Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Double Award Science: Chemistry

GSD21

Unit C1
Foundation Tier

[GSD21]

THURSDAY 10 NOVEMBER 2016, 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 nine** 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 **8(d)**.
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	
Total Marks	

Examiner Only	
Marks	Remark

1 Some properties of metals are given in the list below.

(a) Draw a line to match each property to the correct description.

Property	Description
ductile	can be hammered into flat sheets
	good conductor of heat
malleable	can be pulled into wires
	conducts electricity when solid
sonorous	makes a ringing sound when hit

[3]

(b) (i) Aluminium is a metal which has many uses.

Choose the **property**, from the list in part **(a)**, that makes it suitable for making:

1. a thin foil for wrapping around food

_____ [1]

2. a bell for a bicycle

_____ [1]

(ii) Aluminium is also used in the manufacture of aeroplanes.
Give a property, **not** listed in part **(a)**, which makes it suitable for this use.

_____ [1]

2 The words listed below are often used in chemistry.

condenses	**sublime**	**evaporates**	**mix**
dissolve	**melt**	**freezes**	**boil**

Complete the sentences which follow by choosing the correct word from the list.
You may use the same word once, more than once, or not at all.

(a) Sea water contains salts that _____ in water. [1]

(b) Sometimes white crystals appear on the rocks at the Giant's Causeway when sea water _____ on sunny days. [1]

(c) In winter, car windscreens get "steamed up" when water vapour _____ on the cold surface. [1]

(d) Iodine crystals _____ to form a purple vapour when heated. [1]

(e) The wax in candles starts to _____ when it is heated. The wax then _____ again to form a solid. [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 The picture below shows the coin made for the handover of the Olympic Games from London to Rio in 2012.

This coin is an alloy made of copper, zinc and nickel.

(a) What is meant by the term alloy?

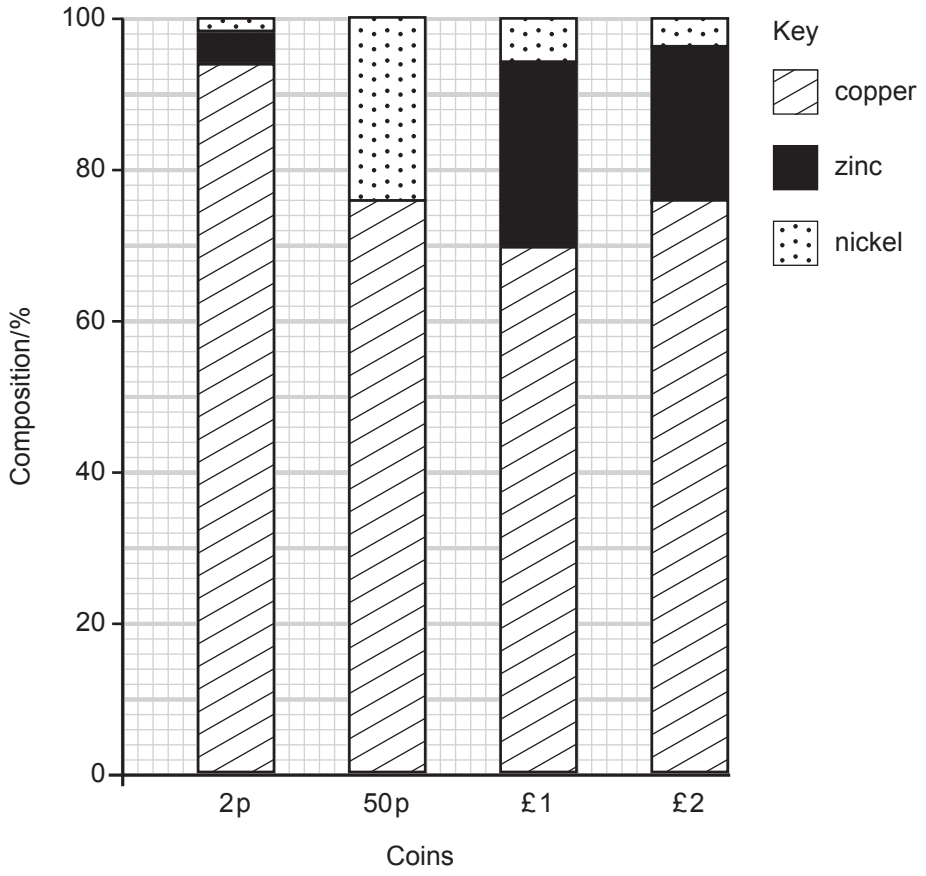
_____

_____ [2]

Examiner Only

Marks	Remark

(b) The bar chart below gives information on the percentages of metals in four different coins.
Use this information to answer the questions that follow.



(i) Which coin has the highest percentage of nickel?

_____ [1]

(ii) What is the percentage of zinc in a £1 coin?

