Chemistry PAPER 2 DRIP SHEETS

(**D**irected **R**evision **In**vested by **P**arents)

Contents

Information

Parents and carers often ask us how they can help the students prepare for their science exams. DRIP sheets are a way to get parents involved with the revision process. The essential facts needed for the science exams can be memorised together. Similar to when you helped your child learn their spellings or timetables at primary school.

This booklet contains **all** the science facts for GCSE chemistry paper 2. There are 6 DRIP sheets in total, two for biology (paper 1 and paper 2), two for chemistry (paper 1 and paper 2) and two for physics (paper 1 and paper 2).

Content for the single science GCSE and combined sciences are included together. The grey boxes contain facts for the single sciences exam. You will not need to learn these if you are studying for combined sciences. Higher tier GCSE facts are also included. You do not need to learn these facts if you are sitting the foundation level tier.

CHEMISTRY paper 2

PARENT DRIP SHEETS

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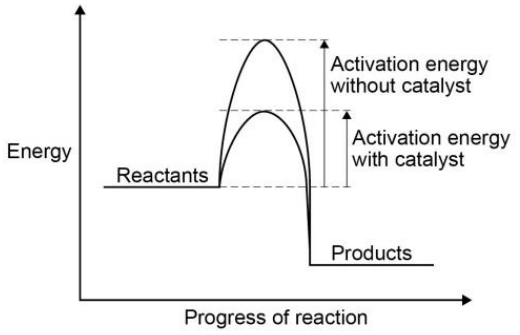
C6 (the rate and extent of chemical change PAPER 2)

DRIP QUESTIONS

Spec	QUESTION	ANSWER	TICK
Specification 4.6.1	What is the equation for working out the rate of a reaction in terms of the reactant used?	$\text{mean rate of reaction} = \frac{\text{quantity of reactant used}}{\text{time taken}}$	
	What is the equation for working out the rate of a reaction based on the product formed?	$\text{mean rate of reaction} = \frac{\text{quantity of product formed}}{\text{time taken}}$	
	How are quantities measured in chemistry?	Mass in grams or by a volume in cm^3.	
	What are the units for rate of reaction?	g/s (grams per second) or cm^3/s (centimetre cubed per second).	
	What does collision theory explain?	How various factors affect rates of reactions.	
	What is needed for a chemical reaction to occur?	Particles colliding with each other and with sufficient energy.	
	What is the activation energy?	The minimum amount of energy that particles must have to react.	
	What are the 4 main ways to increase the rate of reaction (without adding any chemicals additionally)	• Increasing the concentration of reactants in solution • Increasing the pressure of reacting gases • Increasing the surface area of solid reactants • increasing the temperature	
	How does changing the temperature increase the rate of a chemical reaction?	Increases the frequency of collisions and makes the collisions more energetic.	
	What is a catalyst?	Catalysts change the rate of chemical reactions but are not used up during the reaction.	
	How are enzymes like catalysts?	Enzymes act as catalysts in biological systems.	
	How do catalysts increase the rate of a chemical reaction?	Increase the rate of reaction by providing a different pathway for the reaction that has a lower activation energy.	
	Draw a reaction profile diagram for a reaction that has been given a catalyst	A reaction profile for a catalysed reaction can be drawn in the following form:  	
Specification 4.6.2	What are reversible reactions, how are they written down?	The products of the reaction can react to produce the original reactants $A + B \rightleftharpoons C + D$	
	What is an exothermic reaction?	A reaction where thermal energy is released into the surroundings.	
	What is an endothermic reaction?	A reaction where thermal energy is removed from the surroundings.	
	If a reaction is exothermic in one direction, what can be said about the reaction in the reverse direction?	If a reversible reaction is exothermic in one direction, it is endothermic in the opposite direction.	

