Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Science: Single Award

Unit 2 (Chemistry)

Foundation Tier

[GSS21]

GSS21

THURSDAY 17 MAY 2018, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

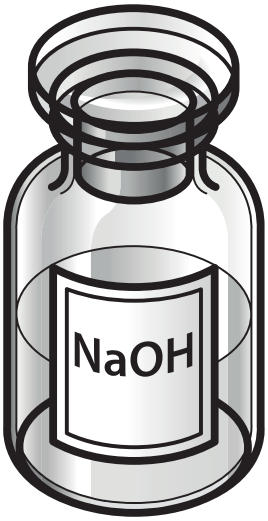
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
Quality of written communication will be assessed in Question **9**.
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)** Oven cleaner contains sodium hydroxide which is a corrosive substance.

(i) In the box below draw the hazard symbol for a corrosive substance.



© ZernLiew / iStock / Thinkstock

[1]

(ii) Suggest **one** reason why anyone using oven cleaner should wear gloves.

_____

_____ [1]

(b) Vinegar is a common acidic household substance.

© GIPhotoStock / Science Photo Library

(i) What is the chemical name for vinegar?

Circle the correct answer.

citric acid : **ethanoic acid** : **hydrochloric acid**

[1]

(ii) Complete the following sentence.

Choose from:

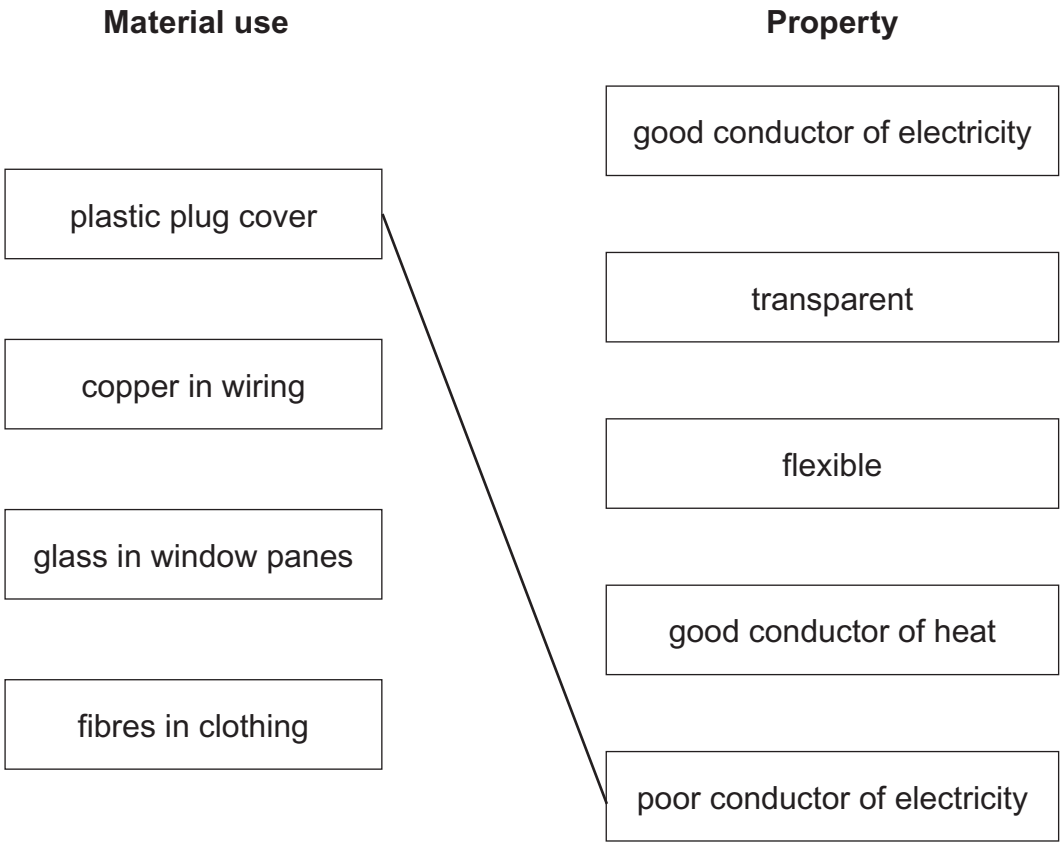
neutral **acidic** **alkaline**

Vinegar can be used to treat a wasp sting because a wasp sting

is _____. [1]

[Turn over

2 **(a)** Materials have particular uses depending on their properties.
Using lines, match each material use to **one** property that makes it suitable for that use.
One has been done for you.



