Paper 3

Questions are applicable for both core and extended candidates

1 Samarium is a metal.

(a) Deduce the number of electrons and neutrons in the samarium atom shown.

$^{154}_{62}Sm$

number of electrons .....

number of neutrons .....

[2]

2 Magnesium is an element in Group II of the Periodic Table.

(a) Deduce the electronic configuration of magnesium.

..... [1]

(e) Fig. 7.2 shows the electronic configuration of an element in Group II of the Periodic Table.

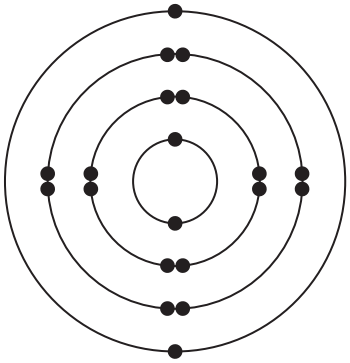


Fig. 7.2

Deduce the period in the Periodic Table to which this element belongs.

Period ..... [1]

3 Table 2.1 shows the masses of some of the ions in 1000 cm^3 of the solution obtained by filtering a sample of soil with distilled water.

Table 2.1

name of ion	formula of ion	mass of ion in 1000 cm^3 of solution / mg
ammonium	NH_4^+	25.0
calcium	Ca^{2+}	0.4
chloride	Cl^-	0.5
iron(II)	Fe^{2+}	27.0
magnesium	Mg^{2+}	4.0
nitrate	NO_3^-	23.0
phosphate	PO_4^{3-}	15.5
potassium	K^+	29.0
sodium	Na^+	2.0
	SO_4^{2-}	6.0

(c) Complete Fig. 2.1 to show:

- the electronic configuration of a sodium ion
- the charge on the ion.

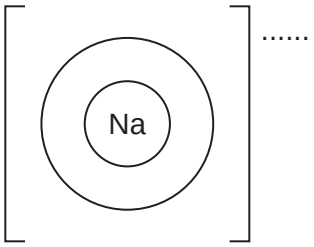


Fig. 2.1

[2]

4 Potassium iodide is an ionic compound.

(c) Deduce the number of protons and neutrons in the iodide ion shown.

$^{127}_{53}I^-$

number of protons .....

number of neutrons .....
[2]

5 Fig. 1.1 shows part of the Periodic Table.

I	II										III	IV	V	VI	VII	VIII
							H									He
												C	N	O		
Na	Mg										Al				Cl	
K	Ca						Fe			Cu					Br	
															I	

Fig. 1.1

Answer the following questions using only the elements in Fig. 1.1.

Each symbol of the element may be used once, more than once or not at all.

Give the symbol of the element that:

(b) has an atom with a complete outer electron shell

..... [1]

(c) has an atom with five occupied electron shells

..... [1]

6 (c) Complete the diagram in Fig. 2.1 to show the electronic configuration of a chlorine atom.

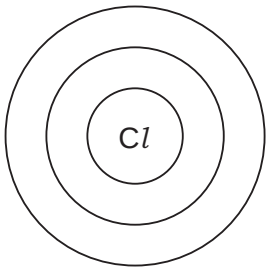


Fig. 2.1

[1]

7 Lithium bromide is a compound with ionic bonding.

(b) Complete Fig. 8.1 to show:

- the electronic configuration of a lithium ion
- the charge on the ion.

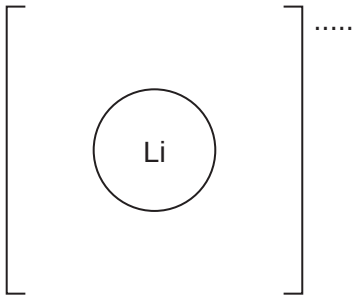


Fig. 8.1

[2]

(c) Deduce the number of protons and neutrons in the bromide ion shown.

$^{79}_{35}Br^-$

number of protons .....

number of neutrons .....

[2]

8 This question is about halogens and halogen compounds.

(a) Deduce the number of electrons, neutrons and protons in one atom of the isotope of chlorine shown.

$^{37}_{17}Cl$

number of electrons .....

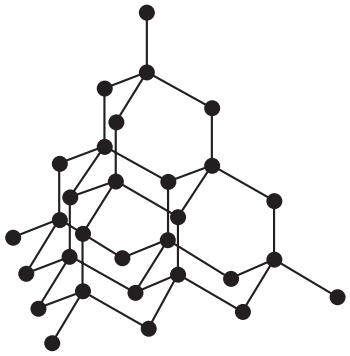
number of neutrons .....

number of protons .....

[3]

9 This question is about Group IV elements and their compounds.

(e) Diamond is a form of carbon.
The structure of diamond is shown.

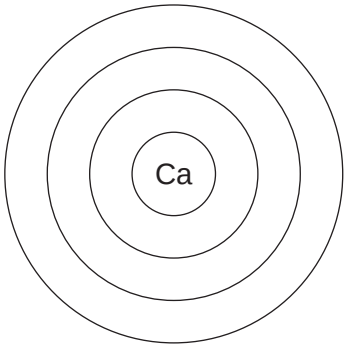


(iv) Deduce the electronic structure of carbon.

Use the Periodic Table to help you.

..... [1]

10 (b) Complete the diagram to show the electron arrangement in a calcium atom.



[2]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

11 Iron ore contains iron(III) oxide, Fe_2O_3. A blast furnace is used to extract iron from Fe_2O_3.

Equations for some of the reactions in the blast furnace are shown.

equation 1 $C + O_2 \rightarrow CO_2$

equation 2 $CaCO_3 \rightarrow CaO + CO_2$

equation 3 $CaO + SiO_2 \rightarrow CaSiO_3$

(f) Both iron(III) oxide and aluminium oxide contain metal ions with a 3+ charge.

(i) Write the electronic configuration of an Al^{3+} ion.

..... [1]

(ii) Deduce the number of protons and electrons in an Fe^{3+} ion.

protons	electrons

[2]

12 **(a)** The symbols of the elements in Period 2 of the Periodic Table are shown.

Li Be B C N O F Ne

Use the symbols of the elements in Period 2 to answer the questions that follow.
Each symbol may be used once, more than once or not at all.

Give the symbol of the element that:

(ii) contains atoms with only three electrons in the outer shell ..... [1]

(iii) contains atoms with only nine protons ..... [1]

13 A list of gases is shown.

ammonia
carbon dioxide
carbon monoxide
ethene
fluorine
oxygen
sulfur dioxide
xenon

Answer the following questions using only the gases from the list.
Each gas may be used once, more than once or not at all.

Give the name of the gas that:

(c) is inert

..... [1]

14 Boron and aluminium are Group III elements.

(a) Boron has only two naturally occurring isotopes, ^{10}B and ^{11}B.

Complete Table 2.1 to show the numbers of protons, neutrons and electrons in an atom of ^{11}B.

Table 2.1

number of protons	number of neutrons	number of electrons

[2]

15 **(a)** Atoms are made of protons, neutrons and electrons. Atoms of the same element are known as isotopes.

(i) Complete the table.

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

[2]

(b) Mg^{2+} ions have the electronic structure 2,8.

Give the formula of the following particles which have the same electronic structure as Mg^{2+} ions.

- a cation (positive ion)

.....

- an anion (negative ion)

.....

- an atom

.....

[3]