## RISK ASSESSMENTS

You will need to carry out a full risk assessment for all of the practicals shown below. Information given here is just about apparatus, reagents and potential quantities aimed at groups of up to 30 students.

## GCSE 020 – Heating metal carbonates

For each pair:

- Stand, clamp, boss
- Bunsen & mat
- 5 test tubes
- Test tube rack
- Delivery tube from test tube (90°)
- Stopwatch

4 labelled beakers of each reagent with spatulas:

- $MgCO_3$ (s)
- $ZnCO_3$ (s)
- $K_2CO_3$ (s)
- $CuCO_3$ (s)

- limewater (perhaps in 4 conical flasks)

## GCSE 021 – Reactions of acids with carbonates

For each pair:

- test tube rack
- 4 x test tubes

4 labelled beakers of each reagent with spatulas:

- $NiCO_3$ (s)
- $Na_2CO_3$ (s)
- $CaCO_3$ (s)
- $CuCO_3$ (s)

4 labelled bottles of each acid:

- dilute HCl(aq) bottles (typically 2 mol $dm^{-3}$)
- dilute $H_2SO_4$(aq) bottles (typically 1 mol $dm^{-3}$)
- dilute $HNO_3$(aq) bottles (typically 2 mol $dm^{-3}$)

## GCSE 022 – Heating limestone

- 15 x Bunsen, tripod, gauze, mat
- matches & spills
- "limestone" chips
- 15 x evaporating basins
- spatulas
- teat pipettes
- universal indicator solution with colour charts

## GCSE 024 – Making concrete & mortar

- plastic cups
- tubs of sand with teaspoons
- tubs of gravel with teaspoons
- tubs of cement with teaspoons

## GCSE 045 – Testing lipids

Pupils mix 2 drops of each oil with 1 $cm^3$ of ethanol in a conical flask. They add bromine water from a burette 5 $cm^3$ at a time, bung and shake until the colour is no longer decolourised

- 4 x beakers of different vegetable oils with pipettes (alongside the bottles) (could use solid fats if they are kept in warm water bath to melt them)
- 30 x burettes / stands
- 30 x funnels
- bromine water (about 2 litres – 0.004 M) [7% $Br_2$ solution = 0.4 M, so 0.004 M is about 1.5 ml in 2 litres]
- 30 x conical flasks
- 30 x bungs for conical flasks
- 4 x bottles of ethanol with pipettes
- 30 x 100 $cm^3$ beakers

## GCSE 051 – Burning alcohols

Pupils find the heat released when one mole of an alcohol is burned. Students could all do the same alcohol or different ones (e.g. methanol, ethanol, propan-1-ol)

- 15 x alcohol spirit burners (e.g. 5 x methanol, 5 x ethanol, 5 x propan-1-ol)
- 15 x copper can calorimeters
- 15 x stand, boss, clamps
- 15 x thermometers (1°C, 0-110°C)
- 15 x 100 $cm^3$ measuring cylinders
- balances (0.1 g)
- 15 x mats
- matches & spills

## GCSE 052 – Finding energy change for neutralisation reaction

Pupils find the heat released when NaOH reacts with HCl.

- 1.0 M hydrochloric acid (~50 $cm^3$ per pair)
- 1.0 M sodium hydroxide (~50 $cm^3$ per pair)
- per pair:
  - 25/50 $cm^3$ measuring cylinder
  - 2 x polystyrene cup with lid
  - thermometer (-10 to 50°C) (0.1°C scale)
  - tripod

## GCSE 053 – Finding energy change for displacement reaction

Pupils find the heat released when an excess of Zn reacts with $CuSO_4$(aq)

- 0.5 M copper sulfate (~50 $cm^3$ per pair)
- Zn powder (labelled beaker with spatula by each balance)
- balances (0.1 g)
- per pair:
  - 25 $cm^3$ measuring cylinder
  - polystyrene cup with lid
  - thermometer (-10 to 110°C) (1°C scale)
  - tripod
  - weighing bottle

## GCSE 063 – Structure types

Pupils carry out simple tests to see if 5 substances have simple molecular, ionic, metallic or giant covalent structures. They heat some in an ignition tube to get an indication of the melting point; they test to see if it soluble in water; they see if the solid conducts; they see if the solution conducts (if it dissolves).