[2]

(b) Car bodies can be made from glass fibre. This material combines the properties of glass and plastic fibres producing a more useful material.

(i) What name is given to this type of material?

Circle the correct answer.

composite material : **smart material** : **nanomaterial**

[1]

(ii) Suggest **one** advantage of using glass fibre for car bodies.

_____

_____ [1]

3 The Periodic Table is a way of classifying the chemical elements.

(a) Tick (✓) **two** correct statements about the Periodic Table below.

Statement	**Tick (✓)**
Group 1 metals do **not** react with cold water	
the vertical columns are called Periods	
the elements are arranged by atomic number	
noble gases are very unreactive	

[2]

(b) Name **one** element that is an alkaline earth metal.

_____ [1]

(c) What name is given to the Group 7 elements?

_____ [1]

(d) Complete the following sentence about the development of the Periodic Table.

Choose from:

octaves **groups** **elements**

In 1864 John Newlands proposed the law of _____. [1]

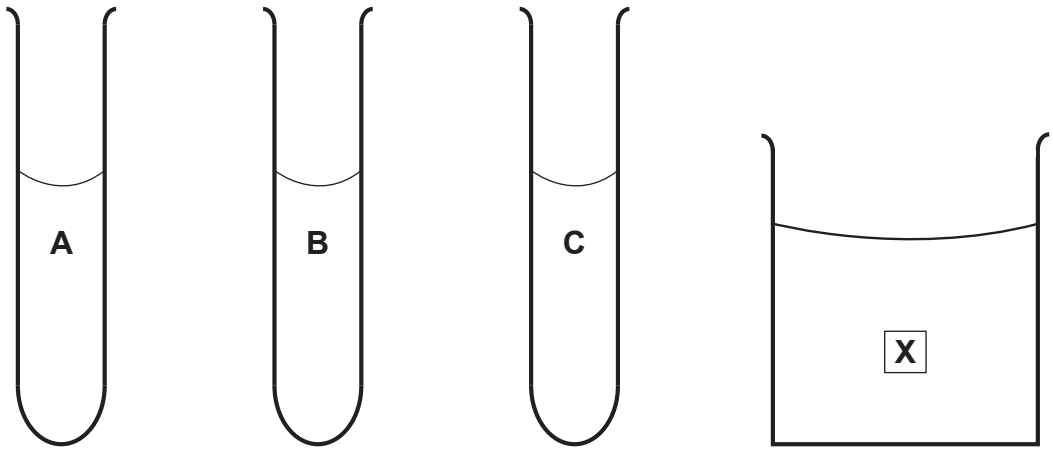
(e) Name the Russian scientist who further developed Newlands' table by leaving gaps for undiscovered elements.

_____ [1]

[Turn over

4 A student investigated the hardness of three water samples, **A**, **B** and **C**, using the method described below.

1. Measure 10 cm^3 of each water sample and place into three separate test tubes as shown below.



Source: Principal Examiner

2. Add 1 cm^3 of the solution labelled **X** and shake for 30 seconds.
3. Repeat step 2 until a permanent lather is formed.
4. Record the volume of solution **X** used.

(a) Solution **X** is added in step 2 to test for hardness of water. What is solution **X**?

_____ [1]

(b) Give **two** things that were done to make this investigation a fair test.

1. _____

2. _____ [2]

(c) Explain how the student would know which sample was the hardest using the volumes of solution **X** added.

