Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Science: Single Award

Unit 2 (Chemistry)
Foundation Tier

GSS21

[GSS21]

THURSDAY 8 NOVEMBER 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 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 for your use.

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

Examiner Only	
Marks	Remark

1 **(a)** Shown below are some hazard symbols and their names.

Using lines, match each symbol to its name. The first one has been done for you.

Hazard symbol	Name
	toxic
	corrosive
	explosive
	flammable

[2]

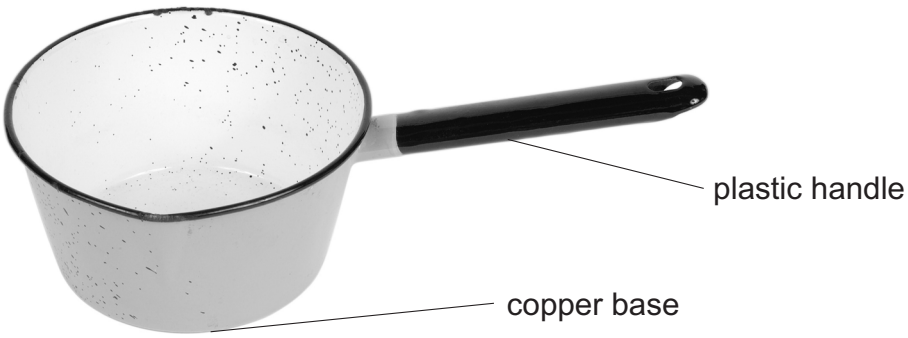
(b) Hazard symbols are used to warn of danger. Give **one** reason why symbols are used rather than words.

_____

_____ [1]

Examiner Only	
Marks	Remark

2 **(a)** Saucepan handles are often made from plastic and their bases from copper.



(i) What makes plastic a suitable material for use in saucepan handles?
Tick (✓) **two** properties from the list below.

- ☐ flexible
- ☐ soft
- ☐ strong
- ☐ insulator
- ☐ shiny

[2]

(ii) Explain fully why copper is a good choice of material for the base of a saucepan.

_____

_____ [2]

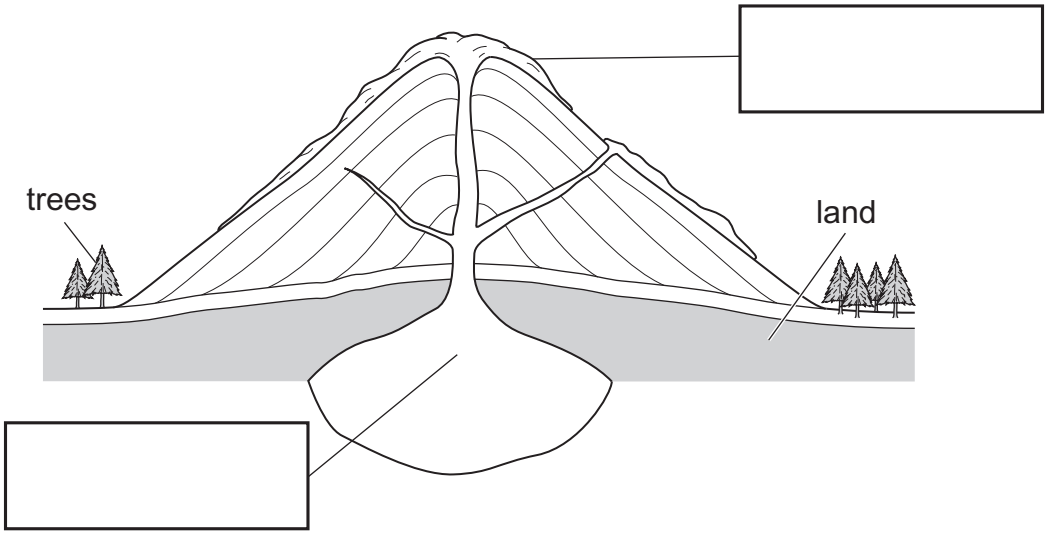
(b) Cotton, wool and silk are all examples of natural materials. What is meant by the term **natural material**?

