



GCSE



S24-3400U30-1E

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

MONDAY, 8 JANUARY – FRIDAY, 9 FEBRUARY 2024

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)

Instructions to Teachers/Exams Officers

CONFIDENTIAL

3400U301E
01

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, 8 JANUARY – FRIDAY, 9 FEBRUARY 2024**. 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.

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 temperature on cell membranes	S24-3400U30-1A	S24-3400U30-1B
		Investigating the effect of sweating on the rate of cooling	S24-3400U30-1C	S24-3400U30-1D
GCSE Chemistry (One task should be completed)	Unit 3 (3410U30)	Investigating the effect of concentration on the reaction between an acid and an alkali	S24-3410U30-1A	S24-3410U30-1B
		Investigating exothermic reactions	S24-3410U30-1C	S24-3410U30-1D
GCSE Physics (One task should be completed)	Unit 3 (3420U30)	Investigating the strength of an electromagnet	S24-3420U30-1A	S24-3420U30-1B
		Investigating the motion of a falling object	S24-3420U30-1C	S24-3420U30-1D
GCSE Science (Double Award) (Two tasks should be completed)	Unit 7 (3430U70)	Investigating the effect of sweating on the rate of cooling	S24-3430U70-1A	S24-3430U70-1B
		Investigating exothermic reactions	S24-3430U70-1C	S24-3430U70-1D
		Investigating the motion of a falling object	S24-3430U70-1E	S24-3430U70-1F
GCSE Applied Science (Double Award) (Two tasks should be completed)	Unit 5 (3445U50)	Investigating heat radiation	S24-3445U50-1A	S24-3445U50-1B
		Investigating the vitamin C content of fruit juices	S24-3445U50-1C	S24-3445U50-1D
		Investigating exothermic reactions	S24-3445U50-1E	S24-3445U50-1F
GCSE Applied Science (Single Award) (One task should be completed)	Unit 4 (3440U40)	Investigating the vitamin C content of fruit juices	S24-3440U40-1A	S24-3440U40-1B
		Investigating the effect of concentration on the breakdown of hydrogen peroxide	S24-3440U40-1C	S24-3440U40-1D

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 2024		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
Surname:	Forename(s):	11	11CO	4068	UCI	C

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.

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, 1 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.

<p>Centre/Canolfan: 68999</p> <p>Subject/Pwnc: Physics 3420U30</p> <p>WJEC/CBAC Unit 16A - 17 Treforest Industrial Estate Pontypridd CF37 5XF</p>	<p>Centre/Canolfan: 68999</p> <p>Subject/Pwnc: Double 3430U70</p> <p>WJEC/CBAC Unit 16A - 17 Treforest Industrial Estate Pontypridd CF37 5XF</p>
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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 TEMPERATURE ON CELL MEMBRANES

The task is to carry out an investigation on the effect of temperature on cell membranes; 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
- cylinders of beetroot
- 1 × white tile
- 1 × scalpel
- 5 × test tube containing 5 cm³ of deionised water
- 1 × test tube rack
- 5 × 250 cm³ beaker
- 1 × stopwatch (± 0.01 s)
- 1 × thermometer (± 1 °C) (–10 °C to 100 °C)
- 1 × forceps
- 1 × 30 cm ruler (± 1 mm)
- 1 × piece of white card

Access to:

water baths at 20 °C, 30 °C, 40 °C, 50 °C and 60 °C.
paper towels

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

- Beetroot must be raw, not cooked.
- Use a size 4 cork borer and cut with care using a cutting board.
- Cut enough cores to allow each group to be able to cut their own five 1 cm lengths.
- Leave the cores overnight in a beaker of deionised water. The pigment from any cells that have been cut by the cork borer will leak into the water. Rinse away any pigmented water in the morning and replace with fresh water.
- Thermostatic water baths could be used as a source of water for 30 °C, 40 °C, 50 °C and 60 °C and a container of water at room temperature for 20 °C. Please note the temperatures do not have to be exact. If thermostatic water baths are not available then hot water (from a recently boiled kettle) and cold water should be mixed to achieve the approximate temperatures.
- You may wish to refer to CLEAPSS Technician Tip – cutting beetroot discs – a quick method for cutting even-sized beetroot discs.
- Please note that repeat readings are not required for this investigation.

