GCSE

S25-3400U30-1E

To be opened on receipt for immediate use by TEACHERS / EXAMS OFFICERS

MONDAY, 6 JANUARY – FRIDAY, 21 FEBRUARY 2025

SCIENCE – PRACTICAL ASSESSMENT

BIOLOGY – Unit 3 (3400U30)

CHEMISTRY – Unit 3 (3410U30)

PHYSICS – Unit 3 (3420U30)

SCIENCE (Double Award) – Unit 7 (3430U70)

APPLIED SCIENCE (Double Award) – Unit 5 (3445U50)

APPLIED SCIENCE (Single Award) – Unit 4 (3440U40)

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Instructions to Teachers / Exams Officers

CONFIDENTIAL

This document should be stored securely by the exams officer when not in use by the teacher / technician.
This document must not be stored within the science department when not in use by the teacher / technician.
Its contents should not be divulged except to those concerned with the preparation of the assessment.

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A. Instructions to Exams Officers / Teachers

Receipt of "Instructions to teachers / exams officers", "Setting up instructions" documents and assessments.

1. The "Instructions to teachers / exams officers" and the "Setting up instructions" (which will follow later in the Autumn term) documents must be stored **securely by the exams officer**. Appropriate checking-out and checking-in processes for these documents must be in place when they are in use by science teachers / technicians, a **log** needs to be kept for this. **They must not be stored within the science department when not in use by the teacher / technician.**

2. Sufficient copies of the question papers for all tasks will be sent to the exams officer in each centre in advance of the assessments taking place. The number sent will be **based on the preliminary entries** submitted by the centre, so please ensure these are submitted on time.

3. **The question papers must be kept in secure storage until the date/s on which you intend conducting the assessments.**

4. On receipt of the examination papers, please check the despatch note to ensure that you have the correct number of question papers for each of the qualifications that your candidates are taking. There are specific tasks for each qualification and it is important that candidates are given the correct ones. There is a table on the next page which outlines the tasks which are applicable to each qualification. The barcode on the top right side on the front cover of each question paper indicates the paper code and this should be checked against the table. Please contact WJEC as soon as possible if additional copies are required.

5. Any access arrangements a candidate is entitled to for the written examination papers apply to the practical unit also. **Please ensure that WJEC are made aware of any modified papers that are required by candidates as soon as possible.**

Conducting assessments

6. The assessment window runs from **MONDAY, 6 JANUARY – FRIDAY, 21 FEBRUARY 2025**. However, in order to maintain the confidentiality of the assessment, the question papers for each group can only be given to the teacher conducting the assessments on the date/s on which each group will complete each particular assessment.

7. Each task will be completed in two sessions each of 60 minutes duration, a Section A and a Section B. Section A and Section B will be two separate question papers.

Section A will be completed in session 1 and will involve the obtaining of results. This will be collected from the candidates at the end of session 1 and returned to the exams officer for secure storage.
Section B will be completed in session 2 and will involve the analysis and evaluation of the results. Candidates should be given access to their Section A question paper at the start of session 2. Section B should not be given to candidates until the second session. Both sections should be collected in at the end of session 2 and returned to the exams officer.

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8. Each candidate will have to submit the number of tasks indicated in the table below.

Qualification	Unit Number	Task	Number under barcode	
			Section A paper	Section B paper
GCSE Biology (**One** task should be completed)	Unit 3 (3400U30)	Investigating the effect of substrate concentration on the rate of enzyme action	S25-3400U30-1A	S25-3400U30-1B
		Investigating the effect of glucose concentration when testing for diabetes	S25-3400U30-1C	S25-3400U30-1D
GCSE Chemistry (**One** task should be completed)	Unit 3 (3410U30)	Investigating the rate of the reaction between calcium carbonate and hydrochloric acid	S25-3410U30-1A	S25-3410U30-1B
		Investigating the electrolysis of copper(II) sulfate	S25-3410U30-1C	S25-3410U30-1D
GCSE Physics (**One** task should be completed)	Unit 3 (3420U30)	Investigating the resistance of a light dependent resistor	S25-3420U30-1A	S25-3420U30-1B
		Investigating the effect of drop height on the size of an impact crater	S25-3420U30-1C	S25-3420U30-1D
GCSE Science (Double Award) (**Two** tasks should be completed)	Unit 7 (3430U70)	Investigating the effect of glucose concentration when testing for diabetes	S25-3430U70-1A	S25-3430U70-1B
		Investigating the electrolysis of copper(II) sulfate	S25-3430U70-1C	S25-3430U70-1D
		Investigating the effect of drop height on the size of an impact crater	S25-3430U70-1E	S25-3430U70-1F
GCSE Applied Science (Double Award) (**Two** tasks should be completed)	Unit 5 (3445U50)	Investigating the effect of glucose concentration when testing for diabetes	S25-3445U50-1A	S25-3445U50-1B
		Investigating the effect of temperature on the current in a thermistor	S25-3445U50-1C	S25-3445U50-1D
		Investigating the rate of dissolving of potassium nitrate	S25-3445U50-1E	S25-3445U50-1F
GCSE Applied Science (Single Award) (**One** task should be completed)	Unit 4 (3440U40)	Investigating the effect of temperature on the current in a thermistor	S25-3440U40-1A	S25-3440U40-1B
		Investigating the strength of bones	S25-3440U40-1C	S25-3440U40-1D

9. Centres will need to record candidate attendance data for each session. The centre's MIS / SIMS should be used to produce a centre generated attendance register. This register must list:

- the centre number
- paper details, including date of assessment
- candidate numbers and candidate names
- whether candidates were present or absent from the assessment.