_____ [1]

(iii) Calculate the average percentage of copper in all four coins.

Show your working.

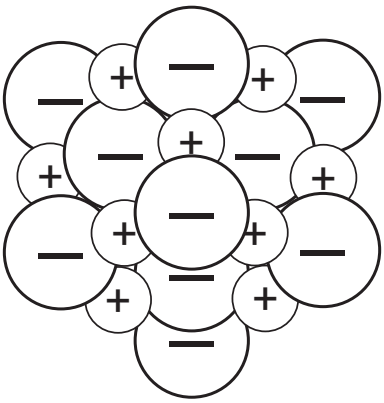
Answer _____ % [3]

(c) Suggest a reason why coins are made of more than one metal.

_____ [1]

Examiner Only	
Marks	Remark

4 The diagram shows the arrangement of the particles in a compound such as sodium chloride.



Complete the following sentences by putting a circle around the correct word or phrase from each box.

(a) When sodium atoms and chlorine atoms bond

electrons are

shared.
transferred.
delocalised.

[1]

(b) Sodium chloride has

covalent
metallic
ionic

bonds. [1]

(c) The bonds in sodium chloride are

weak.
strong.
neither weak or strong.

[1]

(d) Sodium chloride is made up of

simple molecules.
a giant lattice structure.
diatomic particles.

[1]

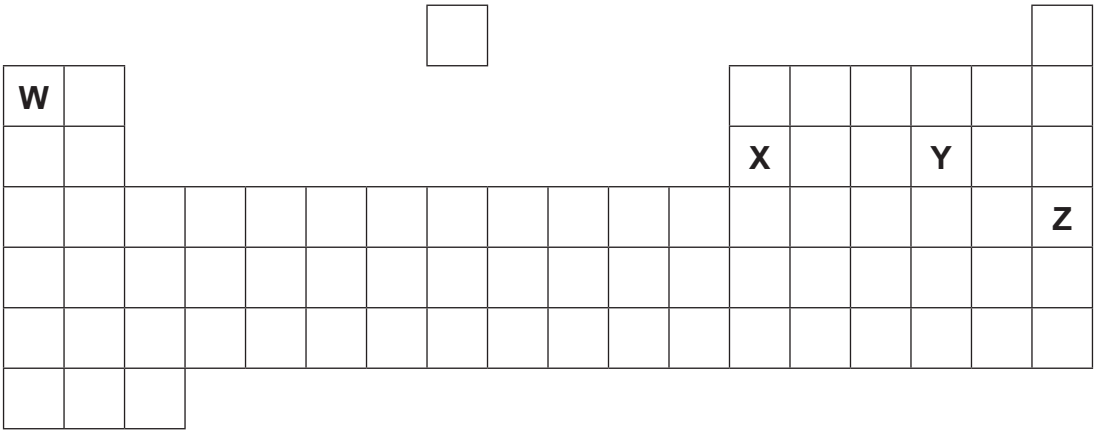
5 The following statements are about the Periodic Table.
Some of the statements are true and some are false.

(a) Put a tick (✓) beside each of the statements to show which are **true** and which are **false**.

Statement	True	False
Mendeleev arranged elements in order of atomic number.		
Newlands wrote the law of octaves.		
Mendeleev was able to predict the properties of undiscovered elements.		
An atom with 4 electrons in its outer shell would belong to an element in Group 4.		
The elements of Group 0 are non-reactive metals.		

[5]

(b) The diagram below shows an outline of part of the Periodic Table.



(i) To which Group does W belong?

_____ [1]

(ii) In which Period are X and Y found?

_____ [1]

(iii) Would you expect Z to be a solid, a liquid or a gas?

_____ [1]

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Marks	Remark

6 **(a)** **(i)** When lithium reacts with water it produces two products.
Complete the word equation for this reaction.

lithium + water → + [2]

(ii) What pH would you expect for the solution formed when lithium reacts with water?
Circle the correct answer:

2 **5** **7** **8** **12** [1]

(iii) When lithium reacts with chlorine it forms a compound.
Write a balanced symbol equation for this reaction.

_____ [3]

(iv) Lithium compounds can be used to give a red colour to fireworks.
The colour comes from the lithium ion.
What is the symbol for the lithium ion?

_____ [1]

(b) Potassium also reacts with water.

Describe three ways in which the reaction of lithium with water is different to the reaction of potassium with water.

1. _____

2. _____

3. _____ [3]

(c) Handling the metals lithium and potassium involves risks.

Give one danger or risk of **handling** these metals and give a safe way of managing the risk in the laboratory.

Danger or risk: _____

_____ [1]

Safe way of managing risk: _____

_____ [1]

7 The table below gives information about particles P, Q, R, S and T.
Use this information to answer the questions that follow.

Particle	Number of protons	Number of electrons	Number of neutrons
P	6	6	8
Q	18	18	22
R	6	6	6
S	11	10	12
T	17	17	20

(a) Which particle P, Q, R, S or T is a noble gas?

