

### Core questions – Chemistry unit 1 - Atomic Structure and the Periodic Table

No.	Question	Answer
1	Define atom	The smallest part of an element that can still be recognised as that element
2	Define element	A substance made of only one type of atom
3	Define compound	A substance made of two or more different atoms chemically bonded together
4	Define molecule	A substance made of more than one atom chemically bonded together (can be atoms of the same type!)
5	Define mixture	A substance made of more than one thing <b>not</b> chemically bonded together
6	Approximately how many elements are there?	100
7	How are elements represented on the periodic table?	Chemical symbols
8	How are chemical symbols written?	The first letter is always upper case. The second letter always lower case
9	Name four methods of separating mixtures	Crystallisation, filtration, distillation and chromatography
10	What is filtration used to separate?	An insoluble solid from a liquid
11	What is meant by the term filtrate?	A liquid which has passed through a filter
12	What is meant by the term residue?	A solid which has not passed through a filter
13	How is filtration used to separate a mixture?	A mixture of an insoluble solid and liquid is added to a funnel containing filter paper. The liquid will pass through the pores in the filter paper leaving behind the insoluble solid.
14	What is evaporation?	Evaporation is the change of state from a liquid to a gas
15	What is evaporation used to separate?	A soluble solid from a liquid it is dissolved in
16	How is evaporation used to separate a mixture?	The mixture of a soluble solid and liquid is heated until the liquid evaporates leaving behind a solid
17	What is crystallisation?	The formation of a soluble solid after a liquid has evaporated
18	What is distillation used for?	To separate liquids with different boiling points
19	What are the two changes of state involved with distillation?	Evaporation and condensation
20	How is distillation used to separate a mixture?	Heat a mixture of liquids, the liquid with the lowest boiling point evaporates then condenses first, leaving the second liquid behind
21	What is chromatography used for?	To separate mixtures of different chemicals
22	How does chromatography work to separate mixtures?	A spot of a mixture is placed near the bottom of a piece of chromatography paper and the paper is then placed upright in a suitable solvent. As the solvent soaks up the paper, it carries the mixture with it. Different components of the mixture will move at different rates and the mixture separates out
23	What did scientists think about atoms before the discovery of the electron?	They were tiny spheres that could not be broken up
24	Which sub-atomic particle did JJ Thomson discover?	Electrons
25	What model did JJ Thomson use, following the discovery of an electron, to describe the structure of an atom?	Plum pudding model

26	How did JJ Thomson describe an atom?	Spheres of positive charge with tiny negative electrons stuck in them
27	Which sub atomic particle was discovered by Rutherford and Marsden?	Protons
28	Describe the experiment Rutherford and Marsden did	Fired alpha particles at a thin piece of gold foil.
29	If the plum pudding model was correct what should have happened to the alpha particles when fired at the gold foil?	Pass straight through or be deflected only slightly
30	What did happen to the alpha particles when fired at the gold foil?	Most passed straight through, some were deflected more than expected and some were deflected backwards off the foil.
31	What new ideas about the atom were concluded from the gold foil experiment?	1. Most of the mass was in the centre of atom in a tiny nucleus 2. The nucleus had a positive charge 3. Most of the atom is empty space
32	What name was given to the model of the atom following the gold foil experiment?	The nuclear model
33	How was the atom described in the first nuclear model?	A positively charged nucleus surrounded by a <i>cloud</i> of electrons
34	How did the work of Niels Bohr improve the nuclear model?	He suggested that electrons orbit the nucleus at specific distances
35	How did Bohr realise that his suggestions were correct?	His theoretical calculations agreed with experimental observations
36	What did later experiments show that led to the understanding of protons?	Scientists discovered that the positive charge of a nucleus can be divided into a whole number of smaller particles that each have the same positive charge.
37	Which sub-atomic particle was identified by James Chadwick?	The neutron
38	What is the current model of an atom?	There is a positively charged nucleus (made up of protons and neutrons), surrounded by negatively charged electrons.
39	In what order were the sub-atomic particles discovered?	Electrons, protons, neutrons
40	What are the three sub-atomic particles that make up an atom?	Protons, neutrons and electrons
41	What is the relative mass of a proton?	1
42	What is the relative mass of an electron?	Very small
43	What is the relative mass of a neutron?	1
44	What is the relative charge of a proton?	+1
45	What is the relative charge of an electron?	-1
46	What is the relative charge of a neutron?	0 (neutral)
47	Why is the overall charge of an atom zero?	An atom has the same number of protons and electrons
48	What is 'atomic number'?	The number of protons in an atom
49	What is 'atomic mass number'?	The number of protons and neutrons added together
50	Where is most of the mass of the atom?	In the nucleus
50	What is the average radius of an atom	$1 \times 10^{-10}$ m or 0.1nm (nanometres)
51	How big is the radius of the nucleus?	It is less than 1/10,000th of the radius of the atom.
52	What are energy levels?	The electrons are arranged at different distances from the nucleus in "energy levels" which are sometimes called "shells".
53	How many electrons can the first shell hold?	2

