Chemistry paper one (foundation tier)
Knowledge organiser:

Learn each of the quiz questions and answers off by heart. This could be done by:

- Turning them into flash cards and testing yourself
- Using 'look, cover, write, check'
- Asking a friend or family member to quiz you

	Paper:	**C1**
	Topic:	**The Three States (C.1)**
1	In which state do atoms have strong bonds between them?	Solid
2	Describe motion of particles in a solid, liquid and gas	S = Vibrating, L = Sliding, G = quick & random
3	In which state can diffusion NOT happen?	Solid
4	In which states, can particles not be compressed?	Solid & liquid
5	Which state is the least dense?	Gas
6	Which state is the densest?	Solid
7	In which state are there weaker forces between particles?	Gases
8	In which state do particles remain in a fixed position?	Solid
9	What is the name for the change of state when a solid change to a liquid?	Melted
10	What is the name for the change of state when a liquid changes to a gas?	Evaporation
11	What is the name for the change of state when a gas changes to a liquid?	Condensation
12	What is the name for the change of state when a liquid changes to a solid?	Freezing/solidifying
13	What is the name for the temperature where a liquid turns into a gas?	Boiling point
14	What is the name for the temperature where a solid turns into a liquid?	Melting point
15	Why is there no overall temperature change when a substance is changing state?	The particles are absorbing thermal energy to overcome the forces between them. The particles are absorbing thermal energy to overcome the forces between them. Particles are absorbing the thermal energy to overcome the forces between them.
	Topic:	**Elements, compounds (C.2)**
1	What is the name for substances made of only ONE type of atom?	Elements
2	What is the name for substances made of two or more types of atoms NOT chemically bonded together?	Mixtures
3	What is the name for substances made of two or more types of atoms chemically BONDED together?	Compounds
4	What is the formula for water?	H_2O
5	What is the formula for Methane?	CH_4
6	Define "alloy"	A mixture of a metal and at least one other element
7	Why are alloys harder than pure metals?	Different sized atoms distort the regular rows so that the layers can't slide over each other
8	What is the word for an element that always exists as two atoms bonded together?	Diatomic
9	Is an alloy an element, compound or mixture?	Mixture
10	What is the formula for glucose?	$C_6H_{12}O_6$
11	Which elements exist diatomically?	N_2, H_2, O_2 and all of group 7
12	How many electrons can be held in the first shell and then second and third shell of an atom?	First shell is TWO, all other shells EIGHT
13	What is the different between Ar (relative atomic mass) and Mr (relative molecular mass)	Ar = for an element Mr = for a compound
14	Define "ion"?	An electrically charged atom that has gained or lost electrons

