



National 5 Chemistry
Past Paper Revision Questions

Topic 2: Atomic Structure

1.

An atom has 26 protons, 26 electrons and 30 neutrons.

The atom has

- A atomic number 26, mass number 56
- B atomic number 56, mass number 30
- C atomic number 30, mass number 26
- D atomic number 52, mass number 56.

2.

When an atom X of an element in Group 1 reacts to become X^+

- A the mass number of X decreases
- B the atomic number of X increases
- C the charge of the nucleus increases
- D the number of occupied energy levels decreases.

3.

Which of the following particles contains a different number of electrons from the others?

You may wish to use the data booklet to help you.

- A Cl^-
- B S^{2-}
- C Ar
- D Na^+

4.

The table shows the numbers of protons, electrons and neutrons in four particles, W, X, Y and Z.

<i>Particle</i>	<i>Protons</i>	<i>Electrons</i>	<i>Neutrons</i>
W	17	17	18
X	11	11	12
Y	17	17	20
Z	18	18	18

Which pair of particles are isotopes?

- A W and X
- B W and Y
- C X and Y
- D Y and Z

5.

Which line in the table correctly describes an electron?

	<i>Mass</i>	<i>Charge</i>
A	negligible	+1
B	negligible	-1
C	1	+1
D	1	0

6.

The table shows information about some particles.

<i>Particle</i>	<i>Number of</i>		
	<i>protons</i>	<i>neutrons</i>	<i>electrons</i>
A	9	10	10
B	11	12	11
C	15	16	15
D	19	20	18

Identify the particle which is a negative ion.

7.

An atom is neutral because

- A the number of electrons equals the total number of protons plus neutrons
- B the number of neutrons equals the total number of electrons plus protons
- C the number of protons equals the number of neutrons
- D the number of electrons equals the number of protons.

8.

2,8,8 is the electron arrangement for an atom of an element belonging to the

- A halogens
- B noble gases
- C alkali metals
- D transition metals.

9. Which line in the table correctly describes a proton?

	Mass	Charge	Location
A	negligible	0	outside nucleus
B	negligible	-1	outside nucleus
C	1	+1	in nucleus
D	1	0	in nucleus

- 10.

Which of the following is the electron arrangements for a halogen atom?

- A 2, 4
- B 2, 5
- C 2, 6
- D 2, 7

- 11.

Which of the following numbers is the same for lithium and oxygen atoms?

- A Mass number
- B Atomic number
- C Number of outer electrons
- D Number of occupied energy levels

12.

Electrons can be removed from all atoms.

The energy required to do this is called the ionisation energy.

The first ionisation energy for an element is defined as the energy required to remove one mole of electrons from one mole of atoms, in the gaseous state.

The equation for the first ionisation energy of chlorine is



(a) State the electron arrangement for the $\text{Cl}^{\text{+}}$ ion. 1

You may wish to use the data booklet to help you.

(b) Write the equation for the first ionisation energy of magnesium. 1

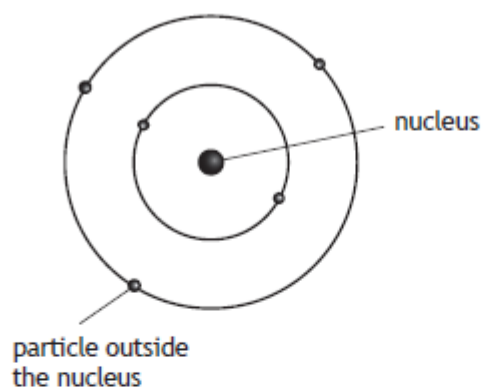
(c) Information on the first ionisation energy of some elements is given in the table.

<i>Element</i>	<i>First ionisation energy (kJ mol⁻¹)</i>
lithium	526
fluorine	1690
sodium	502
chlorine	1260
potassium	425
bromine	1150

Describe the trend in the first ionisation energy going down a group in the Periodic Table.

1

13. Elements are made up of atoms.



- (a) Complete the tables to show the missing information.

