Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Chemistry

GSD21

Unit C1
Foundation Tier

[GSD21]

THURSDAY 12 NOVEMBER 2015, 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 ten** 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 **5**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

BLANK PAGE

1 Lists of chemical terms and their meanings are given below.

(a) Draw a line to match each chemical term with the correct meaning. One has been done for you.

Chemical term	Meaning
solvent	a substance that is dissolved
saturated solution	contains water of crystallisation
hydrated	can be dissolved
soluble	contains the maximum mass of a dissolved substance
solute	a substance in which other materials can dissolve

[3]

(b) Draw, in the box below, the hazard symbol you would expect to find on a bottle containing a poisonous (toxic) solution.

[1]

Examiner Only
Marks | Remark

2 There are three states of matter, **solid**, **liquid** and **gas**.

(a) Complete the table below which gives 5 properties of solids, liquids and gases. For each property, place a tick (✓) in the correct box. The first one has been done for you.

Property	Solid	Liquid	Gas
Can be compressed			✓
Takes the volume and shape of the container			
Takes only the shape of the container			
Will condense when cooled			
Has a fixed shape			

[4]

The table below lists the melting points and boiling points of four substances **A**, **B**, **C** and **D**.

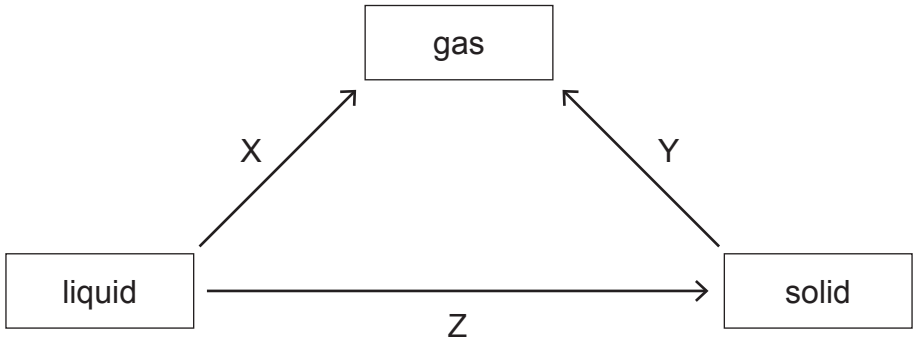
Substance	Melting point/°C	Boiling point/°C
A	114	444
B	–220	–118
C	–7	59
D	3500	4827

(b) Which of the substances **A**, **B**, **C** or **D** is in the liquid state at:

(i) 20 °C? _____ [1]

(ii) 200 °C? _____ [1]

The diagram below shows three **changes of state** labelled X, Y and Z.



(c) Name each change of state:

X _____

Y _____

Z _____ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

3 Four substances **E**, **F**, **G** and **H** are described below. Read each description carefully and answer the questions which follow.

Substance **E** is a green solid which when heated produces a black powdery solid and a gas.

(a) Is substance **E** an element, a compound or a mixture?

_____ [1]

(b) Substance **F** is a silvery grey solid which is a good conductor of heat and electricity.

(i) Substance **F** is a mixture of metals. What name is given to this type of mixture?

_____ [1]

(ii) Give two other properties, apart from being a good conductor of heat and electricity, which you would expect a mixture of metals to have.

1. _____

2. _____ [2]

(c) Substance **G** is a colourless gas which forms only water when it burns.

(i) Substance **G** is an element. What is the name of substance **G**?

_____ [1]

(ii) Complete the sentence.

An element is a substance which _____

_____ [1]

(d) Substance **H** is a black liquid which separates easily into different gases and liquids.

