New Specification

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2018

# GCSE Chemistry

Unit 1

Foundation Tier

**[GCM11]**

*GCM11*

**WEDNESDAY 13 JUNE, MORNING**

**TIME**

1 hour.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
**You must answer the questions in the spaces provided.**
**Do not write outside the boxed area on each page or on blank pages.**
Complete in black ink only. **Do not write with a gel pen.**
Answer **all five** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 60.
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)(ii)**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

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**1** Many scientists have contributed to ideas about the structure of the atom as we know it today.

**(a) (i)** Name the scientist who proposed the 'Plum Pudding' model of the atom.

_____ [1]

**(ii)** Name the **two** subatomic particles found in the nucleus of an atom.

_____ [1]

**(iii)** Name the subatomic particle discovered by James Chadwick in 1932.

_____ [1]

**(iv)** An atom of aluminium has 13 electrons. Write the electronic configuration of an aluminium atom.

_____ [1]

**(v)** Draw the electronic configuration of an aluminium **ion** and state the charge on the ion.

[2]

**(vi)** Name the ion formed from an oxygen atom.

_____ [1]

**(vii)** Explain the meaning of the term anion.

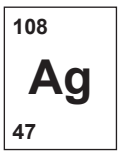
_____ [1]

**(b)** Nanoparticles and their applications have been widely researched in recent years.

**(i)** State the size of a nanoparticle.

_____ [1]

**(ii)** Silver nanoparticles help to heal wounds. Silver is found in the Periodic Table as shown below.




Complete the table below giving information about an atom of silver.

| | |
|---|---|
| Atomic number | |
| Mass number | |
| Number of protons | 47 |
| Number of electrons | |
| Number of neutrons | |

[3]

**[Turn over**



**2** **(a)** Lithium metal reacts with oxygen to form lithium oxide.

Write a balanced symbol equation for the reaction of lithium with oxygen.

_____ [3]

**(b)** Lithium metal also reacts with water.

A teacher carried out a demonstration of this reaction by removing some lithium from a jar, preparing it for the reaction and then adding it to a trough of water. Heat was released and the lithium moved on the surface of the water until it became smaller and disappeared.

**(i)** Describe **two** ways in which the lithium is prepared for this reaction.

1. _____

_____

2. _____

_____ [2]

**(ii)** State **two** other observations which can be made during this reaction.

1. _____

_____

2. _____

_____ [2]

**(iii)** Name the gas produced in this reaction.

_____ [1]

**(c)** Lithium reacts with elements of the group shown below.

| |
|---|
| fluorine |
| chlorine |
| bromine |
| iodine |
| astatine |

Complete the paragraph below.

The group of elements shown above is known as the _____.

The element in this group which is a liquid at room temperature and pressure is _____. The most reactive element in this group is _____. [3]

**[Turn over**

**3** Indicators may be used to classify solutions as acidic, neutral or alkaline.

**(a) (i)** The table below gives information on a range of indicators. Complete the table.

| Indicator | Solution to which indicator is added | Colour of indicator in solution | pH of solution | Classification of solution |
|---|---|---|---|---|
| phenolphthalein | sodium hydroxide | | 14 | |
| blue litmus paper | lemon juice | | 3 | |

[4]

**(ii)** The pH of a solution was measured and found to be 12.4. Suggest how the pH of the solution was measured.

_____ [1]

**(b)** Hydrochloric acid reacts with sodium hydroxide solution in a neutralisation reaction to form a salt and water.

**(i)** Write a balanced symbol equation for this reaction.

_____ [2]

**(ii)** A student recorded the temperature during the reaction between hydrochloric acid and sodium hydroxide solution. The results obtained are shown below.

| Time/s | 0 | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 |
|---|---|---|---|---|---|---|---|---|---|
| Temperature/°C | 21 | 23 | 26 | 27 | 29 | 30 | 28 | 26 | 24 |

Calculate the maximum temperature change in the reaction.

_____ [1]

**(iii)** Explain why this reaction is described as exothermic.

_____ [1]

**(c)** Excess hydrochloric acid in the stomach causes indigestion. The excess acid can be neutralised by taking an antacid tablet containing calcium carbonate.

