

Year 9 Term 2 Knowledge Organiser



Science Knowledge Organiser

	<b>Topic:</b>	<b>Types of bonding (C.7)</b>
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
	<b>Topic:</b>	<b>Describing chemical reactions, reactions of metals and gas tests (C.9)</b>
1	metal + oxygen ->	metal oxide
2	metal + water ->	metal hydroxide + hydrogen gas
3	metal + acid ->	metal salt + hydrogen gas

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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

	<b>Term:</b>	<b>Au2</b>
	<b>Topic:</b>	<b>Properties of materials (C.8)</b>
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

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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
15	What is reduction & oxidation (in terms of electrons)? (HT only)	Oxidation = Is Loss of electrons, Reduction = Is Gain electrons, (OIL RIG)
	<b>Topic:</b>	<b>Acids and Alkalis (C.10)</b>
1	Which ions make a solution alkaline?	OH <sup>-</sup> (hydroxide)
2	Which ions make a solution acidic?	H <sup>+</sup>
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 an strongly ACIDIC solution?	pH 1 - 3 (red)
5	What pH and colour is universal indicator in an 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
11	What is the definition of a) strong acid and b) weak acid?	a) Strong acid completely ionises (breaks down into its ions) in water, b) Weak acid partially ionises in water
12	Give 3 examples of a strong acid (H only)	Hydrochloric acid, sulphuric acid, nitric acid
13	List the steps in making a soluble salt	1) Add solid to heated acid until no more reacts (in excess), 2) Filter excess solid, 3) Leave for 24hrs for water to evaporate (crystallisation), 4) Dab dry
14	State three examples of weak acids (H only)	Ethanoic acid, citric acid and carbonic acid
15	What does a decrease in pH by one unit mean? (HT only)	The hydrogen ion concentration increases by a factor of 10
	<b>Topic:</b>	<b>Electrolysis (C.12)</b>
1	Define 'electrolysis'	A substance is decomposed (broken down) using electricity

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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 it's 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.

	<b>Topic:</b>	<b>Electrolysis &amp; Half equations (HT mainly) (C.13)</b>
1	Write an ionic half equation for the reaction of the cathode in electrolysis of dilute sodium chloride solution (HT only)	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
2	Write an ionic half equation for the reaction of the anode in electrolysis of dilute sodium chloride solution (HT only)	$2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
3	What would be produced at the anode in electrolysis of molten aluminium oxide? (HT only)	Oxygen
4	What would be produced at the cathode in electrolysis of molten aluminium oxide? (HT only)	Aluminium
5	Write an ionic half equation for the reaction at the anode in electrolysis of molten aluminium oxide (HT only)	$2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$

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6	Write an ionic half equation for the reaction at the cathode in electrolysis of molten aluminium oxide (HT only)	$Al^{3+} + 3e^{-} \rightarrow Al$
7	What is an advantage of using a pH probe rather than universal indicator?	pH probe is more precise
8	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
9	What is a displacement reaction	More reactive metal displaces less reactive metal from compound
10	What are the 4 state symbols?	(aq) (s) (l) (g)
11	Give one disadvantage of using electrolysis to extract a metal from its ore	Uses lots of energy so expensive

	<b>Topic:</b>	<b>RP: Making salts (C1) (C.35)</b>
1	What is the aim of the experiment?	Prepare a pure, dry sample of a soluble salt from an insoluble salt.
2	Which acid should be used?	Metal nitrate = dilute nitric acid Metal sulfate = dilute sulfuric acid Metal chloride = dilute hydrochloric acid
3	Which metal compound should be used?	Metal oxide powder
4	Step 1:	Gently heat the dilute acid
5	Step 2:	Use a spatula to add excess metal oxide powder
6	Step 3:	Stir until all the metal oxide stops reacting and some is left in the bottom of the beaker
7	Step 4:	Filter the excess metal oxide powder
8	Step 5:	Gently heat the solution in an evaporating basin over a water bath
9	Step 6:	When crystals start to form, leave the evaporating basin for 24 hours in a warm place
10	Step 7:	Pat the crystals dry
11	Why is excess metal oxide used?	To ensure all of the acid and metal oxide have reacted
12	Why is the solution filtered?	To remove any excess metal oxide
13	Name two risks and precautions	1) Take caution when heating the dilute acid as this may spill and burn 2) Wear safety goggles as the solution may spit when evaporating 3) The crystals are toxic so should not be touched
14	Name the change in state taking place	Water is evaporating (from liquid to gas)

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15	What are possible variations in this method?	Explain how to prepare an insoluble salt from a soluble salt - (react two soluble salts and a precipitate will form, filter, wash with water, then dry in an oven).
	<b>Topic:</b>	<b>RP: Electrolysis (C3) (C.37)</b>
1	What is the aim of the experiment?	Identify the products formed during electrolysis of an aqueous solution.
2	Step 1:	Pour the aqueous solution of copper chloride into a small beaker
3	Step 2:	Place two electrodes into the beaker and ensure they do not touch
4	Step 3:	Connect the electrodes to the + and - terminals of the power pack and turn on at 4V
5	Step 4:	Check for bubbles of gas at each electrode and record observations
6	Step 5:	Hold blue litmus paper to each electrode and record observations
7	What should be observed at the anode (+) for CuCl <sub>2</sub> ?	Bubbles of green chlorine gas (Cl <sub>2</sub> ) are produced
8	What should be observed at the cathode (-) for CuCl <sub>2</sub> ?	Formation of copper around the electrode
9	Step 6:	Repeat steps 1 - 5 for aqueous sodium chloride solution
10	What should be observed at the cathode (-) for NaCl?	Bubbles of hydrogen gas are produced
11	What should be observed at the anode (+) for NaCl?	Bubbles of green chlorine gas (Cl <sub>2</sub> ) is produced
12	How can you test for chlorine gas?	Chlorine will bleach the litmus paper
13	How could you test for hydrogen gas?	Collect the gas in a test tube and it will burn with a squeaky pop
14	Why is hydrogen produced at the cathode rather than sodium?	The metal is more reactive than hydrogen
15	What are possible variations in this method?	1) Investigate the products formed during electrolysis of aqueous copper sulphate.  2) Describe how you would carry out electrolysis of molten zinc chloride