_____

_____ [1]

Examiner Only	
Marks	Remark

3 The diagram shows a cross section through an active volcano.



Source: Principal Examiner Phyllis VandeVyver, CCEA

(a) Complete the diagram above by adding the correct labels in the two boxes. [2]

(b) Complete the sentences below to describe a volcanic eruption.

Choose from:

tectonic **Richter** **pressure** **heat**

A volcano erupts because _____ plates

are moving together or apart. This causes a build-up

of _____ which makes the volcano erupt. [2]

(c) Name and give one example of the **type** of rock produced by volcanic activity.

Type of rock _____

Example _____ [2]

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

4 James investigated the strength of five fibres (**A**, **B**, **C**, **D** and **E**). He added 0.5 N weights to a length of each fibre until it broke.
His results are shown below.

Fibre	Weight needed to break the fibre/N
A	2.0
B	5.5
C	7.0
D	3.0
E	4.5

(a) Which fibre (**A**, **B**, **C**, **D** or **E**) is the strongest?

_____ [1]

(b) What could James have done to make sure his results were reliable?

Circle the correct answer.

repeat the test using more fibres

repeat the test for a new sample of each fibre

repeat the test using different fibres

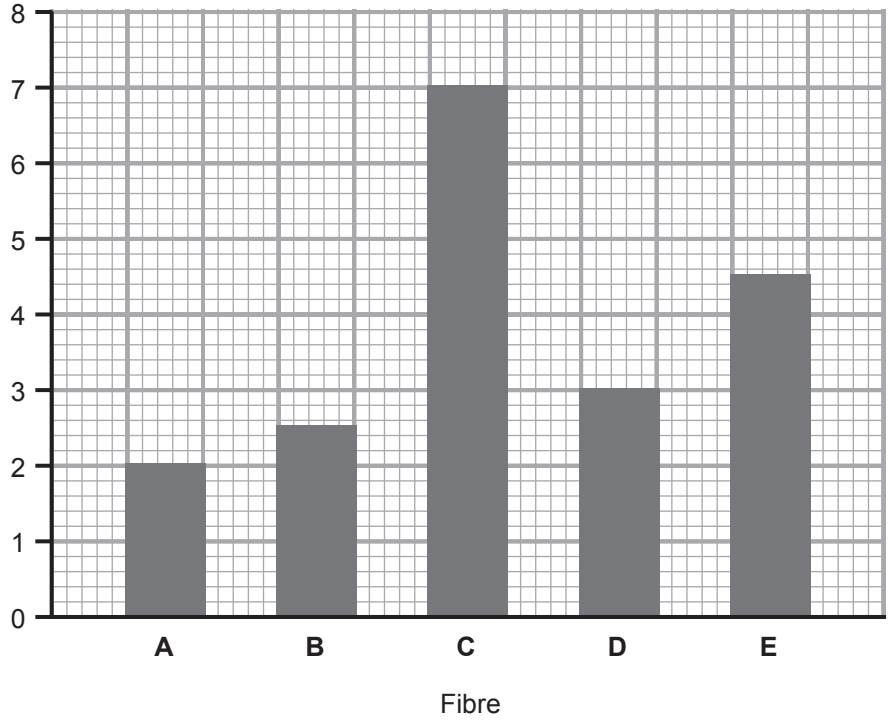
[1]

(c) Suggest **one** thing James may have done to make this a fair test.

_____

_____ [1]

James used the results opposite to draw the bar chart shown below. However, he has made two mistakes.



(d) State **two** things James has done wrong when drawing the bar chart.

1. _____

_____

2. _____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** Tropical fish can only live in water with a suitable temperature and pH.

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The table below gives the most suitable temperature and pH ranges for some tropical fish.

Fish	Temperature range/°C	pH range
reed fish	22–28	6.5–7.5
dinosaur birchir	25–29	7.0–8.2
emerald catfish	21–28	6.5–6.8
rose catfish	22–26	6.0–7.0
disk tetra	23–27	5.0–7.0
ornate birchir	26–28	6.0–8.0

(i) Name a piece of apparatus that could have been used to measure the pH.

