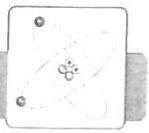
1 – Key terms



Fill in the gaps in each sentence using the key terms in the box, below.

1 mark for each correct answer

• protons	• atomos	• energy levels
• equals	• positively	• no charge
• uncuttable	• mass number	• atomic number
• configuration	• subatomic particles	• shells
• nucleus	• electron	• atoms
• negatively	• neutrons	• greater
• same	• innermost	

1 The famous Greek philosopher Democritus (c. 460–371 BCE) was the first to mention atoms. He called them _____ .

2 The word 'atom' comes from *atomos*, a Greek word meaning _____ .

3 All substances, even you, are made of particles called _____ .

4 Atoms are made of even smaller particles, called _____ .

5 Most of an atom's mass is concentrated in its centre, in a region called the _____ .

6 The nucleus of an atom contains _____ and _____ .

7 Neutrons have _____ , but protons are _____ charged. This is balanced by the _____ charged electrons.

8 The number of positive protons in the nucleus of an atom _____ the number of negative electrons orbiting the nucleus.

9 Protons and neutrons have approximately the _____ mass, which is far _____ than the mass of an electron.

10 The number of protons in the nucleus of an atom is called the proton number or the _____ .

11 The total number of protons and neutrons found in the nucleus of an atom is called the _____ .

12 The electrons orbiting the nucleus of any atom are not randomly arranged. They orbit the nucleus in _____ or _____ .

13 The electrons always fill the lowest available energy levels first, so the _____ shells are always filled before the outer shells.

14 The way the electrons are arranged is called the _____ structure or electron _____ .

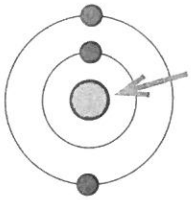
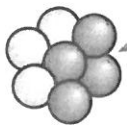
2 – Atomic symbols and numbers

Complete the information in the diagrams and answer the questions that follow.

/20

1 mark for each correct answer

1

On some periodic tables	What they mean
3 ← atomic number Li Lithium 7 ← mass number	**Atomic number**  nucleus contains three protons a _____ → $_{3}Li$
When writing b _____ → $^{7}_{3}Li$ c _____	**Mass number**  nucleus contains three protons and four neutrons d _____ → ^{7}Li

2 **a** What is the atomic number for lithium? _____

b How many protons does lithium have? _____

c What is the mass number for lithium? _____

d How many neutrons does lithium have? _____

group numbers →

1 (1A)	2 (2A)											13 (3A)	14 (4A)	15 (5A)	16 (6A)	17 (7A)	18 (8A)
$^{1}_{1}H$																	
$^{7}_{3}Li$																	
												$^{27}_{13}Al$					$^{40}_{18}Ar$
	$^{40}_{20}Ca$						$^{56}_{26}Fe$										
																$^{127}_{53}I$	

