Rewarding Learning

General Certificate of Secondary Education 2014

Double Award Science: Chemistry

Unit C2

Foundation Tier

[GSD51]

TUESDAY 10 JUNE 2014, AFTERNOON

TIME

1 hour 15 minutes, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

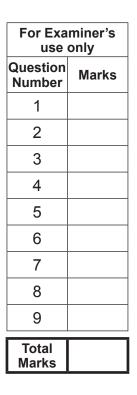
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

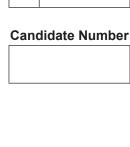
Write your answers in the spaces provided in this question paper. Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

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 included in this question paper.









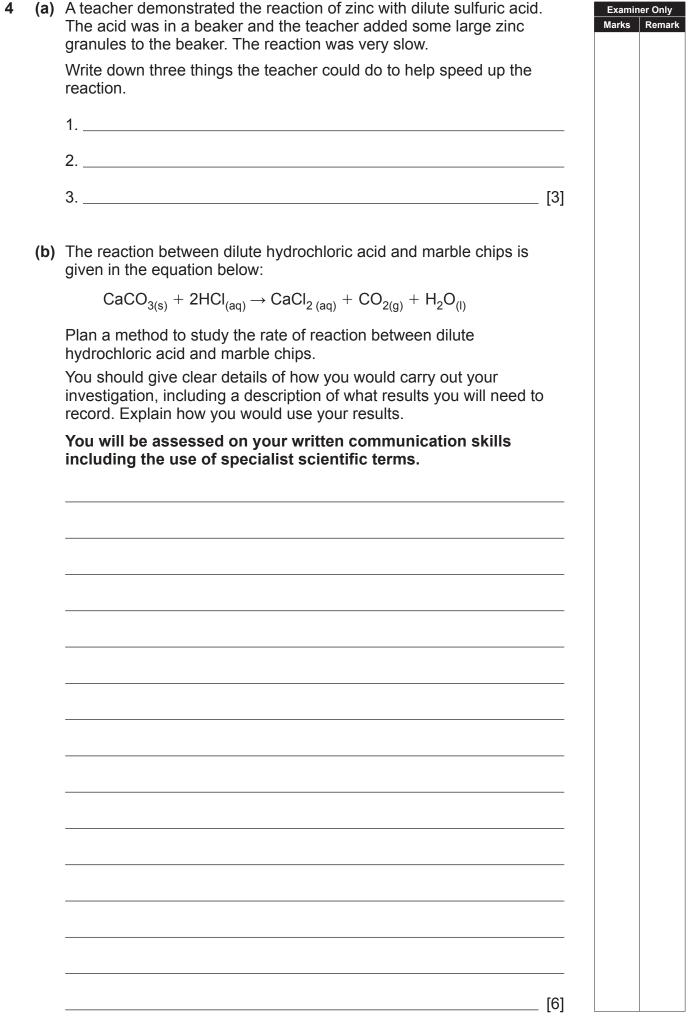
Centre Number

| 1 | (a) | | s part of the question i ow. Choose from the v | | Complete the sentence | es | Examir Marks | ner Only Remark |
|---|-----|------|---|---|-------------------------------|-----|-----------------|--------------------|
| | | | hydrogen | nitrogen | oxygen | | | |
| | | | rusting | neutralisation | reduction | | | |
| | | (i) | Oxidation is the addit | tion of | | | | |
| | | | to a substance, or the | e removal of | | - | | |
| | | | from a substance. | | | [2] | | |
| | | (ii) | The reverse of oxidat | tion is called | | [1] | | |
| | (b) | | ow are 5 chemical equ resent oxidation reacti | | e three equations whic | h | | |
| | | | NaOH + HCI | \rightarrow NaCl + H ₂ O | | | | |
| | | | $2Cu + O_2$ | \rightarrow 2CuO | | | | |
| | | | CuCO ₃ | \rightarrow CuO + CO ₂ | | | | |
| | | | 2HI | \rightarrow H ₂ + I ₂ | | | | |
| | | | $CuS + O_2$ | $\rightarrow \text{Cu} + \text{SO}_2$ | | [3] | | |
| | | | | | | | | |
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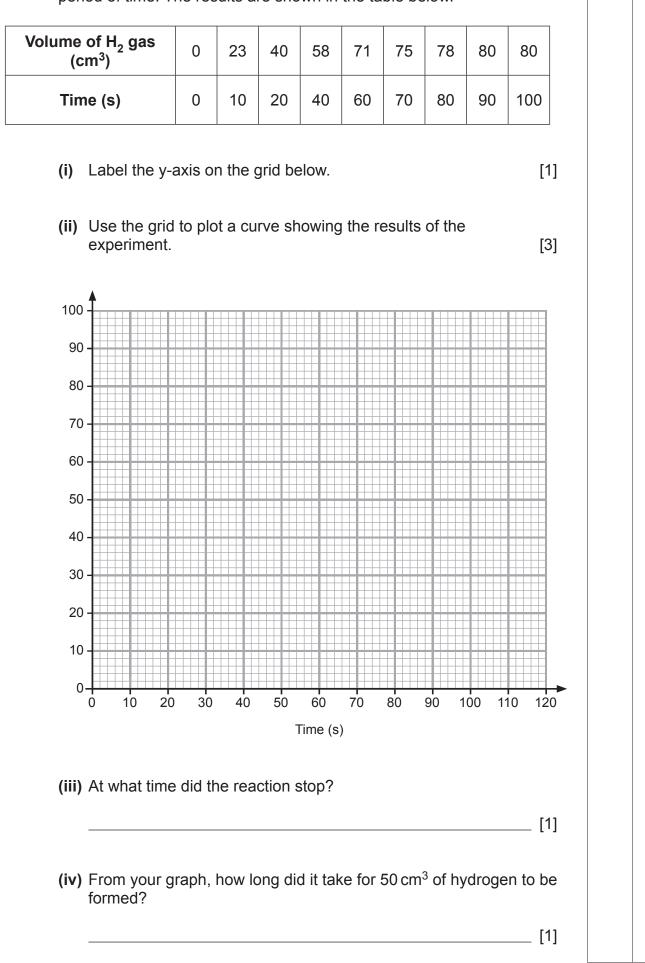
2 (a) The element oxygen is a gas. Examiner Only Marks Remark Write down two other physical properties of oxygen. 1._____ 2._____[2] (b) Write down two uses of oxygen gas. 1. _____ 2. _____ [2] (c) Oxygen is a reactive element which reacts with both metals and non-metals such as magnesium and sulfur. Fill in the blank spaces in the table below. Colour of Colour of flame during Element Description of product element heating with oxygen sulfur [1] [1] [2] magnesium [1] [2] [1] [8]

