GCSE CHEMISTRY CORE PRACTICALS SUMMARY

You will need to know these core practicals as the exam board may ask you questions based on them!

Name of practical and independent & dependent variables	Other variables to be controlled	Required Equipment	Method and outcome	Possible evaluation issues and improvements to method.	Safety Precautions
SC2d: Investigating inks **Independent**: n/a **Dependent:** n/a	✓ Temperature should remain at 100 ^{o}C	• Conical flask • Collecting tube • Boiling tube • Thermometer • Tripod • Gauze • Bunsen burner • Large beaker of ice • Anti-bumping granules • Ink solution • Chromatography paper attached to pencil or glass rod. • Beaker • Water soluble pens • Pencil and ruler.	**Method -Simple distillation:** Add anti bumping granules to a conical flask. Add ink solution, place flask on a tripod and gauze. Attach collecting tube which leads into a boiling tube in an ice bath. Heat so that the temperature remains at about 100 ^{o}C and until a colourless liquid appears in the boiling tube. ***Outcome:*** *You should have collected a sample of distilled water with no colour from the ink within the sample.* **Method - Chromatography:** Take chromatography paper and draw a pencil line 2 cm from the bottom of the page. Put one or two small ink marks on the line and attach the other end to a pencil or rod that is long enough to go over the edges of a beaker. Fill the beaker up to 1cm and place in the chromatography paper so that the water level is below that of the pencil line. Wait until the water solvent has run up the paper and dry before the ink reaches the top of the paper. Calculate the Rf value by dividing distance of solute from the pencil line over distance of solvent. ***Outcome:*** *Rf value should be less than 1 and different for different colours in ink.*	Ensure about three quarters of the boiling tube is submerged in the ice water. Control the temperature of the ink solution using thermometer and closing the gas tap when required. Use small ink spots, which are well spread out on pencil line to ensure colours do not run into each other. Measure distance of solute from the centre of the ink spot.	✓ Wear eye protection to protect against splashes from boiling water. ✓ Use anti bumping granules to prevent solution boiling over.
SC8c: Preparing copper sulfate **Independent**: n/a **Dependent:** n/a	✓ n/a	• Copper oxide • Dilute sulfuric acid • Water bath set at 50 ^{o}C • Tongs • Filter paper • Filter funnel • Stirring rod • Spatula • Evaporating basin • Measuring cylinder • Heat proof mat • Tripod • Bunsen burner • Beaker • Conical flask	**Method:** Warm 20cm^{3} of the acid in a beaker placed in the water bath so that the temperature of the acid is also around 50 ^{o}C. Add a spatula of copper oxide and stir using spatula. Keep adding copper oxide until it is in excess and sinks to the bottom of the beaker. Return the beaker to the water bath to bring the temperature back to 50 ^{o}C and add more copper oxide if it is used up. Filter this mixture to remove excess copper oxide. Place the filtrate into an evaporating basin and heat gently until the solution becomes dark blue or two thirds of the water has evaporated. Allow the solution to cool and the remaining water to evaporate over a few days. ***Outcome:*** *Solution should be left to cool slowly, and large blue, diamond shaped crystals should be formed.*	Ensure copper oxide and sulfuric acid is well stirred and reaches temperature of around 50 ^{o}C The filtrate should not contain any copper oxide. If it does check for holes in the filter paper and filter again.	✓ Wear eye protection to protect against splashes from acid and hot solutions. ✓ Caution should be used to prevent burns when using Bunsen burners. ✓ Keep naked flame away from lose items of clothing and hair. ✓ Do not heat copper sulfate solution too quickly as it will spit over the edge of the evaporating basin.

