



Rewarding Learning

General Certificate of Secondary Education
2024

Centre Number

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Candidate Number

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GCSE Chemistry

Unit 1

Foundation Tier



[GCM11]

GCM11

WEDNESDAY 22 MAY, 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(c)**.

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

13958



16GCM1101

(b) Group 1 of the Periodic Table contains reactive elements. They show similar chemical properties and there is a trend in reactivity down the group.

(i) How are the Group 1 elements stored in the laboratory?

_____ [1]

(ii) State the name by which the Group 1 elements are known.

_____ [1]

(iii) Explain why the Group 1 elements show similar chemical properties.

_____ [1]

(iv) State and explain the trend in reactivity down Group 1.

Trend: _____

Explanation: _____

_____ [3]

[Turn over



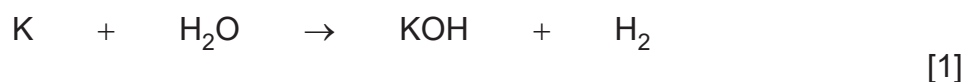
(c) Group 1 elements react vigorously with cold water.

(i) State two observations which are made when a piece of potassium reacts with cold water but are not made when a piece of lithium reacts with cold water.

1. _____

2. _____ [2]

(ii) Balance the symbol equation below for the reaction of potassium with water.





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(Questions continue overleaf)

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[Turn over



16GCM1105

2 (a) Ideas about the structure of the atom have changed over the last 150 years.

(i) Name the scientist who suggested an atom consists of a nucleus surrounded by electrons.

_____ [1]

(ii) Name the subatomic particle discovered by James Chadwick.

_____ [1]

(iii) Name the subatomic particle with the smallest relative mass.

_____ [1]

(iv) Explain why atoms have no overall charge.

_____ [1]



(b) Magnesium chloride is a compound formed from the elements magnesium and chlorine.

(i) Name the type of bonding in the compound magnesium chloride.

[1]

(ii) Draw a dot and cross diagram to show how magnesium chloride forms from atoms of magnesium and chlorine.

Include the charges of the ions formed.

[6]

(iii) State one physical property of magnesium chloride.

[1]

[Turn over]



3 Acidic, neutral and alkaline solutions may be classified using indicators.

(a) Complete the table below.

Solution	pH	Indicator	Colour of indicator
sodium hydroxide	12	phenolphthalein	
hydrochloric acid		universal indicator	

[3]

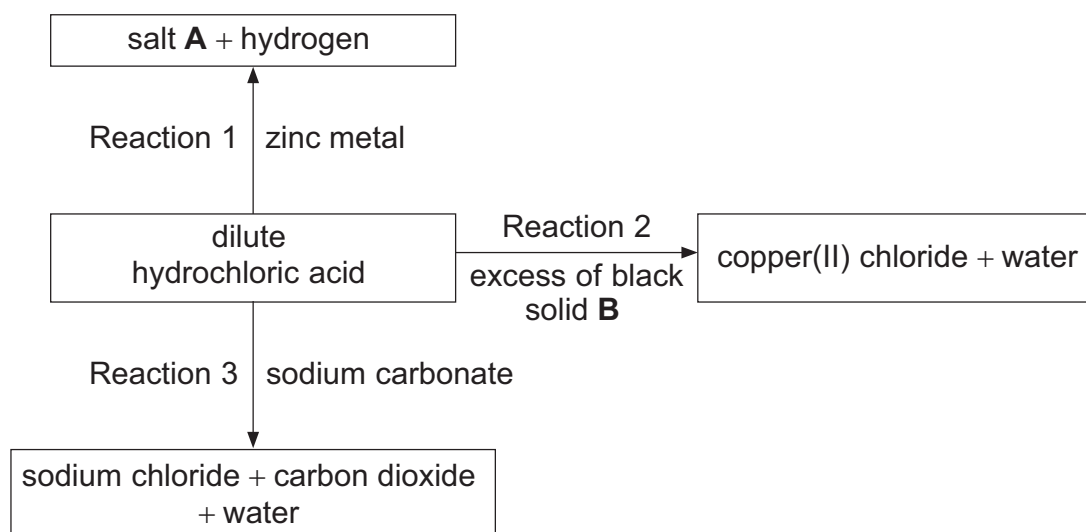
(b) Complete the following sentences by filling in the blanks.

All acids contain _____ ions in aqueous solution. All aqueous solutions of alkalis contain _____ ions.

[2]



(c) The diagram below shows three reactions used to prepare soluble salts.



(i) Name the salt **A** produced in Reaction 1.

_____ [1]

(ii) Describe the test for hydrogen gas, produced in Reaction 1.

_____ [1]

(iii) Name the black solid **B** used in Reaction 2.

_____ [1]

(iv) Explain why an excess of black solid **B** is used in Reaction 2.

_____ [1]

(v) Write a balanced symbol equation for Reaction 3.

