EZY SCIENCE

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

AQA 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.

AQA specifies 28 required practicals (22 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 required 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.

REQUIRED PRACTICAL ACTIVITY 1
USING A LIGHT MICROSCOPE

SPECIFICATION STATEMENT	EzyBiology Code
4.1.1.2 Use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included.	CB1.2

CB1.2:
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.

CB1.2a:
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

REQUIRED PRACTICAL ACTIVITY 2
ANTISEPTICS/ANTIBIOTICS (BIOLOGY ONLY)

SPECIFICATION STATEMENT	EzyBiology Code
4.1.1.6 Investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.	CB2.1

CB2.1:
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.

CB2.1a:
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

REQUIRED PRACTICAL ACTIVITY 3
OSMOSIS

SPECIFICATION STATEMENT	EzyBiology Code
4.1.3.2 Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.	CB3.2

CB3.2.1:
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.

CB3.2.2:
Investigating Osmosis (Analysing the Results)
(Lecture Video)

This lecture video uses the results table produced by the end of the CB3.2.1 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.

CB3.2a:
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

REQUIRED PRACTICAL ACTIVITY 4
FOOD TESTS

SPECIFICATION STATEMENT	EzyBiology Code
4.2.2.1 Use qualitative reagents to test for a range of carbohydrates, lipids and proteins. To include: Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein.	OR1.4

OR1.4:
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.

OR1.4a:
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

REQUIRED PRACTICAL ACTIVITY 5
pH AND ENZYMES

SPECIFICATION STATEMENT	EzyBiology Code
4.2.2.1 Investigate the effect of pH on the rate of reaction of amylase enzyme. Students should use a continuous sampling technique to determine the time taken to completely digest a starch solution at a range of pH values. Iodine reagent is to be used to test for starch every 30 seconds. Temperature must be controlled by use of a water bath or electric heater.	OR1.3

OR1.3.1:
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.

OR1.3.2:
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.

OR1.3.3:
The Effect of pH on Enzymes
(Analysing the Results) **(Lecture Video)**

In the final video Mark uses the results obtained in the experiment in OR1.3.2 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.

OR1.3a:
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

REQUIRED PRACTICAL ACTIVITY 6
RATE OF PHOTOSYNTHESIS

SPECIFICATION STATEMENT	EzyBiology Code
4.4.1.2 Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.	**BE1.3**

BE1.3.1:
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 collect in a tally chart, and Mark finishes by calculating averages to complete the table of results.

BE1.3.2:
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 BE1.3.1. He then compares the results from the experiment to the hypothesis that was made in BE1.3.1.

BE1.3a:
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

REQUIRED PRACTICAL ACTIVITY 7
HUMAN REACTION TIME

SPECIFICATION STATEMENT	EzyBiology Code
4.5.2.1 Plan and carry out an investigation into the effect of a factor on human reaction time.	**HO2.2**

HO2.2:
Human Reaction Time
(Lecture Video)

In this video Mark first discusses what is meant by reaction time, and provides a hypothesis. He then introduces the ruler drop method as a way reaction time can be tested. Mark then narrates as this method is carried out by Katherine and Jacob, and explains how to interpret results. Results of multiple tests are then analysed, including the identification of anomalies and calculation of averages. The results are then compared to the hypothesis from the beginning of the video. Mark then discusses an alternative method to test reaction time using a computer, and finishes with a discussion about fair testing.