| (a) Th | his part of | une questi | | | | | Ex Ma | rks Re |
|---------------------|---|--|--|--|------------------------------|------------|-------------|--------|
| | | | efficient fire, o can produce | | - | • | d. | |
| (i) |) Why is | carbon mc | noxide gas ve | ery dangero | ous? | | | |
| | | | | | | | _ [2] | |
| (ii | i) What ca | auses carb | on monoxide t | to be form | ed in a faul | ty fire? | | |
| | | | | | | | [1] | |
| - | his part of ioxide. | the question | on is about the | e propertie | s and uses | of carbor | 1 | |
| (i) | | rcle round | of gases are in two of those p | | | to carbon | | |
| | | | | | | | | |
| colo | ourless | р | ungent smell | | denser t | han air | | |
| colo | ourless | p burns | - | uble in wa | | han air | [2] | |
| | | burns | - | uble in wa | ater | | | |
| | | burns own a reas | insolu | u ble in wa n dioxide is | a ter s used in fi | zzy drinks | S. | |
| (ii | i) Write d | burns own a reas | insolu | uble in wa n dioxide is arbon diox | a ter s used in fi | zzy drinks | s. _ [1] | |
| (ii | i) Write d ii) Write d 1 | burns own a reas | insolu | uble in wa | ater s used in fi ide. | zzy drinks | s. _ [1] | |
| (ii | i) Write d ii) Write d 1 | burns own a reas | insolu | uble in wa | ater s used in fi ide. | zzy drinks | s. _ [1] | |
| (ii (ii c) Bi | i) Write d ii) Write d 1 2 urning coa | burns | insolu | uble in wa | ater s used in fi | zzy drinks | s. _ [1] | |
| (ii (ii c) Bi | i) Write da ii) Write da 1 2 urning coa arbon diox | burns own a reas own two of al and othe ide in the a | insolution why carbon ther uses of carbon ther uses of carbon ther uses of carbon ther to the effect | uble in wa | ater s used in fi ide. | zzy drinks | s. _ [1] | |

