Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

GSD22

TUESDAY 25 FEBRUARY 2014, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **4(b)**.
A Data Leaflet which includes a Periodic Table of the elements is provided.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** The table below gives data on the solubility of some salts. Use this information to identify patterns for these salts and answer the questions that follow.

Anion \ Cation	Cu^{2+}	Na^{+}	Pb^{2+}	Ca^{2+}
Cl^{-}	soluble	soluble	insoluble	soluble
SO_4^{2-}	soluble	soluble	insoluble	slightly soluble
CO_3^{2-}	insoluble	soluble	insoluble	insoluble
NO_3^{-}	soluble	soluble	soluble	soluble

(i) What is the solubility rule for **sodium** salts?

_____ [1]

(ii) What is the solubility rule for **chloride** salts?

_____ [2]

(iii) Which **anion** always produces soluble salts?

_____ [1]

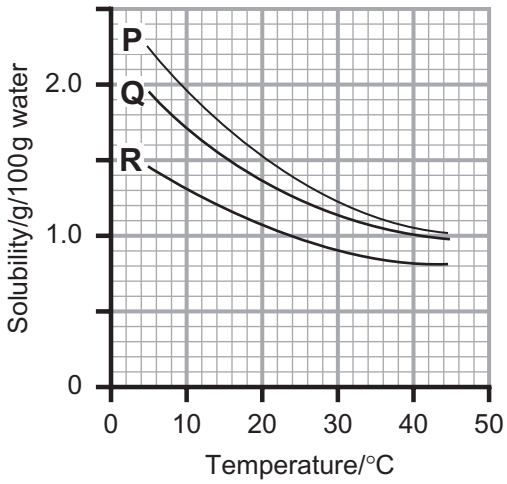
(b) Use the information you have gained from the table to predict the solubility of the following compounds:

zinc nitrate _____

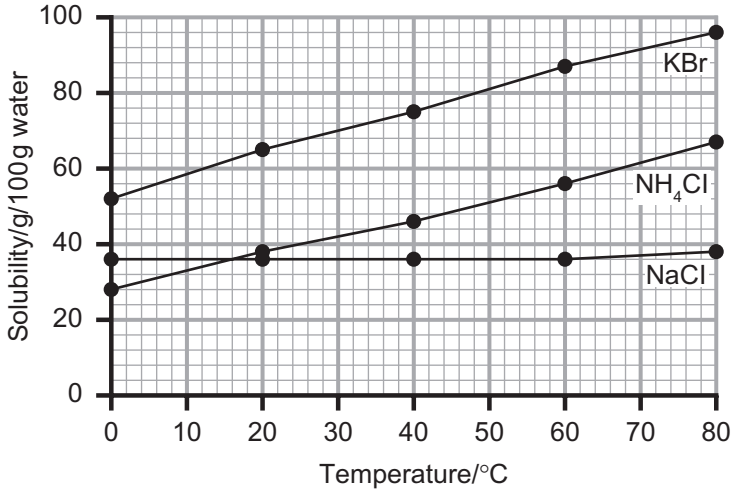
sodium sulfite _____

magnesium chloride _____ [3]

2 **(a)** Look at the two graphs below showing solubilities.



graph X



graph Y

Examiner Only	
Marks	Remark

(i) Describe the **trend** in solubility shown by the substances **P**, **Q** and **R** in graph **X**.

_____

_____ [2]

(ii) In what physical state would you expect the substances **P**, **Q** and **R** to be?

_____ [1]

(iii) Describe the **trends** in solubility for the substances in graph **Y**.

_____

_____

_____

_____ [2]

(iv) At what temperature do NaCl and NH_4Cl have the same solubility?

_____ [1]

Read the following passage and answer the questions that follow.

The river Bush is good for salmon fishing. In summer, after a spell of hot weather, heavy rain caused water from a nearby car park to run into the river. This water was warmed by the hot tarmac and it increased the river water temperature by several degrees.

(b) (i) What effect would increased water temperature have on the oxygen levels in the river water?

_____

_____ [1]

(ii) Explain how salmon could be affected if the temperature in the river rises.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

3 Aluminium is combined with small amounts of some other elements to produce a new material called **X**. This new material has improved properties making it tougher and stronger than pure aluminium. It has excellent corrosion resistance and very good resistance to seawater.

The table below gives some information about material **X**.

elements used to make X	% by weight	relative atomic mass
aluminium		27
magnesium	0.8	24
silicon	0.6	28
iron	0.7	56
zinc	0.2	65
copper	0.4	64

(a) Why can **X** be described as an alloy?

_____

_____ [2]

(b) **(i)** Calculate the **total** percentage by weight of all the other elements added to aluminium in this alloy.

_____ [1]

(ii) Calculate the percentage by weight of aluminium in this alloy. Show your working.

_____% [2]

(c) (i) From the information given in the passage opposite and your own knowledge, explain why **X** would be very suitable in the manufacture of aircraft.

_____

_____

_____

_____ [2]

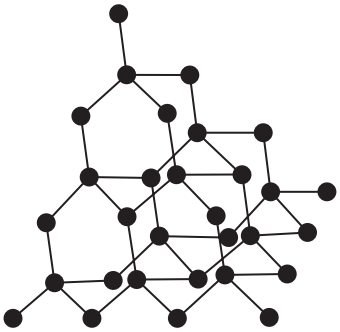
(ii) Suggest another use for **X** based on the information in the passage and the table.