**GCSE****CHEMISTRY – Unit 3**

INVESTIGATING THE EFFECT OF CONCENTRATION ON THE REACTION BETWEEN AN ACID AND AN ALKALI

The task is to carry out an investigation into the effect of concentration on the reaction between an acid and an alkali; this is from:

Section 2.2 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 × 50 cm³ burette

1 × 25 cm³ measuring cylinder

1 × conical flask

1 × filter funnel

1 × white paper (or white tile)

1 × clamp and stand (or burette stand)

1 × 100 cm³ beaker (for waste)

250 cm³ of dilute hydrochloric acid

30 cm³ of 0.04, 0.06, 0.08 and 0.10 mol/dm³ sodium hydroxide solution

phenolphthalein indicator

Access to:

waste bowl

CLEAPSS student safety sheet: 31 – Sodium hydroxide. 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






- A 100 cm³ or 250 cm³ conical flask can be used.
- The 250 cm³ of dilute hydrochloric acid should be made up as 0.07 mol/dm³ but the candidates should not be made aware of the concentration.

Student safety sheets

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Sodium hydroxide

also applies to Soda lime and Potassium hydroxide

Substance	Hazard	Comment
Sodium or potassium hydroxide solid Also known as caustic soda and caustic potash . Soda lime contains about 5 % sodium hydroxide, 1 % potassium hydroxide, 0.2 % silicon dioxide, 14–19 % water and the remainder calcium hydroxide (it is used to absorb carbon dioxide). Carbosorb in addition contains an indicator.	 CORROSIVE  HARMFUL	DANGER: causes severe skin burns and eye damage. Potassium hydroxide is also harmful if swallowed. It gives out heat when added to water which can cause boiling or create a choking mist. It is used in the home for clearing drains.
Sodium or potassium hydroxide solution (if 0.5 mol/dm ³ or more Sodium hydroxide; 0.4 mol/dm ³ or more potassium hydroxide)	 CORROSIVE  HARMFUL	DANGER: causes severe skin burns and eye damage. Potassium hydroxide is also harmful if swallowed if 3 mol/dm ³ or more. Fehling's solution contains sodium hydroxide of this concentration. It is used in the home as an oven cleaner.
Dilute sodium or potassium hydroxide solution (if less than 0.5 mol/dm ³ but 0.1 mol/dm ³ or more sodium hydroxide; if less than 0.4 mol/dm ³ but 0.1 mol/dm ³ or more potassium hydroxide)	 IRRITANT	WARNING: irritating to the eyes and skin.
Very dilute sodium or potassium hydroxide solution (if less than 0.125 mol/dm ³ sodium hydroxide; if less than 0.1 mol/dm ³ potassium hydroxide).	Currently not classified as hazardous	It may still cause harm in the eyes or in a cut.

Typical control measures to reduce risk

- Use the lowest concentration possible; avoid using the solid if possible.
- Use the smallest amount possible.
- **Wear eye protection**, including when making or disposing of solutions. Protect the face when transferring/dispensing large quantities of corrosive substance.
- If possible, use a safer alternative, e.g. sodium carbonate when making salts or Benedict's solution rather than Fehling's solution for food tests.

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. Solution spurting out of test tubes when being heated.
- How serious would it be if something did go wrong?
Note – alkali in the eye causes more damage than acid of equivalent concentration.
- 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. If it is necessary to go to hospital, continue washing the eye during the journey in an ambulance.
- 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 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. Rinse clothing.
- Spilt on the floor,
bench, etc.
Wipe up small amounts with a damp cloth and rinse it well. For larger amounts, and especially for (moderately) concentrated solutions, cover with mineral absorbent (e.g. cat litter) and scoop into a bucket. Neutralise with citric acid. Rinse with plenty of water.