SC8d: Investigating neutralisation **Independent:** Mass of calcium hydroxide **Dependent:** Change in pH	✓ 0.3g of calcium hydroxide powder each time ✓ Time left before recording pH on indicator paper. ✓ Amount of stirring	• Calcium hydroxide powder • Dilute hydrochloric acid • Universal indicator paper and pH scale • White tile • Spatula • Glass rod • Spatula • 1dp balance • Weighing boat • Measuring cylinder • Beaker	**Method:** Using the measuring cylinder place 50cm^3 of hydrochloric acid into a beaker. Put a piece of universal indicator paper onto the white tile. Dip the glass rod into the acid and place a drop onto the indicator paper, record the pH. Measure out 0.3g of calcium hydroxide powder using the weighing boat and balance. Add this to the acid and stir well. Wash the end of the glass rod and again dip it into the solution and measure the pH using the universal indicator paper. Repeat this another 7 times and record results in a table. ***Outcome:*** *A steady change in pH should result which should be draw on a graph.*	The calcium hydroxide should be well stirred in and should not settle at the bottom of the beaker. Ensure no calcium hydroxide is left in the weighing boat.	✓ Wear eye protection to protect against splashes from acid and calcium hydroxide. ✓ Calcium hydroxide is an irritant so avoid skin contact.
SC10a: Electrolysis of copper sulfate **Independent:** Current on ammeter **Dependent:** mass of anode and cathode	✓ Concentration of copper sulfate solution ✓ Volume of copper sulfate ✓ Amount of electrode cleaning	• Balance measuring to at least 1dp • Use of propanone in a fume cupboard • Copper sulfate solution • Two pieces of copper foil • Two graphite rods • Stop clock • Beaker • Crocodile clips • Wires • Power pack • Variable resistor • Ammeter • Sand paper	**Method 1- Copper electrodes:** Take two pieces of copper foil and clean them with sand paper. Measure and record the mass of each of the electrodes. Attach the pieces of copper foil to crocodile clips and wires. Connect the ammeter and variable resistor in series with wires and pieces of copper foil making note of which is the anode, and which is the cathode. Fill a beaker with 150cm^3 of copper sulfate solution. Place the copper foil electrodes into the solution, set the current to 0.2A using the variable resistor and leave for 20min. Adjust the variable resistor is this current changes from 0.2A during this time. Turn off the power and wash the electrodes using distilled water. Dip them in propanone, take out and allow to evaporate. Record the mass of each of the electrodes and repeat the process using 0.3A, 0.4A and 0.5A. ***Outcome:*** *As the current increased the mass of the anode decreases and the mass of the cathode should increase. The increase and decrease in mass should be equivalent.* **Method 2- Inert electrodes:** Using the same equipment as in method 1, change the copper electrodes so they are graphite electrodes. Adjust the current until you can observe changes at the anode and cathode. Record what you can see. ***Outcome:*** *Small bubbles of gas should be seen at the anode and a brown deposit of copper should be seen coating the cathode.*	Do not touch electrodes, this will cause sparks and electrolysis will not take place. Ensure current stays constant using variable resistor. Ensure electrodes are dry after dipping them in propanone to get an accurate mass.	✓ Wear eye protection to protect against splashes from copper sulfate ✓ Use propanone in a well-ventilated area and away from naked flames ✓ Be aware of sharp edges on copper foil

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SC14d: Acid-alkali titration **Independent**: n/a **Dependent**: n/a	✓ Always stick to stated values with each titration.	• Hydrochloric acid of unknown concentration • Sodium hydroxide solution (concentration 0.1 moldm^3) • Methyl orange indicator • Bottle of distilled water • White tile • Conical flask • Pipette and filler • Burette and stand • Funnel • Beaker to collect unwanted solutions	**Method:** Take a burette and wash out using acid to remove any residue from previous experiments. Fill the burette with the acid so that there is no air in the jet and the reading is close to zero but not above the line. Using a pipette filler and pipette measure out 25cm^3 of sodium hydroxide solution and put it into a clean conical flask. Add a few drops of methyl orange, enough to see a yellow solution. Place this on a while tile under the burette stand. With the burette in the stand let out the acid into the conical flask, swirling the flask as you do so. When the solution stays orange this is the end point and the reading on the burette should be noted down. Repeat this, making sure you top up the burette as required 4 more times or until results are concordant. If the solution is red, then too much acid has been added and experiment should be repeated. ***Outcome:*** *Results should be concordant (within 0.2 difference)* **This experiment can be extended to prepare sodium chloride crystals-** Once an exact end point has been calculated repeat the experiment without using methyl orange indicator. With the neutral solution formed use the same method as SC8c to make pure, dry clean crystals.	Slow down burette so acid it added drop by drop as end point approaches. Read burette at eye level and from the bottom of the meniscus. Make sure funnel is removed during titration to prevent drops from entering the burette. Ensure jet on burette is filled with acid.	✓ Wear eye protection to protect against splashes from sodium hydroxide or hydrochloric acid.
SC18b: Investigating reaction rates **Independent:** surface area of marble chips. **Dependent:** volume of gas produced. **Independent:** concentration of acid.	✓ Volume of acid ✓ Concentration of acid ✓ Mass of marble chips ✓ Size of marble chips	• Large marble chips • Small marble chips • Dilute hydrochloric acid • Collecting tube and bung • Water trough • Measuring cylinder x 2 • Clamp and stand or beehive shelf. • Stop clock	**Method, task 1 -Changing surface area:** Place measuring cylinder in water trough ensuring there are no air bubbles inside. Upturn the bottom of the measuring cylinder so that the water remains inside and secure it in an upright position using a beehive self or clamp and stand. Feed the end of the collecting tube under the water and into the open end of the measuring cylinder. Measure 5g of large marble chips and put them into a conical flask. Use a measuring cylinder to measure 40cm^3 of acid and place it into the conical flask. Immediately put the bung into the top of the conical flask. Measure and record the volume of gas produced every half minute and until no more gas is being produced. Repeat the same experiment using small marble chips. ***Outcome:*** *As small limestone chips have a larger surface area they should finish producing gas more quickly than large chips. A graph should be drawn to compare further.* **Method, task 2 -Changing concentration:** Repeat task 1 using small marble chips, of the same mass and the same volume of	The use of a large measuring cylinder will allow readings to be made over a longer period. Reaction will occur quickly at the start so be ready with stop clock and results table. Carbon dioxide is slightly soluble in water, so volume of gas may be less than if a gas cylinder were used.	• Wear eye protection to protect against splashes from acid.

