



Rewarding Learning

General Certificate of Secondary Education
2017–2018

Centre Number

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Candidate Number

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Double Award Science: Chemistry

Unit C1
Foundation Tier

[GDW21]

THURSDAY 22 FEBRUARY 2018, 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 seven** 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.

A Data Leaflet including a Periodic Table of the elements is provided.

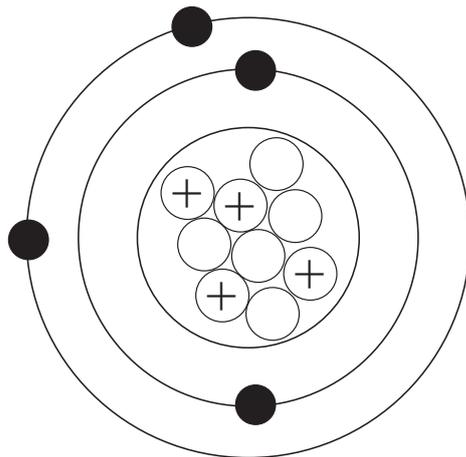
Quality of written communication will be assessed in Question **7(a)**.For Examiner's
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	

Total
Marks

--

1 The diagram below represents an atom of element X.



(a) Complete the table below to identify the three particles present in this atom.

Particle	Name
●	
○	
⊕	

[3]

(b) Use the diagram of an atom of element X to answer the following questions:

(i) What is the atomic number of X?
Circle the correct answer.

4 5 8 9 13

[1]

(ii) What is the mass number of X?
Circle the correct answer.

4 5 8 9 13

[1]

(c) Why does an atom of element X have no electrical charge?

_____ [1]

Examiner Only	
Marks	Remark
○	○

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(Questions continue overleaf)

2 (a) Hazard symbols are used to warn about risks or dangers.

(i) For each hazard symbol below **draw a line** from the symbol to the correct risk or danger.

Hazard symbol

Risk or danger



Severe skin burns and eye damage



Contains gas under pressure

Flammable



Harmful to the environment



Toxic

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[4]

(ii) Give **one** reason why hazard symbols have been internationally agreed.

[1]

Examiner Only	
Marks	Remark
○	○

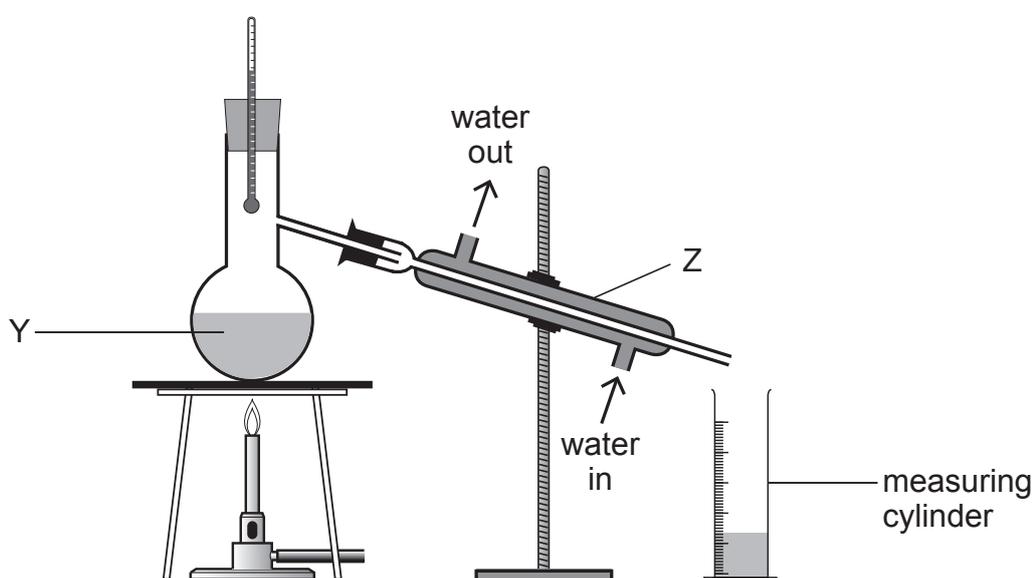
- 3 (a) What **test** can be carried out on a solid to determine if the solid is a **pure substance**?

_____ [1]

- (b) What is meant by the **term** 'pure substance'?

 _____ [2]

- (c) The diagram below shows apparatus used to separate a liquid from a solution.



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- (i) Why is the thermometer placed at the neck of the flask?

_____ [1]

Examiner Only	
Marks	Remark
○	○

- 4 (a) The list below gives the names of some common laboratory chemicals.

ammonia sodium chloride potassium hydroxide
 hydrochloric acid ethanoic acid sodium sulfate

Choose from the list a chemical which is a:

(i) weak acid _____ [1]

(ii) strong alkali _____ [1]

(iii) salt _____ [1]

- (b) (i) What pH would you expect for a carbonic acid solution?
 Circle the correct answer.