**GCSE****PHYSICS – Unit 3**

INVESTIGATING THE STRENGTH OF AN ELECTROMAGNET

The task is to carry out an investigation on the strength of an electromagnet; this is from:

Section 1.9 of the GCSE Physics specification.

Apparatus Required

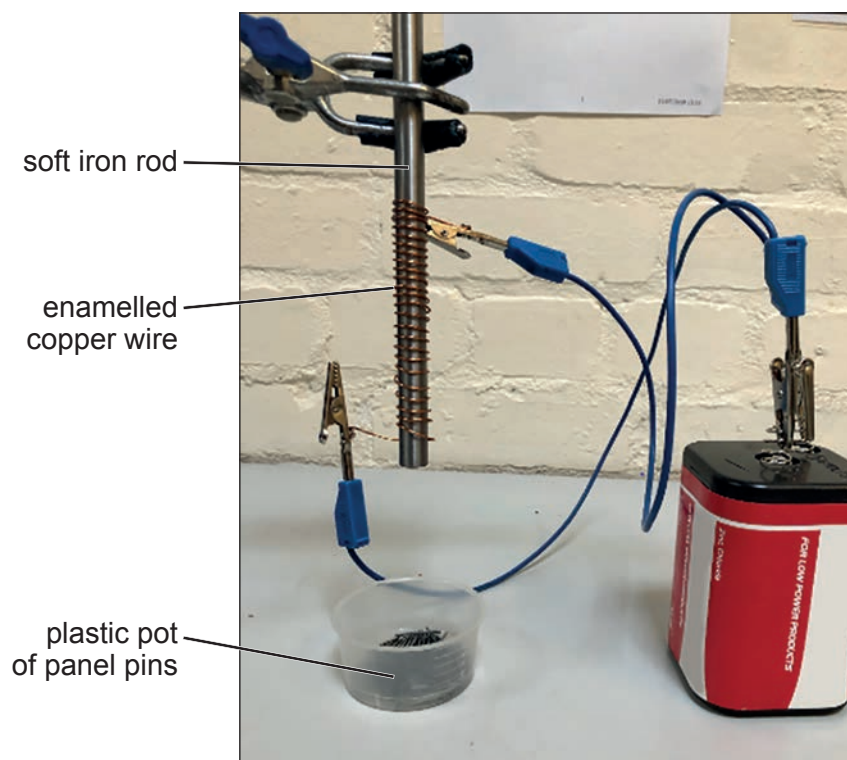
The following apparatus is required for each group: (each group should consist of no more than three candidates).

- 1 × stand and clamp
- 1 × soft iron rod
- 1 × 120 cm enamelled copper wire with crocodile clips
- 1 × 6 V battery
- 2 × connecting wires
- 1 × plastic pot of panel pins

Access to:

balance ± 0.1 g

Diagram



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

- Soft iron rods are available from Phillip Harris product code: B8H26291 £1.30 or Scichem.com product code XMG430011 £1.69.
- In trials 20 SWG enamelled copper wire gave good results. This is available from Phillip Harris, B8R06768, £5.95.
- The ends of the wire will need to be sanded slightly to ensure a good electrical connection.
- Steel panel pins or moulding pins, widely available in DIY stores, worked well. The ones used in trials each had a mass of around 0.15 g (depending on the type of pin, the length varied between 12–20 mm, but this is not important). Paper clips have a much higher mass and did not work as well.
- Make up the wire by connecting the ends to the crocodile clips.
- It is important that candidates do not leave the battery connected in between taking readings. CLEAPSS guidance is to use a battery rather than a power pack.

**GCSE****BIOLOGY – Unit 3****SCIENCE (Double Award) – Unit 7**

INVESTIGATING THE EFFECT OF SWEATING ON THE RATE OF COOLING

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

Section 2.5 of the GCSE Biology specification.

