

Atomic Structure and Model

Q1. (2018)

1 Figure 1 shows the dot and cross diagram for a molecule of ammonia.

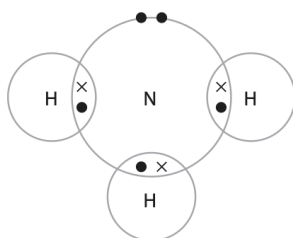


Figure 1

(a) (i) What do the dots and crosses represent in the diagram?

(1)

- ☐ A electrons
- ☐ B neutrons
- ☐ C protons
- ☐ D nuclei

Q2. (2018)

A)

3 (a) Atoms contain electrons, neutrons and protons.

(i) Draw one line to link each particle to its correct relative charge.

(2)

particle	relative charge
electron	+1
neutron	0
proton	-1

B)

(ii) Which of the following is the relative mass of a proton?

(1)

- ☐ A 0
- ☐ B $\frac{1}{1837}$
- ☐ C 1
- ☐ D -1

(c) Figure 4 shows the atomic number and mass number of two isotopes of argon.

isotope	atomic number	mass number
argon-38	18	38
argon-40	18	40

Figure 4

Describe the structure of an atom of argon-38 and of an atom of argon-40.

(3)

(c) Salts of metals can be prepared by reacting the metal with an acid to produce the salt and hydrogen.

(ii) Nickel is a metal.

Explain how the structure of a nickel atom, Ni, changes when it forms a nickel ion, Ni^{2+} .

(2)

8 In Figure 8, the letters **A, E, G, J, X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

[illegible]

Figure 8

(a) Using the letters **A, E, G, J, X** and **Z**

(iii) give the letter of an element that normally forms an ion with a charge of +1.

(1)

8 In Figure 8, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

[illegible]

Figure 8

(b) Element **E** has an atomic number of 5.

In a sample of **E** there are two isotopes. One isotope has a mass number of 10 and the other isotope has a mass number of 11.

A)

(i) Explain, in terms of subatomic particles, what is meant by the term **isotopes**.

(2)

B)

(ii) All atoms of element **E** in this sample contain

(1)

- ☐ **A** 5 protons
- ☐ **B** 5 neutrons
- ☐ **C** 6 protons
- ☐ **D** 6 neutrons

Q7. (2019) – 8c

8 In Figure 8, the letters **A, E, G, J, X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

[illegible]

Figure 8

(c) Element **X** has an atomic number of 18.

State the electronic configuration of an atom of element **X**.

(1)

Q8. (2020)

2 Chlorine has an atomic number of 17.

(a) Figure 3 shows the arrangement of electrons in an atom of chlorine.

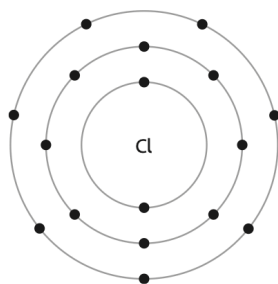


Figure 3

(i) What is the electronic configuration of this atom?

(1)

- ☐ **A** 10.7
- ☐ **B** 17
- ☐ **C** 2.8.7
- ☐ **D** 7.8.2

Q9. (2020) – 2b

- (b) The nucleus of an atom is made up of protons and neutrons.
Atoms of chlorine contain 17 protons.

Figure 4 shows some information about a proton, a neutron and an electron.

	relative mass	relative charge
proton	1	+1
neutron	1	0
electron	very small	-1

Figure 4

A)

- (i) Explain, using the information in Figure 3 and Figure 4, why atoms of chlorine have no overall charge.

(2)

B)

- (ii) Atoms of chlorine-37 have a mass number of 37.

Calculate the number of neutrons in atoms of chlorine-37.

(1)

C)

- (iii) There are two isotopes of chlorine, chlorine-35 and chlorine-37.

Explain the meaning of the term **isotopes**.

(2)

Q10. (2021)

- 8 The scientist John Dalton lived over 200 years ago.

- (a) John Dalton suggested an early model of atoms.

When Dalton first described atoms he said that

- all elements are made of atoms
- atoms are not formed of any smaller particles
- all atoms of the same element are identical.

Give two differences between Dalton's model of atoms and today's model of atoms.

(2)

Q11. (2022)

- 5 (a) An atom of aluminium has an atomic mass of 27.

Aluminium has an atomic number of 13.

State the number of electrons, neutrons and protons in this atom.

(3)

number of electrons = ...

number of neutrons = ...

number of protons = ...

Q12. (2022)

9 Magnesium carbonate has the formula MgCO_3 .

(a) Magnesium carbonate contains Mg^{2+} and CO_3^{2-} ions.

(i) The atomic number of magnesium is 12.

What is the electronic configuration of the Mg^{2+} ion?

(1)

- ☐ A 2
☐ B 2.8
☐ C 2.8.2
☐ D 2.8.4

Q13. (2023) – 6b

(b) (i) Magnesium atoms have 12 electrons.

Complete the electronic configuration of a magnesium atom.

(1)

2.8.....

Q14. (2024) – 3b

(b) Some tap water contains chloride ions.

(i) Explain, in terms of electrons, how a chlorine atom, Cl, forms a chloride ion, Cl^- .

(2)

Q15. (2024)

5 (a) Figure 8 shows some information about an atom of chlorine.



Figure 8

State the number of protons, neutrons and electrons in this atom.

(3)

number of protons = ...

number of neutrons = ...

number of electrons = ...

Q16. (2024)

9 Sodium carbonate has the formula Na_2CO_3 .

(a) Sodium carbonate contains Na^+ ions and CO_3^{2-} ions.

(i) The atomic number of sodium is 11.

What is the electronic configuration of the Na^+ ion?

(1)

- ☐ A 1
☐ B 2.8
☐ C 2.8.1
☐ D 2.8.2