Atomic Structure

Question paper 4

Level	IGCSE(9-1)
Subject	Chemistry
Exam Board	Edexcel IGCSE
Module	Single Award (Paper 2C)
Topic	Principles of Chemistry
Sub-Topic	Atomic Structure
Booklet	Question paper 4

Time Allowed: **53 minutes**

Score: **/44**

Percentage: **/100**

Grade Boundaries:

9	8	7	6	5	4	3	2	1
>90%	80%	70%	60%	50%	40%	30%	20%	10%

1 The table shows the numbers of protons, neutrons and electrons in some atoms and ions.

Atom or ion	Protons	Neutrons	Electrons
P	6	8	
Q	5	6	
R	9	10	10
S	3	4	
T	6	6	

(a) (i) Which particles have the same mass?

(1)

- ☒ **A** electrons and protons
- ☒ **B** electrons and neutrons
- ☒ **C** neutrons and protons
- ☒ **D** electrons, neutrons and protons

(ii) What is the atomic number of P?

(1)

- ☒ **A** 6
- ☒ **B** 8
- ☒ **C** 12
- ☒ **D** 14

(iii) What is the mass number of Q?

(1)

- ☒ **A** 5
- ☒ **B** 6
- ☒ **C** 10
- ☒ **D** 11

(b) Which group of the Periodic Table contains element T?

(1)

.....

(c) (i) Which two letters represent isotopes of the same element?

(1)

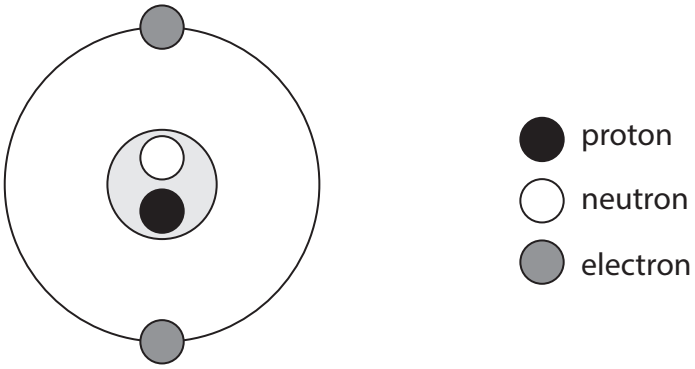
..... and .....

(ii) Which letter represents a positive ion?

(1)

.....

(d) The diagram shows the arrangement of particles in another ion.



How does the diagram show that this ion has a negative charge?

(1)

.....

.....

(Total for Question 1 = 7 marks)

2 An atom of an element has an atomic number of 6 and a mass number of 12.

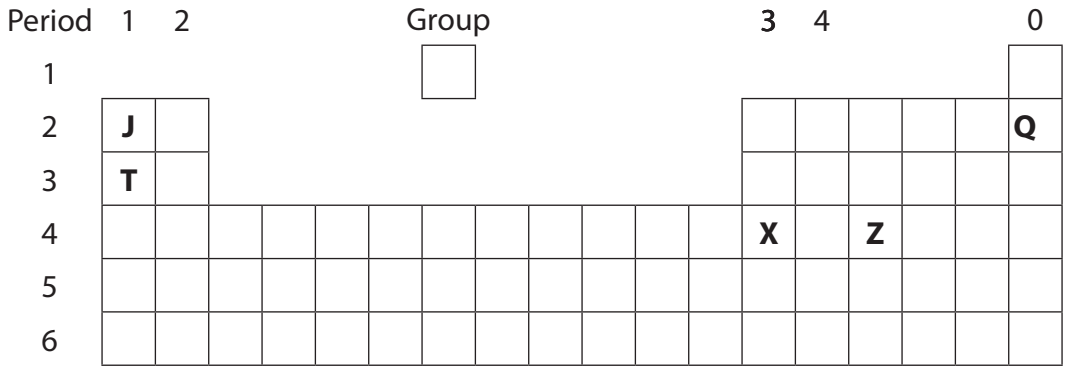
(a) Using this information, complete the table to show the numbers of protons, neutrons and electrons in one atom of this element.

(2)

number of protons	
number of neutrons	
number of electrons	

(b) The Periodic Table shows the positions of five elements, J, Q, T, X and Z.

The letters do **not** represent the symbols for the elements.



(i) How many electrons are there in the outer shell of an atom of X?

(1)

.....

(ii) There are 31 protons in an atom of X.

Using this information, explain how many protons there are in an atom of Z.

(2)

.....

.....

.....

.....

(iii) What is the electronic configuration of an atom of Q?

(1)

.....

