledge to Predict
Q8	Collecting Results and Extrapolating
Q9	Collecting Results and Extrapolating
Q10	Interpreting and Evaluating Results

CORE PRACTICAL 5
TITRATIONS – CHEMISTRY ONLY

SPECIFICATION STATEMENT	EzyChemistry Code
5.9 Carry out an accurate acid-alkali titration, using burette, pipette and a suitable indicator.	SCi2.1

SCi2.1:
Titrations **(Lecture Video)**

In this video, Mark begins by describing neutralisation reactions and how this affects pH and the colour of universal indicator. He then talks about what a titration is and the equipment needed to perform one. Katherine sets up and performs the titration as Mark narrates the process. Katherine first performs a rough titration to estimate the reacting volume, before repeating the titration several times to obtain concordant results. Mark calculates the average titration volume and considers the uncertainty of the burette readings. He finishes by summarising the titration process before identifying any safety precautions undertaken.

Determination of concentration using titrations is covered in SCi2.6.

CC2.5a:
Titrations **(Assessment)**

Q1	Video Q - Safety Issues
Q2	Video Q - Safety Issues
Q3	Experimental Process
Q4	Labelling Equipment
Q5	Use of Equipment
Q6	Video Q - Reading Burettes
Q7	Reading Burettes
Q8	Identifying Anomalous Results
Q9	Using Measuring Cylinders for Titrations
Q10	Using Measuring Cylinders for Titrations

CC2.5a:
Titrations **(Assessment)**

Q1	Reading Burettes and Scaffolded Analysis of Results
Q2	Scaffolded Analysis of Results
Q3	Reading Burettes and Analysis
Q4	Reading Burettes and Analysis
Q5	Titration Volumes Without Burette Refilling and Analysis
Q6	Titration Volumes Without Burette Refilling and Analysis
Q7	Using Measuring Cylinders for Titrations and Analysis
Q8	Using Measuring Cylinders for Titrations and Analysis
Q9	Uncertainty (%) in Burette and Measuring Cylinder Readings
Q10	Uncertainty (%) in Burette and Measuring Cylinder Readings

EZY CHEMISTRY

CORE PRACTICAL 6
RATES OF REACTION

SPECIFICATION STATEMENT	EzyChemistry Code
7.1 Investigate the effects of changing the conditions of a reaction on the rates of chemical reactions by: a) measuring the production of a gas (in the reaction between hydrochloric acid and marble chips) b) observing a colour change (in the reaction between sodium thiosulfate and hydrochloric acid).	**GR2.3**

GR2.3.1:
Investigating Rates of Reaction (Concentration)
(Lecture Video)

In this video, Mark begins by discussing how we can measure the rate of reaction and then talks about the reaction of calcium carbonate with hydrochloric acid, before describing how we can investigate the effect of changing acid concentration on the rate by measuring the volume of carbon dioxide formed in one minute. Mark outlines his hypothesis for this reaction and explains his reasoning behind it. Mark identifies the equipment used in this experiment, before narrating as Matt weighs and measures the reactants and performs the experiment. Mark summarises the experiment and plots the results for each concentration against the volume of gas collected. He talks about the relationship between the two variables and tests his hypothesis against his results. Mark finishes by discussing fair testing and safety conditions.

GR2.3.2:
Investigating Rates of Reaction (Temperature)
(Lecture Video)

In this video, Mark starts by discussing how we can measure the rate of reaction and how we could apply this to the reaction of sodium thiosulfate and hydrochloric acid. He outlines the general approach that Matt will undertake during the practical to investigate the effect of temperature on the rate and creates his hypothesis. Mark narrates as Matt heats the thiosulfate solution using a water bath before he mixes the two reactants and times the reaction. Mark describes what happens as the two solutions react, forming a precipitate that obscures the cross placed beneath the conical flask. Mark summarises the experiment before commenting as Matt performs the reaction at various times. Matt analyses the results by plotting the time taken for the cross to disappear against time.