	What does equilibrium mean when referring to a reversible reaction?	Forward and reverse reactions occur at exactly the same rate.	
	Higher ONLY What is the name of the principle used to predict the effects of changing the conditions on equilibrium?	Le Chatelier's Principle.	
	Higher ONLY In simple terms what is Le Chatelier's Principle?	If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change.	
	Higher ONLY What does Le Chatelier's Principles say about changing concentrations in a reaction?	If the concentration of one of the reactants or products is changed, the system is no longer at equilibrium and the concentrations of all the substances will change until equilibrium is reached again.	
	Higher ONLY What does Le Chatelier's Principles say about decreasing concentrations in a reaction?	If the concentration of a product is decreased, more reactants will act until equilibrium is reached again.	
	Higher ONLY What does Le Chatelier's Principles say about increasing the temperature in a reaction?	The relative amount of products at equilibrium increases for an endothermic reaction. The relative amount of products at equilibrium decreases for an exothermic reaction.	
	Higher ONLY What does Le Chatelier's Principles say about decreasing the temperature in a reaction?	The relative amount of products at equilibrium decreases for an endothermic reaction. The relative amount of products at equilibrium increases for an exothermic reaction.	
	Higher ONLY What does Le Chatelier's Principles say about increasing the pressure in a reaction?	An increase in pressure causes the equilibrium position to shift towards the side with the smaller number of molecules as shown by the symbol equation for that reaction.	
	Higher ONLY What does Le Chateliers Principle say about decreasing the pressure in a reaction?	A decrease in pressure causes the equilibrium position to shift towards the side with the larger number of molecules as shown by the symbol equation for that reaction.	

C7 Organic chemistry (PAPER 2)

Spec	QUESTION	ANSWER	TICK
Specification 4.7.1	Where is crude oil found?	In rocks.	
	What is crude oil?	Ancient biomass consisting mainly of plankton that was buried in mud.	
	What are the most common elements found in crude oil?	Hydrogen and carbon atoms.	
	What are the most common hydrocarbons are found in oil?	Most of the hydrocarbons in crude oil are hydrocarbons called alkanes.	
	What is the general formula for working out the number of hydrogen and carbon atoms in an alkane?	C_2H_{2n+2}	
	Name the first 4 members of the alkane family	Methane, ethane, propane and butane.	
	What is the name of the process where crude oil is separated into fractions?	Fractional distillation.	
	How does fractional distillation work?	The many hydrocarbons in crude oil may be separated into fractions, each of which contains molecules with a similar number of carbon atoms.	
	What do the fractions get used for?	Fuels and feedstock.	
	What are the names of the fractions?	Petrol, diesel oil, kerosene, heavy fuel oil and liquefied petroleum gases.	
	Name some useful chemicals produced by the petrol chemistry industry	Solvents, lubricants, polymers, detergents.	
	What do the properties of hydrocarbon compounds depend on?	The size of their molecules.	
	Name some properties of hydrocarbons that depend on the size of the molecules	Boiling point, viscosity and flammability.	
	What is released when you combust hydrocarbon fuels?	Energy.	

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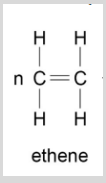
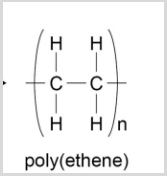
	What happens chemically to hydrogen and carbon during combustion?	Oxidation (they become oxidised).	
	What are the products of complete combustion of a hydrocarbon fuel?	Carbon dioxide and water.	
	What is the name of the process when hydrocarbons are broken down?	Cracking.	
	What are the names of the methods that achieve cracking?	Catalytic cracking and steam cracking.	
	What types of hydrocarbons are produced during cracking?	Alkanes and alkenes.	
	What is the test for alkenes?	Bromine water.	
	What are the uses of small molecules produced from cracking?	Fuels.	
	What are alkenes used to produced?	Polymers.	
Specification 4.7.2 single sciences ONLY	What makes an alkene different to an alkane?	A double carbon-carbon bond.	
	What is the general formula for alkenes?	C_nH_{2n}	
	Why are alkene molecules described as unsaturated?	They contain two fewer hydrogen atoms than the alkane with the same number of carbon atoms.	
	What are the names of the first 4 members	ethene, propene, butene and pentene.	
	What is the functional group of alkenes?	Alkenes are hydrocarbons with the functional group C=C.	
	What impact does the functional group have on a chemical	Functional groups determine how a compound reacts.	
	When alkenes react with oxygen, how do they tend to burn?	With smoky flames because of incomplete combustion.	
	How do alkenes react with hydrogen, water and the halogens in terms of bonding?	By the addition of atoms across the carbon-carbon double bond so that the double bond becomes a single carbon-carbon bond.	
	What functional group does alcohol have?	Alcohols contain the functional group –OH.	
	What are the first four members of the alcohol family?	Methanol, ethanol, propanol and butanol.	
	How can alcohols be produced?	Sugar solutions are fermented using yeast.	
	What is the functional group for carboxylic acids?	Carboxylic acids have the functional group –COOH.	
	Name the first four members of the carboxylic acid family	methanolic acid, ethanoic acid, propanoic acid and butanoic acid.	
Specification 4.7.3 single science ONLY	What are alkenes used to produce and what is the name of the process?	Polymers such as poly(ethene) and poly(propene) by addition polymerisation.	
	Explain what additional polymerisation is	Many small molecules (monomers) join together to form very large molecules (polymers).	
	Draw how ethane would be represented as a polymer  ethene	 poly(ethene)	
	The monomers that make up polymers have a certain number of atoms. How many atoms are in the repeating polymer?	The same number of atoms as the monomer.	
	When condensation polymerisation happens, what is important about the monomers used?	Condensation polymerisation involves monomers with two functional groups.	
	Why are condensation reactions given this name?	When monomers react they join together, usually losing small molecules such as water, and so the reactions are called condensation reactions.	
	How many functional groups do amino acids have?	Amino acids have two different functional groups in a molecule.	
	What do amino acids form after going condensation polymerisation reactions?	Polypeptides.	
	What do different amino combine to form?	Proteins.	
	What is DNA?	DNA (deoxyribonucleic acid) is a large molecule essential for life.	