HO2.2a:
Human Reaction Time
(Assessment)

Q1	Video Q – Recording results
Q2	Recording results
Q3	Scaffolded – Identifying anomalies and calculating average of results
Q4	Identifying anomalies and calculating average of results
Q5	Fair testing
Q6	Calculating mean and scaffolded calculation of uncertainty
Q7	Calculating mean and scaffolded calculation of uncertainty
Q8	Calculating mean and uncertainty, and analysing results
Q9	Calculating mean and uncertainty
Q10	Calculating mean and uncertainty

REQUIRED PRACTICAL ACTIVITY 8
LIGHT AND PLANT GROWTH

SPECIFICATION STATEMENT	EzyBiology Code
4.5.4.1 Investigate the effect of light or gravity on the growth of newly germinated seedlings. Record results as both length measurements and as careful, labelled biological drawings to show the effects.	**HO4.2**

HO4.2:
Light Intensity and Plant Growth
(Lecture Video)

This video looks at the effect of light on the growth of newly germinated seedlings. Mark discusses why photosynthesis is important for plants before introducing a hypothesis for how light intensity affects plant growth. Mark then narrates as Katherine carries out the method, and results of the experiment are recorded. Mark details how to calculate mean, median and mode of results, before explaining how to construct a graph of results. The results are then compared to the hypothesis, before finishing with a discussion about fair testing, limitations and safety.

HO4.2a:
Light Intensity and Plant Growth
(Assessment)

Q1	Method Recall
Q2	Identifying Variables
Q3	Calculating Mean, Median and Range
Q4	Calculating Mean, Median and Range
Q5	Calculating Percentage Increases and Identifying a Conclusion
Q6	Considering Limitations of a Test
Q7	Calculating Mean, Median and Range
Q8	Understanding Variables and Interpreting Results
Q9	Calculating Mean, Median and Range, and Interpreting Results
Q10	Interpreting Graph of Results

REQUIRED PRACTICAL ACTIVITY 9
POPULATION SIZE

SPECIFICATION STATEMENT	EzyBiology Code
4.7.2.1 Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.	EC2.1

EC2.1.1:
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.

EC2.1.2:
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

REQUIRED PRACTICAL ACTIVITY 10
MILK DECAY – BIOLOGY ONLY

SPECIFICATION STATEMENT	EzyBiology Code
4.7.2.3 Investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.	EC3.3

EC3.3:
Temperature and the Rate of Decay of Milk
(Lecture Video)

Mark begins by explaining the theory behind the experiment – what happens when milk decays. Mark then discusses one method which can be used to study this effect, using water baths with thermostats and a data logger. Mark then moves on to discuss an alternative method that can be used to study the decay of milk – investigating the effect of changing temperature on the action of lipase in milk. This second method will be used for the remainder of the video. Mark explains the theory behind this method, before narrating as Katherine carries out the experiment. Results are collected, and Mark then explains how to construct a graph of the results. To finish, a conclusion of the results is discussed.

EC3.3a:
Temperature and the Rate of Decay of Milk
(Assessment)

Q1	Identifying Variables and Understanding the Method
Q2	Analysing Results from a Graph
Q3	Understanding of Method
Q4	Understanding of Method
Q5	Calculating Rate of Decay, and Interpreting Results
Q6	Calculating Mean, Median, Range and Uncertainty
Q7	Calculating Mean and Uncertainty
Q8	Understanding Precision and Accuracy
Q9	Interpreting Graph of Results
Q10	Interpreting Graph of Results

EZY CHEMISTRY

REQUIRED PRACTICAL ACTIVITY 1
PREPARING SOLUBLE SALTS

SPECIFICATION STATEMENT	EzyChemistry Code
4.4.2.3 Preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution.	CC2.3

CC2.3:
Salt Production
(Lecture Video)

In this video, Mark begins by describing how salts are made through neutralisation reactions and what the state symbol of each chemical indicates. He then talks about the equipment used during the practical, before narrating as Katherine performs each stage of the experiment to prepare a sample of copper chloride using insoluble copper carbonate. The stages are: 1) the reaction of the acid with an excess of base; 2) removing the excess base through filtration; 3) isolation of the copper chloride from a saturated solution. The practical is then repeated by Katherine using copper oxide as the insoluble base. Mark finishes by recapping the purpose of each stage of this practical and the safety precautions undertaken during the experiment.

