



Rewarding Learning

General Certificate of Secondary Education

Centre Number

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Candidate Number

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GCSE Chemistry

Unit 1

Foundation Tier



[GCM11]

GCM11

Assessment

TIME

1 hour.

Assessment Level of Control:

Tick the relevant box (✓)

Controlled Conditions	
Other	

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 **2(c)**.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

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1 Atoms are made up of three types of subatomic particles – protons, neutrons and electrons.

(a) What name is given to the part of the atom which contains protons and neutrons?

_____ [1]

(b) (i) The neutron was the last of the three subatomic particles to be discovered. Suggest a reason for this.

_____ [1]

(ii) Name the scientist who discovered the neutron.

_____ [1]

(c) The table below gives details of some atoms and ions (A, B, C and D). The letters do not represent the symbols for elements.

Atom/ion	Number of protons	Number of electrons	Electronic configuration
A	11	10	2,8
B	20	20	2,8,8,2
C	7	10	2,8
D	1	1	1

(i) Which one of A, B, C or D is an ion with a charge of 3-?

_____ [1]

(ii) Which one of A, B, C or D is found in Period 4 of the Periodic Table?

_____ [1]



(iii) Identify A.

_____ [2]

(d) The bonding in calcium is metallic.

(i) Complete the sentence below about metallic bonding.

Metallic bonding is the _____ between
_____ ions and delocalised _____ . [3]

(ii) State two physical properties of metals.

1. _____

2. _____ [2]

[Turn over



2 Approximately 80% of the elements in the Periodic Table are metals.

(a) What is meant by the term element?

[1]

(b) Atoms of metal X have 2 electrons in their outer shell. Metal X reacts with chlorine to form a metal chloride.

(i) To which group of the Periodic Table does metal X belong?

[1]

(ii) Write the formula of the metal chloride formed.

[1]

(c) Compare the physical properties and chemical properties of the alkali metals with those of the transition metals.

Your answer should compare:

- Physical properties including density, melting point and colour of the compounds of the metals.
- Chemical properties including relative reactivity, reaction with water and the charges on the ions formed.

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



3 Nitric acid is a strong acid and has many uses in food processing and in the manufacture of fertilisers and explosives.

(a) (i) Complete the table below.

Indicator	Colour in nitric acid
phenolphthalein	
methyl orange	

[2]

(ii) Suggest a pH value for nitric acid.

[1]

(iii) Name the ion which is present in solutions of all acids.

[1]

(iv) State the name and write the formula of another strong acid.

Name: _____

Formula: _____ [2]

(v) State one safety precaution which is necessary when handling strong acids in the laboratory.

_____ [1]



(b) Ammonium nitrate is an important fertiliser which may be produced from the reaction of nitric acid with ammonium carbonate.

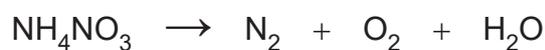
(i) Name one **other** substance which would react with nitric acid to form ammonium nitrate.

_____ [1]

(ii) Describe the appearance of ammonium nitrate.

_____ [2]

(iii) When heated rapidly, ammonium nitrate decomposes to form nitrogen, oxygen and water. The symbol equation below shows the reaction.



Balance this equation. [1]

(c) Sodium nitrate is a salt which is used as a food preservative. It may be produced from the reaction between nitric acid and sodium carbonate.

Write the balanced symbol equation for the reaction between nitric acid and sodium carbonate.

_____ [3]

[Turn over



4 Nicotine is a harmful and highly addictive compound found in tobacco.

(a) The molecular formula of nicotine is $C_{10}H_{14}N_2$.

(i) Determine the relative molecular mass (M_r) of nicotine.

relative molecular mass = _____ [1]

(ii) Determine the empirical formula of nicotine.

_____ [1]

(iii) Calculate the percentage of nitrogen by mass in nicotine.

percentage of nitrogen = _____ % [2]



(b) When a sample of 8.1 g of nicotine was burned, 16.5 g of carbon dioxide were produced.

(i) Calculate the number of moles of carbon dioxide produced.

moles of carbon dioxide = _____ [1]

(ii) The theoretical yield of carbon dioxide is 22 g. Calculate the percentage yield.

percentage yield = _____ % [1]

(iii) In the same reaction 0.35 moles of water were produced. Calculate the mass of water produced in grams.

mass of water = _____ g [1]

[Turn over



(c) Another compound found in tobacco is ethanoic acid, CH_3COOH .

(i) Calculate the mass of one mole of ethanoic acid.

mass of one mole = _____ g [1]

(ii) Calculate the number of moles present in 540 g of ethanoic acid.

moles of ethanoic acid = _____ [1]

(iii) Hydrated copper(II) ethanoate is a salt of ethanoic acid. Its formula is $(\text{CH}_3\text{COO})_2\text{Cu}\cdot 2\text{H}_2\text{O}$.