	What does DNA do?	DNA encodes genetic instructions for the development and functioning of living organisms and viruses.	
	What are the names of the four different monomers that form polymer chains in the form of double helix in DNA?	Nucleotides.	
	Name 3 other important polymers important for life.	Proteins, starch and cellulose.	

C8 Chemical analysis (PAPER 2)

Spec	QUESTION	ANSWER	TICK
Specification 4.8.1	What is a 'pure substance'?	A single element or compound not mixed with any other substance.	
	What is the relationship between the melting points and boiling points of elements and compounds that are said to be pure?	Melting and boiling occur at specific temperatures.	
	What can melting and boiling points be used for in analysis?	To distinguish pure substances from mixtures.	
	What is a formulation?	A mixture that has been designed as a useful product.	
	How are formulations made?	By mixing the components in carefully measured quantities to ensure that the product has the required properties.	
	Name some common formulations	Fuels, cleaning agents, paints, medicines, alloys, fertilisers and foods.	
	What is chromatography used for?	Chromatography can be used to separate mixtures and can give information to help identify substances.	
	Chromatography involves 2 'phases' that we measure. What are the names of the two phases?	Stationary phase and a mobile phase.	
	What does the separation of a substance depend on during chromatography?	Separation depends on the distribution of substances between the phases.	
	What is the equation for working out R_f value?	$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$	
	What do R_f values do?	Different compounds have different Rf values which can be used to help identify the compounds in a mixture.	
	How does chromatography tell you the difference between a pure substance and a mixture?	The compounds in a mixture may separate into different spots depending on the solvent but a pure compound will produce a single spot in all solvents.	
Specification 4.8.2	What is the test for hydrogen gas?	A burning splint held at the open end of a test tube of the gas.	
	What is a positive result for hydrogen during the squeaky pop test?	Hydrogen burns rapidly with a pop sound (squeaky pop test).	
	What is the test for oxygen?	The test for oxygen uses a glowing splint inserted into a test tube of the gas.	
	What is a positive result for oxygen during the test?	The splint relights in oxygen.	
	What is the test for carbon dioxide?	Calcium hydroxide (lime water).	
	What is a positive result in the test for carbon dioxide?	Limewater turns milky (cloudy).	
	What is the test for chlorine?	Litmus paper.	
	What is the positive result for chlorine?	The litmus paper is bleached and turns white.	
single sciences only 4.8.3	What are flame tests used for?	Flame tests can be used to identify some metal ions (cations).	
	What is a positive result for lithium	Lithium compounds result in a crimson flame.	
	What is a positive result for sodium	Sodium compounds result in a yellow flame.	
	What is a positive result for potassium	Potassium compounds result in a lilac flame.	
	What is a positive result for calcium	Calcium compounds result in an orange-red flame.	
	What is a positive result for copper	Copper compounds result in a green flame.	

