



General Certificate of Secondary Education  
2016–2017

Centre Number

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Candidate Number

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## Science: Single Award

Unit 2 (Chemistry)

Foundation Tier

[GSS21]



**THURSDAY 18 MAY 2017, MORNING**

### TIME

1 hour, 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.

**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.

Answer **all ten** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Quality of written communication will be assessed in Question **10**.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

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

- 1 (a) Common household substances contain chemicals. Use lines to match each household substance to the chemical it contains.

Household substance	Name of chemical
baking soda	sodium hydroxide
lemon juice	sodium hydrogencarbonate
	citric acid

[2]

- (b) Hazard symbols on containers warn of danger.



A



B



C

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- (i) Weedkiller is poisonous. Which symbol (A, B or C) would you expect to find on a bottle of weedkiller?

\_\_\_\_\_ [1]

Petrol is a dangerous chemical. The hazard symbol below is used on containers of petrol.



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(ii) Name this hazard symbol.

\_\_\_\_\_ [1]

- 2 The picture below shows the remains of a fish which lived in the sea millions of years ago.



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- (a) What name is given to animal remains found in rocks?

\_\_\_\_\_ [1]

- (b) Name the **type** of rock where these animal remains are found.

\_\_\_\_\_ [1]

- (c) Igneous rocks are found in volcanic regions. Give **one** example of an igneous rock.

\_\_\_\_\_ [1]

- 3 (a) Burglars often break into houses when there is no one at home. Many people stop newspaper deliveries before they go on holiday.

How might this prevent burglars from breaking into houses?

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[1]

- (b) Forensic scientists often collect fingerprints after a break-in.



© chege011 / iStock / Thinkstock

Why is fingerprint evidence useful in solving crime? Explain fully.

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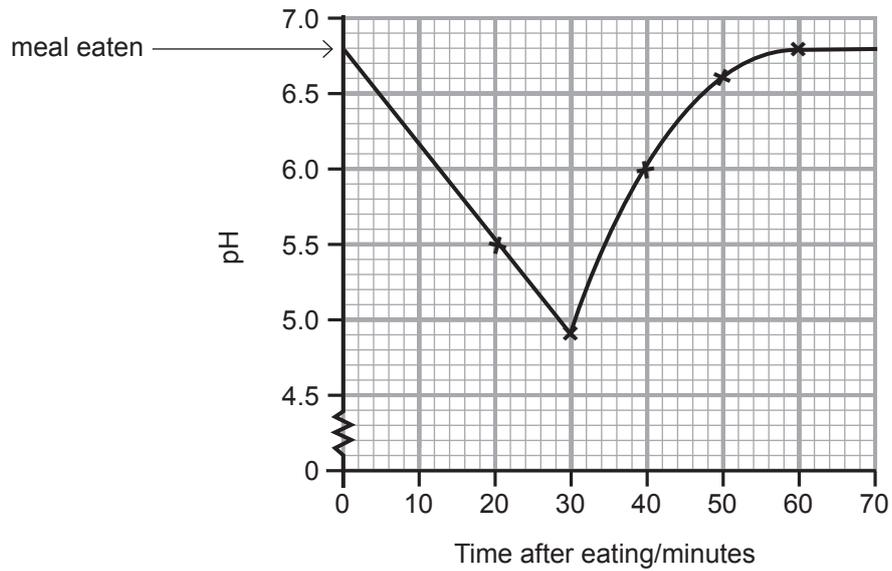
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[2]

[Turn over

- 4 (a) The graph below shows the pH of a person's mouth after eating a meal. The normal pH in the mouth is just below pH 7.



- (i) pH values below 5.5 can cause tooth decay. How long after eating does it take for the pH to reach a value that can cause tooth decay?

\_\_\_\_\_ minutes [1]

- (ii) Calculate the maximum change in pH after eating the meal. Show your working out.

\_\_\_\_\_ [2]

(iii) Describe fully the change in acidity of this person's mouth after they have eaten the meal.

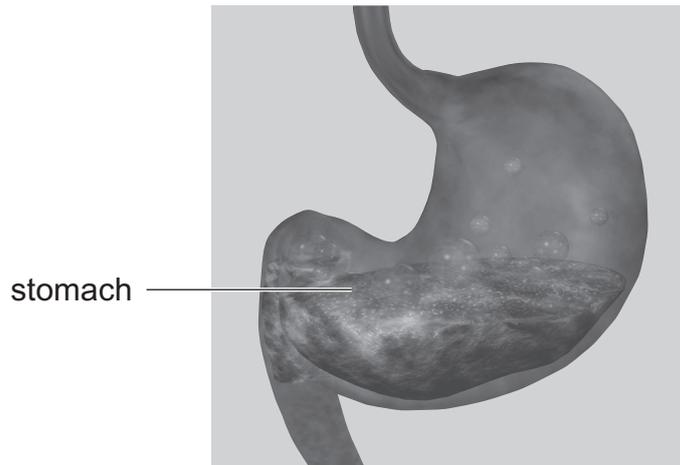
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[2]

The diagram below shows the human stomach.