15	How do you calculate Ar of an element	It is it's mass number
	Topic:	**Mixtures (C.3)**
1	Define "pure" substance	A single element or compound
2	What temperature is the melting point of water?	$0^{o}C$
3	What temperature is the boiling point of water?	$100^{o}C$
4	Define "formulation"	A mixture designed as a useful product
5	Give three examples of a formulation	Fuel, paint, alloys
6	Define "soluble"	Can dissolve
7	Define "insoluble"	Cannot dissolve
8	Define "solute"	A solid which can dissolve
9	Define "solvent"	A liquid in which a solid will dissolve
10	Define "solution"	A mixture of a dissolved solute and solvent
11	What is filtration used to separate?	An insoluble solid and a liquid
12	What is crystallisation used to separate?	A soluble solid and a solvent (collect solid)
13	What is simple distillation used to separate?	A soluble solid and a solvent (collect liquid)
14	What is fractional distillation used to separate?	Liquids with different boiling points
15	What is chromatography used to separate?	Different colours of ink or dye
	Topic:	**Chromatography (C.4)**
1	What are the two "phases" in chromatography?	Mobile and stationary phase
2	What is the "mobile phase" in chromatography	The solvent (that travels up the paper)
3	What is the "stationary phase" in chromatography	The paper
4	Why should the start line be drawn in pencil?	Because pencil will not dissolve and affect the results.
5	Why should the start line sit above the solvent?	So that the dots of ink or dye do not wash off the paper
6	Why do the dots of ink or dye need to be the same size?	To make it a fair test
7	How is the Rf value calculated?	Rf = distance by dye / distance by solvent
8	What does a high Rf value tell us?	The substance is more soluble and travelled further
9	What does a low Rf value tell us?	The substance is less soluble and travelled less distance
10	What should the Rf value always be?	A number between 0 - 1
11	What solvents are used in chromatography?	Water, alcohol, acetone
12	Where should the distance moved by the dye be measured from?	The same place each time (top, bottom or middle)
13	What is chromatography used for?	To separate different coloured compounds (dyes or inks)
14	How will temperature affect the rate of chromatography?	The higher the temperature, the faster the rate
15	How can chromatography be used to identify an unknown substance?	Compare with a known substance
	Topic:	**Structure of an atom (C.5)**
1	What is the charge, relative size and location of a proton?	Charge: 1+, Size = 1, Location = Nucleus
2	What is the charge, relative size and location of a neutron?	Charge: 0, Size = 1, Location = Nucleus
3	What is the charge, relative size and location of an electron?	Charge: -1, Size = 1/2000, Location = Shells
4	What is the radius of an atom?	0.1 nm (1×10^{-10}m)
5	What is the radius of a nucleus?	1×10^{-14}m
6	Define "atomic number"	No. of protons in an atom
7	Define "atomic mass number"	Sum of protons and neutrons in an atom
8	Define isotope?	Atoms of the same element that have the same number of protons but different numbers of neutrons
9	What was the Dalton model of the atom?	Atoms = tiny spheres
10	Describe Thompson's 'Plum Pudding' model of an atom.	Ball of positive charge with electrons embedded throughout
11	Describe Rutherford's model of the atom	Dense, positive mass in the centre (the nucleus)
12	Describe the Neil's Bohr model of the atom	Positive nucleus orbited by negative electrons
13	Describe Chadwick's 'Nuclear Model' of an atom	Neutrons & protons in a +ve nucleus, -ve electrons in shells
14	What is the name for the current model of the atom?	Nuclear model

15	What 3 things did the alpha scattering experiment prove?	1) Nucleus = positive (deflected & reflected +ve α particles) 2) Nucleus = dense mass in centre of atom, 3) Rest = empty space

	Topic:	**The periodic table (C.6)**
1	How are elements arranged in the periodic table?	In order of atomic number (lowest to highest)
2	What does the column (group) in the periodic table tells us?	Number of electrons in the outer shell
3	What are the rows of the periodic table called?	Periods
4	What did Mendeleev do when creating the modern periodic table?	Left gaps to make the pattern fit
5	Where are alkali metals found in the periodic table?	Group 1
6	Where are non-metals found in the periodic table?	Right
7	Name the groups in the periodic table (1, 7, 0)	1 = Alkali metals, 7 = Halogens, 0 = Noble gases
8	State 3 properties of group 7	Non-metal, highly reactive, diatomic
9	What happens to reactivity as you move down group 7?	They become less reactive - it is harder to gain an electron
10	What is the name of the elements found in the middle of the periodic table that are not part of a group?	Transition metals
11	Give 4 properties of metals	1) High melting point, 2) Good thermal and electrical conductors, 3) Ductile, 4) Malleable
12	Give 3 properties of non-metals	1) Low melting point, 2) Poor thermal and electrical conductors, 3) Brittle
13	Give 5 properties of the alkali metals	1) Highly reactive, 2) Low melting and boiling points, 3) Low density, 4) Shiny when cut, 5) Soft
14	What is formed when alkali metals react with water?	Alkaline metal hydroxide
15	What happens to reactivity as you move down group 1?	They become more reactive - it is easier to lose their outer electron.