CC2.3a:
Salt Production
(Assessment)

Q1	Labelling Equipment
Q2	Experimental Process
Q3	Experimental Process
Q4	Reasoning Behind Process
Q5	Experimental Process
Q6	Use of Equipment
Q7	Reasoning Behind Process
Q8	State Symbols
Q9	State Symbols
Q10	Definitions

CC2.3b:
Salt Production
(Assessment)

Q1	Experimental Process
Q2	Experimental Process
Q3	Identifying Reactants
Q4	Using a Soluble Base
Q5	Limitations of Practical

REQUIRED PRACTICAL ACTIVITY 2
TITRATIONS – CHEMISTRY ONLY

SPECIFICATION STATEMENT	EzyChemistry Code
4.4.2.5 Determination of the reacting volumes of solutions of a strong acid and a strong alkali by titration. (HT only) determination of the concentration of one of the solutions in mol/dm^3 and g/dm^3 from the reacting volumes and the known concentration of the other solution.	CC2.5

CC2.5:
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 CC2.6.

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

REQUIRED PRACTICAL ACTIVITY 3
ELECTROLYSIS OF AQUEOUS SOLUTIONS

SPECIFICATION STATEMENT	EzyChemistry Code
4.4.3.4 Investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis.	CC3.3

CC3.3:
Electrolysis of Aqueous Solutions
(Lecture Video)

In this video, Mark starts by describing the ions present in aqueous solutions and the rules governing what ions are discharged at each electrode. He then identifies the equipment used during the electrolysis of an aqueous solution. Mark develops a hypothesis about the products of the electrolysis of aqueous sodium chloride, before narrating as Liam performs the electrolysis. Liam collects the gases collected at each electrode and performs tests to confirm the presence of hydrogen at the cathode and chlorine at the anode, validating Mark's original hypothesis. Hypotheses are also developed for the products of the electrolysis of aqueous copper chloride and copper sulfate. The hypotheses are once again proven through identification of the products formed at each electrode. Mark finishes by summarising the steps undertaken during electrolysis of aqueous solutions, how to identify the products and the safety precautions used.

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

Q1	Labelling Equipment
Q2	Experimental Process
Q3	Tests for Gases
Q4	Rules Governing Cathode Products
Q5	Rules Governing Anode Products
Q6	Identifying Gases
Q7	Identifying Gases
Q8	Identifying Products of Electrolysis
Q9	Hypothesis of Products
Q10	True/False Statements about Electrolysis of Copper Sulfate

EZY CHEMISTRY

CC3.3b:
Electrolysis of Aqueous Solutions
(Assessment)

Q1	Hypothesis of Products
Q2	Hypothesis of Products
Q3	Identifying a Salt from its Electrolysis Products
Q4	Identifying a Salt from its Electrolysis Products
Q5	Identifying the Electrode and the Metal Deposited
Q6	Using Observations to Determine a Salt's Identity
Q7	Hypothesis of Products and Gas Tests
Q8	Using Observations to Determine a Salt's Identity
Q9	Using Observations to Determine a Salt's Identity
Q10	Using Observations to Determine a Salt's Identity

REQUIRED PRACTICAL ACTIVITY 4
TEMPERATURE CHANGES IN REACTIONS

SPECIFICATION STATEMENT	EzyChemistry Code
4.5.1.1 Investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals.	**PC1.1**

PC1.1:
Exothermic and Endothermic Reactions
(Lecture Video)

In this video, Mark starts by defining the terms 'endothermic' and 'exothermic', before outlining the equipment that can be used to identify simple temperature change. He narrates as Matt sets up an experiment to measure the temperature change seen when hydrochloric acid reacts with an hydroxide – an exothermic reaction. Mark then explains why we see an increase in temperature. We then look at an endothermic example – the dissolution of potassium chloride in water. Mark finishes by describing the steps undertaken in both examples and how we can use temperature changes can determine whether a reaction is exothermic or endothermic.

