Ionic structure

Introduction

These questions are designed to help you to develop your mental models (pictures in your head) of ions. Being able to think about ions in different ways will help to develop your understanding of ionic structures. Use the icon in the margin to find out which level of understanding the question is developing. You can refer back to your **Ionic bonding in table salt: Johnstone's triangle** worksheet to support you.

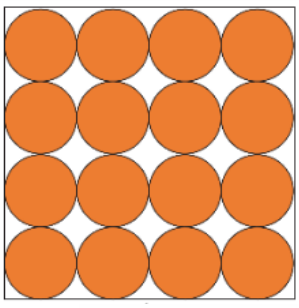
Macroscopic: what we can see. Think about the properties that you can observe, measure and record.

Sub-microscopic: smaller than we can see. Think about what is happening at a particle or atomic level.

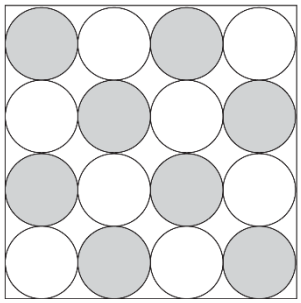
Symbolic: how we represent what is happening. Think about the models you use to represent what you cannot see including diagrams and symbols.

Questions

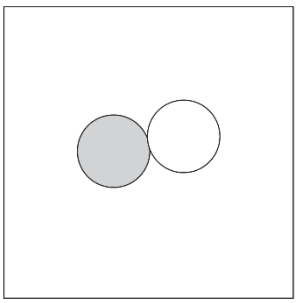
1. Sodium chloride is an ionic compound. Select the diagram that shows the structure of sodium chloride.



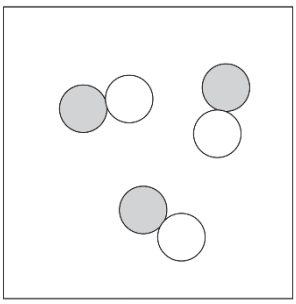
A



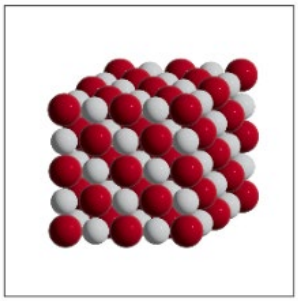
B



C

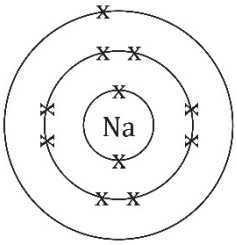


D

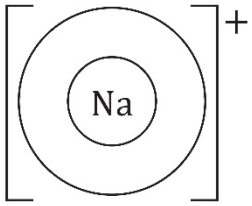


E

2. A sodium atom has 11 electrons. The diagram below shows an electron configuration diagram of a sodium atom.



(a) Complete the electron configuration diagram for a sodium ion (Na^+).



(b) Draw the electron configuration diagrams for the following ions:

i. lithium ion (Li^+)
(A lithium atom has 3 electrons.)

ii. chloride ion (Cl^-)
(A chlorine atom has 17 electrons.)

iii. fluoride ion (F^-)
(A fluorine atom has 9 electrons.)

(c) Complete the following sentences using the words **larger** or **smaller**.

i. A sodium ion is _____ than a chloride ion.

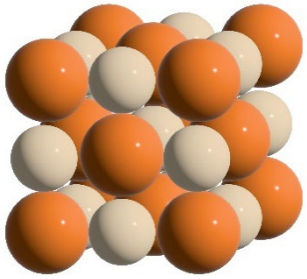
ii. A chloride ion is _____ that a fluoride ion.

iii. A lithium ion is _____ than a fluoride ion.

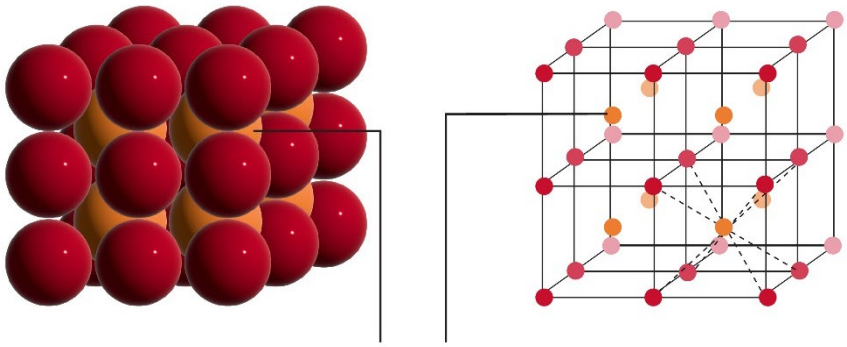
(d) In diagrams of ionic lattices, ions are shown as spheres. Different ions are shown with different colours or shading. Ions are not really different colours but it helps to show the structure of the lattice more clearly.

The diagram below shows the structure of lithium fluoride. On the diagram, label:

i. a lithium ion
ii. a fluoride ion



3. The diagram below shows two models of the structure of caesium chloride.



Space-filling model Ball-and-stick model

(a) Suggest why the ions in the caesium chloride lattice are arranged differently to the ions in lithium fluoride (in question 2(d)).

(b) Give one advantage and one disadvantage for the space-filling model and the ball-and-stick model.