Section 4.5 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 × 100 cm³ measuring cylinder

2 × boiling tube (each covered in five layers of newspaper) in a boiling tube rack

1 × small beaker of cold water

1 × 250 cm³ beaker of hot water

1 × thermometer ($\pm 1^\circ\text{C}$) (-10°C to 100°C)

1 × medium sized paint brush

1 × stopwatch ($\pm 0.01\text{ s}$)

1 × tray

Access to:

kettle

paper towels

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

- Water in the 250 cm³ beaker needs to have been recently boiled.
- Medium sized child's paintbrushes can be purchased from many stockists such as Amazon (£4.99 for 8 brushes) and Hobbycraft (£1.80 for 3 brushes – product number 6066891000). Cotton wool may be used instead of paintbrushes if they are not available.
- Five layers of newspaper are required for each boiling tube. The boiling tubes should be given to the candidates already wrapped in newspaper in the boiling tube rack.
- Candidates will need access to paper towels to mop up excess water.
- Any suitable tray can be used to prevent the spillage of water, for example, Gratnell.
- Please note repeat readings are not required for this investigation.

**GCSE****CHEMISTRY – Unit 3****SCIENCE (Double Award) – Unit 7****APPLIED SCIENCE (Double Award) – Unit 5****INVESTIGATING EXOTHERMIC REACTIONS**

The task is to carry out an investigation on exothermic reactions; this is from:

Section 1.1 of the GCSE Chemistry specification.

Section 2.1 of the GCSE Science (Double Award) specification.

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

1 × polystyrene cup

1 × 100 cm³ measuring cylinder

1 × 250 cm³ beaker

1 × 250 cm³ beaker containing approximately 60 cm³ of 0.5 mol/dm³ copper(II) sulfate solution

2 × pre-weighed sample of zinc powder (2.5 g in each sample)

1 × thermometer (± 1 °C) (–10 °C to 100 °C)

1 × stopwatch (± 0.01 s)

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

- The copper(II) sulfate solution should be made up by dissolving 125 g of the solute in 1000 cm³ of water.
- Ensure the polystyrene cup fits inside the 250 cm³ beaker.
- The pre-weighed samples of zinc powder should be approximately 2.5 g each.
- Please follow standard laboratory procedures governing the disposal of the waste produced from the experiment.
 - Waste from each class should be dealt with separately.
 - Clamp a large filter funnel and filter paper above a large beaker.
 - Pour the waste and rinse the residual solid from each group into the filter funnel.
 - Waste solution should be washed down the drain with 10 times the volume of water.
 - Filter paper and solid waste should be put in the bin.














CLEAPSS

Student safety sheets

Copper and its compounds

including Copper oxides, carbonate, sulfate, chloride, nitrate

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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)	   CORR.* IRRITANT ENVIR.	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)	  IRRITANT ENVIRONMENT	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	   CORR. IRRITANT ENVIR.*	DANGER. Solids and solutions ($\geq 1.0 \text{ mol/dm}^3$ sulfate , $\geq 1.3 \text{ mol/dm}^3$ 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	  CORROSIVE IRRITANT	DANGER. Sulfate ($< 1.0 \text{ mol/dm}^3$ and $\geq 0.2 \text{ mol/dm}^3$) and nitrate ($< 1.3 \text{ mol/dm}^3$ and $\geq 0.2 \text{ mol/dm}^3$): skin irritant; cause serious eye damage. WARNING. Sulfate ($< 0.2 \text{ mol/dm}^3$ and $\geq 0.02 \text{ mol/dm}^3$) and nitrate ($< 0.15 \text{ mol/dm}^3$ and $\geq 0.05 \text{ mol/dm}^3$): skin and eye irritant. Currently not classified as hazardous. Sulfate ($< 0.02 \text{ mol/dm}^3$) and nitrate ($< 0.05 \text{ mol/dm}^3$). Benedict's solution and Fehling's solution both contain dilute copper(II) sulfate but Fehling's solution has other hazards.
Copper(II) chloride Solid	  IRRITANT ENVIRONMENT	WARNING. eye and skin irritant; harmful if swallowed; toxic to aquatic life.
Copper(II) chloride Solutions (if 0.8 mol/dm^3 or more)	 IRRITANT	WARNING. Eye and skin; harmful if swallowed ($\geq 1.8 \text{ mol/dm}^3$).
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).

