

Ionic structure and bonding

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.



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



Sub-microscopic: smaller than we can see. Think about the particle or atomic level.

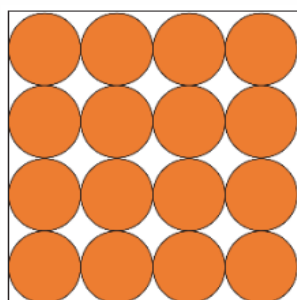
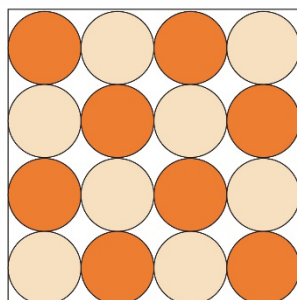
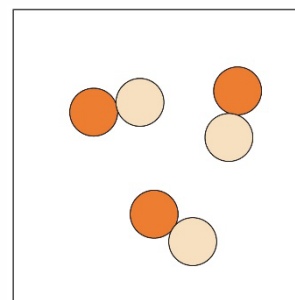


Symbolic: representations. Think about how we represent chemical ideas including symbols and diagrams.

Questions



1. Sodium chloride is an ionic compound. It is in the solid state at room temperature.

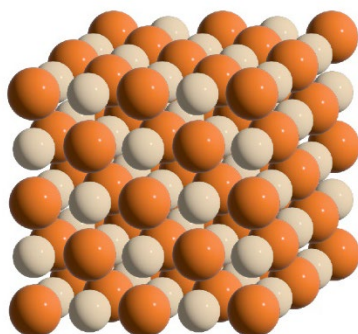
**A****B****C**

- (a) Select the diagram that shows the structure of sodium chloride at room temperature.

- (b) Complete the sentence.


This is the best representation of the structure of sodium chloride because...

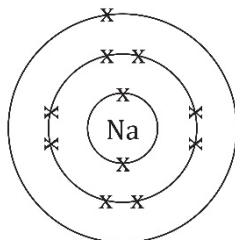
-  2. Sodium chloride is made up of white crystals. The structure of sodium chloride can also be represented by the diagram below.



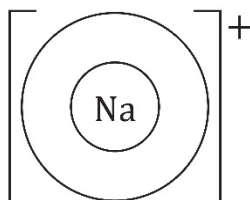
(a) Describe what this diagram shows.

(b) Explain why this diagram is a better representation of sodium chloride than the representation you chose in question 1 (a).

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



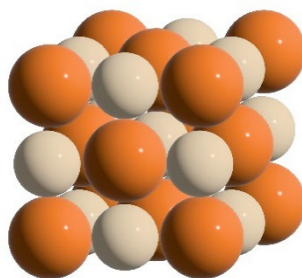
(a) Complete the electron configuration diagram for a sodium ion (Na^+).



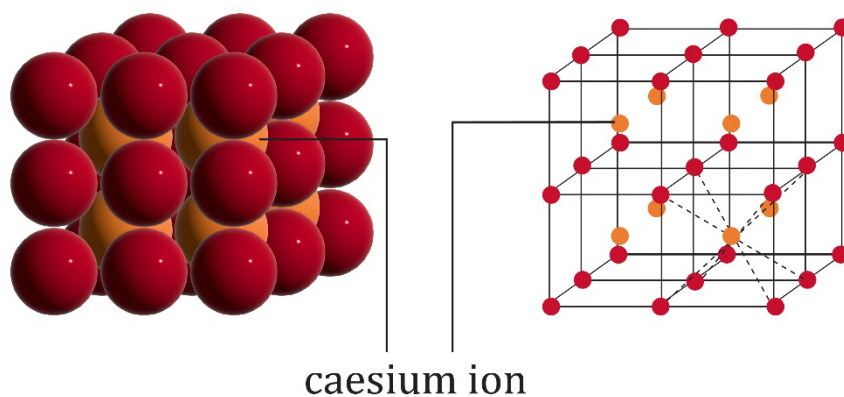
(d) In diagrams of ionic lattices, ions are shown as spheres. Different ions are shown with different colours or shading. Ions are not really different colours but it helps to show the structure of the lattice more clearly.

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

- i. a lithium ion
- ii. a fluoride ion



4. 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 3(d).

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

Space filling model

Advantage: _____

Disadvantage: _____

Ball-and-stick model

Advantage: _____

Disadvantage: _____