An example of the register is shown below:

Element Entry Listing

Season: June 2025 **Qualification :** **GCSE**
Board: WJEC/GCSE **Level:** **GCSE/B**
Code: 3420U3 **Title:** Physics Practical Assessment

Surname:	Forename(s):	Year	Reg Group	Exam Number	UCI	Entry Mode
Surname:	Forename(s):	11	11ST	4013	UCI	C
Surname:	Forename(s):	11	11CO	4022	UCI	C
Surname:	Forename(s):	11	11PS	4028	UCI	C
Surname:	Forename(s):	11	1180	4029	UCI	C
Surname:	Forename(s):	11	11ST	4044	UCI	C
Surname:	Forename(s):	11	11PS	4065	UCI	C
			11CO	4068	UCI	

10. Centre staff should remind candidates that they are not permitted to pass on any examination / assessment-related information to anyone else by means of talking, electronic, written or non-verbal communication. Such actions will lead to a candidate malpractice investigation. Further information is available on the JCQ Information for candidates – Guidelines when referring to examinations / assessments for Non-Examination Assessment.

11. **Section A:** It is permissible for candidates to work in small groups, of no more than three candidates. Teachers should ensure that each group has adequate working space and that the groups are set a reasonable distance apart. Each group requires uninterrupted access to the allocated apparatus – one set of apparatus per group. Section A should be carried out under a limited level of control.

Section A should be supervised at all times by a member of staff responsible for teaching GCSE Science. Centres may use additional laboratories, provided that a subject teacher is available to supervise all groups at all times. Technical support should be available in case it is needed.

12. **Section B:** This must be carried out under a high level of control, i.e. candidates work individually, set a suitable distance apart and under supervision. This could be carried out in the laboratory or in an examination hall. It is permissible for Section B to be supervised by a member of staff responsible for GCSE Science, although centres may choose to use external invigilators. Candidates should have access to their Section A question paper, as they need the results obtained in the first session to answer the questions in Section B.

13. Candidates must write their answers in the spaces provided on the question paper. Should there be a need for additional space, then a standard answer booklet should be provided.

14. All candidates must attempt to obtain results practically in Section A. In the exceptional circumstance that a candidate fails to obtain results using the practical equipment, it is acceptable for them to be given **unformatted** teacher results. WJEC will not provide these results, they should be generated by the centre when they trial the task. **Please include the unformatted results and details of the candidates who have been given unformatted data on the '*Information required from centres*'** form which is inside the "Setting up instructions" document.

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15. As soon as both the assessments have taken place, the candidates should insert their completed Section B question paper inside the completed Section A question paper. The question papers should all be collected before candidates are allowed to leave the room. The collected question papers must be immediately returned to the exams officer for secure storage. **Teachers should not be given access to the completed question papers after the actual assessments have taken place.**

16. Monitoring visits will take place on a random sample of centres to ensure the practical assessment unit is being administered correctly. We will contact each centre selected for such a visit to clarify arrangements.

Return of scripts

17. Candidates' completed scripts must be returned at the end of the assessment period, in **candidate number order** with the centre MIS / SIMS generated register.

18. Prior to despatch centres must check that:
- there is an assessment for every candidate marked as present on the attendance registers
- the names on the assessments match the details on the attendance registers
- candidates have used their correct centre and candidate details
- the "Information Required from Centres" sheets for all the completed tasks are included with the assessments. These sheets will be included in the "Setting up instructions" document.

19. The tasks for each **science qualification** must be **packaged separately**.

20. The tasks will be marked by a WJEC examiner. All completed assessments should be despatched with the centre-generated attendance registers, to **WJEC CBAC, Unit A16 / A17, Gwaelod Y Garth Road, Treforest Industrial Estate, Pontypridd, Rhondda Cynon Taf, CF37 5XF**.
All completed assessments should be returned to the above address by **FRIDAY, 7 MARCH**.

21. Stationery will be sent to centres for the return of scripts. This will include labels. Please ensure these are completed correctly as shown in the sample below.

Centre/Canolfan: 68999
Subject/Pwnc: Physics 3420U30
WJEC/CBAC
Unit 16A - 17
Treforest Industrial Estate
Pontypridd
CF37 5XF

Centre/Canolfan: 68999
Subject/Pwnc: Double 3430U70
WJEC/CBAC
Unit 16A - 17
Treforest Industrial Estate
Pontypridd
CF37 5XF

B. Specific Instructions

Details of the apparatus and materials required for the tasks follow.

If any difficulty is experienced in providing the apparatus, WJEC should be informed as soon as possible.