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

INVESTIGATING THE MOTION OF A FALLING OBJECT

The task is to carry out an investigation into the motion of a falling object; this is from:

Section 2.2 of the GCSE Physics specification.

Section 6.2 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).

2 × metre ruler (attached) or 1 × tape measure (± 1 mm)

1 × clamp stand and pointer

1 × paper cake case

1 × stopwatch (± 0.01 s)

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

- A tape measure at least 2 m long can be used as an alternative to the metre rulers.
- The clamp and stand with a suitable pointer can be set-up beforehand for candidates but not set at the correct starting height of 150 cm.
- Any size paper cake case will be acceptable.

**GCSE****APPLIED SCIENCE (Double Award) – Unit 5**

INVESTIGATING HEAT RADIATION

The task is to carry out an investigation on heat radiation; this is from:

Section 1.2.3 of the GCSE Applied Science (Double Award) specification.

Apparatus Required

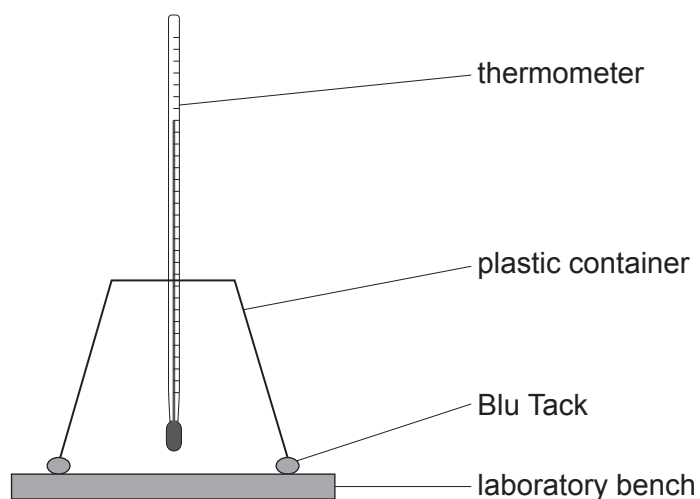
The following apparatus is required for each group: (each group should consist of no more than three candidates).

- 1 × small plastic container, inverted, with hole in top, painted black
- 1 × small plastic container, inverted, with hole in top, wrapped with aluminium foil
- 2 × thermometer ($\pm 1\text{ }^{\circ}\text{C}$) ($-10\text{ }^{\circ}\text{C}$ to $100\text{ }^{\circ}\text{C}$)
- 1 × stopwatch ($\pm 0.01\text{ s}$)
- 1 × filament lamp
- 1 × small piece of Blu Tack
- 1 × 30 cm ruler

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 small plastic containers (plastic shot glasses) are available from various suppliers, for example, Amazon (pack of 50 plastic shot glasses for £5.95). Alternatively, small plastic drinking cups could be used.
- Matt black paint should be used to paint one of the containers.
- The holes made in the bottom of each container should be **just large enough** for a thermometer to be pushed through them. The tight-fitting thermometer can then be set up to be vertical (see diagram below).
- These plastic containers are very brittle and crack easily when an attempt is made to make the hole with a sharp, pointed tool or drill bit. It is suggested that a 6" nail be heated in a Bunsen flame and then used to make the hole by melting the plastic. This works well and the size of the hole can be adjusted (using the hot nail) so that the thermometer just fits through it.
- To avoid the thermometers causing the containers to topple candidates should use several very small pieces of Blu Tack to secure each plastic container to the bench. The small piece of Blu Tack supplied will be more than enough for candidates to divide up into several very small pieces for this purpose. Alternatively, the containers may be secured with clamps and stands.
- 60 W filament lamps are preferable to use as the heat source in this investigation. However, 40 W lamps are an acceptable alternative. Do not use lamps greater than 60 W or low energy lamps.
- The diagram below illustrates how each plastic container should be set up.



