

1 The table gives the composition of three particles.

particle	number of protons	number of electrons	number of neutrons
A	15		16
B	15		16
C	15		17

(a) What is the evidence in the table for each of the following?

(i) Particle **A** is an atom.

.....
..... [1]

(ii) **A**, **B** and **C** are all particles of the same element.

.....
..... [1]

(iii) Particles **A** and **C** are isotopes of the same element.

.....
..... [2]

(b) (i) What is the electronic structure of particle **A**?

..... [1]

(ii) Is element **A**, a metal or a non-metal? Give a reason for your choice.

.....
..... [1]

[Total: 6]

2 Protons, neutrons and electrons are subatomic particles.

(a) Complete the table to show the relative mass and relative charge of a proton, a neutron and an electron.

particle	relative mass	relative charge
proton		
neutron		
electron	$\frac{1}{1840}$	

[3]

(b) Bromine has two isotopes.

(i) Define the term *isotope*.

.....
..... [2]

(ii) Explain why the two isotopes of bromine have the same chemical properties.

.....
..... [2]

(c) The table shows the number of protons, neutrons and electrons in some atoms and ions.

Complete the table.

particle	number of protons	number of neutrons	number of electrons
${}^7_3\text{Li}$			
${}^{34}_{16}\text{S}^{2-}$			
	19	22	18

[5]

[Total: 12]

3 (a) (i) Define the term *atomic number*.

..... [1]

(ii) Define the term *nucleon number*.

.....
..... [2]

(b) The table shows the number of protons, neutrons and electrons in some atoms or ions.

Complete the table. The first line is given as an example.

particle	number of protons	number of electrons	number of neutrons	symbol or formula
A	6	6	6	$^{12}_6\text{C}$
B	12	12	12	
C	8			$^{16}_8\text{O}^{2-}$
D	11	10	13	

[6]

[Total: 9]

4 (a) The table below gives information about particles.

Complete the table. The first line has been done for you.

particle	number of protons	number of electrons	electronic configuration	charge on particle
A	12	10	2,8	2+
B		18	2,8,8	1-
C	18		2,8,8	0
D	8	10		

[4]

(b) Gallium is a Group III element.

Define the term *element*.

.....

.....

..... [1]

(c) The following are gallium atoms.



Complete the following table.

atom	number of protons	number of neutrons	number of electrons
${}_{31}^{69}\text{Ga}$			
${}_{31}^{71}\text{Ga}$			

[3]

[Total: 8]

5 (a) The symbols of six particles are shown below.



Select from the list of particles to answer the following questions. A particle may be selected once, more than once or not at all.

- (i) Which **two** ions have the same electronic structure? [1]
- (ii) Which ion has the same electronic structure as an atom of argon? [1]
- (iii) Which atom can form an ion of the type X³⁻? [1]
- (iv) Which atom can form a hydride which has a formula of the type XH₄? [1]

(b) (i) How many protons, neutrons and electrons are there in one copper(II) ion ⁶⁴₂₉Cu²⁺?

number of protons

number of neutrons

number of electrons

[2]

(ii) ⁴⁵₂₁Sc represents an atom of scandium.

How many nucleons and how many charged particles are there in one atom of scandium?

number of nucleons

number of charged particles

[2]

(c) Two different atoms of sodium are ²³₁₁Na and ²⁴₁₁Na.

(i) Explain why these two atoms are isotopes.

.....
..... [2]

(ii) ²⁴₁₁Na is radioactive. It changes into an atom of a different element which has one more proton.

Identify this element.

..... [1]

(iii) State **two** uses of radioactive isotopes.

.....
..... [2]

- 6 Complete the following table which gives the number of protons, electrons and neutrons in each of the five particles.

particle	number of protons	number of electrons	number of neutrons
.....	19	19	20
${}^{56}_{26}\text{Fe}$
.....	3	2	
${}^{70}_{31}\text{Ga}^{3+}$
.....	34	36	45

[Total: 8]

7 (a) Define the term *isotope*.

.....
..... [2]

(b) The table gives information about four particles, **A**, **B**, **C** and **D**.

Complete the table.

The first line has been done for you.

particle	number of protons	number of electrons	number of neutrons	nucleon number	symbol or formula
A	6	6		12	C
B	11	10	12		
C	8		8		O ²⁻
D		10		28	A ³⁺

[7]

[Total: 9]

8 The table below gives the composition of six particles which are either atoms or ions.

particle	number of protons	number of neutrons	number of electrons
A	33	40	33
B	19	20	18
C	34	45	36
D	33	42	33
E	13	14	13
F	24	28	21

(a) Which particles are atoms? Explain your choice.

.....
..... [2]

(b) Which particle is a negative ion and why has this particle got a negative charge?

.....
..... [2]

(c) Which particles are positive ions?

..... [1]

(d) Explain why particle **A** and particle **D** are isotopes.

.....
..... [2]

[Total: 7]