PC1.1a:
Exothermic and Endothermic Reactions
(Assessment)

Q1	Video Q – Observing and Calculating Temperature Changes
Q2	Video Q – Observing and Calculating Temperature Changes
Q3	Video Q – Observing and Calculating Temperature Changes
Q4	Identifying Variables, Reading Graphs and Testing Hypothesis
Q5	Identifying Variables and Anomalous Results
Q6	Evaluating Variables and Predicting Results
Q7	Identifying Exothermic and Endothermic Reactions
Q8	Evaluating Variables and Predicting Results
Q9	Reading Thermometers and Evaluating Statements
Q10	Reading and Interpreting Graphs

REQUIRED PRACTICAL ACTIVITY 5
RATES OF REACTION

SPECIFICATION STATEMENT	EzyChemistry Code
4.6.1.2 Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity. This should be an investigation involving developing a hypothesis.	**PC2.3**

PC2.3.1:
Investigating Rates of Reaction (Collecting a Gas)
(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.

PC2.3.2:
Investigating Rates of Reaction
(Formation of a Precipitate) **(Lecture Video)**

In this video, Mark begins by discussing how we can measure the rate reaction and uses this to investigate of the effect of acid concentration on the rate at which sodium thiosulfate and hydrochloric acid react. He outlines the general approach that Matt will undertake during the practical and explains how the 'disappearing cross' can be used to monitor the rate. Mark creates a hypothesis and explains his reasoning behind it. He summarises the experiment and narrates as Matt performs the practical at each concentration. Mark plots the results and investigates the relationship between the two variables, using it to test his hypothesis. Mark finishes by discussing fair testing and safety conditions.

PC2.3a:
Investigating Rates of Reaction
(Assessment)

Q1	Video Q – Recording Values and Scaff. Calculation of Rate
Q2	Video Q – Recording Values and Calculating Rate
Q3	Reading Gas Syringes and Calculating Rates
Q4	Reading Graphs and Evaluating Statements
Q5	Video Q – Identifying Variables and Evaluating Uncertainty
Q6	Video Q - Recording Values and Calculating Rate
Q7	Video Q - Recording Values and Calculating Rates
Q8	Testing Hypothesis
Q9	Video Q – Identify Control Variables
Q10	Reading Graphs and Evaluating Statements

REQUIRED PRACTICAL ACTIVITY 6
CHROMATOGRAPHY

SPECIFICATION STATEMENT	EzyChemistry Code
4.8.1.3 Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.	**CA1.2**

CA1.2a:
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.

CA1.2a:
Chromatography
(Assessment)

Q1	Definitions and Interpreting Results
Q2	Scaffolded Calculation of Rf Values
Q3	Calculating Rf Values
Q4	Comparing Chromatograms and Rf Values
Q5	Evaluating Statements About a Chromatogram
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

REQUIRED PRACTICAL ACTIVITY 7
TESTING FOR IONS

SPECIFICATION STATEMENT	EzyChemistry Code
4.8.3 Use of chemical tests to identify the ions in unknown single ionic compounds covering the ions from sections Flame tests to Sulfates.	**CA2.2**

CA2.2:
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.

CA2.2a:
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

REQUIRED PRACTICAL ACTIVITY 8
PURIFYING WATER

SPECIFICATION STATEMENT	EzyChemistry Code
4.10.1.2 Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.	**UR1.3**

UR1.3:
Potable Water
(Lecture Video)

In this video, Mark starts by discussing what potable water is and why we want to purify water, before outlining the various steps Matt will undertake during the analysis and purification of water, followed by identifying the equipment Matt will use. Mark narrates as Matt measures the pH of rain water, sea water and spring water. Mark's narration continues as Matt investigates the effects of the distillation of sea water by determining the dissolved mass of salts and comparing the pH before and after the process. Mark finishes by discussing the effects of distillation on sea water.