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

INVESTIGATING THE VITAMIN C CONTENT OF FRUIT JUICES

The task is to carry out an investigation on the vitamin C content of fruit juices; this is from:

Sections 2.3.1 of the GCSE Applied Science (Double Award) specification.

Sections 2.1.1 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).

eye protection

9 × test tube

1 × test tube rack

3 × dropping pipette

1 × 1 cm³ syringe

Approx 50 cm³ of three different fruit juices labelled as orange, pineapple and grapefruit




12 cm³ of 0.01% DCPIP solution

CLEAPSS student safety sheet: 5 – Food testing (2). 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

- In acidic conditions, DCPIP does not decolourise completely, but remains pink which could confuse determination of the endpoint. Do not use actual fruit juices. Samples containing different concentrations of vitamin C (ascorbic acid) should be made up and labelled as the different juices as follows:
 - Orange approx. 0.2 mg/cm³
 - Grapefruit approx. 0.3 mg/cm³
 - Pineapple approx. 0.02 mg/cm³
- If when trialling 0.01% DCPIP is found to be too pale, it is acceptable to increase the concentration to 0.1%. There is no need to inform candidates of any change.

Substance	Hazard	Comment
Sakaguchi test Used to test for proteins	 CORROSIVE  HIGHLY FLAMMABLE  ENVIRONMENT	The test involves mixing three solutions: sodium hydroxide (~1.3 mol/dm ³), naphthalen-1-ol in ethanol (~0.07 mol/dm ³) and sodium chlorate(I) (hypochlorite) (~1.5 mol/dm ³). Despite these hazards, it is safer to use than either form of Millon's reagent because it does not need to be heated and only a few drops are required. The biuret test is safer still. DANGER: Corrosive to skin and eyes, highly flammable.
DCPIP Used to test for Vitamin C	Currently not classified as hazardous	
Saliva Used to break down starch	Currently not classified as hazardous	Negligible risk.
Clinistix Used to test for glucose	Currently not classified as hazardous	The tip of the stick contains a minute amount of a known carcinogen and should not be touched. The sticks should be stored and disposed of safely. It is normally used for testing urine.
Albustix Used to test for proteins	Currently not classified as hazardous	This will not detect all proteins. It is normally used for testing urine.

Typical control measures to reduce risk

- Wear eye protection and use the smallest possible amounts of chemicals.
- Use the least-hazardous substance that achieves the required effect.

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?
- How serious would it be if something did go wrong?
e.g. Could ethanol (in the Sakaguchi test) catch fire, or acid splash into the eye?
- 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 skin or clothing** Remove contaminated clothing. Then drench the skin with plenty of water. If a large area is affected or symptoms occur, 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.

**GCSE****APPLIED SCIENCE (Single Award) – Unit 4****INVESTIGATING THE EFFECT OF CONCENTRATION
ON THE BREAKDOWN OF HYDROGEN PEROXIDE**

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

Section 2.2.1 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).

eye protection
5 × 100 cm³ measuring cylinder
1 × 10 cm³ measuring cylinder
1 × spatula
1 × stopwatch (± 0.01 s)
1 × graduated plastic dropping pipette
4, 8, 12, 16 and 20 vol of hydrogen peroxide
manganese dioxide powder

Access to:



washing up liquid
paper towels

CLEAPSS student safety sheet: 57 – Hydrogen peroxide and 48 – Manganese and its compounds. 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.