3 How many protons does a hydrogen atom have? _____ How many neutrons? _____

4 How many protons does an aluminium atom have? _____ How many neutrons? _____

5 How many protons does an iron atom have? _____ How many electrons? _____

6 How many electrons does an iodine atom have? _____ How many neutrons? _____

7 How many electrons does a calcium atom have? _____ How many protons? _____

8 How many electrons does an argon atom have? _____ How many neutrons? _____

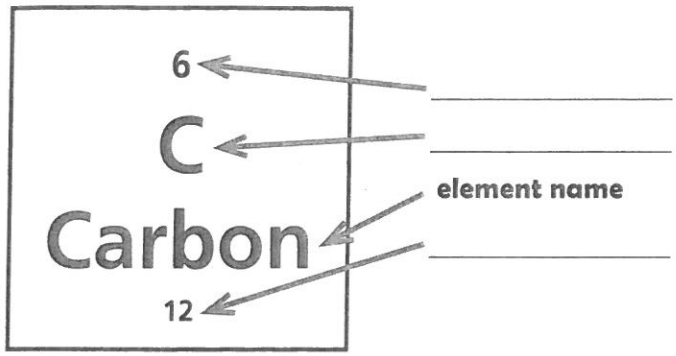
TOTAL /20

3 – Atomic numbers and mass numbers

1 Use the information given to help you fill in the gaps.

1 mark for each correct answer /25

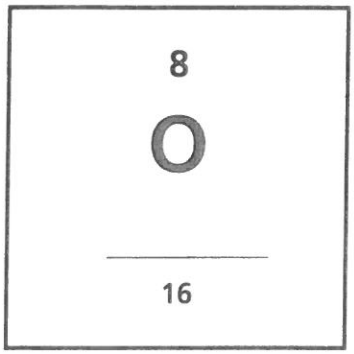
a



b **Atomic number** equals the number of _____ or _____

c **Mass number** equals the number of _____ + _____

d

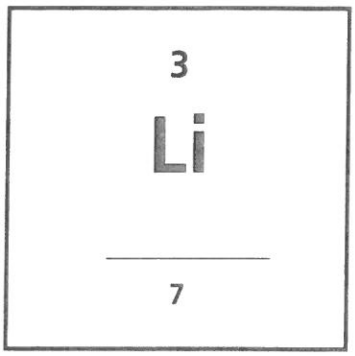


Atomic number: _____
Mass number: _____
Number of protons: _____
Number of neutrons: _____
Number of electrons: _____

e

Atomic number: _____
Mass number: _____
Number of protons: _____
Number of neutrons: _____
Number of electrons: _____

f



Atomic number: _____
Mass number: _____
Number of protons: _____
Number of neutrons: _____
Number of electrons: _____

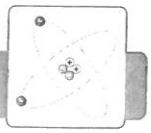
2 Complete the table below. The first row has been done for you.

5 marks for each correct row /35

	Element	Symbol	Atomic number	Mass number	Number of		
					Protons	Neutrons	Electrons
a	Hydrogen	$^{1}_{1}H$	1	1	1	0	1
b		$^{7}_{3}Li$		7			
c		$^{16}_{8}O$	8				
d			13	27			
e	Argon					22	
f					19	20	
g				127			53
h		$^{238}_{92}U$	92				

TOTAL /60

4 – Atoms and electrons



1 Fill in the gaps using the key terms in the box, below. One of the terms is used twice.

/14

1 mark for each correct answer

• electron configuration	• shells	• periodic table
• K, L, M and N	• atomic number	• 18
• 2	• proton	• electrons
• noble gases	• order	
• 32	• element	

a _____ are arranged in different orbits around an atom's nucleus.

b The different orbits are sometimes called _____.

c The shells are called _____.

d The shells can hold different numbers of _____.

e K can hold _____ electrons; L holds 8 electrons; M holds _____ electrons; and N holds _____ electrons.

f Each _____ has a different number of electrons.

g The number of electrons can be determined from the _____.

h For every _____ in an atom there is an electron.

i The shells fill up in a special _____.

j The arrangement of electrons in the shells is called the _____.

k The positioning of rows and columns in the _____ is based on the electron configuration of the atoms.

l _____ have stable electron configurations.

2 Atoms are said to be neutrally charged particles. Explain why this is so, mentioning the number of protons and electrons and the charges involved.

3 marks for the correct answer

/3

_____

_____

_____

3 Complete the following table.

1 mark for each correct answer

/18

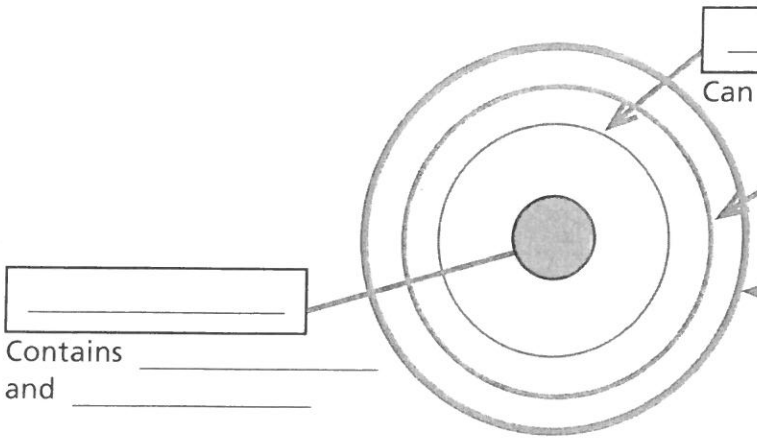
	Symbol	Atomic number	Number of protons	Number of neutrons	Number of electrons	Mass number
a	$^{11}_{5}B$	5		6		11
b		11				24
c			31	37		
d		29		35		
e			17			35

TOTAL /35

5 – Drawing atoms

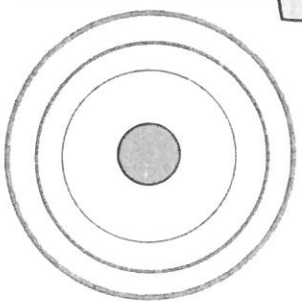
1 Complete the following diagram.