_____

_____ [1]

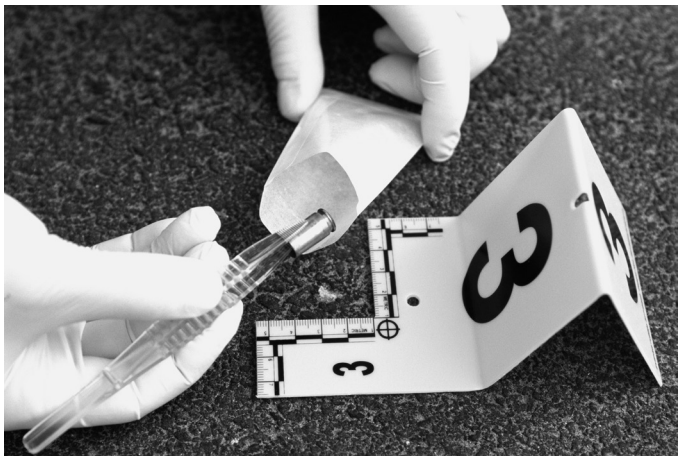
(d) Give **two** disadvantages of hard water.

1. _____

2. _____ [2]

[Turn over

5 Evidence collected by forensic scientists can be used in court to identify someone who has committed a crime.



© Philippe Psaila / Science Photo Library

Forensic scientists at a crime scene should wear protective clothing. Before anything is moved or touched, the scene must be fully documented and photographed.

Clothes should be placed in separate bags and labelled. Items collected from the suspect and victim should not be in contact to prevent contamination. Bed clothes should be carefully handled to avoid loss of hairs and fibres. All fibres that might have transferred to a suspect or victim should be collected.

Use this information to answer parts **(a)** and **(b)** below.

(a) Give **two** pieces of evidence that could be collected at this crime scene.

1. _____

2. _____ [1]

(b) Give **one** thing that should be done to make sure evidence is not contaminated at this scene. Explain why this is done.

_____

_____

_____

_____ [2]

(c) Explain fully why fingerprints are useful in placing a person at a crime scene.

_____

_____

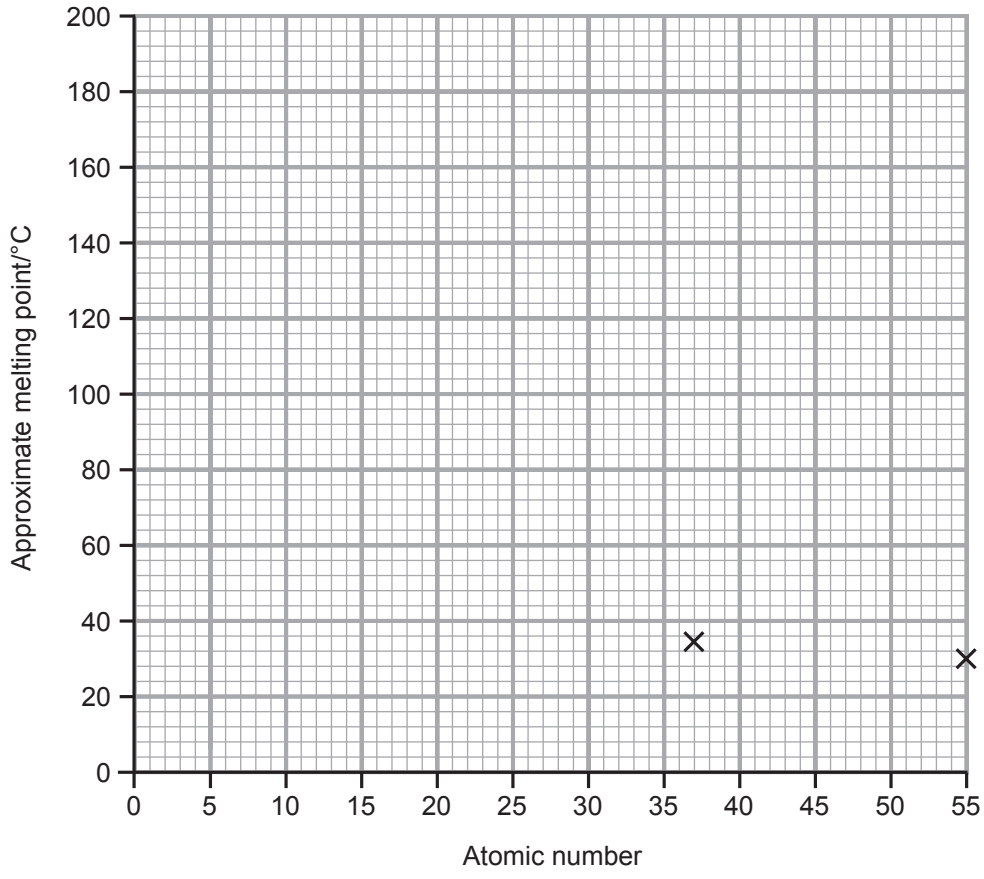
_____ [2]