Teacher/Technician Notes

- For the best results a fresh bottle of hydrogen peroxide should be used for the experiment due to its decomposition over time.
- If volumes of foam are below 50 cm^3 then 50 cm^3 measuring cylinders may be a suitable alternative to the 100 cm^3 in the list. Alternatively use a larger quantity of the manganese dioxide on the spatula.
- If the number of 100 cm^3 measuring cylinders available is limited, it is acceptable to just use one per group and wash and dry it between each concentration.
- Each group will need approximately 15 cm^3 washing up liquid and 35 cm^3 of each concentration of hydrogen peroxide.
- When trialling these experiments, it is essential to ensure that an appropriate volume of foam is observed after 30 seconds. It may be necessary to vary the concentrations or time to ensure the volumes are appropriate.

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: <ul style="list-style-type: none"> Molarity: as with any chemical, the concentration may be given as $x \text{ mol/dm}^3$, or $x \text{ M}$, i.e. $x \text{ mol}$ in 1 dm^3 of solution Percentage, w/v: a $y \%$ w/v solution will contain $y \text{ g}$ hydrogen peroxide in 100 cm^3 of solution Vol: 1 cm^3 of z volume strength will give $z \text{ cm}^3$ 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.










CLEAPSS

Student safety sheets

Manganese and its compounds

including manganese(IV) oxide (dioxide) and potassium manganate(VII) (permanganate)

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Substance	Hazard	Comment
Manganese (metal) Solid	Currently not classified as hazardous	Note that the powder would be highly flammable.
Manganese(II) carbonate Solid		Insoluble in water.
Manganese(II) chloride Solid and concentrated solutions (if 1.5 mol/dm ³ or more)	 IRRITANT	WARNING: harmful if swallowed.
Manganese(II) chloride Dilute solutions (if less than 1.5 mol/dm ³)	Currently not classified as hazardous	
Manganese(II) sulfate Solid and concentrated solutions (if 0.7 mol/dm ³ or more)	  HEALTH ENVIR.	WARNING: may cause damage to organs through prolonged or repeated exposure. Toxic to aquatic life with long-lasting effects.
Manganese(II) sulfate Dilute solutions (if less than 0.7 mol/dm ³)	Currently not classified as hazardous	
Manganese(IV) oxide (Manganese dioxide) Solid	 HARMFUL	WARNING: Harmful by inhalation or if swallowed. It is often used as a fine powder. Many hazardous reactions occur with reducing agents or concentrated acids. It is used in dry cells (batteries). Insoluble in water.
Potassium manganate(VII) (potassium permanganate) Solid	  OXIDISING HARMFUL   HEALTH HAZ. ENVIR.	DANGER: oxidiser; harmful if swallowed; suspected of damaging the unborn child; very toxic to aquatic life with long-lasting effects. Stains the hands and clothing. Many hazardous reactions occur with concentrated acids or reducing agents. On heating, releases a fine dust of potassium manganate(VI) [OXIDISING; IRRITANT] and oxygen gas.
Potassium manganate(VII) (potassium permanganate) Solutions (if 0.1 mol/dm ³ or more)	 IRRITANT	WARNING: irritating to eyes and skin. Stains the hands and clothing.
All manganates(VII) (permanganates) Very dilute solutions (if less than 0.1 mol/dm ³)	Currently not classified as hazardous	They stain hands and clothing.

Typical control measures to reduce risk

- Wear eye protection.
- Avoid inhaling dusts.
- Avoid skin contact, especially with manganates(VII).
- Avoid contact between manganates(VII) or manganese(IV) oxide and concentrated acids or reducing agents.

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. Dust is accidentally inhaled.
- How serious would it be if something did go wrong?
e.g. Are there hazardous reactions such as violent oxidations or decompositions?
- 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** Remove contaminated clothing. Irrigate the affected area with gently-running tap water for at least 20 minutes. Call 999/111 as appropriate. Rinse clothing. Manganate(VII) will permanently stain clothing. Stains to the skin will wear off in a few days.
- **Spilt on floor, bench, etc** Wear eye protection and gloves. Scoop up the solid. Rinse the area with water and wipe up, rinsing repeatedly. Manganate(VII) will give permanent stains. Rinse the mop or cloth thoroughly.

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