	If a mixture of ions is in a sample contains a mixture of ions, how might we isolate a single ion?	We mask the known ions in the sample.	
	What compound might you use to identify some metal ions (cations)?	Sodium hydroxide (cations).	
	What is the positive test for aluminium, calcium and magnesium ions using sodium hydroxide?	White precipitates.	
	Which metal ion precipitate dissolves in excess sodium hydroxide?	Aluminium hydroxide.	
	How are copper (II), iron (II) and iron (III) ions identifiable using sodium hydroxide solution?	They all form coloured precipitates.	
	What colour precipitate forms when copper (II) is tested with sodium hydroxide?	A blue precipitate.	
	What colour precipitate forms when iron (II) is tested with sodium hydroxide?	A green precipitate.	
	What colour precipitate forms when iron (III) is tested with sodium hydroxide?	A brown precipitate.	
	How might you identify a carbonate using dilute acid?	Carbonates react with dilute acids to form carbon dioxide gas. Carbon dioxide can be identified with limewater.	
	How do you identify halide ions in a solution?	Halide ions produce precipitates with silver nitrate solution in the presence of dilute nitric acid.	
	What colour precipitate forms with silver chloride solution?	Silver chloride is white.	
	What colour precipitate forms with silver bromide solution?	Silver bromide is cream.	
	What colour precipitate forms with silver iodide solution?	Silver iodide is yellow.	
	What colour precipitate forms from sulfate ions using barium chloride solution?	A white precipitate forms with barium chloride solution in the presence of dilute hydrochloric acid.	
	Why are instrumental methods of analysis preferred to chemical tests nowadays?	Instrumental methods are accurate, sensitive and rapid.	
	What is flame emission spectroscopy?	An instrumental method used to analyse metal ions in solutions.	
	How does flame emission spectroscopy work?	The sample is put into a flame and the light given out is passed through a spectroscope. The output is a line spectrum that can be analysed to identify the metal ions in the solution and measure their concentrations.	

C9 Chemistry of the atmosphere

Spec	QUESTION	ANSWER	TICK
Specification 4.9.1	What proportions of the atmosphere are nitrogen, oxygen and other gases?	79% Nitrogen 20% Oxygen 1% Carbon dioxide, water vapour and noble gases.	
	Why are scientists are not always confident about the composition of the atmosphere from millions of years ago compared with now?	Theories about what was in the Earth's early atmosphere and how the atmosphere was formed have changed and developed over time.	
	What sort of time scale covers the development of our atmosphere?	4.6 billion years.	
	How do scientists describe the atmosphere in the first billion years?	There was intense volcanic activity that released gases that formed the early atmosphere and water vapour that condensed to form the oceans.	
	What planets do scientists often compare the Earths early atmosphere too?	Mars and Venus today, consisting of mainly carbon dioxide with little or no oxygen gas.	
	What gases did the volcanoes release into the atmosphere in the first 1 billion years?	Volcanoes produced nitrogen which gradually built up in the atmosphere and there may have been small proportions of methane and ammonia.	
	What did the presence of oceans do to the early atmosphere?	When the oceans formed carbon dioxide dissolved in the water.	
	What formed from the carbon dioxide dissolved into the water?	Sediment.	

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	Where did the oxygen come from that is now in our atmosphere?	Algae and plants (through photosynthesis).	
	What is the chemical formula that describes how oxygen was produced (the photosynthesis formulae)?	$6CO_2 + 6H_2O \xrightarrow{\text{light}} C_6H_{12}O_6 + 6O_2$ carbon dioxide + water → glucose + oxygen	
	When did algae first produce oxygen?	2.7 billion years ago.	
	What happen for the next billion years after algae first appeared?	Plants evolved and the percentage of oxygen gradually increased to a level that enabled animals to evolve.	
	What other process led to the decrease of carbon dioxide in the atmosphere?	The formation of sedimentary rocks and fossil fuels that contain carbon.	
Specification 4.9.2	Why were greenhouse gases initially useful for life on Earth?	Greenhouse gases in the atmosphere maintain temperatures on Earth high enough to support life	
	Name 3 greenhouse gases	Water vapour, carbon dioxide and methane.	
	Which two greenhouse gases are human activities primarily linked to?	Carbon dioxide and methane.	
	What do scientists think (through peer review) will happen to the atmosphere in the future?	The temperature of the Earth's atmosphere to increase at the surface and that this will result in global climate change.	
	Why can't scientists be 100% sure global temperatures will rise due to human activity?	It is difficult to model such complex systems as global climate change.	
	Why must people be careful when discussing global warming?	Speculation and opinions presented in the media that may be based on only parts of the evidence and which may be biased.	
	What do we think an increase in global temperature might lead to?	Climate change.	
	What is a carbon footprint?	The total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event.	
	What will decrease a carbon foot print?	Reducing emissions of carbon dioxide and methane.	
	What is a major source of atmospheric pollutants?	The combustion of fuels is a major source of atmospheric pollutants.	
	What compounds in fuels maybe negative on the environment?	Carbon, hydrogen and sulfur.	
	What gases are released into the air when a fuel is burnt?	Carbon dioxide, water vapour, carbon monoxide, sulphur dioxide and oxides of nitrogen.	
	What are particulates?	Solid particles and unburned hydrocarbons that enter the atmosphere.	
	Why is carbon monoxide bad for our atmosphere?	Carbon monoxide is a toxic gas.	
	Why is carbon monoxide so difficult to detect?	It is colourless and odourless.	
	Why is sulfur dioxide and oxides of nitrogen particularly negative?	They compounds cause respiratory problems in humans and cause acid rain.	
	What do particulates do to the environment?	Global dimming and health problems for humans.	