GR2.3a:
Investigating Rates of Reaction
(Assessment)

Q1	Video Q – Recording Results and Scaffolded Calculation of Rate
Q2	Video Q – Recording Results and Calculation of Rate
Q3	Recording Results and Calculation of Rates
Q4	Reading Graphs and Interpreting Results
Q5	Video Q – Identifying Variables
Q6	Interpreting Results
Q7	Video Q – Identifying Variables and Sources of Uncertainty
Q8	Video Q – Recording Results and Calculation of Rate
Q9	Video Q – Recording Results and Calculation of Rate
Q10	Interpreting Result

CORE PRACTICAL 7
TESTING FOR IONS (CHEMISTRY ONLY)

SPECIFICATION STATEMENT	EzyChemistry Code
9.6 Identify the ions in unknown salts, using the tests for the specified cations and anions in 9.2C, 9.3C, 9.4C, 9.5C.	**SCii1.1**

SCii1.1:
Chemical Tests for Ions
(Lecture Video)

In this video, Mark begins by looking at tests used to identify positive ions, narrating as Matt performs a flame test of a lithium compound. He then describes how we can identify metals from the colour of their flames. Mark follows this by looking at sodium hydroxide tests, detailing the colour changes and precipitates formed when aqueous salts of various metals react with sodium hydroxide with Matt performing an example reaction. Mark describes how we can identify different metals when white precipitates are formed by either adding more sodium hydroxide or by additionally using a flame test. Mark then moves onto tests for negative ions, starting with test for carbonate ions. He narrates as Matt adds acid to aqueous lithium carbonate, noting the formation of carbon dioxide. The gas is collected and bubbled through limewater, confirming its identity. Mark then looks at the tests for halide ions, describing the colour of the precipitate formed as Matt adds silver nitrate to solutions containing the various halide ions. His final test looks at sulfate ions, confirming their presence through the addition of aqueous barium chloride. Mark summarises all the tests for both positive and negative ions. Mark finishes by using the results of a series of tests performed by Matt to elucidate the identity of an unknown salt.

SCii1.1a:
Chemical Tests for Ions
(Assessment)

Q1	Video Q – Ion Test Results and Identifying the Salt
Q2	Video Q – Ion Test Results and Identifying the Salt
Q3	Video Q – Ion Test Results and Identifying the Salt
Q4	Video Q – Ion Test Results and Identifying the Salt
Q5	Video Q – Ion Test Results and Identifying the Salt
Q6	Predicting Ion Test Results
Q7	Predicting Ion Test Results
Q8	Using Test Results to Identify a Salt
Q9	Predicting Ion Test Results from a Mixture of Salts
Q10	Using Test Results to Identify a Salt

CORE PRACTICAL 8
ALCOHOLS AS FUELS (CHEMISTRY ONLY)

SPECIFICATION STATEMENT	EzyChemistry Code
9.28 Investigate the temperature rise produced in a known mass of water by the combustion of the alcohols ethanol, propanol, butanol and pentanol.	**UR1.3**

SCii2.2:
Alcohols as Fuels
(Lecture Video)

In this video, Mark begins by looking at the combustion of alcohols and describes the background of this experiment. Mark summarises the process and discusses fair testing, before identifying the equipment used. Mark narrates as Matt sets up the equipment and lights the methanol burner, starting the experiment. Mark calculates the temperature rise before narrating as Matt repeats the experiment with the other alcohols. Mark analyses the results by plotting the temperature rise against each alcohol and identifies the best fuel. He finishes by deriving a conclusion from the results and discussing any anomalies.

SCii2.2a:
Alcohols as Fuels
(Assessment)

Q1	Fair Testing
Q2	Video Q – Observation and Recording Results
Q3	Interpreting Results
Q4	Scaffolded Calculation of Temperature Rises per Gram
Q5	Manipulation and Interpretation of Results
Q6	Comparing Different Sets of Results
Q7	Identifying Variables
Q8	Manipulation and Interpretation of Results
Q9	Calculation of Temperature Rise per Gram
Q10	Manipulation of Results

EZY PHYSICS

CORE PRACTICAL 1
FORCE AND ACCELERATION

SPECIFICATION STATEMENT	EzyPhysics Code
2.19 Investigate the relationship between force, mass and acceleration by varying the masses added to trolleys.	MF3.4

MF3.4.1:
Measuring Force and Acceleration
(Lecture Video)

Mark begins this lecture video by briefly looking at what happens to the acceleration of a trolley as the force applied to the trolley and the mass of the trolley change. He then goes on to explain how to investigate the relationships between force and acceleration, and between mass and acceleration. Next, Mark discusses the different methods of applying the force to the trolley before explaining how friction has been compensated for in this experiment. Two approaches to measure the acceleration of the trolley are outlined by Mark, one of which is then carried out by Matt. Using the measurements recorded by Matt, Mark calculates the acceleration of the trolley as it travels down the inclined slope. To conclude this lecture video, Mark summarises Matt's approach to measuring acceleration, outlining the advantages and disadvantages.