	Topic:	**Types of bonding (C.7)**
1	Which type of bonding occurs between metals and non-metals?	Ionic
2	Which type of bonding occurs between non-metals?	Covalent
3	Which type of bonding occurs between metals?	Metallic
4	When electrons leave the shells of an atom, they are said to be ……?	Delocalised
5	Which type of ions are formed by metals?	Positive ions
6	Which type of ions are formed by non-metals?	Negative ions
7	What is graphene?	A single layer of graphite
8	What is a fullerene?	Hollow carbon structures
9	What is Buckminster Fullerene?	Spherical carbon shape with 60 carbon atoms
10	What is an allotrope?	Two or more different physical arrangements of the same atom e.g. diamond, graphite, graphene
11	What is a carbon nanotube?	A cylindrical fullerene with a very high length to diameter ratio
12	Describe what happens in ionic bonding	Electrons are transferred from a metal atom to a non-metal atom = strong electrostatic attraction between oppositely charged ions
13	Describe what happens in covalent bonding	Electrons are shared between atoms = strong electrostatic attraction between electrons and nucleus
14	Describe what happens in metallic bonding	Electrons become delocalised creating a sea of negative charge = strong electrostatic attraction with positive metal ions & sea of delocalised electrons
15	Why do noble gases not form compounds?	Because they already have a full outer shell of electrons

	Topic:	**Properties of materials (C.8)**
1	State two properties of simple covalent molecules	1) Low melting & boiling point, 2) Poor conductor of thermal & electrical energy
2	State three properties of diamond	1) Hard, 2) Poor electrical conductor, 3) Good thermal conductor
3	State two properties of graphite	1) Soft & slippery, 2) Conducts electricity
4	State two properties of silicon dioxide	1) Hard, 2) Doesn't conduct electricity

5	Why do metals and graphite conduct electricity?	Delocalised electrons can move through structure carrying electrical charge
6	Why do ionic compounds, metallic compounds and giant covalent compounds have high melting and boiling points?	Strong INTRAmolecular bonds/forces = difficult to move apart
7	Why do simple compounds have low melting and boiling points?	Weak INTERmolecular bonds/forces = easy to move apart
8	Why do ionic compounds conduct electricity when molten/aqueous?	Ions are free to move carrying charge
9	Name the structure that ionic bonding forms	Giant ionic lattice
10	State three examples of giant covalent structures	Diamond, graphite, silicon dioxide
11	Name the two types of structure that can be formed from covalent bonding	Simple covalent molecules, giant covalent structures
12	How are unreactive metals (e.g. gold) removed from their ore?	They are native (unreactive so don't form an ore)
13	How are metals LESS reactive than carbon removed from their ore?	They are reduced (reacted with) by carbon
14	How are metals MORE reactive than carbon removed from their ore?	Electrolysis
	Topic:	**Describing chemical reactions, reactions of metals and gas tests (C.9)**
1	metal + oxygen ->	metal oxide
2	metal + water ->	metal hydroxide + hydrogen gas
3	metal + acid ->	metal salt + hydrogen gas
4	Define oxidation (in terms of oxygen)	Addition of oxygen to an element
5	Define reduction (in terms of oxygen)	Removal of oxygen from a compound
6	What is the law of conservation of mass?	No atoms are lost or made during a reaction (mass of reactants = mass of products)
7	acid + alkali (or base) ->	salt + water
8	If sulphuric acid reacts with a metal, what will the salt end in?	______ sulphate
9	If nitric acid reacts with a metal, what will the salt end in?	________ nitrate
10	metal carbonate + acid ->	metal salt + water + carbon dioxide
11	If hydrochloric acid reacts with a metal, what will the salt end in?	_______ chloride
12	What is the test for hydrogen gas?	A burning splint will make a squeaky pop
13	What is the test for carbon dioxide gas?	Limewater will turn cloudy
14	What is the test for oxygen gas?	A glowing splint will relight
15	What is the test for chlorine gas?	Damp litmus paper will be bleached and turned white
	Topic:	**Acids and Alkalis (C.10)**
1	Which ions make a solution alkaline?	OH^- (hydroxide)
2	Which ions make a solution acidic?	H^+
3	Give 3 ways to measure the pH of a substance	Litmus paper, universal indicator, pH probe
4	What pH and colour is universal indicator in a strongly ACIDIC solution?	pH 1 - 3 (red)
5	What pH and colour is universal indicator in a strongly ALKALINE solution?	pH10-14 (purple)
6	What pH and colour is universal indicator in a weak ACID?	pH 4-6 (orange/yellow)
7	What pH and colour is universal indicator in a weak ALKALI?	pH8-9 (blue)
8	What colour is methyl orange in acid and alkali?	Red (acid), orange (alkali)
9	What colour is phenolphthalein in acids and alkali?	Colourless (acid), pink (alkali)
10	What is the difference between the solubility of alkalis and bases?	Alkalis are soluble and bases are insoluble
	Topic:	**Electrolysis (C.12)**
1	Define 'electrolysis'	A substance is decomposed (broken down) using electricity
2	Why can electrolysis only occur if an ionic substance is molten or aqueous?	The ions are free to move
3	What is the name of the negative and positive electrode?	Negative: Cathode Positive: Anode
4	Which ions are attracted to the anode and which to the cathode?	Anode = negative Cathode = positive

