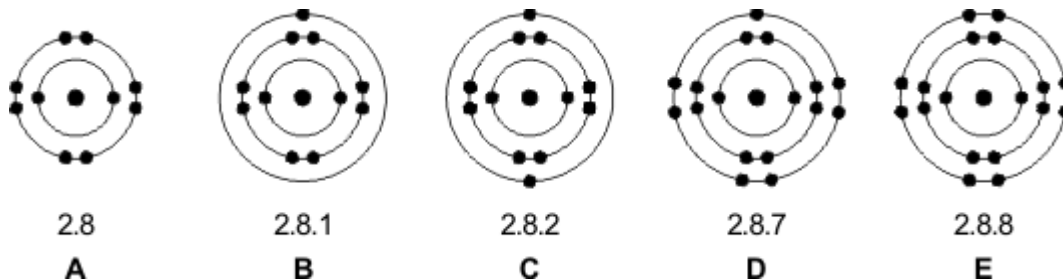


**Structure and bonding**

1. Use the Data Sheet to help you answer this question.

When sodium reacts with water it forms sodium ions.

The diagrams below represent the electron arrangements of some atoms and ions.

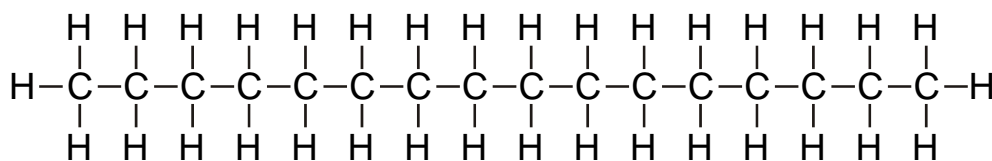


Which of the diagrams, A to E, represents the electron arrangement of each of the following?

- (i) A sodium atom, Na .....
- (ii) A sodium ion, Na<sup>+</sup> .....

**(Total 2 marks)**

2. Diesel oil is obtained from crude oil. It can be used as a fuel for car engines. The diagram below represents a compound found in diesel oil.



(a) What is the formula of this compound?

.....

**(1)**

(b) Each of the lines on the diagram above represents a covalent bond.

What is a covalent bond?

.....

.....

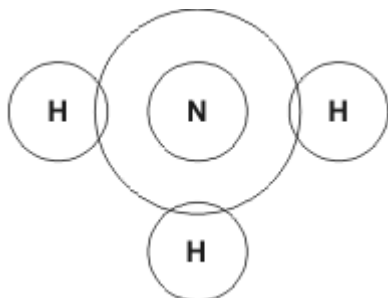
**(2)**  
**(Total 3 marks)**

3. Ammonia (NH<sub>3</sub>) is an important chemical which is used to make fertilisers. Ammonia is made from nitrogen and hydrogen,

(a) The diagrams represent the electron arrangements in atoms of nitrogen and hydrogen.



Complete the diagram showing the arrangement of electrons in a molecule of ammonia.



(1)

- (b) Name the type of bonding which holds the nitrogen and hydrogen atoms together in an ammonia molecule.

.....

(1)

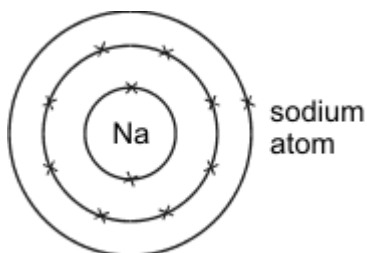
(Total 2 marks)

4. (a) The electronic structure of a sodium atom can be written 2,8,1. Write the electronic structure of a potassium atom in the same way.

.....

(1)

- (b) The electronic structure of a sodium atom can also be represented as in the diagram below.



- (i) Draw a similar diagram for a fluorine atom.  
 (ii) Draw similar diagrams to show the electronic structure of the particles in sodium fluoride.

(4)

(Total 5 marks)

5. Fluorine is a very useful element. It is placed in group 7 of the Periodic Table.

Use your knowledge of the elements in group 7 to help you answer these questions. You may find that information in the Data Sheet may help you with this question.

- (a) Name another element in group 7 of the Periodic Table.

.....

(1)

- (b) Cylinders filled with fluorine molecules are commercially available. What would you expect the formula of a fluorine molecule to be?

.....

(1)

- (c) Fluoride ions are added to drinking water to help prevent tooth decay. What is the charge on fluoride ions in the water?

.....

(1)

- (d) Fluorine reacts with the non-metal sulphur to make sulphur hexafluoride (SF<sub>6</sub>).