(iv) State one similarity and one difference between the electronic configurations of atoms of J and T.

(2)

similarity .....

difference .....

(Total for Question 2 = 8 marks)

3 The diagram shows a section of the Periodic Table and the symbols for the first 20 elements.

		H														He
Li	Be										B	C	N	O	F	Ne
Na	Mg										Al	Si	P	S	Cl	Ar
K	Ca															

(a) (i) What name is given to a horizontal row of elements such as Na to Ar?

(1)

.....

(ii) Name two metals in the row Na to Ar.

(1)

..... and .....

(iii) Which is the least reactive element in the row Na to Ar?

Explain your answer.

(2)

least reactive element .....

explanation .....

.....

.....

(b) State, in terms of electronic configurations, why the elements in the column Li to K have similar chemical properties.

(1)

.....

.....

(c) (i) Which element has atomic number 6?

(1)

.....

(ii) Which element has atoms with an electronic configuration of 2.8.6?

(1)

.....

(d) An atom has atomic number 8 and mass number 18.

How many protons, neutrons and electrons does this atom contain?

(2)

protons .....

neutrons .....

electrons .....

(Total for Question 3 = 9 marks)

4 Neon is an element with atomic number 10.

(a) Which sub-atomic particles are present in the nucleus of a neon atom?

(1)

- ☒ **A** electrons and neutrons
- ☒ **B** electrons and protons
- ☒ **C** electrons and neutrons and protons
- ☒ **D** neutrons and protons

(b) Use words from the box to complete the sentences about the particles in a neon atom.

Each word may be used once, more than once or not at all.

(3)

electrons	ne ons	nuc otons

The particles with the smallest mass are .....

An atom of neon has no overall charge because it contains equal numbers

of ..... and .....

The chemical properties of neon depend on the number of

..... in the outer shell.

(c) What is the electronic configuration of a neon atom?

(1)

- ☒ **A** 2.8
- ☒ **B** 2.2.6
- ☒ **C** 2.8.8
- ☒ **D** 2.8.8.2

(d) Neon has two main isotopes that can be represented as ^{20}Ne and ^{22}Ne.

(i) Explain, with reference to sub-atomic particles, what is meant by the term **isotopes**.

(2)

.....

.....

.....

.....

(ii) The relative atomic mass of neon is 20.2

How does this information support the fact that a sample of neon contains more ^{20}Ne than ^{22}Ne?

(1)

.....

.....

(e) Neon belongs to the family of noble gases and is inert.

(i) What is meant by the term **inert**?

(1)

.....

.....

(ii) Why are noble gases inert?

(1)

.....

.....

(Total for Question 4 = 10 marks)

5 The table shows the electronic configurations of four elements.

Element	Electronic configuration
chlorine	2.8.7
argon	2.8.8
potassium	2.8.8.1
calcium	2.8.8.2

(a) Why is argon an unreactive element?

(1)

.....

.....

(b) Krypton is an unreactive element in the same group of the Periodic Table as argon, but in Period 4. It has an atomic number of 36.

Deduce the electronic configuration of krypton.

(1)

☒ **A** 2.8.8.8

☒ **B** 2.8.18.8

☒ **C** 2.8.8.2.8.8

☒ **D** 2.8.8.8.8.2

(c) Calcium reacts with chlorine to form the ionic compound calcium chloride ($CaCl_2$).

(i) Describe, in terms of electrons, how an atom of calcium reacts with two chlorine atoms to form calcium chloride.

You may use a diagram in your answer.

(3)

(ii) Write the formula of a calcium ion.

(1)

(iii) In the reaction between calcium and chlorine, both oxidation and reduction occur.

Which row shows the element that is oxidised and the element that acts as the reducing agent in this reaction?

(1)

	Element that is oxidised	**Element that acts as the reducing agent**
☒ **A**	calcium	calcium
☒ **B**	calcium	chlorine
☒ **C**	chlorine	calcium
☒ **D**	chlorine	chlorine

(d) A student uses a flame test to distinguish between separate samples of calcium chloride and potassium chloride.

This is the student's method.

There is one mistake in step 1 and one mistake in step 3.

step 1 dip a platinum wire into some concentrated sodium hydroxide solution

step 2 dip the platinum wire into the sample

step 3 place the wire and sample into a luminous Bunsen flame

step 4 record the colour of the flame

Describe a correct method for step 1 and step 3.

(2)

step 1 .....

.....

step 3 .....

.....

(e) What colour is the flame when the test on potassium chloride is carried out correctly?

(1)

☒ **A** green

☒ **B** lilac

☒ **C** orange

☒ **D** red

(Total for Question 5 = 10 marks)