UR1.3a:
Potable Water
(Assessment)

Q1	Using Universal Indicator to Determine pH
Q2	Using Universal Indicator to Determine pH and Reasoning
Q3	Identifying Equipment
Q4	Effects of Distillation
Q5	Reasoning Behind Experimental Process
Q6	Calculating Mass of Dissolved Salts and % Change
Q7	Calculating Mass of Dissolved Salts and Mean Mass
Q8	Calculating Uncertainty
Q9	Calculating Mass of Dissolved Salts, Mean Mass and Uncertainty
Q10	Evaluating Statements

REQUIRED PRACTICAL ACTIVITY 1
SPECIFIC HEAT CAPACITY

SPECIFICATION STATEMENT	EzyPhysics Code
4.1.1.3 Investigation to determine the specific heat capacity of one or more materials. The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored.	**EN1.7**

EN1.7: Finding the Specific Heat Capacity **(Lecture Video)**

In this video Mark begins by explaining the term 'specific heat capacity' before detailing the equation relating it to energy, mass, and change in temperature. Mark then lists the equipment required to conduct an experiment to calculate the specific heat capacity of aluminium, and narrates as Katherine sets up the experiment. As Katherine is conducting the experiment, Mark identifies and records the variables that are needed to calculate the specific heat capacity of aluminium. Once Katherine completes the experiment, Mark explains how the experimental data is used to calculate specific heat capacity. Mark finishes the video by comparing the specific heat capacity obtained from the experiment to the actual specific heat capacity of aluminium.

EN1.7a: Finding the Specific Heat Capacity **(Assessment)**

Q1	Identifying Mistakes in the Experiment
Q2	Identifying Mistakes in the Experiment
Q3	Scaffolded Calculation of Specific Heat Capacity
Q4	Calculation of Specific Heat Capacity
Q5	Calculation of Specific Heat Capacity
Q6	Comparing Experimental and Actual Specific Heat Capacities
Q7	Comparing Experimental and Actual Specific Heat Capacities
Q8	Calculation of Specific Heat Capacity from a Graph
Q9	Calculation of Specific Heat Capacity
Q10	Calculation of Specific Heat Capacity

REQUIRED PRACTICAL ACTIVITY 2
THERMAL INSULATORS – PHYSICS ONLY

SPECIFICATION STATEMENT	EzyPhysics Code
4.1.2.1 Investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material.	**EN2.2**

EN2.2: Thermal Insulators **(Lecture Video)**

In this video Mark first explains what is meant by the term 'thermal insulator' before detailing the equipment used in this experiment to investigate the thermal properties of three different materials; paper, sawdust, and straw. Mark then describes the method Liam will be using to conduct the experiment and how he will keep it a fair test. As Liam conducts the experiment, Mark narrates each step that Liam takes and records the variables from the experiment. Finally, Mark uses the data to plot a graph comparing the thermal properties of the three insulators and concludes his findings.

EN2.2a: Thermal Insulators **(Assessment)**

Q1	Identifying Correct Measurements
Q2	Identifying Control Variables
Q3	Analysing the Temperature Drop in a Beaker of Water
Q4	Comparing Temperature Drop and Time as Dependant Variables
Q5	Effects of Material Thickness on Insulating Ability
Q6	Identifying Independent, Dependent and Control Variables
Q7	Fair Testing
Q8	Rate of Temperature Drop Calculations
Q9	Rate of Temperature Rise Calculations
Q10	Comparing 'Student' Statements About Experimental Variables

REQUIRED PRACTICAL ACTIVITY 3
RESISTANCE

SPECIFICATION STATEMENT	EzyPhysics Code
4.2.1.3 Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: • the length of a wire at constant temperature • combinations of resistors in series and parallel.	**EL1.4**

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

Mark begins this video by stating 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 $V = IR$ 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 $V = IR$ 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.