Dependent: volume of gas produced. **Independent:** temperature. **Dependent:** time taken for cross to disappear	✓ Volume of acid ✓ Mass of marble chips ✓ Concentration of acid ✓ Volume of acid ✓ Concentration of sodium thiosulfate. ✓ Size of conical flask	• Sodium thiosulfate solution • Dilute hydrochloric acid • 250cm^3 conical flask • 10cm^3 measuring cylinder • 50cm^3 measuring cylinder • Water bath • Stop clock • Thermometer • Paper and thick black pen.	acid. Change the concentration of acid and record the volume of gas produced in one minute. Use concentrations of 0.8, 1.6, 2.4, 3.2 and 4.0 gdm^{-3} ***Outcome:*** *The higher the concentration the more particles in the same volume of acid. Therefore, there will be more collisions and more successfully collisions. This leads to a faster rate of reaction. A graph should be drawn to compare the results.* **Method, task 3 -Changing temperature:** Place 10cm^3 of sodium thiosulfate and 40cm^3 of water in a conical flask. Measure the temperature of this solution. Measure out 5cm^3 of hydrochloric acid, this should be at the same temperature as the thiosulfate solution. Prepare a white piece of paper, marked with a black cross. Add the acid to the thiosulfate solution, start the clock and place the conical flask on top of the black cross. Eventually the solution will go cloudy and yellow and when looking from above you will no longer see the black cross. At this stage stop the clock and record the temperature and the time taken for the cross to disappear. Repeat this experiment but before adding the acid to the thiosulfate solution allow them both to warm within suitable containers in a water bath before mixing. Choose 4 different temperatures and measure the time it takes for the cross to disappear. ***Outcome:*** *The higher the temperature the faster the rate of reaction. (the quicker the cross will disappear) This is because the particles have more energy so will collide with more force. They are also moving more quickly so will collide more often. This leads to more frequent, successful collisions.*	When the reactants are removed from the water bath mix them as soon as possible. They will cool quickly. Ensure that the same person decides when the clock is stopped. Different people may have a different opinion as to whether they see the cross or not.	• Wear eye protection to protect against splashes from acid and thiosulphate.
SC23b: The combustion of alcohols **Independent:** Length of Alcohol chain **Dependent:** Mass of alcohol burnt.	✓ Height of the bottom of the conical flask from the flame ✓ The size of the wick on the burner ✓ Volume of water in conical flask ✓ Size of conical flask	• Spirit burners with caps containing ethanol, propanol, butanol and pentanol • An electronic balance • Thermometer • Draft shield or heat resistant insulation • Heat proof mat • Boss, stand and clamp • 100cm^3 measuring cylinder	**Method:** Take one of the spirit burners and cap and record the mass using a balance. Place this on a heat proof mat. Add 100cm^3 of water to the conical flask and attach it to a clamp, boss and stand so that the bottom of the flask would be close to the top of the flame. Add a thermometer and record the temperature of the water. Remove the cap and light the wick. Surround the burner with a draft screen but ensure the thermometer can still be seen and the flame does not go out. Allow the temperature to rise to around 40 ^{o}C and put the cap back on the burner. Record the final temperature. Weigh the mass of the burner and cap again and write this down. Calculate the mass of alcohol needed to raise the temperature by one degree by dividing the change in mass by the change in temperature. Do this again for propanol, butanol and pentanol, each time calculating what mass of alcohol is required to increase the temperature by one degree.	Ensure the cap is replaced as quickly as possible to ensure little of the alcohol evaporates into the air. Not all the energy will be transferred to heating the water. Try to reduce heat loss by adding insulating materials. Ensure that with each new experiment a different conical flask is used which is at room temperature.	• Wear eye protection to protect against splashes from hot liquids • Keep naked flame away from lose items of clothing and hair. • Keep lid in burners when not in use.

