

C4 (Higher) Key Questions that will help you get the level you deserve
Learn these! Try each one. Ones you don't know try again and again
Fold over 'The Answers' column and reveal having attempted the questions

1.	Recall the formula of sodium chloride		NaCl
2.	Recall the formula of potassium chloride		KCl
3.	Recall the formula of chlorine		Cl ₂
4.	Recall the formula of bromine		Br ₂
5.	Recall the formula of iodine		I ₂
6.	Recall the formula of water		H ₂ O
7.	Recall the formula of carbon dioxide		CO ₂
8.	Recall the formula of hydrogen		H ₂
9.	Recall the formula of sodium oxide		Na ₂ O
10.	Recall the formula of magnesium oxide		MgO ₂
11.	Recall the formula of zinc oxide		ZnO
12.	Recall the formula of copper (II) oxide		CuO
13.	Recall the formula of iron (II) oxide		FeO
14.	Recall the formula of manganese oxide		MnO ₂
15.	Recall the formula of magnesium chloride		MgCl ₂
16.	Recall the formula of barium chloride		BaCl ₂
17.	Recall the formula of copper(II) carbonate		CuCO ₃
18.	Recall the formula of iron(II) carbonate		FeCO ₃
19.	Recall the formula of zinc carbonate		ZnCO ₃
20.	Recall the formula of manganese carbonate		MnCO ₃
21.	Recall the formula of sodium hydroxide		NaOH
22.	Recall the formula of potassium hydroxide		KOH
23.	Recall the formula of lithium hydroxide		LiOH
24.	Recall the formula of copper (II) hydroxide		Cu(OH) ₂
25.	Recall the formula of iron (II) hydroxide		Fe(OH) ₂
26.	Recall the formula of iron (III) hydroxide		Fe(OH) ₃
27.	Recall the formula of silver nitrate		AgNO ₃
Atomic Structure			
28.	What makes up an atom?		A positively charged nucleus surrounded by negatively charged electrons.
29.	What is the overall charge of an atom?		Neutral
30.	Where is the atomic number of an element on the periodic table?		The lowest number (bottom) is the number of protons.
31.	What is the mass number?		The total number of protons and neutrons in an atom
32.	How can you tell whether something is an element or a compound from its formula?		Element = only one capital letter Compound = two or more capital letters
33.	What are the maximum number of electrons that can fill each shell?		2, 8, 8, 8.
34.	Which number in the periodic table tells you how many electrons an element has?		The bottom number
35.	What did J.J Thomson discover about atoms?		Discovery of the electron
36.	What did Rutherford determine about atoms?		Nuclear atom
37.	What did Bohr determine about atoms?		Electron orbits
38.	What is an ion?		A charged atom or group of atoms
39.	Compare the electrical conductivity of sodium chloride in solid, molten liquid and solution		As a solid doesn't conduct electricity because ions are not free to move. Molten or in solution and it does conduct electricity
40.	Compare the melting points of sodium chloride and magnesium oxide		Magnesium oxide has an even higher melting point than sodium chloride (which is high). Therefore there are more, stronger bonds.