Telephone: 029 2240 4252

Email: science@wjec.co.uk

GCSE

BIOLOGY – Unit 3

INVESTIGATING THE EFFECT OF SUBSTRATE CONCENTRATION ON THE RATE OF ENZYME ACTION

The task is to carry out an investigation on the effect of substrate concentration on the rate of enzyme action; this is from:

Section 1.1 of the GCSE Biology specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection
1 × 10 cm^3 measuring cylinder
5 × 10 cm^3 syringe
1 × forceps
5 × test tube
15 × filter paper disc
1 × stopwatch (± 0.01 s)
2 × germinated mung beans
1 × pestle and mortar
20 cm^3 of hydrogen peroxide solution at concentrations of 2, 4, 6, 8 and 10 vol
1 × 100 cm^3 beaker of deionised water
paper towels

CLEAPSS student safety sheets: 2 – Enzymes and 57 – Hydrogen peroxide. These are provided in both this document and Section **A** of the candidate's examination paper if required.

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

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Teacher / Technician Notes

- ‘Germinated mung beans’ are commonly known as beansprouts and can be purchased from the vegetable aisle of any supermarket.
- Candidates should be provided with labelled beakers of 2, 4, 6, 8 and 10 vol hydrogen peroxide. Candidates must be aware of the maximum concentration of hydrogen peroxide used in vol.
- Any type of forceps can be used but candidates may find sharp forceps easier to use with this method.
- A hole punch can be used to produce the filter paper discs.
- Specimen bottles can be used as an alternative to test tubes.

CLEAPSS

Student safety sheets 2

Enzymes

including **amylase, catalase, cellulase, diastase, lipase, proteases (e.g. pepsin, trypsin), urease**

Substance	Hazard	Comment
Enzymes Powders 'Biological' detergents contain enzymes	 CORROSIVE HEALTH HAZARD IRRITANT	DANGER: Most enzymes are sensitisers (see below) and may cause allergy or asthma symptoms, or breathing difficulties if inhaled. DANGER: Some enzymes can cause serious eye damage. WARNING: Many enzymes irritate the eyes, skin and respiratory system.
Enzymes Concentrated solutions	 CORROSIVE HEALTH HAZARD IRRITANT	DANGER: Most enzymes are sensitisers (see below) and may cause allergy or asthma symptoms, or breathing difficulties if inhaled. DANGER: Some enzymes can cause serious eye damage. WARNING: Many enzymes irritate the eyes, skin and respiratory system.
Enzymes Dilute solutions (less than 1% w/w) or 5% Lipase	**Currently not classified as hazardous**	Most at these concentrations are unlikely to offer any significant risk. Biological systems are rich sources of enzymes, e.g. liver (catalase), saliva (amylase).

Note: Some people are **allergic** to particular substances; their bodies' immune system reacts to these substances to an unusual extent. **Asthma** is one type of allergy which results in breathing difficulties. A **sensitiser** is a substance that may produce only a small or even no allergic reaction when humans are first exposed to it (sometimes over an extended period of time) but can produce a much more severe reaction on subsequent occasions, even when the body is exposed to much smaller amounts.

Typical control measures to reduce risk

- Use the lowest concentration/smallest amount possible.
- Wear eye protection for enzyme at 1% or higher concentration.
- Avoid powdered enzymes escaping into the air; use a fume cupboard (not switched on) when transferring/dispensing enzyme powders.
- Do not spray enzyme solutions.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
  e.g. could enzyme dust be breathed in?
- How serious would it be if something did go wrong?
- How can the risk(s) be controlled for this activity?
  e.g. can it be done safely? Does the procedure need to be altered?

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- **In the eye** — Irrigate the eye with gently running tap water for at least 20 minutes. Call 999/111.
- **Swallowed** — Do no more than rinse and spit with drinking water. Do **not** induce vomiting. Call 999/111.
- **Dust breathed in** — Remove the casualty to fresh air. Call 999/111 if breathing is difficult.
- **Spilt on the skin or clothing** — Remove contaminated clothing. Wash off the skin with soap and plenty of water. Rinse contaminated clothing.
- **Spilt on the floor, bench, etc.** — Scoop up powders, taking care not to raise dust. Wipe up solution spills or any traces of powders with a damp cloth.

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Hydrogen peroxide

Substance	Hazard	Comment
Concentrated hydrogen peroxide solution (if less than 8.3 mol / dm^3 but 2.3 mol / dm^3 or more) or (if 100 vol or less but over 28 vol) or (if 30% w/v or less but over 8%)	**CORROSIVE**	DANGER: causes serious eye damage and may be harmful if swallowed. This is the most-concentrated solution found in schools. Take care to avoid skin contact. It decomposes slowly to produce oxygen gas; pressure may build up and care needs to be taken when opening a bottle. It should be stored in the dark. Decomposition is speeded up by catalysts such as some metal oxides and some enzymes. The oxygen formed will assist fires.
Dilute hydrogen peroxide solution (if less than 2.3 mol / dm^3 but 1.5 mol / dm^3 or more) or (if less than 28 vol but 18 vol or more) or (if less than 8% w/v but 5% or more)	**IRRITANT**	WARNING: irritating to the eyes (and to the skin, although not officially classified as such). The typical concentration used in school science practical work. It decomposes slowly to produce oxygen gas; pressure may build up and care needs to be taken when opening a bottle. It should be stored in the dark. Decomposition is speeded up by catalysts such as some metal oxides and some enzymes.
Very dilute hydrogen peroxide solution (if less than 1.5 mol / dm^3) or (if less than 18 vol) or (if less than 5% w/v)	**Currently not classified as hazardous**	It is used for bleaching hair. It decomposes slowly to produce oxygen gas; pressure may build up and care needs to be taken when opening a bottle. It should be stored in the dark. Decomposition is speeded up by catalysts such as some metal oxides and some enzymes. Old stock may have insufficient peroxide molecules for the intended activity.