- about 50 ignition tubes
- boiling tubes and bungs for dissolving
- 15 x Bunsen burners & mats
- 15 x 100 ml beakers
- several power packs / batteries
- several sets of leads, with crocodile clips
- several sets of electrodes
- 15 x ignition tube holders
- 2 x 100 ml beakers of salt (labelled "A") – with 2 spatulas
- 1 x lump of salt (on piece of paper labelled "A") next to battery / leads / bulb)
- 2 x 100 ml beakers of sugar (labelled "B") – with 2 spatulas
- 1 x lump of sugar (on piece of paper labelled "B") next to battery / leads / bulb)
- 2 x 100 ml beakers of $SiO_2$ (labelled "C") – with 2 spatulas
- 1 x lump of quartz / $SiO_2$ (on piece of paper labelled "C") next to battery / leads / bulb)
- 2 x 100 ml beakers of wax shavings (labelled "D") – with 2 spatulas
- 1 x lump of wax (on piece of paper labelled "D") next to battery / leads / bulb)
- 2 x 100 ml beakers of zinc powder (labelled "E") – with 2 spatulas
- 1 x strip of zinc (on piece of paper labelled "E") next to battery / leads / bulb)

## GCSE 075 – The effect of concentration on rates

Pupils react calcium carbonate with hydrochloric acid of different concentrations. They measure the rate in $cm^3/s$ by finding the volume of gas produced in 30 seconds. They prepare the different concentrations of acid using shared class burettes of water and 2.0 $mol/dm^3$ HCl.

- 3 burettes of deionised water on window bench
- 3 burettes of 2 M hydrochloric acid on window bench
- small/medium calcium carbonate chips in 4 x beakers with spatulas
- 4 x 0.1 g balances
- weighing bottles
- boiling tubes
- 100 ml gas syringes with suitable connectors for boiling tubes
- stands, bosses and clamps
- boiling tube racks
- stopwatches
- washing up bowls for $CaCO_3$/acid residues

## GCSE 076 – The effect of surface area on rates

Pupils react acidified potassium dichromate with rhubarb. The manganate reacts and loses its colour. The students use rhubarb as it is and then cut it up into pieces to increase the surface area.

- small beakers
- measuring cylinders (50 $cm^3$)
- acidified potassium manganite solution (about 1.5 litres per class) [to make the potassium manganate(VII) solution: put 4 or 5 crystals into a large jug with about 500 $cm^3$ of 1.0 $mol/dm^3$ sulfuric acid. Stir until the crystals dissolve and then add a further 500 $cm^3$ of 1.0 $mol/dm^3$ sulfuric acid and stir. The solution should be pale purple.
- rhubarb (need 12 cm of stem per pair)
- table knives
- tiles
- stopwatches

## GCSE 077 – The effect of temperature on rates

Pupils react acid with sodium thiosulfate solution which then goes cloudy. They judge the reaction time as the time to go so cloudy that they can't see through it (cross on paper). The rate is measured as 1000/time. They vary the concentration and see the effect on the rate.

- 0.05 M sodium thiosulphate solution (5 litres per class, roughly 8 g/litre )
- tray of 2 M hydrochloric acid bottles
- 15 x 50 ml measuring cylinders
- 15 x 5 ml plastic syringes
- 30 x 250 ml beakers (15 could be plastic)
- box of marker pens
- 15 x Bunsen, tripod, mat, gauze
- matches & spills
- 15 x stirring rods
- 15 x mercury thermometers
- Mercury spill kit should be accessible
- 15 x stop clocks
- scrap paper to mark crosses on
- box of tissues

## GCSE 097 – Making sodium chloride

Students follow instructions to make sodium chloride by reacting solutions of sodium hydroxide and hydrochloric acid until the mixture is neutral using universal indicator paper.

- tray of bottles of 2 M hydrochloric acid
- tray of bottles of 0.4 M sodium hydroxide solution
- 15 x 250 ml conical flasks
- 15 x 10 ml measuring cylinders
- lots of universal indicator paper
- 15 x stirring rods
- 15 x evaporating basins
- permanent pens
- 15 x Bunsen, tripod, gauze, mat
- matches & spills

## GCSE 098 – Making copper sulfate

Students follow instructions to make crystals of hydrated copper sulfate by reaction of copper oxide with warm copper sulfate.

- 15 x dishes of copper oxide (with spatula)
- tray of bottles of 1 M sulphuric acid
- 15 x 100 ml beakers
- 15 x 50 or 100 ml measuring cylinders
- 15 x stirring rods
- 15 x Bunsen, mat, gauze, tripod
- matches & spills
- 15 x filter funnels
- 15 x 250 ml conical flasks
- filter paper
- 15 x wash bottles
- 15 x evaporating basins
- permanent pens

## GCSE 104 – Halogen displacement reactions

Students follow instructions to put the halogens in order of reactivity by reacting solutions of chlorine, bromine and iodine with solutions of potassium chloride, potassium bromide and potassium iodide.