[Turn over

6 **(a)** The table below gives the approximate melting point of some Group 1 elements.

Element	Atomic number	Approximate melting point/°C
lithium	3	180
sodium	11	100
potassium	19	60
rubidium	37	35
caesium	55	30

(i) On the grid below, complete the line graph by plotting the remaining points and drawing a line of best fit.



[3]

(ii) Complete the following sentence to describe the trend shown by this information.

As atomic number _____

_____ [1]

(iii) Francium is another Group 1 element. It has an atomic number of 87.

Predict the melting point of francium.

_____ °C [1]

(b) The Group 1 metal, potassium, is stored in oil in the laboratory.

(i) Explain why potassium needs to be stored in oil.

_____

_____ [1]

(ii) Apart from wearing safety goggles, state **two** other safety precautions needed when adding potassium to water.

1. _____

2. _____ [2]

(iii) Give **one** similarity and **one** difference in the reactions of potassium and lithium with water.

Similarity _____

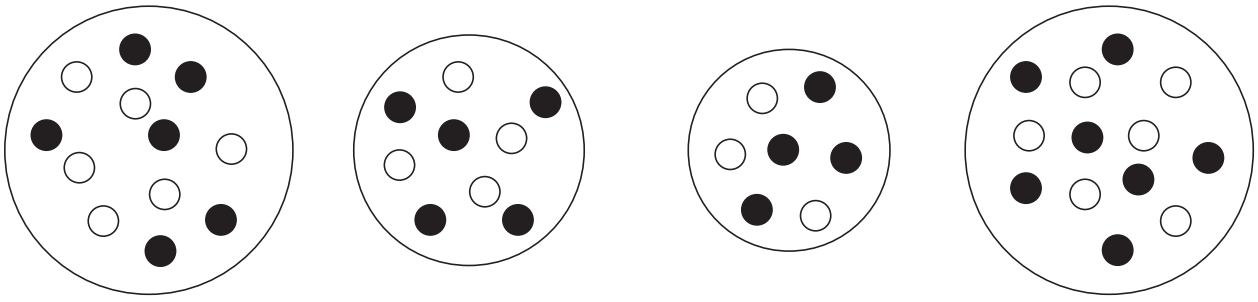
_____

Difference _____

_____ [2]

[Turn over

7 **(a)** The diagrams below show the nuclei (protons and neutrons) of four atoms **A**, **B**, **C** and **D**.



A **B** **C** **D**

Key: ○ Proton
● Neutron

Source: Principal Examiner

(i) Which atom (**A**, **B**, **C** or **D**) has an atomic number of four?

_____ [1]

(ii) Name the element represented by **C**.

You may find your Data Leaflet helpful.

_____ [1]

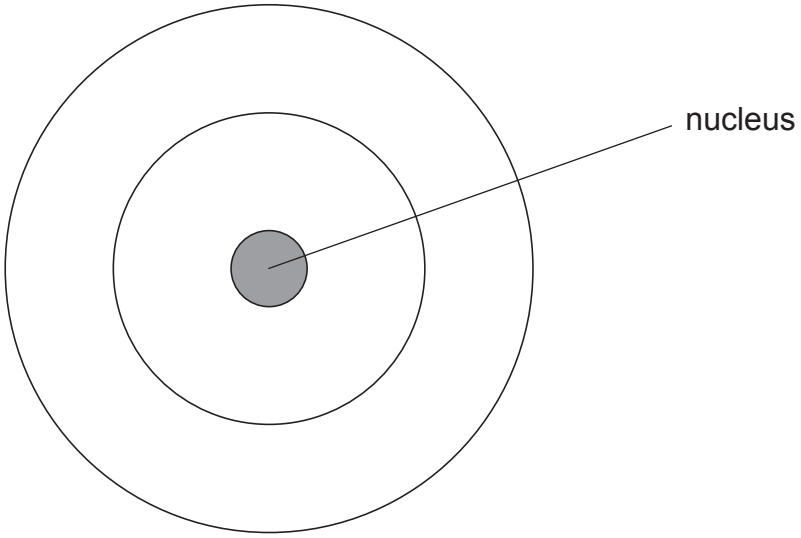
(iii) Which two nuclei (**A**, **B**, **C**, **D**) are from the same element?