Additional information: Concentration of hydrogen peroxide solutions may be expressed in several different ways:

- Molarity: as with any chemical, the concentration may be given as x mol / dm^{-3}, or x M, i.e. x mol in 1 dm^3 of solution
- Percentage, w/v: a y % w/v solution will contain y g hydrogen peroxide in 100 cm^3 of solution
- Vol: 1 cm^3 of z volume strength will give z cm^3 of oxygen when it decomposes.

Typical control measures to reduce risk

- Use the lowest concentration and smallest volume possible.
- Wear eye protection for all but the most-dilute solutions.
- Store concentrated solutions away from heat and light, in bottles with special vented caps. Beware of a rapid release of pressure when opening a bottle.
- Avoid accidental contamination of solutions which may speed up the formation of oxygen and pressure build-up.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
  e.g. Could an impurity / catalyst cause rapid decomposition and frothing?
- How serious would it be if something did go wrong?
  e.g. If the solution splashes onto the skin, is it sufficiently concentrated to cause burns?
- How can the risk(s) be controlled for this activity?
  e.g. Can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

- **In the eye** — Irrigate the eye with gently-running tap water for at least 20 minutes. Call 999/111.
- **In the mouth/swallowed** — Do no more than rinse and spit with drinking water. Do **not** induce vomiting. Call 999/111.
- **Spilt on the skin or clothing** — Remove and soak contaminated clothing. Irrigate the skin-affected area with gently-running tap water for at least 20 minutes. Call 999/111 as appropriate.
- **Spilt on the floor, bench, etc.** — For large spills, and especially for (moderately) concentrated solutions, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Dilute with at least ten times its own volume of water. Rinse the floor etc. with plenty of water. Wipe up small amounts with a damp cloth and rinse it well.

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GCSE

CHEMISTRY – Unit 3

INVESTIGATING THE RATE OF THE REACTION BETWEEN CALCIUM CARBONATE AND HYDROCHLORIC ACID

The task is to carry out an investigation on the rates of reaction between calcium carbonate and hydrochloric acid; this is from:

Section 1.5 of the GCSE Chemistry specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection
1 × 100 cm^3 conical flask
1 × 25 cm^3 measuring cylinder
1 × 100 cm^3 gas syringe
1 × single holed rubber bung connected to delivery tube
1 × thermometer (-10 °C – 110 °C)(± 1 °C)
5 × 2 g pre-weighed sample of calcium carbonate chippings (2–4 mm in diameter)
1 × 250 cm^3 beaker containing approximately 150 cm^3 of dilute hydrochloric acid (1 mol / dm^3)
1 × stopwatch (± 0.01 s)

Access to:
waste bowl
water bath – set at 60 °C

CLEAPSS student safety sheet: 20 – Hydrochloric acid. This is provided in both this document and Section **A** of the candidate's examination paper if required.

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

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Teacher / Technician Notes

- 2 g pre-weighed masses of calcium carbonate chippings should be accurately weighed to ± 0.2 g.
- The recommended size of the calcium carbonate chippings is 2–4 mm. Other sized chippings can be used, although this will affect the reaction times.
- Powdered calcium carbonate must not be used since the reaction times will be too short and will therefore not produce a suitable set of results.
- It is possible to obtain suitable results using either glass or plastic gas syringes. Plastic gas syringes are available cheaply from suppliers such as Amazon.
- You may wish to use a clamp and stand to hold the gas syringe.
- If using a glass gas syringe you may wish to attach the plunger to the barrel with string to prevent it falling out.
- A cold water bath may be used to speed up the cooling process to reach the approximate temperatures.
- Candidates can be told the temperatures can be approximately 60 °C, 50 °C, 40 °C, 30 °C and 20 °C.
- Beakers of dilute hydrochloric acid should be placed into the 60 °C water bath beforehand in order to reach the desired temperature by the start of the assessment.
- If electronic water baths are not available, centres may use beakers of hot water as an alternative.

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Student safety sheets 20

Hydrochloric acid

also applied to **hydrogen chloride gas**

Substance	Hazard	Comment
Hydrogen chloride Gas	CORROSIVE TOXIC	DANGER. It causes severe skin burns and eye damage. It is toxic if breathed in. For a 15-minute exposure, the concentration in the atmosphere should not exceed 8 mg / m^3. Effects of exposure by inhalation may or may not be immediately apparent and can develop and/or increase over time. Inhalation by those with known breathing difficulties (e.g. asthma) may exacerbate such pre-existing conditions.
Concentrated hydrochloric acid (If 6.8 mol / dm^3 or more)	CORROSIVE IRRITANT	DANGER. It causes burns. The vapour irritates the lungs.
Moderately-concentrated hydrochloric acid (If less than 6.8 mol / dm^3 but 2.7 mol / dm^3 or more)	IRRITANT	WARNING. It may irritate the eyes and respiratory system.
Dilute hydrochloric acid (If less than 2.7 mol / dm^3)	**Currently not classified as hazardous**	This includes stomach acid. Dilute acid may still cause harm to the eyes or the skin. Treat as for more concentrated samples.