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

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REQUIRED PRACTICAL ACTIVITY 4
THERMAL INSULATORS – V-I CHARACTERISTICS

SPECIFICATION STATEMENT	EzyPhysics Code
4.2.1.4 Use circuit diagrams to construct appropriate circuits to investigate the V-I characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature.	EL2.1

EL2.1.1:
V-I Characteristics (Resistor)
(Lecture Video)

In this lecture video Mark narrates as Matt constructs a circuit to investigate how the current flowing through a resistor varies with the potential difference across it. Next Mark records the measured current flowing through the resistor as Matt increases the potential difference across it. Mark also explains how this circuit can be used to investigate the effect of positive and negative potential difference on current through a resistor. Finally, Mark uses this data to plot a graph and draw on a line of best fit allowing him to make observations about the relationship between potential difference across a resistor and the current flowing through it.

EL2.1.2:
V-I Characteristics (Filament Lamp)
(Lecture Video)

Here Mark narrates as Matt constructs a circuit to investigate how the current flowing through a bulb/diode varies with the potential difference across it. Next Mark records the measured current flowing through the bulb as Matt increases the potential difference across it for both negative and positive potential differences. Finally, Mark uses this data to plot a graph and draw on a line of best fit allowing him to make observations about the relationship between potential difference across a bulb and the current flowing through it.

EL2.1.3:
V-I Characteristics (Diode)
(Lecture Video)

Here Mark narrates as Matt constructs a circuit to investigate how the current flowing through a bulb/diode varies with the potential difference across it. Next Mark records the measured current flowing through the diode as Matt increases the potential difference across it for both negative and positive potential differences. Finally, Mark uses this data to plot a graph and draw on a line of best fit allowing him to make observations about the relationship between potential difference across a diode and the current flowing through it.

EL2.1a:
V-I Characteristics
(Assessment)

Q1	Making Observations From an Experiment
Q2	Making Observations From an Experiment
Q3	Making Observations From an Experiment
Q4	Identify the Correct Graph for a Set of Results
Q5	Calculating Increase in Current From a V-I Graph
Q6	Calculating Resistance from a V-I Graph
Q7	Analysing a V-I Graph
Q8	Identifying Potential Differences from Circuit Diagrams
Q9	Identifying the Correct Circuit to Investigate V-I Characteristics of a Diode
Q10	Relating Characteristic to the Corresponding Circuit Component

REQUIRED PRACTICAL ACTIVITY 5
DENSITY

SPECIFICATION STATEMENT	EzyPhysics Code
4.3.1.1 Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. Volume should be determined from the dimensions of regularly shaped objects, and by a displacement technique for irregularly shaped objects. Dimensions to be measured using appropriate apparatus such as a ruler, micrometer or Vernier callipers.	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

REQUIRED PRACTICAL ACTIVITY 6
FORCE AND EXTENSION

SPECIFICATION STATEMENT	EzyPhysics Code
4.5.3 Investigate the relationship between force and extension for a spring.	FO3.3

FO3.3.1:
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.

FO3.3.2:
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 discussing the spring constant and introducing the equation relating force, extension, and the spring constant.

F03.3a:
$F = ke$ 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

F03.3b:
$F = ke$ 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

REQUIRED PRACTICAL ACTIVITY 7
FORCE AND ACCELERATION

SPECIFICATION STATEMENT	EzyPhysics Code
4.5.6.2.2 Investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force.	FO8.3

F08.3.1:
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.

F08.3.2:
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.

F08.3.3:
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 $F = m \times a$.

F08.3a:
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

F08.3b:
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

REQUIRED PRACTICAL ACTIVITY 8
MEASURING FREQUENCY, WAVELENGTH AND SPEED

SPECIFICATION STATEMENT	EzyPhysics Code
4.6.1.2 Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements.	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.

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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

REQUIRED PRACTICAL ACTIVITY 9
INVESTIGATING REFLECTION AND REFRACTION

SPECIFICATION STATEMENT	EzyPhysics Code
4.6.1.3 Investigate the reflection of light by different types of surface and the refraction of light by different substances.	**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

REQUIRED PRACTICAL ACTIVITY 10
EMISSION AND ABSORPTION OF IR

SPECIFICATION STATEMENT	EzyPhysics Code
4.6.2.2 Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.	**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