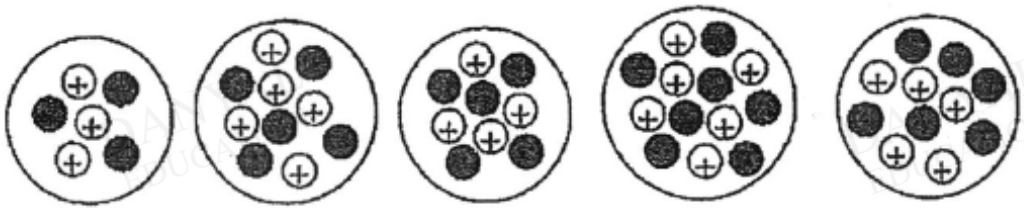
O Level Combined Chemistry Structured

Atomic Structure Test 1.0

Q1

The diagrams represent the nuclei of five different atoms, **V**, **W**, **X**, **Y** and **Z**. These letters are **not** the chemical symbols of the elements.

key: ⊕ positively charged sub-atomic particle in the nucleus of an atom



V W X Y Z

Which of the atoms **V**, **W**, **X**, **Y** and **Z**,

(a) has an atomic number of six, ...

(b) has two electrons in its outermost electron shell, ...

(c) are isotopes of the same element, ...

(d) has a relative atomic mass of six, ...

(e) could form an ion with a charge of 1+? .....

[5]

Q2

Two isotopes of sulfur are $^{32}_{16}S$ and $^{33}_{16}S$.

(a) (i) Explain what is meant by the term *isotopes*.

.....

.....[1]

(ii) Describe the similarities and differences in the atomic structures and electronic configurations of the two isotopes.

.....

.....

.....

.....

.....

.....

.....

.....[5]

Q3

1 The term species is sometimes used to refer to neutral atoms and to positive and negative ions. The table shows the numbers of subatomic particles in eight different species.

species	number of protons	number of neutrons	number of electrons
E	4	5	2
F	4	3	2
G	6	7	6
H	6	7	7
I	7	7	7
J	7	7	10
K	8	8	10
L	8	10	10

(a) Which letter or letters from **E, F, G, H, I, J, K** and **L** represent

(i) the atom with the largest mass number? [1]

.....

(ii) two different isotopes of the same element? [1]

.....

(iii) two negative ions formed from the same element? [1]

.....

(iv) two positive ions that form an ionic compound with a formula of the type YZ_2? [1]

.....

(b) Use your knowledge of electronic structures to explain why when moving across the Periodic Table from lithium to fluorine, the character of these elements changes from being metallic to non-metallic. [1]

.....

.....

.....

Q4

^{79}Br and ^{81}Br are isotopes of bromine.

(a) Explain what is meant by the term *isotopes*.

.....

..... [1]

(b) An ion of ^{79}Br contains the following sub-atomic particles.

particle	number
X	44
Y	36
Z	35

Identify particles **X**, **Y** and **Z**.

particle **X** .....

particle **Y** .....

particle **Z** ..... [3]

(c) Explain why ^{79}Br and ^{81}Br have the same chemical properties.

.....

..... [1]

Q5

Table 2.1 shows a list of particles with their respective number of protons, neutrons and electrons.

Particle	Number of protons	Number of neutrons	Number of electrons
P	1	0	1
Q	2	3	2
R	5	6	5
S	7	7	10
T	9	10	9

Table 2.1

Which particle(s) **P**, **Q**, **R**, **S** or **T** in **table 2.1** fit each of the following descriptions?

(a) An atom with mass number of 5? [1]

.....

(b) An atom with one valence electron? [1]

.....

(c) An ion of a non-metal? [1]

.....

(d) An atom from Group 0? [1]

.....

Answers

Atomic Structure Test 1.0

Q1

2a	Y
b	X
c	W and Z
d	V
e	V

Q2

(a)(i)	Atoms of the same element with same number of protons and different number of neutrons / atoms with same atomic number and different mass number	[1]
(a)(ii)	Both isotopes have - 16 protons - 16 electrons - Electronic configuration 2,8,6 S-32 has 16 neutrons but S-33 has 17 neutrons. R: They have different number of neutrons R: They have same number of protons. R: They have same number of electrons. R: S-32 has one less neutron than S-33. R: They have same number of electron shells. R: They are in the same group of the Periodic Table	[1] [1] [1] [2]

Q3

(a)i	I	[1]
(a)ii	E and F or K and L	[1]
(a)iii	K, L	[1]
(a)vi	E and F	[1]
(b)	Moving across the Periodic Table, the elements have increasing number of valence electrons. Hence they need to gain rather than lose electrons to achieve a stable electronic configuration.	[1]

Q4

(a)	Isotopes are atoms of the same element with the same number of protons but different number of neutrons.		[1]
(b)	particle X	neutrons [1]	[3]
	particle Y	electrons [1]	
	particle Z	protons [1]	
(c)	^{79}Br and ^{81}Br have the **same number of valence electrons**. (do not accept: same number of protons / same number of electrons)		[1]

Q5

(a) An atom with mass number of 5?

Q.....

(b) An atom with one valence electron?

P.....

(c) An ion of a non-metal?

S .....

(d) An atom from Group 0?

Q .....