Typical control measures to reduce risk

- Use the lowest concentration possible.
- Use the smallest volume possible.
- Wear eye protection; goggles for concentrated acids.
- Avoid breathing the gas or fumes from concentrated solutions, e.g. by use of a fume cupboard.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
  e.g. hazardous products (such as chlorine) produced as a result of a reaction with the acid or choking fumes if the concentrated acid is over-heated.
- How serious would it be if something did go wrong?
  NB There are occasional reports of students being taken to hospital as a result of breathing in chlorine.
- How can the risk(s) be controlled for this activity?
  e.g. can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- **In the eye** — Irrigate the eye with gently running tap water for at least 20 minutes. Call 999/111.
- **Vapour breathed in** — Remove to fresh air. Call 999/111 if breathing is difficult.
- **In the mouth/ swallowed** — Do no more than wash out the mouth with drinking water. Do **not** induce vomiting. Call 999/111.
- **Spilt on the skin or clothing** — Remove contaminated clothing. Quickly use a dry cloth or paper towel to wipe as much liquid off the skin as possible. Irrigate the affected area with gently-running tap water for at least 20 minutes. If a large area is affected or symptoms occur, call 999/111.
- **Spilt on the floor, bench, etc.** — For release of gas, including larger spills, consider the need to evacuate the laboratory and open all windows. For large spills, and especially for (moderately) concentrated acid, cover with mineral absorbent (e.g. cat litter), then scoop into a bucket. Neutralise with sodium carbonate. Rinse with plenty of water. Wipe up small amounts with a damp cloth and rinse well.

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GCSE

PHYSICS – Unit 3

INVESTIGATING THE RESISTANCE OF A LIGHT DEPENDENT RESISTOR

The task is to carry out an investigation on the resistance of a light dependent resistor; this is from:

Section 1.1 of the GCSE Physics specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

1 × power supply (set to 12 V for LDR)
1 × variable power supply (0 – 12 V for lamp)
1 × LDR
1 × clamp and stand
1 × ammeter (range 0 – 200 mA) (± 0.1 mA)
1 × 12 V, 24 W filament lamp

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

Teacher / Technician Notes

- The circuits should be set up as in the diagram for the candidates, with the LDR approximately 2.0 cm from the lamp.
- If multimeters are used, they should be set up prior to use with 2 × connecting wires connected in the correct position.
- Use the clamp to secure the position of the LDR.
- An ORP12 LDR or equivalent is suitable for use in this experiment.
- The variable power supply will need to be able to increase in 1 V or 2 V intervals up to 12 V.

GCSE

BIOLOGY – Unit 3
SCIENCE (Double Award) – Unit 7
APPLIED SCIENCE (Double Award) – Unit 5

INVESTIGATING THE EFFECT OF GLUCOSE CONCENTRATION WHEN TESTING FOR DIABETES

The task is to carry out an investigation on glucose concentration and diabetes; this is from:

Section 2.5 of the GCSE Biology specification.
Section 4.5 of the GCSE Science (Double Award) specification.
Section 2.3.1 of the GCSE Applied Science (Double Award) specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection
1 × 250 cm^3 beaker
5 × test tube containing 2 cm^3 of glucose solution at concentrations of 10%, 20%, 30%, 40% and 50% in a test tube rack
1 × stopwatch (± 0.01 s)
1 × Bunsen burner
1 × tripod and gauze
1 × heatproof mat
1 × bottle of Benedict's solution
1 × 2 cm^3 pipette
splints

CLEAPSS student safety sheet: 4 – Food Testing (1). This is provided in both this document and Section **A** of the candidate's examination paper if required.

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

Teacher / Technician Notes

- Solutions of glucose should be made up by mass in volume. For example: to make up 50% solution, dissolve 50 g of glucose in 100 cm^3 of water.
- Candidates should be provided with labelled test tubes containing 2 cm^3 of glucose solution at concentrations of 10%, 20%, 30%, 40% and 50%.
- The end point may vary and may not reach brick red (depending on Benedict's solution). In this instance it is acceptable to tell candidates that the end point is orange. Trialling is essential in each centre to ascertain the end point.
- Any candidates with colour blindness can be placed in a group with non-colourblind candidates.
- In trialling it was found that better results were obtained when the gauze was unfolded from the underside of the tripod.

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Student safety sheets

4 Food testing (1)

Substance	Hazard	Comment
Food	BIOHAZARD	Uncooked samples of food may be contaminated with microbes. Some people are allergic to some foods, especially peanuts.
Fehling's solution Used to test for reducing sugars	CORROSIVE	Solution A contains slightly-acidic copper sulfate solution. Solution B contains 3 mol / dm^3 sodium hydroxide solution. Solution A DANGER: Causes serious eye damage and skin irritation. Solution B DANGER: Causes severe eye damage and skin burns. As the mixture has to be heated in a test tube, there is a risk of alkali spitting out.
Benedict's solution Used to test for reducing sugars	IRRITANT	Contains slightly-alkaline 0.07 mol / dm^3 copper sulfate solution. WARNING: Irritant to skin and eyes. Some risk of spitting when heating test tubes.
Ethanol Used to test for fats (lipids)	HIGHLY FLAMMABLE HARMFUL HEALTH HAZARD	Most schools use IDA (industrial denatured alcohol) rather than pure ethanol. DANGER: highly flammable, harmful by ingestion, may cause damage to organs, causes serious eye irritation. If Bunsen burners are being used nearby for other food tests, there is a serious fire risk.
Iodine solution Used to test for starch	**Currently not classified as hazardous**	The solution is so dilute (about 0.01 mol / dm^3) that it presents only a LOW HAZARD.
Biuret test Used to test for proteins	CORROSIVE	DANGER/WARNING: The very dilute copper sulfate solution is currently not classified as hazardous. Sodium hydroxide solution may be CORROSIVE, IRRITANT or currently not classified as hazardous depending on concentration.