54	How many electrons can the second & third shell hold?	8
55	How can the electronic structure of an atom be represented?	Diagram or numbers
56	How are elements in the modern periodic table ordered?	By atomic number
57	What are groups in the periodic table?	The columns, numbered 1, 2, 3, 4, 5, 6, 7, 0
58	How are elements in the <b>same group</b> similar to each other?	They all have similar chemical properties
59	What can the group tell you about the electrons in an atom?	How many electrons in the outer shell. E.g. carbon is in group 4 so has 4 electrons in the outer shell
60	What are periods in the periodic table?	The rows in the periodic table
61	What can the period tell you about the electrons in an atom?	How many shells an atom has. E.g. carbon is in the second period so has two shells
62	What is an isotope?	Atoms of the same element with a different number of neutrons
63	What is the relative atomic mass of an element?	The average value that takes account of the abundance of the isotopes of the element
64	Why is the relative atomic mass of chlorine 35.5?	75% of chlorine has a mass of 35. 25% of chlorine has a mass of 37. $0.75 \times 35 = 26.25$ $0.25 \times 37 = 9.25$ $9.25 + 26.25 = 35.5$
65	How were elements arranged in the early periodic tables?	By atomic weight
66	What did Mendeleev do differently?	He still arranged them by weight, but left gaps where the properties didn't quite fit
67	Why did Mendeleev put some elements in groups?	Because they had similar chemical properties (e.g. they reacted violently with water)
68	Why did Mendeleev leave gaps in his periodic table?	For elements that had not been discovered yet
69	What is an ion?	An atom that has lost or gained electrons
70	If an atom has gained electrons, what charge will it have?	Negative
71	If an atom has lost electrons, what charge will it have?	Positive (because they have lost a negative!)
72	Which elements react to form positive ions?	Metals
73	Which elements react to form negative ions?	Non-metals
74	Which side of the periodic table has the metals?	The left hand side
75	Define inert	Unreactive
76	What is a trend?	A pattern in properties
77	What group are the noble gases located?	Group 0
78	Why are the noble gases inert?	Their outer electron shell is full, so do not need to lose or gain electrons
79	What is the trend in boiling points as you move <b>down</b> group 0?	They increase
80	In terms of electrons, what do group 1 elements have in common?	1 electron in the outer shell
81	What are the group 1 metals called?	Alkali metals
82	Why are the group 1 metals called alkali metals?	They are metals that form alkalis when they react with water
83	How does the reactivity of alkali metals change as you move down the group?	They become more reactive

84	Why does the reactivity of alkali metals increase as you move down the group?	Their outer electron is easier to lose if it is further away from the nucleus, and if the atom has more shells
85	What is produced when group 1 metals react with water?	Metal hydroxide (alkali) and hydrogen gas
86	What is produced when group 1 metals react with chlorine?	Metal chloride
87	What is produced when group 1 metals react with oxygen?	Metal oxide
88	What is the common name for group 7 elements?	The halogens
89	In terms of electrons, what do group 7 elements have in common?	7 electrons in the outer shell
90	What kind of ion will a halogen form?	A halide ion (X <sup>-</sup> ) with a single negative charge
91	What is the trend in reactivity of group 7 elements as you move down the group?	They become less reactive
92	Why do group 7 elements become less reactive as you move down the group?	It is harder to attract an electron if the outer shell is further away from the nucleus (or if the atom has more shells)
93	What is the trend in melting points and boiling points as you move down group 7?	They increase
94	What is displacement?	A more reactive element replacing a less reactive element from an aqueous solution of its salt
95	Why is chlorine able to displace a bromine ion in sodium bromide?	Chlorine is more reactive than bromine
96T	Where are transition metals found in the periodic table? <b>(Triple only)</b>	Middle section between group 2 & 3
97T	What is a transition metal? <b>(Triple only)</b>	Elements with similar properties to each, but different from those of the elements in group 1
98T	How are the properties of transition metals different from group 1? <b>(Triple only)</b>	Transition metals are: less reactive, more dense, stronger, higher melting and boiling points, harder
99T	What unique properties do transition metals have? <b>(Triple only)</b>	They can form more than one ion They are often coloured, meaning compounds that contain them are colourful They make very good catalysts (e.g nickel)