		• 250cm^3 conical flask	***Outcome:*** *Less mass is required to increase the temperature by one degree as the size of the alcohol chain increases.*		
SC25c: Identifying ions Independent: n/a Dependent: n/a	• n/a	• Bunsen burner • The chlorides of sodium, potassium, calcium and lithium • Flame testing loop (nichrome or platinum wire) • Dilute hydrochloric acid. • Solutions containing ions of the following metals Aluminium, calcium, copper, iron (II) and iron (III) • Sodium hydroxide solution • Dropping pipettes • Test tubes	**Method Task 1- Flame tests:** Light a Bunsen burner and turn it to a blue flame. Take a wire loop, usually make from nichrome and place it into the hydrochloric acid, then into the flame. No colour should appear, and this shows your wire is clean. If it does repeat this process until the wire does not colour the flame. Dip the wire loop into one of the solids containing sodium, lithium, potassium or calcium ions. Hold this in the hottest part of the Bunsen and observe the colour of the flame. Clean the wire again in hydrochloric acid and repeat with one of the other metal ion solids. Record the colours of each. ***Outcome:*** *Lithium ions are red, Potassium ions are lilac, calcium ions are orange-red and sodium ions are yellow.* **Method Task 2- Cation Precipitates:** Take the five metal ion solutions and add 2cm depth into different test tubes. Using a dropping pipette add a few drops of sodium hydroxide solution and gently shake the test tubes from side to side. Record the colours of the precipitates formed. Two of the solutions will form a white precipitate to these add more sodium hydroxide so that the test tube is half full. Again, mix them gently and in one the precipitate with disappear to form a colourless solution. ***Outcome:*** Aluminium – white precipitate, goes colourless with excess sodium hydroxide. Calcium- white precipitate, stays white with excess sodium hydroxide. Copper- blue precipitate. Iron (II)- green precipitate. Iron (III)- brown precipitate. Precipitates are all metal hydroxides. **Method Task 3- Anion Precipitates:** **Part 1: Testing for halide ions:** Take the solutions containing halide ions and put about two centimetres of each into three different test tubes. Add a few drops of nitric acid and gently mix the solution. Add a few drops of silver nitrate and record the colours of the precipitates formed. ***Outcome:*** *Chloride – White. Bromide- Cream. Iodide- Yellow. Precipitates are silver halides.* **Part 2: Testing for sulfate ions:** Fill a test tube to about 2cm with a solution containing sulfate ions. Add a few drops of hydrochloric acid and gently mix. Add a few drops of barium chloride and mix again. Record the colour of the precipitate.	Dropping solids into the Bunsen burner will colour the flame so should be avoided. It may be difficult to see the difference between flame colours such as red-orange, red and yellow. Ensure a different dropping pipette is used for each metal ion solution to prevent contamination. Adding an acid during the halide ions tests and sulfate ion test removes carbonate ions which may form their own precipitate. Nitic acid is used in the halide ions tests as if hydrochloric acid were used this would give a false positive for chloride ions.	• Wear eye protection to protect against splashes from acids and other solutions. Barium chloride is harmful and sodium hydroxide is an irritant. • Keep naked flame away from lose items of clothing and hair. • When missing solutions be careful not to spill.

			Outcome: *Sulfates form a white precipitate of barium sulfate.* **Part 3: Testing for carbonate ions:** Fill a test tube with about 2cm of a solution containing carbonate ions. Add a few drops of hydrochloric acid record if bubbling occurs. ***Outcome:*** *Carbonates will react with acids to make carbon dioxide -these may appear as very small bubbles so look carefully.* *Students should be given unknown solutions to practise the various ions tests to identify the anion and cation.*		