© Purestock / Thinkstock

Sometimes there is too much acid in the stomach. This can be painful.

(b) What is the name of the condition caused by too much acid in the stomach?

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[1]

(c) Describe how taking baking soda can cure this condition.

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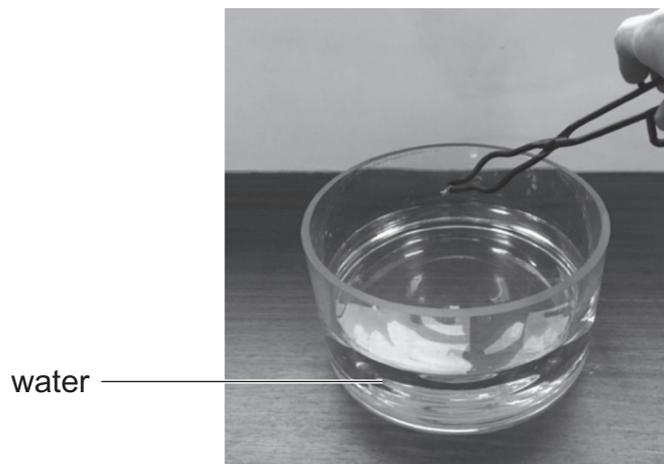
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[2]

[Turn over

- 5 (a) The photograph shows a teacher placing a piece of sodium (a Group 1 metal) into water.



Source: Principal Examiner

- (i) The teacher wears goggles as a safety precaution. Give **one** other safety precaution a teacher should take during this demonstration. Explain how this should make it safer.

Safety precaution \_\_\_\_\_

Explanation \_\_\_\_\_

\_\_\_\_\_ [2]

(ii) Look at the table below. Tick (✓) any statement which describes what happens when sodium is placed in water.

Statement	Tick (✓)
Sodium sinks	
Sodium burns with a lilac flame	
Sodium floats	
Alkaline solution formed	
Acidic solution formed	

[2]

(iii) Name the gas produced during this reaction.

[1]

(b) Name a Group 1 metal that is not used in the school laboratory to demonstrate its reaction with water. Explain why it is not used.

[2]

[Turn over



(c) Some chemical formulae are given below.



From the list, choose the correct formula for:

(i) sodium hydroxide. \_\_\_\_\_ [1]

(ii) water. \_\_\_\_\_ [1]

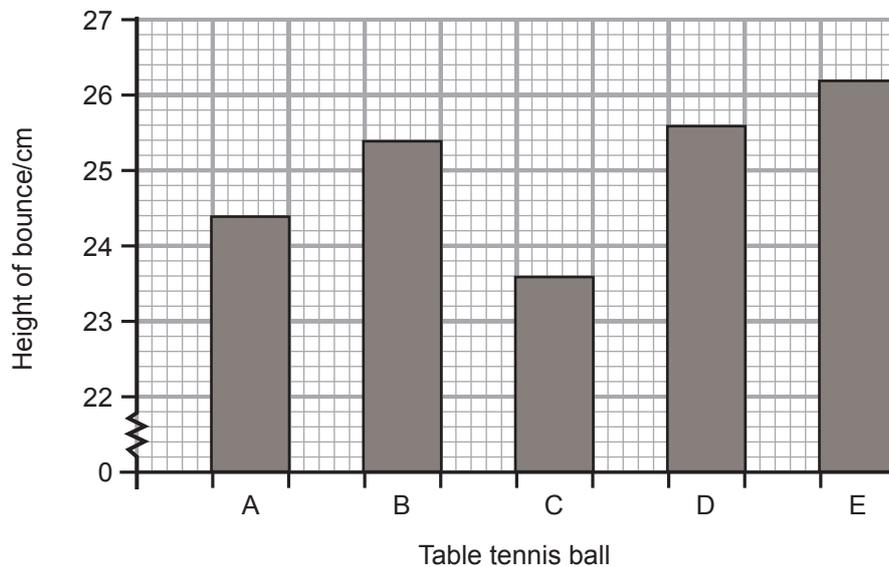
(d) Name the chemical with the formula  $\text{MgO}$ .

\_\_\_\_\_ [1]

- 7 Before being used, table tennis balls must pass a test to make sure they bounce to the correct height.

Each ball is dropped once from a height of 30 cm onto a steel block. The ball should bounce more than 24 cm but less than 26 cm.