Typical control measures to reduce risk

- Do not taste foods in laboratories; avoid using products containing peanuts etc if there is a known allergy.
- Wear eye protection and use the smallest possible amounts of chemicals.
- Use Benedict's solution rather than Fehling's solution and heat with a water bath.
- Do not use ethanol if there are naked flames nearby.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
  e.g. Could chemicals spit out of a heated test tube, or might somebody using a Bunsen be unaware of ethanol being used nearby?
- How can the risk(s) be controlled for this activity?
  e.g. Can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

- **In the eye** — Irrigate the eye with gently running tap water for at least 20 minutes. Call 999/111.
- **In mouth/ swallowed** — Do no more than rinse and spit with drinking water. Do **not** induce vomiting. Call 999/111.
- **Spilt on skin or clothing** — Remove contaminated clothing. Irrigate the affected area with gently running tap water for 20 minutes. If a large area is affected or symptoms occur, call 999/111.
- **Clothing catches fire** — Push casualty to the floor, roll the body or smother flames on clothing or skin with fire blanket or other material. Cool burnt skin with gently running tap water for 20 minutes. Unless trivial, call 999/111.
- **Other ethanol fires** — Allow fires in sinks, etc to burn out. Fires at the top of test tubes, beakers etc can be smothered with a damp cloth or heat-resistant mat if this can be done safely.
- **Spilt on floor, bench, etc** — For small amounts, use a damp cloth. Rinse well. For larger amounts, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise alkali with citric acid. Rinse with water.

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GCSE

CHEMISTRY – Unit 3
SCIENCE (Double Award) – Unit 7

INVESTIGATING THE ELECTROLYSIS OF COPPER(II) SULFATE

The task is to carry out an investigation on the electrolysis of copper(II) sulfate; this is from:

Sections 2.1, 2.3 of the GCSE Chemistry specification.
Sections 5.1, 5.3 of the GCSE Science (Double Award) specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection
1 × 250 cm^3 beaker
1 × d.c. power supply set at 6 V
1 × ammeter (± 0.01 A)
1 × 250 cm^3 measuring cylinder
3 × connecting wire
2 × crocodile clip
2 × copper foil electrode (1 cm width)
200 cm^3 of dilute copper(II) sulfate solution (0.5 mol / dm^3)

Access to:
waste bowl

CLEAPSS student safety sheet: 40 – Copper and its compounds. This is provided in both this document and Section **A** of the candidate's examination paper if required.

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

Teacher / Technician Notes

- Copper foil electrodes should be 1 cm wide and approximately 9 cm in length (dependent on the beaker used). The electrodes should be marked with centimetre lines up to 5 cm using a permanent marker.
- The beaker size is not important but must be large enough to contain enough copper(II) sulfate solution to immerse the electrodes up to a depth of 5 cm.
- Each group will need at least 200 cm^3 of copper(II) sulfate solution which should be enough to immerse the electrodes to a depth of 5 cm.
- Multimeters should be provided to candidates with cables placed in the correct, 0-10 A, sockets to avoid damaging the equipment.
- Copper foil available from Sci-Chem: CO 055 copper foil 0.13 mm, 250 g which is 1.3 m × 15 cm
- Copper(II) sulfate solution can be reused.

CLEAPSS

Student safety sheets 40

Copper and its compounds

including **Copper oxides, carbonate, sulfate, chloride, nitrate**

Substance	Hazard	Comment
Copper (metal)	**Currently not classified as hazardous**	Sharp edges can present a risk of cuts. Granulated copper may be classified by some suppliers as toxic to aquatic life with long lasting effects.
Copper(I) oxides (Cuprous oxides) **Copper(II) oxides** (Cupric oxides)		DANGER. Copper(I) oxide: *causes serious eye damage; skin irritant; harmful if swallowed/inhaled; toxic to aquatic life. WARNING. Copper(II) oxide: causes serious eye irritation; skin irritant; harmful if swallowed/ inhaled; toxic to aquatic life.
Copper(II) carbonate hydroxide (Basic copper carbonate, malachite)		WARNING. Copper(II) carbonate hydroxide: causes serious eye irritation; skin irritant; harmful if swallowed/inhaled, toxic to aquatic life. Also known as malachite.
Copper(II) sulfate **Copper(II) nitrate** Solids and concentrated solutions		DANGER. Solids and solutions (≥ 1.0 mol / dm^3 **sulfate**, ≥ 1.3 mol / dm^3 **nitrate**): cause serious eye damage; skin irritant; harmful if swallowed (especially saturated solutions for crystal-growing). *Solid only: very toxic to aquatic life. Water added to anhydrous solid copper(II) sulfate(VI) produces heat.
Copper(II) sulfate **Copper(II) nitrate** Dilute solutions		DANGER. **Sulfate** (< 1.0 mol / dm^3 and ≥ 0.2 mol / dm^3) and **nitrate** (<1.3 mol / dm^3 and 0.2 mol / dm^3): skin irritant; cause serious eye damage. WARNING. **Sulfate** (< 0.2 mol / dm^3 and 0.02 mol / dm^3) and **nitrate** (≥ 0.15 mol / dm^3 and 0.05 mol / dm^3): skin and eye irritant. Currently not classified as hazardous. **Sulfate** (< 0.02 mol / dm^3) and **nitrate** (0.05 mol / dm^3). Benedict's solution and Fehling's solution both contain dilute copper(II) sulfate but Fehling's solution has other hazards.
Copper(II) chloride Solid		WARNING. eye and skin irritant; harmful if swallowed; toxic to aquatic life.
Copper(II) chloride Solutions (if 0.8 mol / dm^3 or more)		WARNING. Eye and skin; harmful if swallowed (≥ 1.8 mol / dm^3).
Copper(II) chloride Solution (if less than 0.8 mol / dm^3)	**Currently not classified as hazardous**	

