Paper 3

Questions are applicable for both core and extended candidates

1 Table 2.1 shows the masses of some of the ions in a 1000 cm^3 sample of river water.

Table 2.1

name of ion	formula of ion	mass of ion in 1000 cm^3 of river water / mg
	NH_4^+	0.4
calcium	Ca^{2+}	1.4
chloride	Cl^-	0.1
hydrogencarbonate	HCO_3^-	1.2
magnesium	Mg^{2+}	0.6
nitrate	NO_3^-	0.8
phosphate	PO_4^{3-}	1.3
sodium	Na^+	0.5
	SO_4^{2-}	0.4

(a) Answer these questions using the information in Table 2.1.

(i) Name the negative ion that has the highest concentration.

..... [1]

(ii) Name the compound that contains NH_4^+ and SO_4^{2-} ions only.

..... [1]

(iii) Calculate the mass of hydrogencarbonate ions in 200 cm^3 of river water.

(c) Most of the nitrate ions in river water come from fertilisers used on fields.

Describe the benefit of using fertilisers.

..... [1]

2 A list of substances is shown.

ammonium nitrate
carbon monoxide
copper(II) chloride
ethane
ethene
litmus
methane
methyl orange
sodium chloride
sodium sulfate
sulfur dioxide
thymolphthalein

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

Give the name of the substance that:

(b) is in many fertilisers

..... [1]

3 Aqueous sodium hydroxide is a base.

(d) Ammonia is used in the manufacture of nitrogen-containing fertilisers.

Which two of these compounds are present in fertilisers?

Tick **two** boxes.

copper(II) oxide ☐
potassium chloride ☐
sodium phosphate ☐
strontium fluoride ☐
sulfur dioxide ☐

[2]

4 This question is about compounds of nitrogen.

(a) Fertilisers containing nitrogen are used by farmers to improve crop growth.

Name two **other** elements found in most fertilisers that improve crop growth.

..... and ..... [2]

Paper 4

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

5 The Haber process is used to manufacture ammonia.

(c) Ammonia reacts with an acid to form ammonium sulfate, $(NH_4)_2SO_4$.

(i) State the formula of the acid used.

..... [1]

(ii) State **one** use of ammonium sulfate.

..... [1]

(iii) Calculate the percentage composition by mass of nitrogen in $(NH_4)_2SO_4$.

percentage of nitrogen = ... % [2]

6 The names of the elements of Period 2 of the Periodic Table are shown.

lithium beryllium boron carbon nitrogen oxygen fluorine neon

Answer the following questions about these elements.

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

Identify the element which:

(d) is a main component of fertilisers used to improve crop growth

..... [1]