

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.

mass = mg [1]

- (b) Give a test for sodium ions.

test

observations

[2]

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

Describe the benefit of using fertilisers.

..... [1]

- (d)** Water from natural sources can be polluted with harmful substances.

State why sewage and phosphates in river water are harmful.

sewage

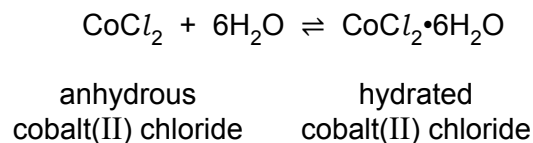
.....

phosphates

.....

[2]

2 (b) Cobalt(II) chloride can be used to test for the presence of water.



(i) State the meaning of the symbol \rightleftharpoons .

..... [1]

(ii) State the colour change when water is added to anhydrous cobalt(II) chloride.

from to [2]

(c) (i) Table 3.1 compares the reactivity of cobalt with that of three other metals.

Table 3.1

metal	reactivity with cold water	reactivity with steam
barium	reacts rapidly	
cobalt	no reaction	reacts slowly when heated
magnesium	reacts very slowly	reacts rapidly
zinc	no reaction	reacts easily when heated

Use this information to put the four metals in order of their reactivity. Put the least reactive metal first.

least reactive
→
 most reactive

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[2]

(ii) State the boiling point of pure water at room temperature and pressure.

..... °C [1]

3 This question is about halogens and halogen compounds.

- (a)** Deduce the number of electrons, neutrons and protons in one atom of the isotope of chlorine shown.



number of electrons

number of neutrons

number of protons

[3]

- (b)** State why chlorine is used in water treatment.

..... [1]

Paper 4

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

- 4** The elements in Group VII of the Periodic Table are known as the halogens. Halogens can form halide ions.

(e) Name a halide compound which can be used to detect the presence of water.

..... [2]

- 5** This question is about the first 30 elements in the Periodic Table.

Name the element which:

(f) has an anhydrous chloride which turns pink when water is added

..... [1]