(i)

In the Nucleus		
<i>Particle</i>	<i>Relative Mass</i>	<i>Charge</i>
proton		+1
neutron	1	

1

(ii)

Outside the Nucleus		
<i>Particle</i>	<i>Relative Mass</i>	<i>Charge</i>
	almost zero	

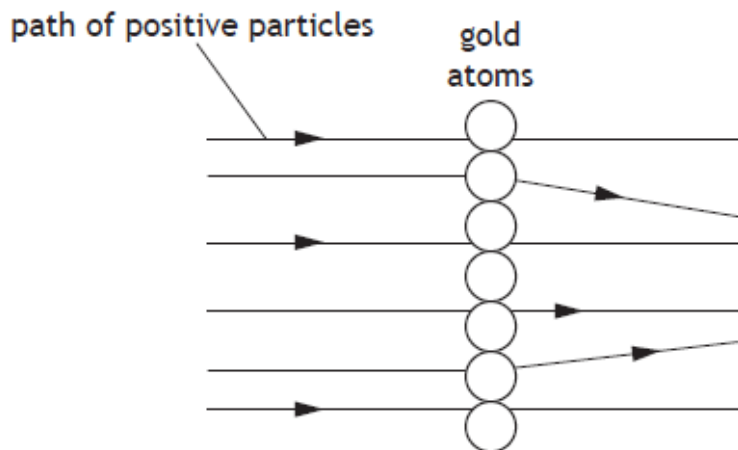
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- (b) A sample of nitrogen was found to contain equal amounts of two isotopes. One isotope has mass number 14 and the other has mass number 15.

What is the relative atomic mass of this sample of nitrogen? 1

14.

In 1911, Ernest Rutherford carried out an experiment to confirm the structure of the atom. In this experiment, he fired positive particles at a very thin layer of gold foil. Most of the particles passed straight through but a small number of the positively charged particles were deflected.



- (a) What caused some of the positive particles to be deflected in this experiment? 1

- (b) Gold is the heaviest element to have only one naturally occurring isotope.

The isotope has a mass number of 197.

- (i) Complete the table to show the number of each type of particle in this gold atom. 1

You may wish to use the data booklet to help you.

Particle	Number
Proton	
Electron	
Neutron	

- (ii) Most elements have more than one isotope.
State what is meant by the term isotope. 1

15.

The group 7 element bromine was discovered by Balard in 1826.

Bromine gets its name from the Greek 'bromos' meaning stench.

Bromine consists of a mixture of two isotopes, $^{79}_{35}\text{Br}$ and $^{81}_{35}\text{Br}$.

(a) What is meant by the term isotope? 1

(b) Complete the table for $^{79}_{35}\text{Br}$. 1

<i>Isotope</i>	<i>Number of protons</i>	<i>Number of neutrons</i>
$^{79}_{35}\text{Br}$		

(c) The relative atomic mass of an element can be calculated using the formula:

$$\frac{(\text{mass of isotope A} \times \% \text{ of isotope A}) + (\text{mass of isotope B} \times \% \text{ of isotope B})}{100}$$

A sample of bromine contains 55% of the isotope with mass 79 and 45% of the isotope with mass 81.

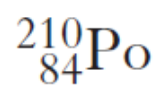
Calculate the relative atomic mass of bromine in this sample. 2

Show your working clearly.

16.

The element polonium was discovered by the scientist Marie Curie.

An isotope of polonium is shown.



(a) How many neutrons are present in an atom of ${}_{84}^{210}\text{Po}$?

_____ 1

(b) What is meant by the term isotopes?

_____ 1

17.

Tritium is a naturally occurring isotope of hydrogen. It can be represented as



(a) Complete the table to show the number of particles in an atom of tritium.

Type of particle	Number of particles
proton	
neutron	
electron	

1

(b) Hydrogen has three isotopes.

Isotope of hydrogen	Mass number
protium	1
deuterium	2
tritium	3

The relative atomic mass of hydrogen is 1.

Which isotope of hydrogen is the most abundant?

1

18.

In the manufacture of glass, other chemicals can be added to alter the properties of the glass. The element boron can be added to glass to make oven proof dishes.

(i) Information about an atom of boron is given in the table below.

Particle	Number
proton	5
electron	5
neutron	6

Use this information to complete the nuclide notation for this atom of boron.



1

(ii) Atoms of boron exist which have the same number of protons but a different number of neutrons from that shown in the table.

What name can be used to describe the different atoms of boron?

1