5	Define "electrolyte"	Ions in a solution that are free to move and can conduct electricity
6	What happens when ions get to an electrode?	Gain or lose electrons becoming neutral atoms again
7	What happens at the anode?	Electrons transferred from the ion to the anode and the non-metal forms
8	What happens at the cathode?	Electrons transferred from the cathode to the ion and a metal is formed
9	When is hydrogen formed from an aqueous solution?	If the metal is MORE reactive than hydrogen
10	When is a metal (not hydrogen) formed from an aqueous solution?	If the metal is LESS reactive than hydrogen
11	State one use of electrolysis	Extracting a reactive metal from its ore
12	Which useful product could be removed from the solution left after electrolysis of dilute sodium chloride solution?	Sodium hydroxide (bleach)
13	What would be formed at the anode in electrolysis of dilute sodium chloride solution?	Chlorine gas
14	What would be formed at the cathode in electrolysis of dilute sodium chloride solution?	Hydrogen
15	When will oxygen be produced at the anode?	When the solution does NOT contain HALIDE ions. Otherwise the halogen is produced.

	Topic:	**Electrolysis & Half equations (HT mainly) (C.13)**
1	What is an advantage of using a pH probe rather than universal indicator?	pH probe is more precise
2	Recall the reactivity series of metals from most reactive to least reactive	Potassium, sodium, lithium, calcium, magnesium, aluminium, (carbon), zinc, iron, tin, lead, (hydrogen), copper, silver, gold, platinum
3	What is a displacement reaction	More reactive metal displaces less reactive metal from compound
4	What are the 4 state symbols?	(aq) (s) (l) (g)
5	Give one disadvantage of using electrolysis to extract a metal from its ore	Uses lots of energy so expensive

	Topic:	**Endothermic and exothermic reactions (C.14)**
1	Which type of reaction releases energy into the surroundings?	Exothermic
2	Which type of reaction absorbs energy from the surroundings?	Endothermic
3	In an exothermic reaction, what has more energy in it? The products or the reactants?	Reactants
4	In an endothermic reaction, what has more energy in it? The products or the reactants?	Products
5	Define "activation energy"	Minimum amount of energy that particles must collide with to react
6	What would happen to the temperature of the surroundings in an exothermic reaction?	Increase
7	What would happen to the temperature of the surroundings in an endothermic reaction?	Decrease
8	Give three examples of endothermic reactions	Thermal decomposition reactions Citric acid + sodium hydrogen carbonate Sports injury packs
9	Give two examples of exothermic reactions	Self-heating cans Hand warmers
10	What is the other name for an energy level diagram?	Reaction profile
11	What is the substance called that reduces the activation energy required by a reaction?	Catalyst
12	Do Exothermic or endothermic reactions require a bigger activation energy?	Endothermic
13	What is the unit for temperature?	Degrees Celsius

	Topic:	**Chemical calculations, volumes and concentrations (C.19)**
1	State the 'law of conservation of mass'	No atoms are lost or made during a chemical reaction
2	The sum of the Mr of the reactants must equal	The sum of the Mr of the products

3	State one example of when a reaction may APPEAR to lose mass	When a gas is produced and escapes
4	When a symbol equation is balanced, what is shown by the large numbers in front of a formula e.g. 2HCl?	The ratio of moles of each substance
5	What is the volume of 1 mole of any gas at room temperature and pressure?	$24dm^3$