_____ [1]

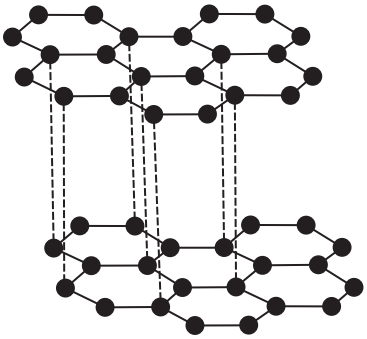
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 Two structural models are shown below.



A



B

(a) (i) Name a substance which has:

Structure **A** _____

Structure **B** _____ [2]

(ii) What do the black dots in the structural models represent?

_____ [1]

In part (b) you will be assessed on your written communication skills including the use of specialist scientific terms.

Examiner Only	
Marks	Remark

(b) Compare and contrast the physical properties of the substances which have structures **A** and **B**.

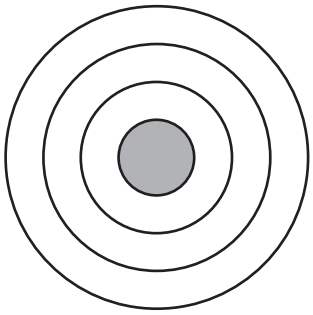
Your answer should include similar physical properties and physical properties which are different.

[6]

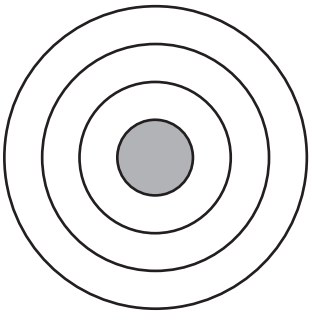
Examiner Only	
Marks	Remark

(c) (i) Sodium reacts with sulfur to form a compound called sodium sulfide.

Complete the diagrams below to show **all** the electrons in a sodium atom and in a sulfur atom.

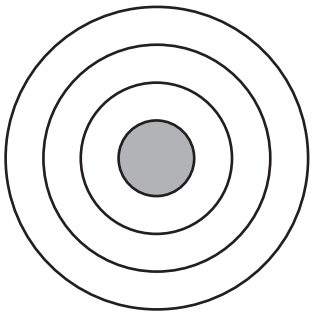


sodium atom

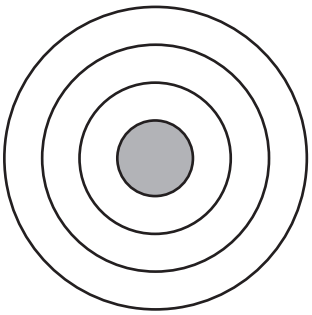


sulfur atom [2]

(ii) In the space below draw diagrams to show **all** the electrons in a sodium ion and in a sulfide ion.



sodium ion



sulfide ion [2]

(iii) How are the ions held together in sodium sulfide?

_____ [1]

(iv) What is the chemical formula for sodium sulfide?

_____ [1]

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

5 **(a)** **(i)** Draw a dot and cross diagram to show how **all** the electrons are arranged in a molecule of water.

[3]

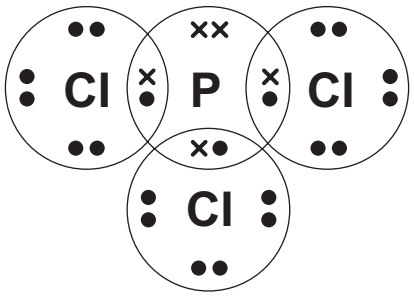
(ii) Describe a **chemical** test for water.

_____

_____ [2]

(b) When phosphorus reacts with chlorine it forms phosphorus trichloride.

The diagram shows a molecule of phosphorus trichloride. Use this diagram to answer the questions which follow.



(i) How many covalent bonds does this molecule have?

_____ [1]

(ii) How many lone pairs are there in this molecule?

_____ [1]

(c) Draw a dot and cross diagram to show how **all** the electrons are arranged in a molecule of nitrogen, N_2.

[2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** **(i)** Describe, in terms of the electrons involved, how calcium and chlorine are able to form the stable compound calcium chloride.

_____

_____

_____

_____

_____ [4]

(ii) Explain fully why all the halogens have similar chemical properties.

_____

_____

_____ [2]

(b) When chlorine is bubbled into potassium bromide solution a colour change takes place.

(i) Describe and explain the colour change that takes place in the solution.

_____

_____

_____ [3]

(ii) Write a balanced chemical equation for the reaction between chlorine and potassium bromide.

_____ [3]

Examiner Only	
Marks	Remark

7 **(a)** When calcium hydroxide reacts with hydrochloric acid a neutralisation reaction occurs. Write a balanced symbol equation for this reaction.

_____ [3]

(b) Write an **ionic** equation, **including state symbols**, to describe the process of neutralisation.

_____ [3]

(c) Molten calcium fluoride, CaF_2, can be used to produce calcium metal by the process of electrolysis.

Write a half equation for the reaction that takes place:

(i) at the cathode. _____ [2]

(ii) at the anode. _____ [2]

THIS IS THE END OF THE QUESTION PAPER