_____ and _____ [1]

(b) (i) How many electrons will an atom of element **B** have?

_____ [1]

(ii) On the diagram below show how the electrons in element **B** are arranged.



[1]

(iii) What is the Group number and Period number of element **B**?

Group _____ Period _____ [2]

[Turn over

8 **(a)** Elements and compounds can be represented by chemical symbols and formulae but they must be written correctly.

You may find your Data Leaflet helpful.

(i) What is the correct formula for sodium chloride?

Circle the correct answer.

Na_2Cl_2 : **Na_2Cl** : **$NaCl_2$** : **NaCl**

[1]

(ii) What is the correct formula for magnesium chloride?

Circle the correct answer.

$mgcl_2$: **$MgCl_2$** : **$MGCL_2$** : **$mGcL_2$**

[1]

(b) A compound has the formula $CaSO_4$.

(i) How many elements are present in $CaSO_4$?

_____ [1]

(ii) How many atoms are represented by the formula $CaSO_4$?

_____ [1]

(iii) Name the compound with the formula $CaSO_4$.

_____ [1]

9 Indigestion can cause severe stomach pain.
Many indigestion tablets contain sodium hydrogencarbonate.

Explain how indigestion tablets work.

Your answer should include:

- the cause of stomach indigestion
- how these tablets remove indigestion
- the names of the chemicals produced during this reaction.

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

[6]

[Turn over

10 The table below gives the colour of five indicators at different pH values.

Indicator \ pH	1	2	3	4	5	6	7	8	9	10	11	12	13	14
cresol red	R	O	Y	Y	Y	Y	Y	V	V	V	V	V	V	V
universal	R	R	O	O	Y	Y	G	B	B	I	I	I	V	V
thymol blue	Y	Y	Y	Y	Y	Y	Y	Y	B	B	B	B	B	B
phenolphthalein	C	C	C	C	C	C	C	P	P	P	P	P	P	P
blue litmus	R	R	R	R	R	R	B	B	B	B	B	B	B	B

Key:
R = red; O = orange; Y = yellow; C = colourless; P = pink;
G = green; B = blue; I = indigo; V = violet

(a) Use the information from the table above to answer the following questions.

(i) What colour is thymol blue indicator in a neutral solution?

_____ [1]

(ii) Name the indicator which gives the largest range of colours.

_____ [1]

(iii) Name the indicator which can **not** distinguish between pH 1 and pH 8.

_____ [1]

(b) Suggest **two** reasons why phenolphthalein indicator is of limited use when testing solutions with different pH values.

_____

_____

_____ [2]

(c) Complete the word equation below for the reaction of an acid with an alkali.

sulfuric acid + [ ] → sodium sulfate + [ ]

[2]

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

BLANK PAGE

DO NOT WRITE ON THIS PAGE

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Number

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
Carbonate	CO_3^{2-}
Dichromate	$Cr_2O_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogen carbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	$HCOO^-$
Nitrate	NO_3^-
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

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

Rewarding Learning

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.

Contents **Page**

gcse
science
chemistry
double award
single award

Rewarding Learning

THE PERIODIC TABLE OF ELEMENTS

Group

1	2											3	4	5	6	7	0
							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	99 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	263 Sg Seaborgium 106	262 Bh Bohrium 107	265 Hs Hassium 108	266 Mt Meitnerium 109	269 Ds Darmstadtium 110	272 Rg Roentgenium 111	285 Cn Copernicium 112						

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

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

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 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