- (a) The results for five table tennis balls are given below.



- (i) Which table tennis balls (A, B, C, D or E) have failed the test?

\_\_\_\_\_ and \_\_\_\_\_ [1]

- (ii) Suggest **one** way the reliability of the results could have been improved.

\_\_\_\_\_ [1]

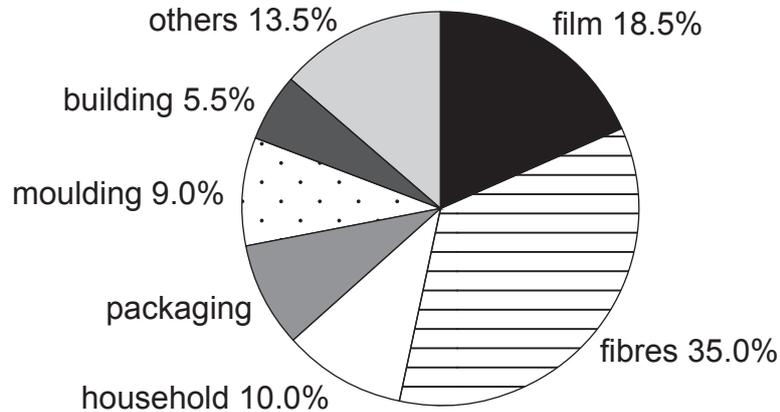
- (iii) Table tennis balls are made from a type of polymer. Describe fully the process of polymerisation.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

(b) Polypropene is a plastic that has many uses.

It breaks easily at temperatures below 5 °C but gets more flexible as it warms up. It melts around 130 °C.

The pie chart below shows the uses of polypropene.



(i) Calculate the percentage of polypropene that is used in packaging.

Show your working out.

\_\_\_\_\_ % [2]

(ii) Why is packaging made from polypropene not used where the temperature drops as low as 0 °C?

\_\_\_\_\_  
 \_\_\_\_\_ [1]

[Turn over

8 Given below is information about some materials.

Material	Cost per tonne/£	Melting point/°C	Resistance to water damage	Density/g/cm <sup>3</sup>	Electrical conductivity
Aluminium	785	660	High	2.7	Very good
Steel	75	1535	Low	7.8	Average
Stainless steel	650	1480	High	7.9	Average
Copper	3238	1083	High	8.9	Excellent
PVC plastic	230	160	High	1.4	None
Iron	40	1528	Low	7.9	Average

Use this information to answer the following questions.

- (a) PVC plastic is used to make children's buckets and spades.  
Give **one** reason why PVC plastic is used.

\_\_\_\_\_ [1]

Mountain hikers often carry hiking poles when walking long distances in wet and cold conditions. They use hiking poles to help them avoid injury on uneven mountain paths.



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- (b) Name the metal from the table which is most suitable for making hiking poles. Give **two** reasons. Explain your choice for each.

Reason 1 \_\_\_\_\_

Explanation \_\_\_\_\_

\_\_\_\_\_

Reason 2 \_\_\_\_\_

Explanation \_\_\_\_\_

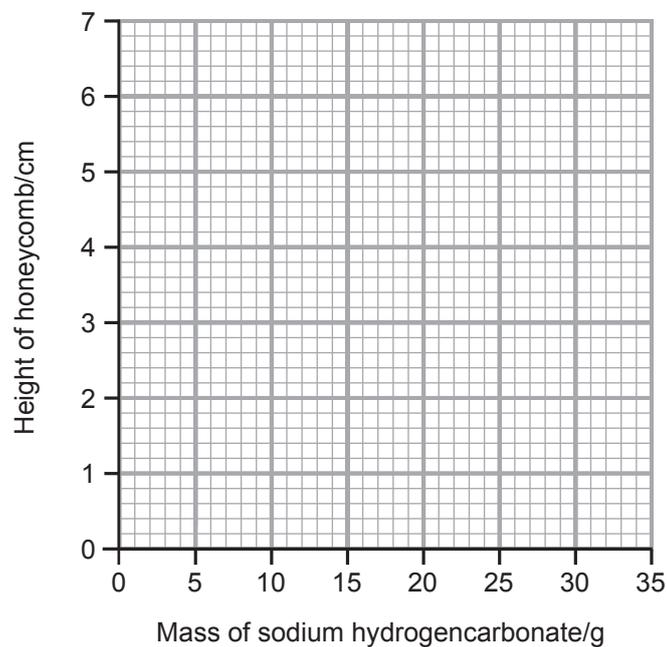
\_\_\_\_\_ [3]

[Turn over

- 9 Mary and Jack were making honeycomb. When they changed the amount of sodium hydrogencarbonate they changed the height of the honeycomb. The results are shown in the table below.