| 4 | | |
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(c) Magnesium ribbon reacts with dilute hydrochloric acid to produce hydrogen gas. A student measured the volume of gas produced over a period of time. The results are shown in the table below.



Examiner Only

Marks Remar

5 (a) To find the order of the reactivity of copper, nickel and zinc, a small amount of each metal was placed into a test tube containing a solution of a salt of one of the other metals. For example, when some copper was added to a test tube containing nickel nitrate solution there was no reaction.

Examiner Only Marks Remark

The table below shows the results for the whole investigation.

| metal salt solution | copper | nickel | zinc |
|---------------------|-------------|-------------|----------|
| copper(II) sulfate | | reaction | reaction |
| nickel nitrate | no reaction | | reaction |
| zinc chloride | no reaction | no reaction | |

(i) From the table, work out the order of reactivity of these three metals from most to least reactive.

| Most reactive | |
|----------------|---------|
| | |
| Ļ | |
| Least reactive | [2] |

- (ii) Why could a similar type of investigation **not** be used to find the order of reactivity of calcium, potassium and sodium?
- (iii) Describe the colour change, in the solution, when zinc reacts with the copper sulfate solution.

| from | to | [2] |
|------|----|-----|
| | | |

(iv) Zinc can be obtained in the laboratory from zinc chloride solution by displacement with metal X.

Write down the name of a metal that could be used as metal X.

___ [1]

| po so | osition of the meta | action of a metal from its ore depends on the I in the reactivity series. The order of reactivity of carbon is given below. Use this order of reactivity the question. | Examiner Only Marks Remar |
|----------|---------------------|---|------------------------------|
| m | ost reactive | calcium | |
| | | aluminium | |
| | | carbon | |
| | | iron | |
| | | lead | |
| | Ļ | silver | |
| le | ast reactive | gold | |
| | In the ground a | s the pure metal? | |
| (ii | | name of one of the metals in the list that will need from its ore by electrolysis. | |
| (ii | | name of one of the metals in the list that could be its ore by chemical reduction with carbon or carbon [1] | |
| | | | |
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| 6 | (a) |) Calculate the relative formula mass of substances. | each of the following | Examiner Only Marks Remark |
|---|-----|---|--|-------------------------------|
| | | (Relative atomic masses: H=1, N=14, | O=16, Na=23, S=32, Ca | a=40) |
| | | (i) sodium nitrate NaNO ₃ | | |
| | | | | _ [1] |
| | | (ii) sulfuric acid H ₂ SO ₄ | | |
| | | | | [1] |
| | | (iii) calcium hydroxide Ca(OH) ₂ | | |
| | | | | _ [1] |
| | (b) |) What is meant by one mole of a substa | ance? | |
| | | | | |
| | | | | [2] |
| | | The economic Te O has a valeting fo | mula mass of 100 | |
| | (C) |) The compound Fe_2O_3 has a relative fo | | |
| | | (i) How many moles are there in 80 g | of Fe ₂ O ₃ ? | |
| | | | | |
| | | Ansv | ver mol | es [1] |
| | | | | |
| | | (ii) How many moles are there in 8 to(1 tonne = 1000 kg) | nnes of Fe ₂ O ₃ ? | |
| | | | | |
| | | | | |
| | | | | |
| | | Ansv | ver mol | es [2] |
| | | | | |