C10 Using resources (paper 2)

Spec	QUESTION	ANSWER	TICK
Specification 4.10.1	What are the main things humans use the Earth's resources for?	Warmth, shelter, food and transport	
	Name some uses of the Earths naturally found resources (not altered).	Food, timber, clothing and fuels	
	What are the Earths 'finite' resources used for?	Finite resources from the Earth, oceans and atmosphere are processed to provide energy and materials	
	What compound is essential for life?	Water of appropriate quality	
	What should be in low levels in water suitable for humans to drink?	Low levels of dissolved salts and microbes	
	What is the name given to water that is safe to drink?	Water that is safe to drink is called potable water	
	Why is potable water not pure?	It contains dissolved substances	
	What impacts the methods used to produce potable water?	Supplies of water and local conditions	

	How is potable water produced?	• choosing an appropriate source of fresh water • passing the water through filter beds • sterilising	
	Name some sterilising agents used for potable water.	Sterilising agents used for potable water include chlorine, ozone or ultraviolet light.	
	If fresh water is limited, what is the next best option?	Desalination of salty water or sea water.	
	How is desalination done?	Distillation or by processes that use membranes such as reverse osmosis.	
	What is the negative impact of desalination?	These processes require large amounts of energy	
	What produces large amounts of waste water that requires treatment before being released into the environment?	Urban lifestyles and industrial processes	
	What needs to be removed from sewage and agricultural waste water?	Organic matter and harmful microbes.	
	List the stages of sewage treatment	• screening and grit removal • sedimentation to produce sewage sludge and effluent • anaerobic digestion of sewage sludge • aerobic biological treatment of effluent.	
	Why are metal ores from rock precious?	Metal ores are limited.	
	Name two methods of removing copper from low grade ore	Phytomining, and bioleaching.	
	Why do Phytomining and bioleaching avoid?	Digging, moving and disposing of large amounts of rock.	
	Describe Phytomining.	Phytomining uses plants to absorb metal compounds. The plants are harvested and then burned to produce ash that contains metal compounds.	
	Describe bioleaching.	Bioleaching uses bacteria to produce leachate solutions that contain metal compounds.	
	How is copper obtained from solutions of copper compounds?	Displacement using scrap iron or by electrolysis.	
Specification 4.10.2	Why are life cycle assessments carried out (LCAs)?	To assess the environmental impact of products.	
	Name 4 things that are looked at during LCAs.	• Extracting and processing raw materials • Manufacturing and packaging • Use and operation during its lifetime • Disposal at the end of its useful life, including transport and distribution at each stage.	
	What are the benefits to LCAs?	Use of water, resources, energy sources and production of some wastes can be fairly easily quantified.	
	What are the draw backs to LCAs?	Allocating numerical values to pollutant effects is less straightforward and requires value judgements, so LCA is not a purely objective process.	
	What are the issues with selective or abbreviated LCAs?	These can be misused to reach pre-determined conclusions, eg in support of claims for advertising purposes.	
	What are the benefits of reduction, reuse or recycling?	Reduces the use of limited resources, use of energy sources, waste and environmental impacts.	
	Name some things produced from limited materials	Metals, glass, building materials, clay ceramics and most plastics.	
	What are the impacts of obtaining raw materials through quarrying or mining?	Causes environmental impacts.	
	How is glass recycled?	Glass bottles can be crushed and melted to make different glass products.	
	How are metals recycled?	Melting and recasting or reforming into different products.	
	What factors affect the amount of separation required for recycling?	The material and the properties required of the final product.	
	How can scrap steel be used to reduce the amount of iron needed to be extracted from its ore?	Some scrap steel can be added to iron from a blast furnace.	
Si n	What is corrosion?	Corrosion is the destruction of materials by chemical reactions with substances in the environment	