<b>Mass of sodium hydrogencarbonate/g</b>	0	5	10	15	20	25	30	35
<b>Height of honeycomb/cm</b>	0	2.5	4.2	5.2	5.7	6.0	6.0	6.0

- (a) (i) Plot a **line graph** of these results on the grid below.



[3]

- (ii) What was the height of the honeycomb when 12 g of sodium hydrogencarbonate was added?

\_\_\_\_\_ cm [1]

(b) (i) Describe fully the trend shown by these results.

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[2]

(ii) A company wants to make honeycomb in 6 cm pieces. They want to sell the honeycomb and make the maximum amount of money. Explain fully why it should use 25 g of sodium hydrogencarbonate.

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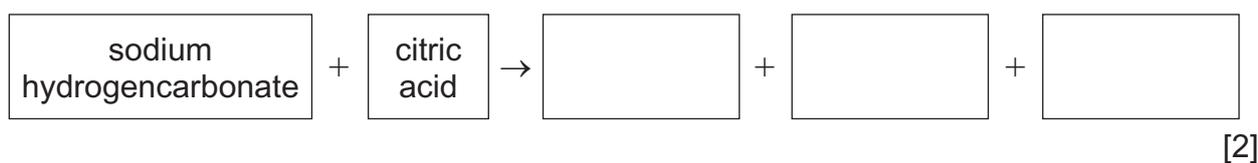
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[2]

(c) Mary suggested that a few drops of citric acid added to the mixture would give an even greater height.

Complete the word equation for this reaction.



[Turn over





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10976.04 ML

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
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7	
8	
9	
10	

<b>Total Marks</b>	
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Examiner Number

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10976.04 ML

## SYMBOLS OF SELECTED IONS

### Positive ions

Name	Symbol
Ammonium	$\text{NH}_4^+$
Chromium(III)	$\text{Cr}^{3+}$
Copper(II)	$\text{Cu}^{2+}$
Iron(II)	$\text{Fe}^{2+}$
Iron(III)	$\text{Fe}^{3+}$
Lead(II)	$\text{Pb}^{2+}$
Silver	$\text{Ag}^+$
Zinc	$\text{Zn}^{2+}$

### Negative ions

Name	Symbol
Carbonate	$\text{CO}_3^{2-}$
Dichromate	$\text{Cr}_2\text{O}_7^{2-}$
Ethanoate	$\text{CH}_3\text{COO}^-$
Hydrogen carbonate	$\text{HCO}_3^-$
Hydroxide	$\text{OH}^-$
Methanoate	$\text{HCOO}^-$
Nitrate	$\text{NO}_3^-$
Sulfate	$\text{SO}_4^{2-}$
Sulfite	$\text{SO}_3^{2-}$

## DATA LEAFLET

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

Contents	Page
Periodic Table of the Elements	2–3
Symbols of Selected Ions	4
Solubility of Common Salts	4

# gcse . Science

## chemistry double award single award



# THE PERIODIC TABLE OF ELEMENTS

## Group

1		2												3	4	5	6	7	0	
																				4 <b>He</b> Helium 2
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4											11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10			
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12											27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulfur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18			
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36			
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	99 <b>Tc</b> Technetium 43	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54			
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	139 <b>La</b> <sup>*</sup> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	186 <b>Re</b> Rhenium 75	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	222 <b>Rn</b> Radon 86			
223 <b>Fr</b> Francium 87	226 <b>Ra</b> Radium 88	227 <b>Ac</b> <sup>†</sup> Actinium 89	261 <b>Rf</b> Rutherfordium 104	262 <b>Db</b> Dubnium 105	263 <b>Sg</b> Seaborgium 106	262 <b>Bh</b> Bohrium 107	265 <b>Hs</b> Hassium 108	266 <b>Mt</b> Meitnerium 109	269 <b>Ds</b> Darmstadtium 110	272 <b>Rg</b> Roentgenium 111	285 <b>Cn</b> Copernicium 112									

\* 58 – 71 Lanthanum series

† 90 – 103 Actinium series

a	x
b	

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

140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	147 <b>Pm</b> Promethium 61	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	159 <b>Tb</b> Terbium 65	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71
232 <b>Th</b> Thorium 90	231 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	237 <b>Np</b> Neptunium 93	242 <b>Pu</b> Plutonium 94	243 <b>Am</b> Americium 95	247 <b>Cm</b> Curium 96	245 <b>Bk</b> Berkelium 97	251 <b>Cf</b> Californium 98	254 <b>Es</b> Einsteinium 99	253 <b>Fm</b> Fermium 100	256 <b>Md</b> Mendelevium 101	254 <b>No</b> Nobelium 102	257 <b>Lr</b> Lawrencium 103