Typical control measures to reduce risk

- Wear eye protection.
- Use the lowest concentration possible.
- Avoid raising dust, e.g. by dampening powders.
- Take care if evaporating solutions to dryness.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
  e.g. Solutions spurting out of test tubes when heated or solutions decomposing to toxic products when heated to dryness.
- How serious would it be if something did go wrong?
  e.g. Are there hazardous reaction products (such as chlorine from the electrolysis of copper chloride)?
- How can the risk(s) be controlled for this activity?
  e.g. Can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- **In the eye** Irrigate the eye with gently-running tap water for at least 20 minutes. Call 999/111.
- **In the mouth/swallowed** Do no more than rinse and spit with drinking water. Do **not** induce vomiting. Call 999/111.
- **Dust breathed in** Remove the casualty to fresh air. Consult a medic if breathing is difficult.
- **Spilt on the skin or clothing** Remove contaminated clothing. Irrigate the affected area with gently-running tap water for at least 20 minutes. Call 999/111 as appropriate. Rinse clothing.
- **Spilt on the floor, bench, etc** Scoop up solid (take care not to raise dust). Wipe up small solution spills or any traces of solid with cloth; for larger spills use mineral absorbent (e.g. cat litter).

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GCSE

PHYSICS – Unit 3
SCIENCE (Double Award) – Unit 7

INVESTIGATING THE EFFECT OF DROP HEIGHT ON THE SIZE OF AN IMPACT CRATER

The task is to carry out an investigation on impact craters; this is from:

Section 2.3 of the GCSE Physics specification.
Section 6.3 of the GCSE Science (Double Award) specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

1 × small steel ball
1 × clamp and stand
1 × metre ruler (± 1 mm)
1 × tray containing dry sand
1 × 30 cm ruler (± 1 mm)

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

Teacher / Technician Notes

- Play sand worked well in trials and is readily available.
- Gratnell trays were suitable, filled with several cm depth of sand (minimum 3 cm).
- Small steel balls (diameter approximately 1.5 cm) gave more clearly defined craters, but marbles could also be used.

GCSE

APPLIED SCIENCE (Double Award) – Unit 5

INVESTIGATING THE RATE OF DISSOLVING OF POTASSIUM NITRATE

The task is to carry out an investigation on the rate of dissolving; this is from:

Section 3.4.1 of the GCSE Applied Science (Double Award) specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection
2 × 500 cm^3 beaker
1 × 100 cm^3 beaker
1 × thermometer (-10 °C – 110 °C) (± 1 °C)
1 × 50 cm^3 measuring cylinder
5 × 3 g pre-weighed sample of potassium nitrate(V)
1 × stopwatch (± 0.01 s)
1 × stirring rod
1 × A4 black card

Access to:
waste bowl
hot water

CLEAPSS student safety sheet: 34 – Sodium and potassium salts. This is provided in both this document and Section **A** of the candidate's examination paper if required.

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

Teacher / Technician Notes

- 3 g pre-weighed masses of potassium nitrate(V) should be accurately weighed to ± 0.2 g.
- Candidates can be told the temperatures can be approximately 60 °C, 50 °C, 40 °C, 30 °C and 20 °C.
- Candidates can use any suitable hot water sources e.g. kettle / tap / thermostatically controlled water bath.
- The solution will not lose cloudiness completely, particularly at low temperatures but candidates should be told to aim for an almost completely clear solution.