41.	What are the relative charges and mass of sub-atomic particles?		Electron = charge -1 and mass zero Proton = charge + 1 and mass 1 Neutron = charge 0 and mass 1
42.	Recall the radius of an atom and mass		Radius = 10^{-10}m Mass = 10^{-23}g
43.	What are isotopes?		Varieties of an element that have the same atomic number but different mass numbers
44.	What did Geiger and Marsden's experiment help to do?		Led to the theory of a nuclear atom.
Ionic Bonding			
45.	Explain, in terms of structure and bonding, some of the physical properties of sodium chloride		High melting points Electrical conductivity of solid, molten liquid and solution
46.	Explain, in terms of structure and bonding, why the melting point of sodium chloride is lower than that of magnesium oxide		Magnesium oxide has an even higher melting point than sodium chloride (which is high). This is because there are a greater number of charges (Mg^{2+}) (O^{2-}) compared to sodium chloride (Na^+) (Cl^-).
47.	Recall what the two types of bonding are and how they can be instantly identified		Ionic bonding = between metals and non-metals Covalent bonding = between non-metals
48.	How would you describe a group of elements?		A vertical column of the periodic table Elements have similar chemical properties
49.	How would you describe a period of elements?		A horizontal row of the periodic table
50.	Describe the main stages in the development of the classification of elements.		Dobereiner Newlands Mendeleev
51.	Explain, in terms of structure and bonding, some of the physical properties of carbon dioxide and water		Low melting points Do not conduct electricity
52.	What do the group number of period additionally tell us about electrons in the elements?		Period = the number corresponds to the number of occupied shells in the electronic structure Group = the number of electrons in the outer shell
53.	Describe the evidence that caused Newlands and Mendeleev to develop new models of periodic classification of elements		Newlands put forward the law of octaves. Mendeleev realised that the physical and chemical properties of elements were related to their atomic mass. He arranged them so that groups of elements with similar properties fell into vertical columns in his table
54.	Explain, using the 'dot and cross' model, the covalent bonding		Can you draw: <ul style="list-style-type: none"> • The covalent bonding in simple binary compounds • Molecules containing single and double covalent bonds
55.	Explain how further evidence confirmed Mendeleev's ideas about the periodic table		Confirmation of his predictions about unknown elements How investigations on atomic structure (mass number and electronic structure) agreed with his ideas.

Group 1 elements			
56.	Why are group 1 elements known as alkali metals?		They form alkaline solutions when they react with water
57.	Explain why group 1 elements are stored under oil		Keep air and water away from them
58.	Describe the reaction of lithium, sodium and potassium with water		Hydrogen is formed An alkali is formed which is the hydroxide of the metal The reactivity with water increases down Group 1 Potassium gives a lilac flame
59.	Construct a word equation for the reaction of a group 1 element with water		Eg. $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
60.	What is the flame test colour for lithium compounds?		red
61.	What is the flame test colour for sodium compounds?		orange
62.	What is the flame test colour for potassium compounds?		Lilac
63.	Explain why group 1 elements have similar properties, in terms of forming positive ions with stable electronic structures		They all have 1 electron in their outer shell. This means they all lose this electron to become a stable positively charged ion.
64.	Explain, in terms of electron loss, the trend in reactivity of the Group 1 elements with water		As you go down group 1 then numbers of shells increase. This means the outer lone electron can be transferred quicker. These metals appear more reactive therefore.
65.	What do we mean by oxidation?		Loss of electron
66.	Describe how to use a flame test to identify the presence of lithium, sodium and potassium compounds		Use of moistened flame test wire Flame test wire dipped into solid sample Flame test wire put into blue Bunsen flame Colours of the flame
Group 7 elements			
67.	What are Group 7 elements known as?		Halogens
68.	Describe the uses of some Group 7 elements		Chlorine is used to sterilise water Chlorine is used to make pesticides and plastics Iodine is used to sterilise wounds.
69.	How do group 7 and group 1 elements react together?		Vigorously
70.	What happens to the reactivity of group 7 elements?		Elements react vigorously with group 1 elements
71.	Describe the physical appearance of the group 7 elements at room temperature		<ul style="list-style-type: none"> Chlorine is a green gas Bromine is an orange liquid Iodine is a grey solid
72.	Predict the properties of fluorine or astatine given the properties of the other group 7 elements		<ul style="list-style-type: none"> Physical properties Melting point Boiling point Displacement reactions
73.	Describe the displacement reactions of group 7 elements with solutions of metal halides		Chlorine displaces bromides and iodides Bromine displaces iodides
74.	Construct the word equation for the reaction between group 1 and a group 7 element		Sodium + Chlorine → Sodium chloride
75.	Construct a balanced symbol equation for the reaction of a group 1 element with a group 7 element		$2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$