_____ [3]

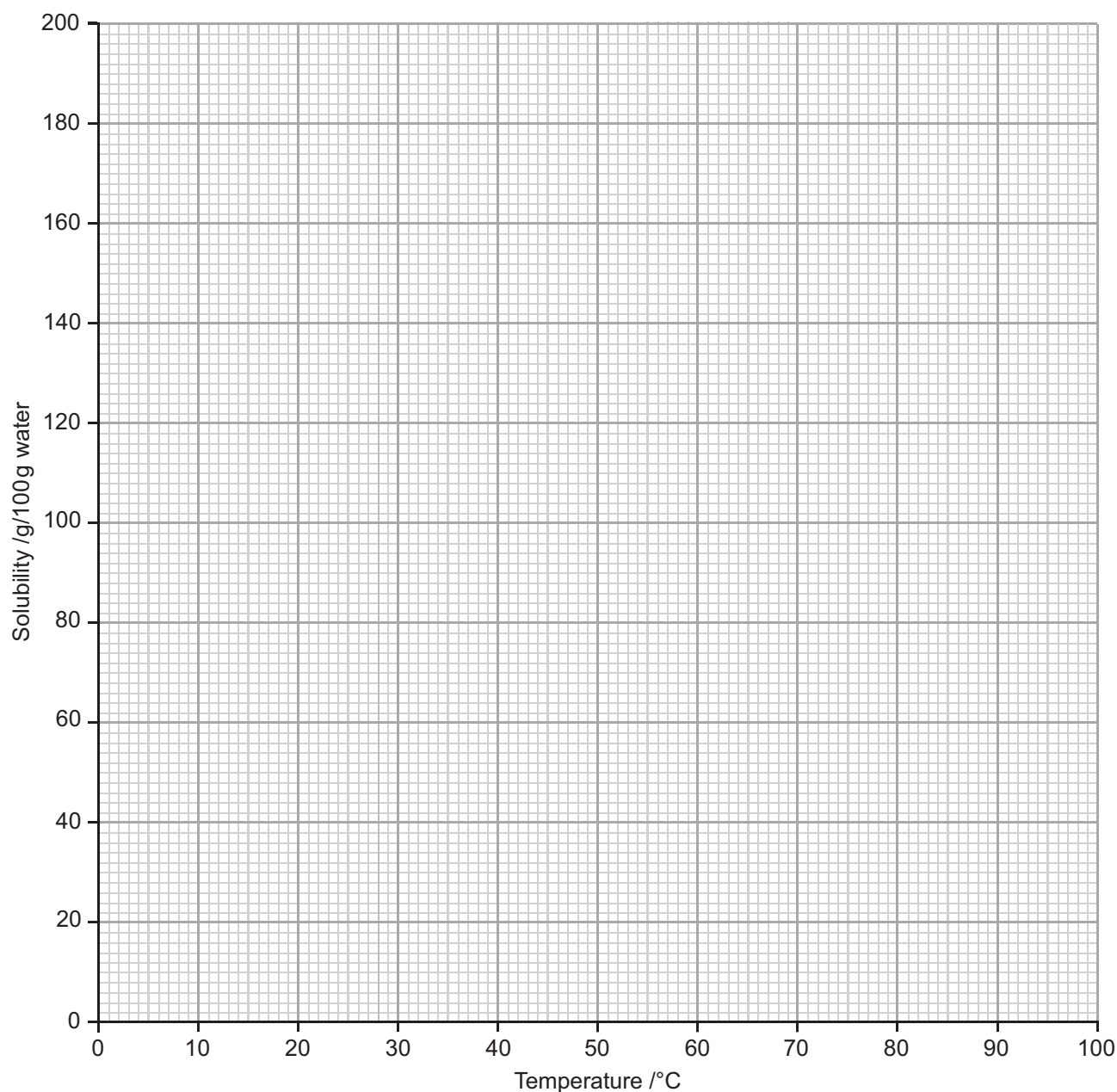
[Turn over]



- 4 The oceans and seas are valuable sources of many chemical compounds which are dissolved in the water. The table below gives solubility values of a solid obtained from sea water.

Temperature /°C	0	20	40	60	80	100
Solubility of solid /g/100 g water	80	87	100	120	145	178

(a) Plot a solubility curve for the solid on the axes below using the data in the table.



[3]



(b) Use the solubility data and the graph you have drawn in **(a)** to answer the following questions.

(i) What is the general trend in the solubility of the solid as temperature increases?

_____ [1]

(ii) What is the solubility of the solid at 90°C?

_____ g/100 g water [1]

(iii) 28 g of the solid are mixed with 25 g of water at 60°C. Explain whether the solution formed is saturated or unsaturated.

_____ [2]

[Turn over]



(c) Sea water contains dissolved sodium ions and chloride ions.

Describe tests that could be carried out on a sample of sea water to confirm the presence of sodium ions and of chloride ions.

Your answer should include:

- how you would carry out the test using a sample of seawater
- any reagents used
- the results for a positive test
- the names of any precipitates formed during the tests.