**(i)** Write a balanced symbol equation for the reaction of hydrochloric acid with calcium carbonate.

_____ [3]

**(ii)** State **two** observations made during the reaction.

1. _____

_____

2. _____

_____ [2]

**[Turn over**

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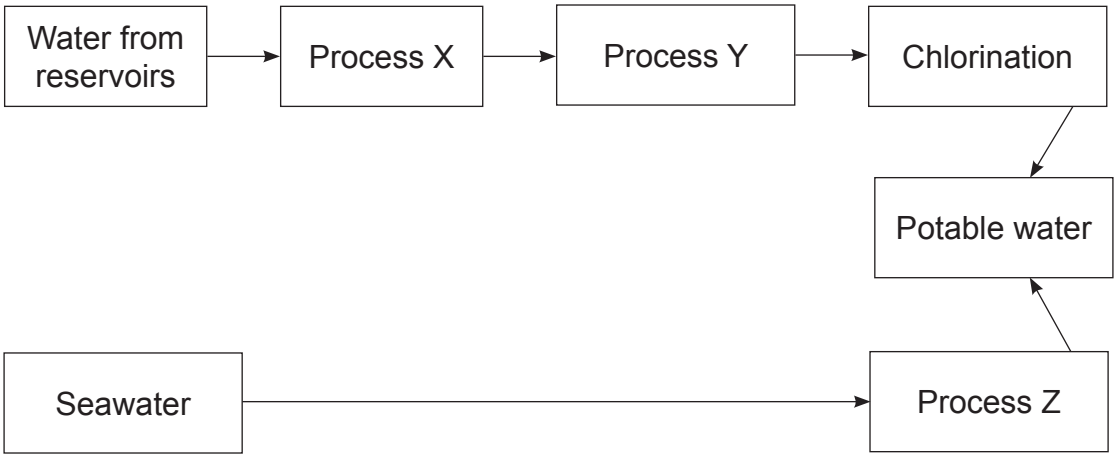
**4** **(a)** Water from reservoirs and seawater can be made potable as shown in the diagram.




**(i)** What is potable water?

_____

_____ [1]

**(ii)** Using the words in the box below, name processes X, Y and Z.

| | | |
|---|---|---|
| crystallisation | distillation | evaporation |
| filtration | precipitation | sedimentation |

Process X: _____

Process Y: _____

Process Z: _____ [3]

**(iii)** What is the purpose of chlorination?

_____ [1]

**[Turn over**

**(b)** Orange juice is not considered by chemists to be a pure substance.

**(i)** What is meant by the term pure substance?

_____

_____ [1]

**(ii)** Describe a paper chromatography experiment you could carry out to prove that orange juice is not a pure substance and to obtain $R_f$ values.

**In your answer you will be assessed on the quality of your written communication including the use of specialist scientific terms.**

_____

_____

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_____

_____

[6]

**(c)** A sports drink contains some dissolved magnesium chloride. When silver nitrate solution is added to a sample of the sports drink a precipitate is formed.

**(i)** Write the formula of magnesium chloride.

[1]

**(ii)** What colour is the precipitate?

[1]

**5** Natron is a naturally occurring mixture of hydrated sodium carbonate ($Na_2CO_3.10H_2O$) and sodium hydrogencarbonate ($NaHCO_3$) along with small quantities of sodium chloride and sodium sulfate ($Na_2SO_4$).

**(a) (i)** Calculate the relative formula mass ($M_r$) of sodium hydrogencarbonate.

Relative formula mass ($M_r$) = _____ [1]

**(ii)** Calculate the percentage of oxygen, by mass, in sodium hydrogencarbonate.

Percentage of oxygen = _____ % [2]

**(iii)** Calculate the relative formula mass ($M_r$) of hydrated sodium carbonate.

Relative formula mass ($M_r$) = _____ [1]

**(iv)** Calculate the mass of one mole of sodium sulfate in grams.

Mass of sodium sulfate = _____ g [1]

**(v)** In a reaction to produce sodium chloride, the theoretical yield was 12.1 g. In the experiment only 3.50 g of sodium chloride were obtained. Calculate the percentage yield.

Percentage yield = _____ % [1]

**[Turn over**



**(b)** A student weighed out 4.90 g of a sample of hydrated sodium carbonate $Na_2CO_3.xH_2O$.

2.65 g of solid remained after heating to constant mass.

**(i)** Calculate the mass of water lost during heating.

Mass of water lost = _____ g [1]

**(ii)** Calculate the number of moles of water lost during heating.

Moles of water lost = _____ [1]

**(iii)** Calculate the number of moles of anhydrous sodium carbonate remaining after heating.

Moles of sodium carbonate = _____ [1]

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| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| Total Marks | |

Examiner Number