76.	Explain why group 7 elements have similar properties, in terms of forming negative ions with stable electronic structures		Group 7 elements have similar properties because they gain a lone electron to become a stable, negatively charged ion. As you move up group 7, the elements become more reactive.
77.	What is reduction?		Gain of electrons
78.	Where are transition elements generally found in the periodic table?		The centre
79.	What properties do transition elements have?		They are metals Have typical metallic properties
80.	Give 2 examples of transition elements		Copper Iron
81.	What is thermal decomposition?		A reaction in which a substance is broken down into at least two other substances by heat
82.	What is the test for carbon dioxide?		Turns limewater milky
83.	What is precipitation?		Reaction between solutions that makes an insoluble solid
84.	What properties do compounds of transition elements often have?		Coloured
85.	What colour are copper compounds?		Often blue
86.	What colour are iron (II) compounds?		Often light green
87.	What colour are iron(III) compounds?		Often orange/brown
88.	Give examples of how transition elements and their compounds are used as catalysts		Iron in the Haber process Nickel in making margarine
89.	Describe what happens in the thermal decomposition of carbonates of transition elements including FeCO_3 , CuCO_3 , MnCO_3 and ZnCO_3 .		Metal oxide and carbon dioxide formed Colour change occurs Water is made as well.
90.	What are the colours of the transition metal ions in solution?		Cu^{2+} gives a blue solid Fe^{2+} gives a grey/green solid Fe^{3+} gives an orange/brown solid The solids are called precipitates
Metal structure and properties			
91.	Explain why iron is used to make cars and bridges		It is strong Malleable It can be pressed into shape
92.	Explain why copper is used to make electrical wiring		Conducts electricity very well Will not rust Malleable Ductility
93.	List the physical properties of metals		Lustrous, hard and high density High tensile strength High melting and boiling points Good conductors of heat and electricity
94.	Suggest properties needed by a metal for a particular given use		Eg. Saucepan bases need to be good conductors of heat
95.	What holds particles in a metal together?		Particles in a metal are held together by metallic bonds
96.	What happens to metals at low temperature?		They become superconductors
97.	What do strong metallic bonds mean in terms of the properties of metals?		Strong attraction of particles means: Boiling points High melting points Additionally a sea of delocalised electrons and close packed positive metal ions – this means metals can conduct electricity

98.	What is meant by the term superconductor		Conducts electricity without resistance. Electrons can flow very easily through the metal at very low temperatures.
99.	Describe the potential benefits of superconductors		Loss free power transmission Super-fast electronic circuits Powerful electromagnets
100.	Explain some of the drawbacks of superconductors		Have to be kept at very low temperature eg with liquid nitrogen and liquid helium.
Purifying and testing water			
101.	Recall different types of water resources found in the UK		Lakes, rivers, aquifers, reservoirs
102.	Explain why water is an important resource for many important industrial chemical processes.		Cheap raw material It's a coolant It's a solvent
103.	List some of the pollutants that may be found in domestic water supplies		Nitrate residues Lead compounds Pesticide residues
104.	List the types of substances present in water before it is purified		Dissolved salts and minerals Microbes Pollutants Insoluble materials
105.	What does chlorination do?		Chlorination kills microbes in water
106.	How are sulfate ions tested?		Barium chloride solution with sulfate ions gives a white precipitate
107.	How are halide ions tested?		Silver nitrate solution is used. Chloride ions give a white precipitate Bromide ions give a cream precipitate Iodide ions give a pale yellow precipitate
108.	Construct word equations for the reactions of barium chloride with sulfates and silver nitrate with halides		Barium chloride + Sodium sulfate → sodium chloride + barium sulfate
109.	How would you go about preparing an insoluble salt eg. Barium sulfate		By precipitation Filtration Washing Drying
110.	Explain why drinking water may contain some of the pollutants listed below: nitrate, lead compounds and pesticide		Nitrates, lead compounds and pesticides are poisonous – used on farmlands and wash off.
111.	Describe some stages to the water purification process		Filtration Sedimentation Chlorination
112.	Explain why some soluble substances are not removed from water during purification		They get washed off into the supply so therefore other methods are needed.
113.	Explain the disadvantages of using distillation of sea water to make large quantities of fresh water		Takes a lot of energy to boil water for this process. This makes fresh water produced much more expensive than water from traditional sources. Problems disposing of salt-rich waste water left over by the process.
114.	Give examples of precipitation reactions		Barium chloride with sulfates And Silver nitrate with halides