1 4 7 10 13
 [1]

- (ii) What pH **range** would you expect for a strong alkali solution?
 Circle the correct answer.

0–2 3–6 7–9 8–11 12–14
 [1]

- (c) (i) Complete the word equation below:

nitric acid + sodium hydroxide \rightarrow _____ + _____
 [2]

- (ii) What colour would you expect for the salt formed in the reaction between nitric acid and sodium hydroxide?
 _____ [1]

- (iii) Choose the word below which describes the reaction between an acid and an alkali. Circle the correct answer.

electrolysis displacement neutralisation combustion
 [1]

Examiner Only	
Marks	Remark
○	○

5 This question is about relative formula masses, moles and the percentage of an element by mass in a compound.

(a) Calculate the relative formula mass of each of the following substances.

(relative atomic masses: H = 1, N = 14, O = 16, S = 32, K = 39)

(i) potassium nitrate KNO_3

_____ [1]

(ii) ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$

_____ [1]

(b) The relative formula mass of ammonium nitrate, NH_4NO_3 is 80.

(i) What is the mass of 0.60 moles of ammonium nitrate?

_____ g [1]

(ii) Ammonium nitrate is used as a fertiliser because it has a high nitrogen content.

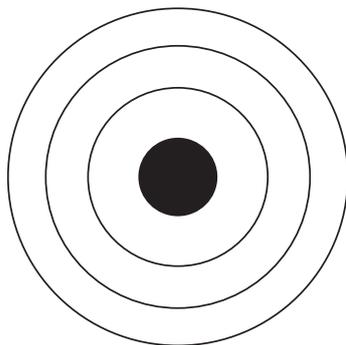
Calculate the percentage of nitrogen, by mass, in ammonium nitrate, NH_4NO_3 .

_____ % [3]

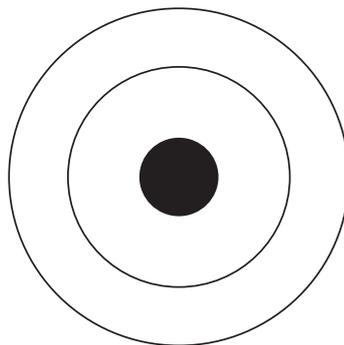
Examiner Only	
Marks	Remark
○	○

6 (a) Oxygen reacts with sodium to form the compound sodium oxide.

(i) Complete the diagrams below to show **all** the electrons in a sodium atom and an oxygen atom.



sodium atom



oxygen atom

[2]

(ii) Write the electronic configurations of a sodium ion and of an oxide ion.

sodium ion: _____

oxide ion: _____ [2]

(iii) What is the formula of sodium oxide?

_____ [1]

(iv) Sodium ions can be identified using a flame test.

What is the flame colour of a sodium ion?

Circle the correct answer.

crimson **lilac** **brick red** **yellow/orange** **white**

[1]

Examiner Only	
Marks	Remark
○	○

- (b) (i) In the space below draw a dot and cross diagram to show the bonding in hydrogen chloride HCl. Only outer electrons are needed.

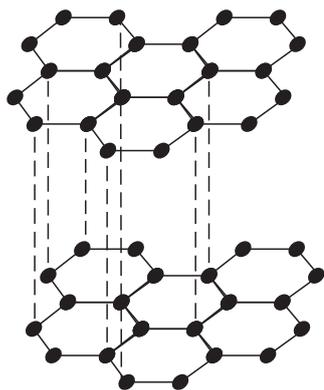
[3]

- (ii) How many lone pairs of electrons are there in a hydrogen chloride molecule?

[1]

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Marks	Remark

7 (a) The diagrams below show two structural models.



Structure A



Structure B

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Both of these structures represent allotropes of carbon. Their structures mean that A and B have particular physical properties. The uses of A and B relate to their structures and properties.

Demonstrate your understanding of the above paragraph by:

- Explaining the meaning of the term “allotrope” and giving the names of the allotropes represented by Structure A and Structure B.
- Explaining why the allotrope with Structure A conducts electricity and why it can be used in pencils.
- Explaining why the allotrope with Structure B has a very high melting point and why it can be used in cutting tools.

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

Explain the meaning of the term “allotrope” and the names of the allotropes A and B:

Examiner Only	
Marks	Remark
○	○

Explain why allotrope A conducts electricity and why it can be used in pencils:

Explain why allotrope B has a very high melting point and why it can be used in cutting tools:

[6]

(b) Graphene, another allotrope of carbon, was first discovered in 2004. It is an exciting new material that has some very special properties.

(i) Describe the structure of graphene.

[2]

(ii) What property of graphene means that it can be used in batteries?

[1]

(iii) Graphene is about 300 times stronger than steel. Explain why graphene is so strong.

[1]

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Marks

Remark

THIS IS THE END OF THE QUESTION PAPER

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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-}

New
Specification

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

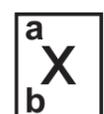
THE PERIODIC TABLE OF ELEMENTS

Group

																		0
																		4
																		He Helium
1	2											3	4	5	6	7		
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