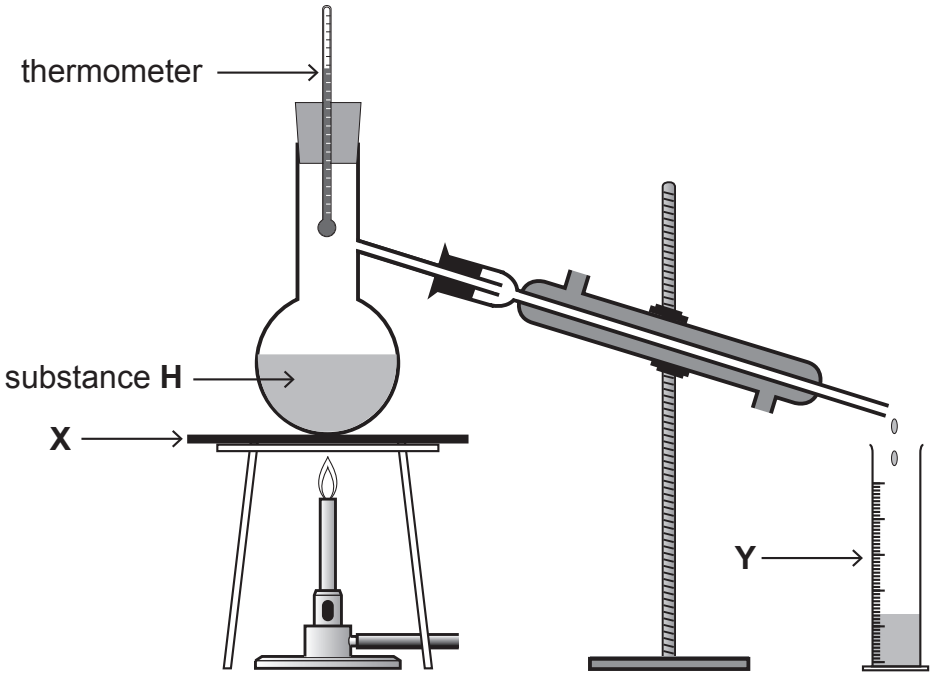
Explain why **H** can be described as a mixture.

_____

_____ [1]

(e) Substance **H** can be separated using the apparatus below.

Examiner Only	
Marks	Remark



(i) Name the pieces of apparatus labelled **X** and **Y**.

X _____

Y _____ [2]

(ii) What does a thermometer measure?

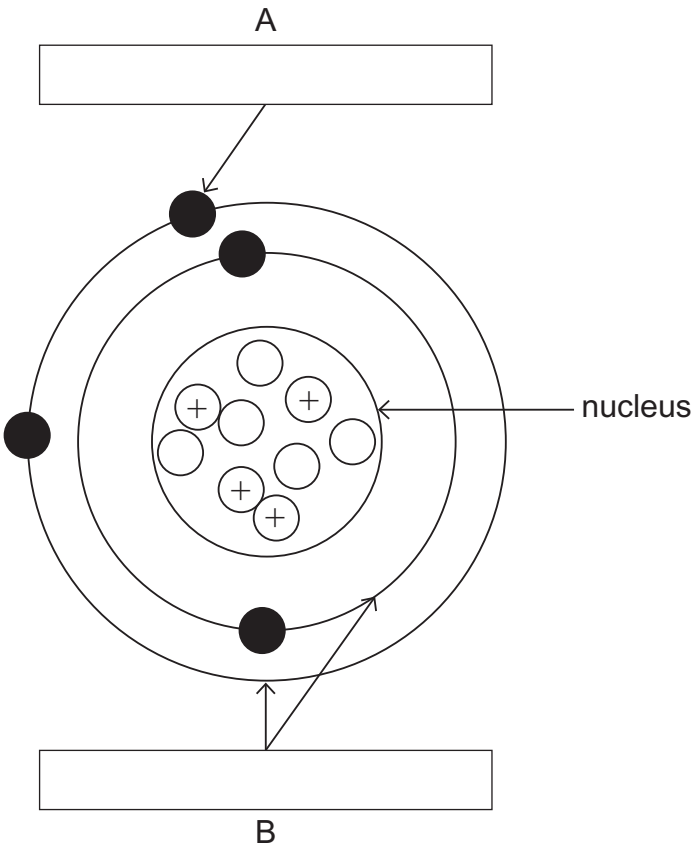
_____ [1]

(iii) Label the diagram above to show the position of the **distillate**. [1]

Examiner Only	
Marks	Remark

4 The diagram below represents an atom.

(a) Complete the labels A and B on the diagram.