MF3.4.2:
Force and Acceleration Experiment
(Lecture Video)

In this lecture video Mark narrates as Katherine carries out an experiment to investigate the relationship between force and acceleration for an object with constant mass. Initially, Mark outlines the experiment Katherine is going to conduct before Katherine starts the experiment. He uses Katherine's first measurements from the experiment to calculate the first value for acceleration for a given force. Mark then calculates additional values for acceleration after increasing the force acting on the trolley before plotting a graph of Katherine's results. Mark uses these results along with a line of best fit to analyse the relationship between force and acceleration. Finally, Mark highlights the steps that Katherine has taken to ensure she obtains accurate results from the experiment.

MF3.4.3:
Mass and Acceleration Experiment
(Lecture Video)

In this lecture video Mark discusses an experiment that investigates the relationship between the mass of an object and the object's acceleration, if the object experiences a constant force. Mark begins by detailing the equipment and the setup of the experiment before calculating the acceleration of the trolley. A table of results obtained from the experiment is then used to plot a graph of acceleration against mass. Finally, Mark draws a line of best fit onto his graph allowing him to make observations and compare the experimental data to $F = m \times a$.

MF3.4a :
Newton's 2nd Law (Experiment)
(Assessment)

Q1	Calculating Acceleration
Q2	Calculating Acceleration
Q3	Calculating Acceleration
Q4	Identifying Incorrectly Plotted Points
Q5	Identifying Correct Line of Best Fit
Q6	Using a Graph to Find Acceleration
Q7	Using a Graph to Find Force-Acceleration Ratios
Q8	Analysing Experimental Data
Q9	Identifying Mistakes in Experimental Procedure
Q10	Identifying Mistakes in Experimental Procedure
Q11	Identifying Mistakes in Experimental Procedure
Q12	Fair Testing
Q13	Calculating Acceleration
Q14	Identifying Mistakes on a Graph
Q15	Analysing the Relationship Between Force, Mass, and Acceleration

MF3.4b:
Newton's 2nd Law (Experiment)
(Assessment)

Q1	Making Observations from an Acceleration-Force Graph
Q2	Making Observations from an Acceleration-Force Graph
Q3	Calculating the Mass of the Trolley from an Acceleration-Force Graph
Q4	Using a Graph to Calculate Acceleration, Force and Mass
Q5	Marking Student's Analysis of Results
Q6	Comparison of Experimental Data to $F = m \times a$
Q7	Comparison of Experimental Data to $F = m \times a$
Q8	Comparison of Experimental Data to $F = m \times a$
Q9	Comparison of Experimental Data to $F = m \times a$
Q10	Marking Student's Analysis of Results

CORE PRACTICAL 2
MEASURING FREQUENCY, WAVELENGTH AND SPEED

SPECIFICATION STATEMENT	EzyPhysics Code
4.17 Investigate the suitability of equipment to measure the speed, frequency and wavelength of a wave in a solid and a fluid.	WA1.4

WA1.4.1:
Measuring v, f and λ for a Wave on a Wire
(Lecture Video)

Mark starts this lecture video by showing how a standing wave forms on a piece of wire before investigating the relationship between the standing wave and the initial wave that formed it. Mark narrates as Liam sets up and conducts the experiment. His narration includes a detailed explanation as to how the wire is displaced. Next Mark summarises the experiment before using the results Liam gathered from the experiment to calculate the wavelength and speed of the wave on the wire.

WA1.4.2:
Measuring v, f and λ for a Wave on Water
(Lecture Video)

In this lecture video Mark begins by detailing the equipment Liam will use in this experiment to calculate the speed of ripples as they travel across a ripple tank. Before watching Liam conduct the experiment, Mark details the equation Liam will eventually use to calculate the speed of these water waves. As Liam is conducting the experiment, Mark describes how he will measure the wavelength and frequency of the water waves. Finally, Liam uses these measurements to calculate the speed of the water waves as they travel across the ripple tank.

