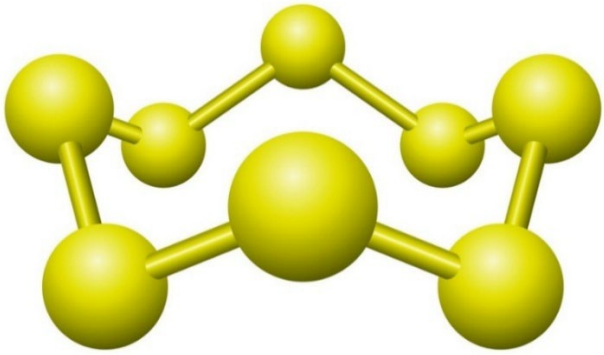
Representing elements and compounds

1 This question is about the chemical formulas of molecular substances.

(a) The diagram shows the ball and stick model of a molecule of the element sulfur.



Source: © Shutterstock

What is the chemical formula for this sulfur molecule?

_____ **(1 mark)**

(b) Complete the table on the next page to show the name and number of atoms in the chemical formulas of some molecular compounds. The first row has been completed for you.

Chemical formula of compound	Name of atoms in the compound	Number of each type of atom in the compound
CH_3COOH	carbon hydrogen oxygen	2 carbon atoms 4 hydrogen atoms 2 oxygen atoms
C_2H_6		
$CH_3(CH_2)_3CH_3$		
H_2NCH_2COOH		
$HOOC(CH_2)_4COOH$		

(4 marks)

2 This question is about the chemical formulas of ionic compounds.

(a) The formula of sodium chloride is NaCl. What type of formula is NaCl?

_____ **(1 mark)**

(b) Each of the following compounds contains group 1 and group 7 elements.

Deduce their formulas.

i. lithium fluoride

_____ **(1 mark)**

ii. potassium iodide

_____ **(1 mark)**

iii. sodium bromide

_____ **(1 mark)**

(c) What is the difference in composition between calcium sulfide and calcium sulfate?

_____

_____

(1 mark)

(d) Each of the following ionic compounds is formed when group 1 or group 2 positive ions combine with group 6 or group 7 negative ions.

Deduce the chemical formula of each compound.

i. sodium oxide

_____ **(1 mark)**

ii. magnesium chloride

_____ **(1 mark)**

iii. calcium sulfide

_____ **(1 mark)**

(e) Use the formulas of the ions provided to deduce the chemical formulas of each of the following ionic compounds.

NH_4^+ OH^- NO_3^- CO_3^{2-} SO_4^{2-}

i. sodium carbonate

_____ (1 mark)

ii. magnesium nitrate

_____ (1 mark)

iii. ammonium hydroxide

_____ (1 mark)

iv. ammonium sulfate

_____ (1 mark)

v. magnesium carbonate

_____ (1 mark)

3 State symbols provide more information about a substance.

Add state symbols to each of the chemical equations provided based on the information given in the description of the reaction that occurs.

(a) An iron nail is placed in copper(II) sulfate solution. The iron nail reacts with the copper(II) sulfate to produce copper metal and a solution of iron(II) sulfate.

$Fe\_\_\_\_\_ + CuSO_4\_\_\_\_\_ \rightarrow Cu\_\_\_\_\_ + FeSO_4\_\_\_\_\_$ (2 marks)

(b) When copper carbonate powder is added to dilute hydrochloric acid, carbon dioxide gas is given off and a green solution is formed.

$CuCO_3\_\_\_\_\_ + 2HCl\_\_\_\_\_ \rightarrow CuCl_2\_\_\_\_\_ + CO_2\_\_\_\_\_ + H_2O\_\_\_\_\_$

(2 marks)

4 Copper forms a Cu^{+} ion and a Cu^{2+} ion. Roman numerals are used in the name of ionic compounds to show the number of positive charges on the metal ion.

(a) Name each of these compounds.

i. Cu_2O

_____ **(1 mark)**

ii. CuO

_____ **(1 mark)**

iii. $CuCl$

_____ **(1 mark)**

(b) Give the chemical formula for each of the following compounds:

i. iron(II) oxide

_____ **(1 mark)**

ii. iron(III) oxide

_____ **(1 mark)**

iii. manganese(IV) oxide

_____ **(1 mark)**

[Total: 28 marks]

Which question(s) did you get wrong? Why?

What will you do next time you're asked a similar question?