[2]

(b) The nucleus contains two different types of particles.

(i) Name the type of particle in the nucleus which has a positive (+) charge.

_____ [1]

(ii) What is the atomic number of the atom shown in the diagram?

_____ [1]

(c) This atom is from an element in Group 2 of the Periodic Table.
What name is given to Group 2 elements?

_____ [1]

5 Sodium reacts rapidly with water. Given a jar containing lumps of sodium, stored under oil, describe how you could **safely** react a piece of sodium with water and what you would see happening.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

safely carrying out the reaction:

observations:

[6]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

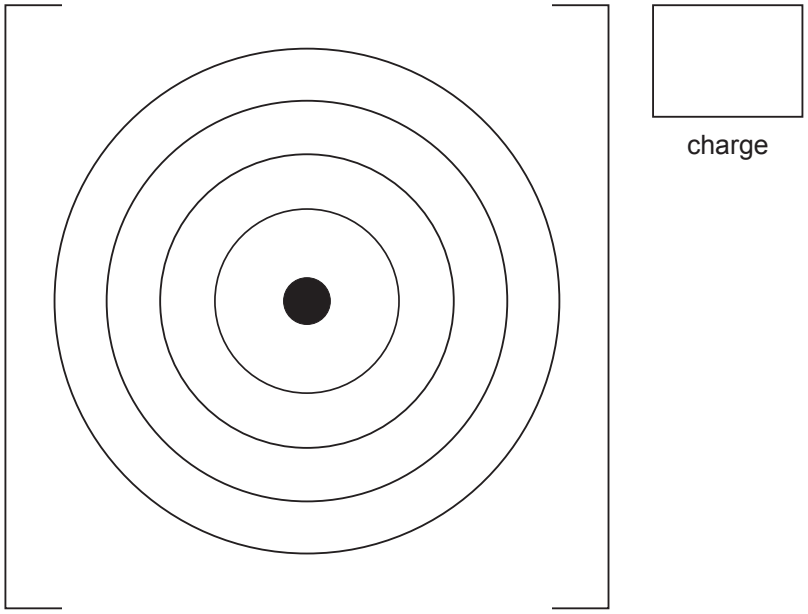
6 Some tap water contains dissolved calcium chloride ($CaCl_2$) and dissolved calcium hydrogen carbonate, $Ca(HCO_3)_2$.

(a) Give two reasons why calcium hydrogen carbonate and calcium chloride could be **ionic** compounds.

1. _____

2. _____ [2]

(b) Draw the electronic configuration of the calcium **ion** and give the charge.



[2]

(c) How many oxygen atoms are there in the formula $Ca(HCO_3)_2$?

_____ [1]

Some tap water can contain dissolved magnesium sulfate or dissolved potassium carbonate.

(d) Write the formulae for magnesium sulfate and potassium carbonate.

magnesium sulfate _____

potassium carbonate _____ [2]

Examiner Only
Marks | Remark

7 The Periodic Table is used by chemists to help them understand the reactions of the elements. John Newlands was one of the first chemists to notice repeating patterns in the properties and reactions of the elements.

(a) What name did Newlands give to the repeating pattern observed in the properties of the elements?

_____ [1]

(b) Almost a decade after Newlands, Dmitri Mendeleev produced a Periodic Table, part of which is shown below.

H							
Li	Be	B	C	N	O	F	
Na	Mg	Al	Si	P	S	Cl	
K Cu	Ca Zn		Ti	V As	Cr Se	Mn Br	Fe Co Ni

(i) In what order did both Mendeleev and Newlands arrange the elements?

_____ [1]

(ii) Which Group of elements is missing from the Periodic Table developed by Mendeleev?

_____ [1]

(iii) Suggest why Mendeleev placed calcium and zinc in the same position in the Periodic Table.

_____ [1]

(c) Name the element which is in Group 7 and Period 3 of the modern Periodic Table.