WA1.4a:
Measuring Frequency, Speed and Wavelength
(Assessment)

Q1	Calculating the Speed of a Wave on a Stretched Wire
Q2	Calculating the Speed of a Wave on a Stretched Wire
Q3	Calculating the Speed of a Wave on a Stretched Wire
Q4	Calculating the Speed of a Ripple
Q5	Calculating the Speed of Wave Across a Ripple Tank
Q6	Calculating the Mean Speed of a Wave on a Stretched Wire
Q7	Calculating the Mean Speed of Wave Across a Ripple Tank
Q8	Calculating the Speed of a Wave on a Stretched Wire
Q9	Investigating How the Speed of a Wave on a Wire Varies with The Tension of the Wire
Q10	Calculating the Mean Speed of Wave Across a Ripple Tank

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CORE PRACTICAL 3
INVESTIGATING REFLECTION AND REFRACTION

SPECIFICATION STATEMENT	EzyPhysics Code
5.9 Investigate refraction in rectangular glass blocks in terms of the interaction of electromagnetic waves with matter.	WA1.6

WA1.6.1:
Investigating Reflection and Refraction
(Lecture Video)

Mark begins this lecture video by explaining the terms angle of incidence, angle of reflection, angle of refraction, and the normal. Mark then details the equipment used by Liam in this experiment before narrating as Liam conducts the experiment. In this experiment Liam investigates the relationships between the angles of incidence, reflection, and refraction by shining a ray of light into a Perspex block at two angles. Mark explains how Liam constructs each part of the experiment and highlights how to obtain the angles from it. Mark rounds this lecture video off by drawing conclusions for the angles measured in this experiment.

WA1.6a:
Investigating Reflection and Refraction
(Assessment)

Q1	Identifying Angles of Incidence, Reflection and Refraction
Q2	Identifying Independent, Dependent and Control Variables
Q3	Identifying Anomalous Results
Q4	Identifying Incorrect Trends in Results
Q5	Identifying the Angle of Refraction
Q6	Identifying Angles of Incidence, Reflection, and Refraction
Q7	Identifying Light Rays Refracted by a Prism
Q8	Identifying Angles of Incidence, Reflection, and Refraction
Q9	Identifying Angles of Refraction
Q10	Identifying Angles of Incidence, Reflection, and Refraction

CORE PRACTICAL 4
EMISSION AND ABSORPTION OF IR (PHYSICS ONLY)

SPECIFICATION STATEMENT	EzyPhysics Code
5.19 Investigate how the nature of a surface affects the amount of thermal energy radiated or absorbed.	WA2.3

WA2.3.1:
Investigating the Emission of IR
(Lecture Video)

In this lecture video Mark starts by defining infrared radiation (IR) before detailing the hypothesis of this experiment – to investigate the ability of different surfaces to emit infrared radiation. Liam starts to conduct the experiment once Mark has detailed all the equipment he will be using. As Liam conducts the experiment, Mark narrates what he is doing and records the time it takes for the temperature of a volume of water to fall by 5 degrees Celsius in a container with a particular surface. This process is repeated for the same volume of water in containers with different surfaces. Finally, Mark concludes the experiment by listing the surfaces of each container in terms of their ability to emit infrared radiation.

WA2.3.2:
Investigating the Absorption of IR
(Lecture Video)

In this lecture video Mark starts by defining infrared radiation (IR) before detailing the hypothesis of this experiment – to investigate the ability of different surfaces to absorb infrared radiation. Liam starts to conduct the experiment once Mark has detailed all of the equipment he will be using. As Liam conducts the experiment, Mark narrates what he is doing and records the temperature rise of a volume of water in a container with a particular surface over 10 minutes. This process is repeated for the same volume of water in containers with different surfaces. Finally, Mark concludes the experiment by listing the surfaces of each container in terms of their ability to absorb infrared radiation. Mark finishes this lecture video with a discussion about the importance of fair testing in this experiment.

WA2.3a:
The Absorption and Emission of IR
(Assessment)

Q1	Fair Testing
Q2	Identifying Control Variables
Q3	Comparing Experimental Data
Q4	Identifying Independent, Dependant and Control Variables
Q5	Analysing Experimental Data
Q6	Identifying Appropriate Experiments to Investigate IR Emission
Q7	Identifying Surface Types from Experimental Results
Q8	Calculating Temperature Drop Rate
Q9	Comparing Experimental Results
Q10	Analysis of Material Properties

CORE PRACTICAL 5
RESISTANCE

SPECIFICATION STATEMENT	EzyPhysics Code
10.17 Construct electrical circuits to: a) investigate the relationship between potential difference, current and resistance for a resistor and a filament lamp. b) test series and parallel circuits using resistors and filament lamps.	EL1.4

EL1.4.1
Finding Resistance (General Principles)
(Lecture Video)

Mark begins this video by stating Ohm's law (the relationship between potential difference, current, and resistance) and explaining how this can be used to calculate resistance. Mark then uses a circuit diagram to clearly explain how to use a voltmeter to measure the potential difference across a resistor and an ammeter to measure the current flowing through it. Mark narrates as Katherine sets up the circuit before going on to calculate the resistance of the resistor using the measured potential difference and current.