Calculate the percentage of water of crystallisation in hydrated copper(II) ethanoate.

percentage = _____ % [3]





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5 Potassium iodide is used as a medicine and dietary supplement.

- (a)** A solution of potassium iodide was prepared by weighing out 39 g of potassium iodide and adding it to 25 g of water in a boiling tube.

The boiling tube was placed in a beaker of water and heated using a Bunsen burner. The contents of the boiling tube were stirred using a thermometer. All the potassium iodide dissolved and a saturated solution was obtained at 35°C.

- (i)** Draw a labelled diagram of the assembled apparatus used in this experiment.

[3]



(ii) Explain what is meant by the term saturated solution.

[1]

(iii) Calculate the solubility of potassium iodide at 35 °C.

solubility = _____ g/100g water [1]

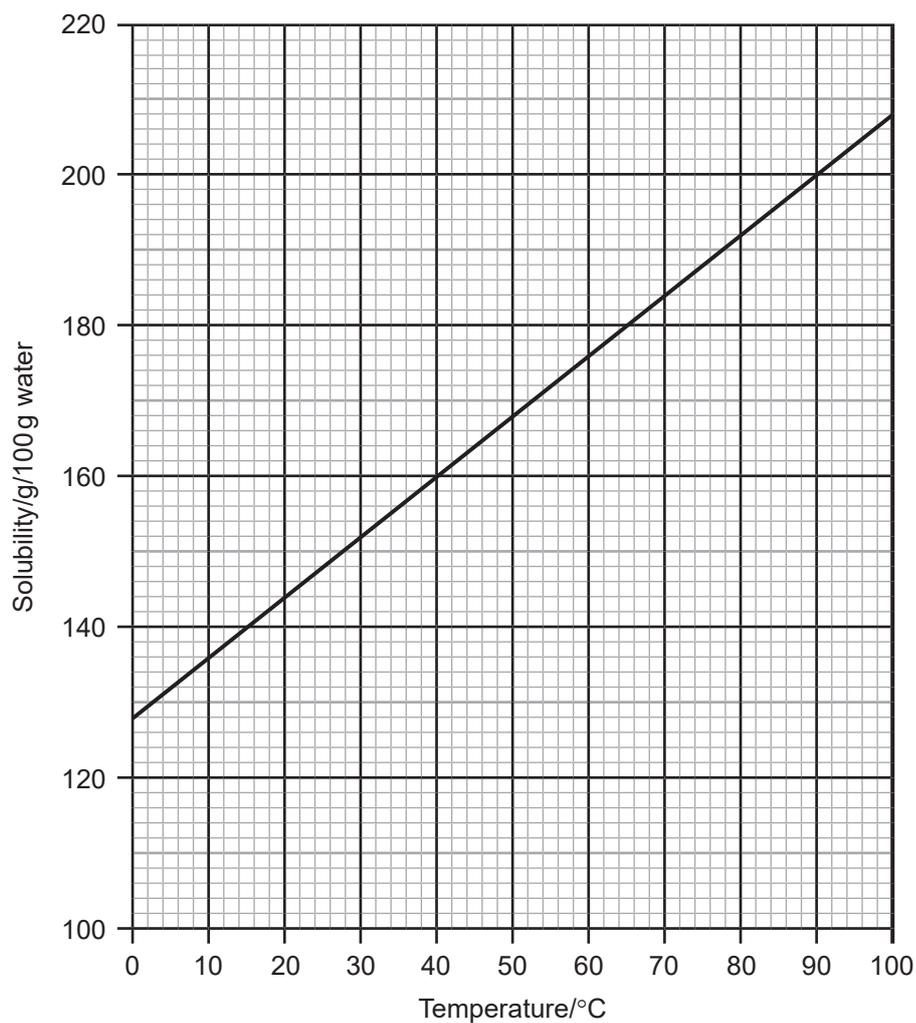
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(b) A solubility curve for potassium iodide is shown below.



Use the solubility curve to answer questions (i) and (ii).

(i) What is the solubility of potassium iodide at 70 °C?

solubility = _____ g/100 g water [1]



- (ii) A hot solution of potassium iodide containing 192 g of potassium iodide in 100 g of water is cooled from 90 °C to 30 °C. At what temperature will crystals begin to form?

temperature = _____ °C [1]

- (c) The table below shows the results of some anion and cation tests which were carried out on three solutions, X, Y and Z.

Test	Solution X	Solution Y	Solution Z
Flame test		yellow flame	
Add sodium hydroxide solution	green precipitate	no reaction	brown precipitate
Add barium chloride solution	white precipitate	no reaction	no reaction
Add silver nitrate solution	no reaction	yellow precipitate	cream precipitate

Based on the results above, write the name of the anion and the cation present in each solution, X, Y and Z.

Solution X: _____ and _____

Solution Y: _____ and _____

Solution Z: _____ and _____ [6]

THIS IS THE END OF THE QUESTION PAPER



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

Total Marks	
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Examiner Number

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