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(Questions continue overleaf)

| 7 | (a) | | s part of the qu bonate. | lestion is abou | t the heating of s | olid calcium | Examiner Only Marks Remark |
|---|-----|-------|-----------------------------|-------------------|--|----------------|-------------------------------|
| | | (i) | Complete the | word equatior | n for this reaction. | | |
| | | | calcium carbonate | heat → | + | | [2] |
| | | (ii) | Which one of | , | example of an er statements descri ct statement. | | - |
| | | | Gives out hea | at energy to the | e surroundings | | |
| | | | Takes in heat | energy from the | ne surroundings | | |
| | | | No change in | energy during | reaction | | [1] |
| | | (iii) | | | pelow that best de alcium carbonate | | of |
| | the | rma | I cracking | displa | cement | neutralisatior | 1 |
| | | | thermal deco | omposition | photosy | vnthesis | [1] |
| | (b) | Ten | nporary hard w | vater is found in | n limestone regio | ns. | |
| | | Exp | blain how wate | r in limestone ı | regions becomes | hard. | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | _ [4] |
| | | | | | | | |
| | | | | | | | |

- (c) During the first billion years of the Earth's existence, there was intense volcanic activity that released gases that formed the early atmosphere. The early atmosphere contained over 90% carbon dioxide, 5% nitrogen, 3% sulfur dioxide and traces of hydrogen sulfide, ammonia and methane, but no oxygen. It was hot, smelly and deadly poisonous.
 (i) What is the difference in percentage composition of nitrogen gas found in the atmosphere today compared to its composition in the
 - _____ [1]
 - (ii) One theory suggests that the early atmosphere changed as living organisms evolved. Write down two ways that the carbon dioxide could have been removed from the early atmosphere.

early atmosphere?

| 1 | |
|---|-----|
| | |
| 2 | [2] |

| (| gas. | | elow tick (🗸) | the two phy | | | |
|------|-----------|-------------------------|------------------|--------------------|--------------------------------|----------------|--|
| | very | | | | sical propertie | es of nitrogen | |
| | | oluble in | water | | | | |
| | pale (| reen colo | oured | | | | |
| | colou | less | | | | | |
| | odou | less | | | | | |
| | swee | t smelling | ļ | | | | |
| | | | | | | [2] | |
| (| | en is use use of nit | | ufacture of a | ammonia. Wri | te down one | |
| | | | | | | [1] | |
| | | with nitrog | $N_{2} + 3H_{2}$ | 0 | w to give the | aanditiana | |
| (| | | | | w to give the e units where | | |
| tem | perature | | | | | | |
| cata | alyst | | | | | | |
| | | | | | | | |
| pres | ssure | | | | | | |
| pres | ssure | | | | | [3] | |
| | | down two | uses of am | monia. | | [3] | |
| | ii) Write | | uses of am | | | | |

| (a) | | Ethene is a member of the alkene homologous series. Its molecular formula is C_2H_4 . | | | | | |
|-----|-------|---|--------------|--|--|--|--|
| | (i) |) Write down the name and molecular formula of one other alkene. | | | | | |
| | | Name | [1] | | | | |
| | | Molecular formula | [1] | | | | |
| | (ii) | When hydrocarbons, such as ethene are completely burnt in ai (oxygen) what two compounds are always formed? | ir | | | | |
| | | and | [2] | | | | |
| | (iii) | Ethene molecules are able to join together to make a very long chain molecule, called a polymer. What is the name of the polymer formed from ethene? | | | | | |
| | | | [1] | | | | |
| | (iv) | Many polymers, such as those used to make plastic bottles, are non-biodegradable. Write down two disadvantages of disposing polymers in landfill sites. | | | | | |
| | | 1 | [1] | | | | |
| | | 2 | [1] | | | | |
| (b) | (i) | Ethanol is used in alcoholic drinks. Write down one other use o ethanol. | of | | | | |
| | | | [1] | | | | |
| | (ii) | Drinking alcohol, in large quantities or over a long period of tim can have harmful effects. Describe two harmful effects that car arise from drinking alcohol. | | | | | |
| | | 1 | | | | | |
| | | | | | | | |
| | | 2 | | | | | |
| | | | [仁] | | | | |
| _ | | | | | | | |

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