EL1.4.2:
Finding Resistance (Resistance vs. Length)
(Lecture Video)

Here Katherine demonstrates as Mark explains how a simple circuit (used to measure the resistance of a resistor) can be adapted to measure the resistance of a length of wire. Once the length of wire has been integrated into the circuit Mark records the potential difference across the wire and the current flowing through. He uses both of these values and Ohm's law to calculate the resistance of particular lengths of wire. Mark then plots a graph to investigate how the resistance of the wire varies with the length of wire in the circuit. Finally, Mark uses his graph to conclude his observations from the experiment.

EL1.4.3:
Finding Resistance (Combinations)
(Lecture Video)

Mark starts this lecture video by explaining how Katherine is going to modify a simple circuit (used to measure the resistance of a resistor) to investigate how the total resistance of a circuit changes with two resistors in series and in parallel. Mark then narrates as Katherine demonstrates how to add a second resistor so that it is in series with the resistor already in the circuit. After measuring the potential difference across both resistors and the current flowing through them, Mark calculates their combined resistance using Ohm's law. Mark then narrates as Katherine changes the circuit so that the two resistors are now in parallel with each other. Once again, he uses Ohm's law to calculate the combined resistance of the two resistors. Mark concludes this lecture video by comparing the total resistance of the circuit with only one resistor, with two resistors in series, and with two resistors in parallel.

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EL1.4:
Finding Resistance
(Assessment)

Q1	Identifying Circuit Components
Q2	Calculating Resistance and Identifying Anomalous Results
Q3	Identify the Correct Graph for a Set of Results
Q4	Using a Graph to Find Resistance, Length of Wire and Resistance per Metre
Q5	Identifying Incorrectly Wired Components in a Circuit
Q6	Calculating Resistance and Extrapolating Data
Q7	Calculating Resistance and Identifying Anomalous Results
Q8	Extrapolating Data
Q9	Calculating Resistance
Q10	Drawing Conclusions from Results

CORE PRACTICAL 6
DENSITY

SPECIFICATION STATEMENT	EzyPhysics Code
14.3 Investigate the densities of solid and liquids.	**PM1.2**

PM1.2:
Determining Density
(Lecture Video)

In this lecture video Mark begins by defining density and how to calculate it using mass and volume. Next Mark narrates as Matt demonstrates how to calculate and measure the volume and mass of three different materials: a regular solid, an irregular solid, and a liquid. Mark calculates the density of each material after measuring their respective mass and volume.

PM1.2a:
Determining Density
(Assessment)

Q1	Using Experimental Observations to Calculate Density
Q2	Identifying Mistakes Made in Measurements
Q3	Measuring Volume and Mass to Calculate Density
Q4	Identify Mistakes Made in an Experiment
Q5	Determining Whether Measured Density is Too High or Too Low
Q6	Calculating Density
Q7	Calculating Density
Q8	Calculating Density
Q9	Calculating Density
Q10	Calculating Density

CORE PRACTICAL 7
THERMAL PROPERTIES OF WATER

SPECIFICATION STATEMENT	EzyPhysics Code
14.11 Investigate the properties of water by determining the specific heat capacity of water and obtaining a temperature-time graph for melting ice.	**PM1.5**

PM1.5.1:
Thermal Properties of Water
(Specific Heat Capacity) **(Lecture Video)**

Mark begins this lecture video by outlining what the specific heat capacity of a substance is before detailing the equipment Liam will be using to measure the specific heat capacity of water. Mark then narrates as Liam demonstrates how to conduct the experiment whilst recording all of the variables. Using the data gathered by Liam in the experiment, Mark uses the equation relating energy, mass, specific heat capacity, and change in temperature to calculate the specific heat capacity of water. Finally, Mark concludes this lecture video by comparing the value of the specific heat capacity of water measured in this experiment to the actual value.