CLEAPSS

Student safety sheets 34

Sodium and potassium salts

Substance	Hazard	Comment
Sodium and **potassium chloride, bromide and iodide** Solid & solution	**Currently not classified as hazardous**	People have been killed through consuming very large amounts of salt. At 'normal' levels, can cause high blood pressure, hence heart disease. Adults should not eat more than 6 g/day, children less. Potassium chloride is approved food additive, E508, used as a 'low-salt' substitute.
Sodium sulfate(VI) Also **potassium sulfate(VI)** Solid & solution		Hydrated sodium sulfate(VI), $Na_2SO_4.10H_2O$ is known as Glauber's salt. Sodium sulfate(VI) is an approved food additive, E514, as is the potassium salt, E515.
Sodium hydrogensulfate(VI) (bisulfate) Solid and concentrated solution (If 0.25 mol / dm^3 or more)	**CORROSIVE**	DANGER: Causes serious eye damage. It is strongly acidic because of acidic hydrogen in $NaHSO_4$. It is used in some toilet cleaners.
Sodium hydrogensulfate(VI) (bisulfate) Dilute solutions (less than 0.25 mol / dm^3 but more than 0.1 mol / dm^3)	**IRRITANT**	WARNING: Causes serious eye irritation. It is strongly acidic because of acidic hydrogen in $NaHSO_4$.
Sodium hydrogensulfate(VI) (bisulfate) Very dilute solutions (< 0.1 mol / dm^3)	**Currently not classified as hazardous**	It is strongly acidic because of acidic hydrogen in $NaHSO_4$.
Sodium and **potassium ethanedioate (oxalate)** Solid	**HARMFUL**	WARNING: harmful if swallowed and in contact with skin.
Sodium and **potassium ethanedioate (oxalate)** Solution	**Currently not classified as hazardous**	Note that all sodium and potassium ethanedioate (oxalate) solutions are currently not classified as hazardous, **Except** potassium ethanedioate is WARNING: **HARMFUL** if swallowed (if 1.5 mol / dm^3 or more).
Sodium nitrate(V) Also **potassium nitrate(V)** Solid and solutions	**OXIDISING** **IRRITANT**	WARNING: Oxidiser Sodium nitrate(V) solid and solutions are harmful if swallowed (if more than 3 mol / dm^3) and irritating to eyes and skin (if more than 1 mol / dm^3).

Typical control measures to reduce risk

- Wear eye protection.
- Avoid raising dust.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
  e.g. Specks of solid transferred into the eye by rubbing with a contaminated finger.
- How serious would it be if something did go wrong?
  e.g. Are there hazardous reaction products (such as chlorine from the electrolysis of sodium chloride)?
- How can the risk(s) be controlled for this activity?
  e.g. Can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- **In the eye** — Irrigate the eye with gently-running tap water for at least 20 minutes. Call 999/111.
- **In the mouth/swallowed** — Do no more than rinse and spit with drinking water. Do **not** induce vomiting. Call 999/111.
- **Spilt on the skin or clothing** — Brush solid off contaminated clothing. Irrigate the affected area with gently-running tap water for at least 20 minutes as appropriate. Call 999/111 as appropriate. Rinse clothing.
- **Spilt on the floor, bench, etc** — Brush up solid spills, trying to avoid raising dust, then wipe with a damp cloth. Wipe up solutions spills and rinse well.

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GCSE

APPLIED SCIENCE (Double Award) – Unit 5
APPLIED SCIENCE (Single Award) – Unit 4

INVESTIGATING THE EFFECT OF TEMPERATURE ON THE CURRENT IN A THERMISTOR

The task is to carry out an investigation on the current in a thermistor; this is from:

Section 1.2.4 of the GCSE Applied Science (Double Award) specification.
Section 1.1.4 of the GCSE Applied Science (Single Award) specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

1 × 3 V battery
1 × thermistor held in a clamp and stand
3 × 4 mm lead
1 × ammeter (± 0.1 mA)
1 × 100 cm^3 beaker
1 × thermometer (-10 °C – 110 °C)(± 1 °C)
1 × empty 500 g margarine tub
1 × stirring rod

Access to:
water at approximately 60 °C
ice

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

Teacher / Technician Notes

- An ntc disc thermistor should be used and connected to a terminal block and two 4 mm stackable leads. This should be held in a clamp and stand. The ntc disc thermistor (approx R = 300 Ω at 25 °C and R = 24 Ω at 100 °C) is available from Rapid Education, Order code 61-0400.

- The complete electrical circuit must be set up prior to use for the candidates. If using a multimeter it should be on a mA setting.

- Use of batteries is the preferred method for the power supply. CLEAPSS is concerned about health and safety issues if a power pack is used.

- Thermometers must be accurate to the nearest °C only. If these are not available, the "**Information required from centres**" sheet in the "Setting up instructions" document needs to reflect this and be given to the exams officer to be sent to the examiner with the completed examination papers.

GCSE

APPLIED SCIENCE (Single Award) – Unit 4

INVESTIGATING THE STRENGTH OF BONES

The task is to carry out an investigation into the strength of bones; this is from:

Section 2.1.4 of the GCSE Applied Science (Single Award) specification.

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

2 × clamp and stand
12 × paper straw each of 35 cm length
10 × 100 g mass
1 × 100 g mass holder
1 × 30 cm ruler (± 1 mm)
1 × pencil
1 × scissors

The numerical values of the various components are intended as a guide only and teachers may use their discretion if these sizes are not readily available.

Teacher / Technician Notes

- In trials 6 mm diameter art straws worked well.
  Art straws can be purchased from Hope Education
  Jumbo Art straws – White
  Product code: HE215923 (6 mm diameter)
  HE215923 – Jumbo Artstraws – White | Hope Education (hope-education.co.uk)

  Any paper straws can be used as an alternative, as long as they are up to 35 cm and all of the same diameter.

- Make sure the clamp is the same height approximately midway up each stand.

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