- 4 x beakers of chlorine water
- 4 x beakers of bromine water
- 4 x beakers of iodine water
- 4 x beakers of sodium chloride solution (labelled potassium chloride)
- 4 x beakers of potassium bromide solution
- 4 x beakers of potassium iodide solution
- test tube racks
- lots of test tubes
- teat pipettes

## GCSE 105 – Which ions make water hard?

Students follow instructions to see which ionic compounds form a scum or lather with soap to identify the ions that make water hard.

- 4 x flasks of $NaNO_3$(aq)
- 4 x flasks of $KNO_3$(aq)
- 4 x flasks of $Mg(NO_3)_2$(aq)
- 4 x flasks of $Ca(NO_3)_2$(aq)
- 4 x flasks of soap solution with teat pipettes
- Boiling tubes
- Boiling tube racks
- Boiling tube bungs

## GCSE 106 – Comparing water hardness

Students follow instructions to test several different water samples to compare their hardness.

- Selection of 4 waters to test, including (depending where people live!):
  - Local tap water (2 litre per class) – label 'tap water'
  - Mineral water (2 litre per class) – use a bottle of mineral bottle – label with name of water
  - Deionised water (2 litre per class) – label 'deionised water'
  - Another water (2 litre per class) – label as appropriate
- Clark's soap solution (max 750 ml per class)
- 30 x burettes
- 30 x stands
- 30 x conical flasks
- 30 x conical flask bungs
- 15 x 50 ml measuring cylinders
- 15 x glass funnels

## GCSE 113 – Analysis

### TASK 1

Students use flame tests to identify some metal ions.

- lots of damp splints
- 15 x Bunsens
- matches & spills
- 15 x mats
- 15 x watch glasses
- samples on watch glasses: A = KI, B = NaCl, C = $BaCl_2$, D = $CaCl_2$, E = LiCl

## TASK 2

Students use tests with NaOH(aq) to identify some metal ions.

- test tubes
- tray of bench bottles of NaOH(aq)
- test tube racks
- mats
- deionised water bottles
- samples in small beakers: F = $Fe(NO_3)_3$ G = $Al_2(SO_4)_3$ H = $MgCl_2$ I = $Ca(NO_3)_2$ J = $CuSO_4$ K = $FeSO_4$ (put K into beaker at last minute)

## TASK 3

Students use tests with $BaCl_2$(aq) to identify compounds containing sulfate ions.

- test tubes
- 4 x bottles of $BaCl_2$(aq)
- 4 x bottles of HCl(aq)
- test tube racks
- mats
- deionised water bottles
- samples in small beakers: O = NaCl, P = $Na_2SO_4$, Q = $MgSO_4$

## TASK 4

Students use tests with $AgNO_3$(aq) to identify compounds containing halide ions.

- test tubes
- 4 x bottles of $AgNO_3$(aq)
- 4 x bottles of $HNO_3$(aq)
- test tube racks
- mats
- deionised water bottles
- samples in small beakers: U = KI, V = $Na_2SO_4$, W = KBr, X = NaCl

## TASK 5

Students use tests with acid to identify compounds containing carbonate ions.

- test tubes
- tray of lab bottles of HCl(aq)
- test tube racks
- mats
- samples in small beakers: Y = $Na_2CO_3$, Z = NaCl, AA = $ZnCO_3$, AB = $CuCO_3$

## TASK 6

Students use all the tests to identify some ionic compounds.

- test tubes
- boiling tubes
- test tube racks
- test tube holders
- mats
- matches & spills
- deionised water bottles
- Bunsens
- pegs
- nichrome wire
- wire cutters
- watch glasses
- tray of bench bottles of HCl(aq)
- tray of bench bottles of $HNO_3$(aq)
- tray of bench bottles of NaOH(aq)
- 4 x bottles of $BaCl_2$(aq)
- 4 x bottles of $AgNO_3$(aq)
- 6 x small bottles of concentrated hydrochloric acid
- samples in small beakers: AC = NaBr, AD = $K_2CO_3$, AE = KI, AF = $Al_2(SO_4)_3$, AG = $BaCl_2$, AJ = $CuSO_4$