PM1.5.2:
Thermal Properties of Water
Temperature-Time Graph) **(Lecture Video)**

In this lecture video Mark outlines an experiment to investigate how the temperature of a sample of ice varies as it changes state from ice to water. Mark begins by explaining how the temperature of the ice can be measured as the ice changes state before narrating as Matt conducts the experiment. Mark then records the temperature of the ice every thirty seconds as it is being heated. Using this data, he plots a graph showing how the temperature of the sample varies over time before plotting a line of best fit. Mark concludes this lecture video by discussing how the temperature of the ice varies as it changes state to water.

PM1.5a:
Thermal Properties of Water
(Assessment)

Q1	Specific Heat Capacity Calculation
Q2	Specific Heat Capacity Calculation
Q3	Specific Heat Capacity Calculation
Q4	Calculation and Comparison of Specific Heat Capacities
Q5	Analysis of Experimental Graphs
Q6	Analysis of Experimental Graphs
Q7	Specific Heat Capacity Calculation
Q8	Specific Heat Capacity Calculation
Q9	Specific Heat Capacity Calculation
Q10	Specific Heat Capacity Calculation

EZY PHYSICS

CORE PRACTICAL 8
FORCE AND EXTENSION

SPECIFICATION STATEMENT	EzyPhysics Code
15.6 Investigate the extension and work done when applying forces to a spring.	**FM1.4**

FM1.4.1:
F = ke Experiment (Doing the Experiment)
(Lecture Video)

To begin with, Mark outlines the experiment by investigating what happens to a spring as masses are suspended from it. Next, he details the equipment that Matt will be using to investigate how the mass suspended from the spring affects the extension of a spring. Mark outlines the method that will be used in this experiment before narrating as Matt conducts the experiment. After recording the first extension of the spring, Mark focusses on calculating the total extension of the spring. Mark continues recording his results and calculating the total extension of the spring to complete his table of experimental data.

FM1.4.2:
F = ke Experiment (Analysing the Results)
(Lecture Video)

Mark begins this lecture video by plotting a graph of Matt's experimental data recorded in the FO3.3.1 lecture video. Mark then uses this data to draw a line of best fit onto his graph and make some observations and draw conclusions about the relationship between the force applied to a spring and the extension of the spring. Mark concludes this video by discuss the spring constant and introducing the equation relating force, extension, and the spring constant. w

FM1.4.3:
F = ke Experiment (Calculating Work Done)
(Lecture Video)

Mark begins this experiment by recapping the results Matt obtained from his experiment to investigate the relationship between the extension of a spring and the force applied to the spring. Next Mark introduces the equation relating the work done on a spring, the spring constant of the spring and the extension of the spring. Using Matt's results, Mark first converts all of the extensions from millimetres to metres followed by calculating the work done on the spring for each extension. Mark then plots a graph to investigate the relationship between the work done on the spring and force applied to spring before drawing some conclusions from Matt's experimental results.

FM1.4a:
F = ke Experiment
(Assessment)

Q1	Identifying Equipment Used to Investigate Force-Extension Relationship
Q2	Identify Mistakes in Recording Force-Extension Data
Q3	Identify Mistakes in Recording Force-Extension Data
Q4	Filling a Table with Experimental Data
Q5	Filling a Table with Experimental Data
Q6	Filling a Table with Experimental Data
Q7	Identifying Incorrectly Plotted Points on a Graph
Q8	Identifying the Correct Line of Best Fit
Q9	Using a Graph to Find the Limit of Proportionality and Force
Q10	Using a Graph to Find Extension and Calculate the Spring Constant
Q11	Putting Experimental Steps in Order

FM1.4b:
F = ke Experiment
(Assessment)

Q1	Using a Graph to Find Extension and Calculate the Spring Constant
Q2	Using a Graph to Calculate the Spring Constant
Q3	Using a Graph to Calculate the Spring Constant
Q4	Comparing Experimental Results
Q5	Using a Graph to Calculate the Spring Constant
Q6	Completing a Table of Experimental Data
Q7	Identify the Correct Graph for a Set of Results
Q8	Using a Graph to Calculate Spring Constants
Q9	Analysing the Relationship Between Force and Extension
Q10	Comparing Experimental Results
Q11	Determining the Limit of Proportionality
Q12	Determining the Limit of Proportionality
Q13	Determining the Limit of Proportionality
Q14	Calculating the Spring Constant
Q15	Identifying the Consequences of a Mistake on Experiment Data

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