_____ [1]

Examiner Only	
Marks	Remark

8 Metal oxides are bases. They react with strong acids to form salts.

(a) What is the pH range of a strong acid?

_____ [1]

Copper oxide reacts with sulfuric acid.

(b) **(i)** Complete the **word** equation below for this reaction.

copper oxide + sulfuric acid → + [2]

(ii) Why can this reaction be described as a neutralisation reaction?

_____

_____ [2]

(iii) What colour change is observed **in the solution** as this reaction is happening?

from _____ to _____ [2]

Sodium oxide reacts with hydrochloric acid.

(c) **(i)** Complete a balanced symbol equation for the reaction between sodium oxide and hydrochloric acid.

Na_2O + HCl → + [3]

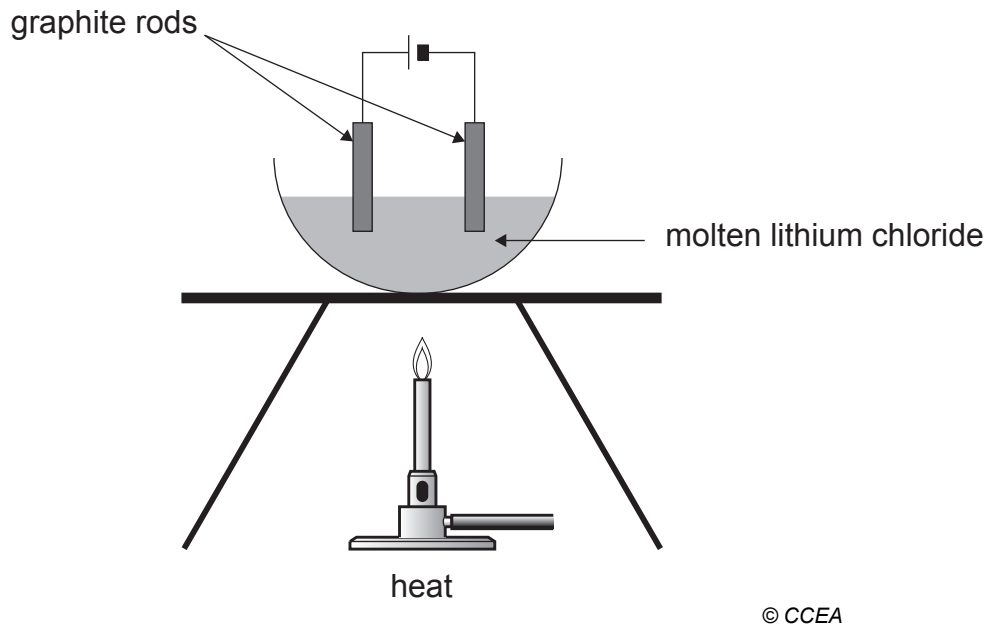
(ii) Sodium oxide is an alkali. Why could sodium oxide be described as an alkali?

_____

_____ [2]

Examiner Only	
Marks	Remark

9 The diagram below shows the apparatus used in the laboratory to conduct electricity through molten lithium chloride.



(a) What is the name given to the graphite rods?

_____ [1]

(b) Give one reason why graphite is used to make these rods.

_____ [1]

(c) Name the **type** of particle which can move and carry the charge in the molten lithium chloride.

_____ [1]

(d) What is formed at the **cathode** when molten lithium chloride undergoes electrolysis?

_____ [1]

10 This question is about covalent structures and covalent bonding.

Examiner Only	
Marks	Remark

(a) What is a covalent bond?

_____ [1]

(b) Draw a dot and cross diagram to show the arrangement of electrons in a molecule of hydrogen chloride (HCl). Show outer electrons only.

[3]

(c) Complete the paragraph below which explains why giant covalent structures have much higher melting points than molecular covalent structures.

There are extremely strong forces of attraction between the _____ in a giant covalent structure which take a lot of heat energy to _____. There are weak forces of attraction between the _____ in a molecular covalent structure which do not require a lot of energy to _____. [3]

THIS IS THE END OF THE QUESTION PAPER