1 mark for each correct answer /9



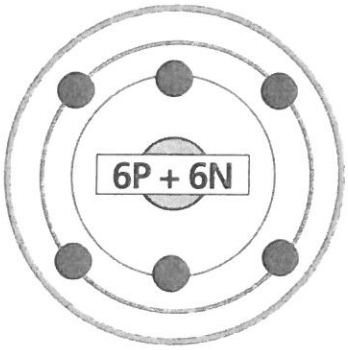
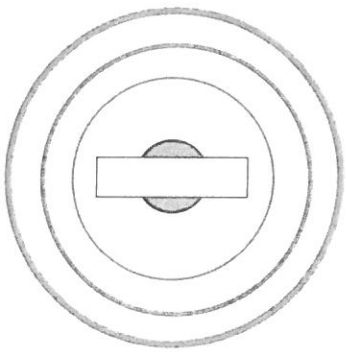
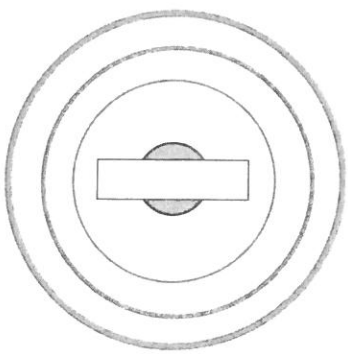
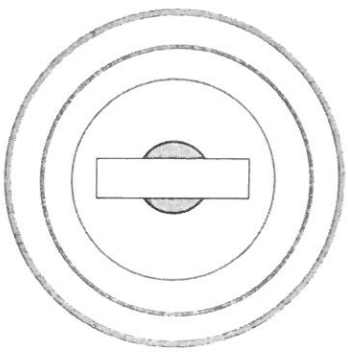
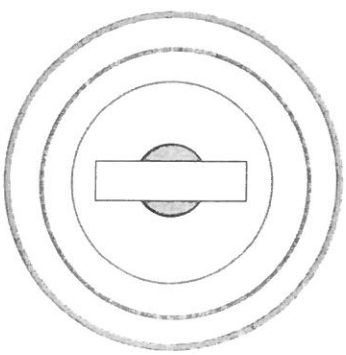
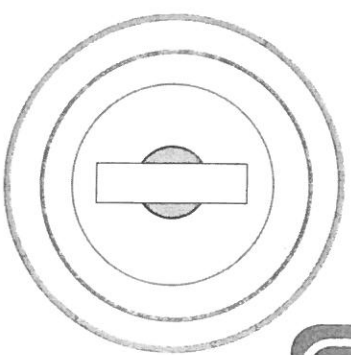
1 mark for the correct answer /1

2 A sulphur atom has an atomic number of 16. It has 16 electrons: 2 electrons in its first shell, 8 electrons in its second shell and 6 electrons in its third shell. Draw the electrons for a sulphur atom using dots on the diagram to the right.



3 You have been given the electron configurations for different atoms, below. Draw the electrons on the diagrams. Add the number of protons and neutrons as well. Carbon has been done for you.

1 mark for each correct answer /5

Carbon: 2, 4	Oxygen: 2, 6	Sodium: 2, 8, 1
		
Aluminium: 2, 8, 3	**Phosphorus: 2, 8, 5**	**Chlorine: 2, 8, 7**
		

TOTAL /15

6 – Isotopes

Isotopes of elements can be written by placing the mass number in front of the name of the element.

Example 1 12-carbon is an isotope of carbon with a mass number of 12.

Example 2 14-carbon is an isotope of carbon with a mass number of 14.

1 Complete the following table for each isotope given.

1 mark for each correct answer /39

	Isotopes	Atomic number	Mass number	Symbol	Number of protons	Number of neutrons	Number of electrons
a	20-neon	10	20	$^{20}_{10}Ne$			
b	22-neon						
c	35-chlorine						
d	37-chlorine						
e	235-uranium						
f	238-uranium						
g	239-uranium						

2 Use your answers from Question 1 to help write a definition for isotopes.

3 marks for a correct answer /3

2-hydrogen	3-hydrogen
3-helium	**4-helium**

2 marks for each correct answer /8

3 Draw the isotopes in the table, left. Show all protons, neutrons and electrons. The electron shells required have been drawn for you.

Use the following symbols:

- protons
- neutrons
- electrons

TOTAL /50