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

[illegible]

[6]



- 5 Silica gel is a desiccant which is often found in small packets in boxes of shoes and optical equipment.



A small quantity of anhydrous cobalt(II) chloride, CoCl_2 , may be added to the silica gel. A colour change from blue to pink is observed as the silica gel absorbs water. The pink colour indicates that the silica gel is no longer effective.

- (a) (i) Suggest what is meant by the term desiccant.

_____ [1]

- (ii) Name another compound which could be used in place of anhydrous cobalt(II) chloride.

_____ [1]

[Turn over



- (b) The formula of hydrated cobalt(II) chloride is $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$. Calculate the percentage of water of crystallisation in hydrated cobalt(II) chloride. Give your answer to 1 decimal place.

percentage = _____ % [2]

- (c) The table below shows information about water and some desiccants.

- (i) Complete the table.

Name of compound	Formula	Total number of oxygen atoms in the formula	Total number of atoms in the formula	Relative formula mass (M_r)
water	H_2O	1	3	18
silica	SiO_2			
magnesium sulfate	MgSO_4		6	
aluminium hydroxide	$\text{Al}(\text{OH})_3$			78

[3]



- (ii) Calculate the number of moles of aluminium hydroxide present in 5.5 g of aluminium hydroxide.

number of moles = _____ [1]

- (iii) Calculate the mass of water in 0.24 moles of water.

mass of water = _____ g [1]

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Question Number	Marks
1	
2	
3	
4	
5	

Total Marks	
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Examiner Number

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GCM11/6
288290



SYMBOLS OF SELECTED IONS

Positive ions

Name	Symbol
Ammonium	NH_4^+
Chromium(III)	Cr^{3+}
Copper(II)	Cu^{2+}
Iron(II)	Fe^{2+}
Iron(III)	Fe^{3+}
Lead(II)	Pb^{2+}
Silver	Ag^+
Zinc	Zn^{2+}

Negative ions

Name	Symbol
Butanoate	$\text{C}_3\text{H}_7\text{COO}^-$
Carbonate	CO_3^{2-}
Dichromate	$\text{Cr}_2\text{O}_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	HCOO^-
Nitrate	NO_3^-
Propanoate	$\text{C}_2\text{H}_5\text{COO}^-$
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

Data Leaflet

Including the Periodic Table of the Elements

For the use of candidates taking
Science: Chemistry,
Science: Double Award
or Science: Single Award

Copies must be free from notes or additions of any
kind. No other type of data booklet or information
sheet is authorised for use in the examinations

SOLUBILITY IN COLD WATER OF COMMON SALTS, HYDROXIDES AND OXIDES

Soluble
All sodium, potassium and ammonium salts
All nitrates
Most chlorides, bromides and iodides EXCEPT silver and lead chlorides, bromides and iodides
Most sulfates EXCEPT lead and barium sulfates Calcium sulfate is slightly soluble
Insoluble
Most carbonates EXCEPT sodium, potassium and ammonium carbonates
Most hydroxides EXCEPT sodium, potassium and ammonium hydroxides
Most oxides EXCEPT sodium, potassium and calcium oxides which react with water

gcse examinations chemistry

THE PERIODIC TABLE OF ELEMENTS

Group

																0									
1		2																							
1 H Hydrogen 1																		4 He Helium 2							
7 Li Lithium 3	9 Be Beryllium 4																	11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10		
23 Na Sodium 11	24 Mg Magnesium 12																	27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18		
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36								
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	98 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54								
133 Cs Caesium 55	137 Ba Barium 56	139 La [*] Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86								
223 Fr Francium 87	226 Ra Radium 88	227 Ac [†] Actinium 89	261 Rf Rutherfordium 104	262 Db Dubnium 105	266 Sg Seaborgium 106	264 Bh Bohrium 107	277 Hs Hassium 108	268 Mt Meitnerium 109	271 Ds Darmstadtium 110	272 Rg Roentgenium 111	285 Cn Copernicium 112														

* 58 – 71 Lanthanum series
† 90 – 103 Actinium series



a = relative atomic mass (approx)
x = atomic symbol
b = atomic number

140	Ce Cerium 58	141	Pr Praseodymium 59	144	Nd Neodymium 60	145	Pm Promethium 61	150	Sm Samarium 62	152	Eu Europium 63	157	Gd Gadolinium 64	159	Tb Terbium 65	162	Dy Dysprosium 66	165	Ho Holmium 67	167	Er Erbium 68	169	Tm Thulium 69	173	Yb Ytterbium 70	175	Lu Lutetium 71
232	Th Thorium 90	231	Pa Protactinium 91	238	U Uranium 92	237	Np Neptunium 93	242	Pu Plutonium 94	243	Am Americium 95	247	Cm Curium 96	245	Bk Berkelium 97	251	Cf Californium 98	254	Es Einsteinium 99	253	Fm Fermium 100	256	Md Mendelevium 101	254	No Nobelium 102	257	Lr Lawrencium 103