_____ [1]

(b) Which particle P, Q, R, S or T is an ion?

_____ [1]

(c) Which two particles are isotopes of the same element?

_____ and _____ [1]

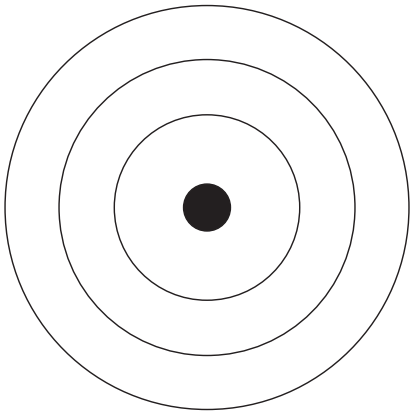
(d) What is the atomic number of particle T?

_____ [1]

(e) What is the mass number of particle S?

_____ [1]

(f) Use the diagram below to draw the electronic structure of particle T.

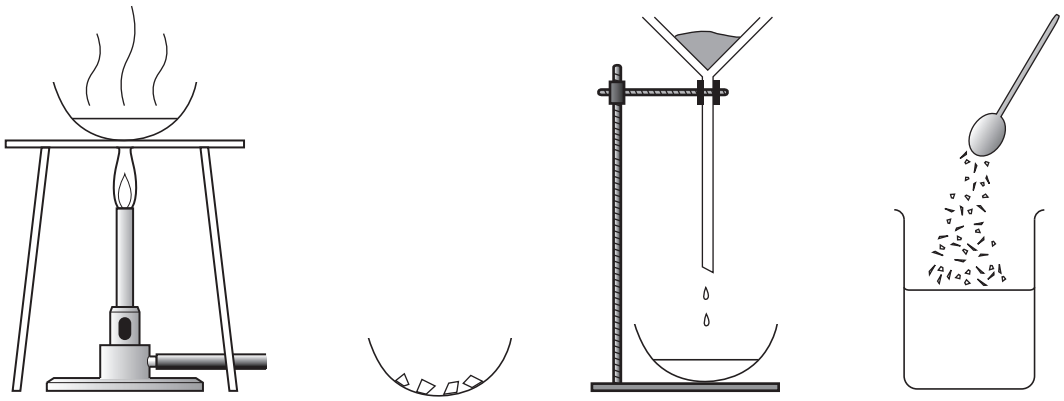


[1]

Examiner Only
Marks | Remark

Examiner Only	
Marks	Remark

8 **(a)** The diagrams below show different stages in the production of copper sulfate crystals from copper oxide and warm dilute sulfuric acid. They are **not** in the correct order.



A **B** **C** **D**

Stage **D** happens first and involves adding copper oxide to warm dilute sulfuric acid. Give the correct order for the three stages which follow stage **D**:

D then _____ then _____ then _____ [1]

(b) Complete the symbol equation for the reaction between sulfuric acid and copper oxide.

$H_2SO_4 + CuO \rightarrow \quad +$

[2]

(c) Copper carbonate also reacts with sulfuric acid to produce copper sulfate crystals.

(i) What colour is solid copper carbonate?

_____ [1]

(ii) What gas is formed when copper carbonate reacts with sulfuric acid?

_____ [1]

(d) Starting with copper oxide and warm dilute sulfuric acid, describe fully how you would produce a sample of copper sulfate crystals by carrying out the four stages shown in part **(a)**.

Your answer should include:

- the names of all pieces of apparatus used
- an explanation of the steps you would take
- any safety precautions required
- the colours of all substances involved

You will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

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Marks	Remark

9 The table below gives information on the solubility of some gases at different temperatures.

Gas	Formula	Solubility at 10 °C g/100 g water	Solubility at 20 °C g/100 g water
argon	Ar	0.79	0.59
nitrogen	N_2	0.28	0.18
carbon dioxide	CO_2	0.25	0.17
oxygen	O_2	0.57	0.44
chlorine	Cl_2	1.00	0.71

Use the information in the table and your own knowledge to answer the questions that follow:

(a) (i) Describe the trend in solubility for these gases as the temperature increases.

_____

_____ [1]

(ii) Which gas is the most soluble at 20 °C?

_____ [1]

(iii) Which gas is the least soluble at 10 °C?

_____ [1]

(iv) Which gas had the smallest change in its solubility as the temperature increased?

_____ [1]

(v) List the gases in the table which are diatomic.

_____ [2]

(vi) Which gas, listed in the table, is toxic?

_____ [1]

Examiner Only

Marks	Remark

(b) Warm water from a factory was discharged into a local river. There were reports of fish dying.

Complete the sentences by adding the missing words:

(i) This can be described as _____ pollution. [1]

(ii) The fish die because they do not have

enough _____. [1]

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Marks	Remark

THIS IS THE END OF THE QUESTION PAPER