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	Give an example of corrosion	Rusting.	
	What two things are necessary for iron to rust?	Both air and water are necessary for iron to rust.	
	How can corrosion be prevented?	Applying a coating that acts as a barrier, such as greasing, painting or electroplating.	
	What has aluminium got that prevents it from corrosion?	An oxide coating that protects the metal (from further corrosion).	
	Why are some coatings reactive to prevent corrosion?	To provide sacrificial protection, eg zinc is used to galvanise iron.	
	What types of metals are used in everyday life?	Alloys.	
	What is bronze an alloy of?	Bronze is an alloy of copper and tin.	
	What is brass an alloy of?	Brass is an alloy of copper and zinc.	
	What is gold (used for in jewellery) alloyed with?	Silver, copper and zinc.	
	What is the proportion of gold in alloys measured in?	Carats.	
	How many carats is 100% gold?	24 carat.	
	How many carats is 75% gold?	18 carat.	
	What is in steel alloy?	Iron, carbon and other metals.	
	How would you describe the properties of high carbon steel?	High carbon steel is strong but brittle.	
	How would you describe the properties of low carbon steel?	Low carbon steel is softer and more easily shaped.	
	If steel contains chromium and nickel, how are the properties altered?	They are hard and resistant to corrosion.	
	Name a property of aluminium alloys	Low density.	
	How is soda lime glass made?	Heating a mixture of sand, sodium carbonate and limestone.	
	What is borosilicate glass made from?	Sand and boron trioxide.	
	How is borosilicate glass different to limestone glass?	Melts at higher temperatures than soda-lime glass.	
	Name some uses of clay ceramics	Pottery and bricks.	
	How are clay ceramics made?	By shaping wet clay and then heating in a furnace.	
	What do the properties of polymers depend on?	What monomers they are made from and the conditions under which they are made.	
	What is a thermsoftening polymer?	Thermosoftening polymers melt when they are heated.	
	What is a thermosetting polymer?	Thermosetting polymers do not melt when they are heated.	
	What are most composite made of?	Most composites are made of two materials, a matrix or binder surrounding and binding together fibres or fragments of the other material.	
	What is the name given to binders surrounding composites or fibres in the composite?	Reinforcement.	
Single sciences ONLY specification 4.10.4	What is the Haber process used for?	To manufacture ammonia.	
	What is ammonia used for?	To produce nitrogen-based fertilisers.	
	What are the raw materials for the Haber process?	Nitrogen and hydrogen.	
	What are the conditions for the Haber process?	The purified gases are passed over a catalyst of iron at a high temperature (about 450°C) and a high pressure (about 200 atmospheres).	
	How does ammonia form in the Haber process?	Some of the hydrogen and nitrogen reacts to form ammonia.	
	The Haber process is reversible. What does this mean?	Some of the ammonia produced breaks down back into nitrogen and hydrogen.	
	Write down the equation for the Haber process	$nitrogen + hydrogen \rightleftharpoons ammonia$	
	What happens during the Haber process when the ammonia is cooled down?	The ammonia liquefies and is removed. The remaining hydrogen and nitrogen are recycled.	
	Which compounds are used as fertilisers to improve agricultural productivity?	Compounds of nitrogen, phosphorus and potassium.	
	What do NPK fertilisers contain?	Nitrogen, phosphorous and potassium.	
	What can Ammonia be used to manufacture?	Ammonium salts and nitric acid.	
	How are potassium chloride, potassium sulphate and phosphate rocks obtained?	By mining.	

	Phosphate rock cannot be used as a fertiliser. How is phosphate rock treated so it can be used as a fertiliser?	Phosphate rock is treated with nitric acid or sulfuric acid to produce soluble salts that can be used as fertilisers.	