- (i) What type of bonding would you expect in sulphur hexafluoride?

.....

(1)

- (ii) Explain the reason for your answer to part (i).

.....

.....

.....

(1)

(Total 5 marks)

6. Part of the Periodic Table showing the symbols for the first twenty elements is given below.

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

- (a) Draw diagrams showing the arrangement of electrons (electronic structures) in:

- (i) an aluminium atom;

- (ii) a chlorine atom.

(2)

- (b) (i) Use electronic structures to help you show why the formula of sodium oxide is Na<sub>2</sub>O.

(3)

- (ii) State why the formation of sodium ions is classified as an oxidation.

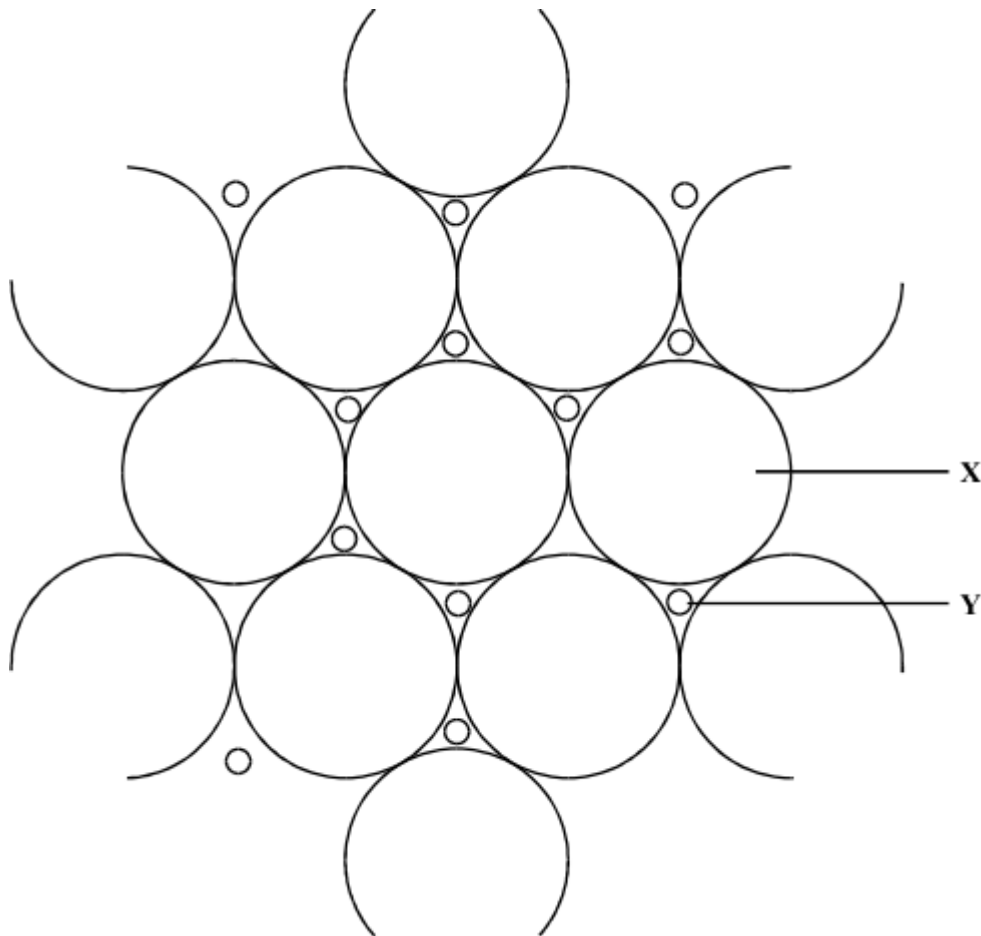
.....

.....

(1)

(Total 6 marks)

7. The diagram shows a model of part of the giant lattice of a metal.



(a) Name particles **X** and **Y**.

**X** .....

**Y** .....

(2)

(b) Explain, in terms of the giant structure above, why is it possible to bend a piece of metal.

.....  
.....  
.....  
.....

(2)

(Total 4 marks)

8. Millions of years ago the Earth formed as a giant ball of molten rock. The outer surface cooled forming a thin, solid outer crust. Volcanic activity on the surface produced an atmosphere containing the compounds carbon dioxide, ammonia, methane and water vapour.

Describe the bonding in any **one** of these compounds. You must include electronic structures in your explanation.

.....

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(Total 4 marks)