_____ [1]

(ii) What is the highest alkaline pH value shown in the table?

_____ [1]

(iii) Name the fish that can live in the widest temperature range.

_____ [1]

Examiner Only	
Marks	Remark

(iv) How many fish named in the table could live in water with a temperature of 23 °C and a pH of 7?

_____ [1]

(v) Suggest **one** temperature in which all these fish could live. Choose from:

24 °C **25 °C** **26 °C** **27 °C**

_____ [1]

(b) Mary wants to keep some emerald catfish. However the water in her fish tank has a pH of 6. She was advised to add some limestone (calcium carbonate) to the water.

(i) Explain fully what effect adding limestone will have on the pH of the water in her fish tank.

_____

_____

_____ [2]

(ii) What is the formula for calcium carbonate?

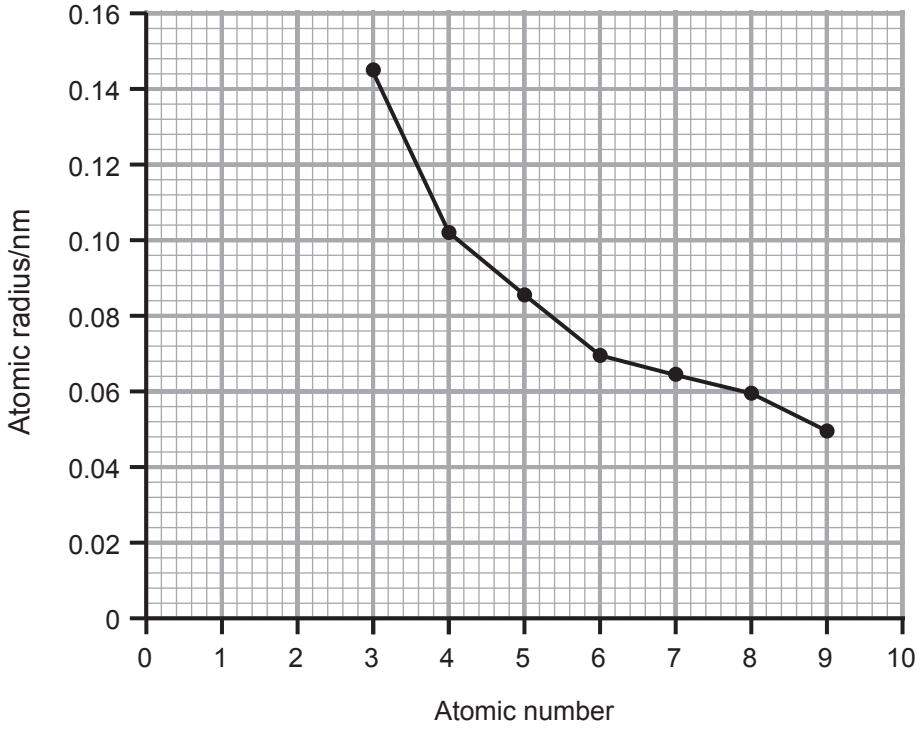
Circle the correct answer.

$CACO_3$: **$CaCO_3$** : **CaC**

[1]

Examiner Only	
Marks	Remark

6 The graph below shows the atomic radius (size) of some elements in Period 2 of the Periodic Table.



(a) What is meant by the term **atomic number**?

_____

_____ [1]

(b) **(i)** State the trend shown by the information in the graph.

_____

_____ [1]

(ii) Predict the atomic radius of the element with an atomic number of 10.

_____ nm [1]

(c) The atomic radius for each element is measured in nanometres (nm). What size is one nanometre?

Circle the correct answer.

1×10^{-9} m : **1×10^{-12} m** : **1×10^{9} m**

[1]

(d) Name the element shown in the graph that has the largest atomic radius.

You may find your Data Leaflet useful.

_____ [1]

(e) The element with atomic number 5 is boron.

(i) Complete the table below to show the number of each particle in an atom of boron.

You may find your Data Leaflet useful.

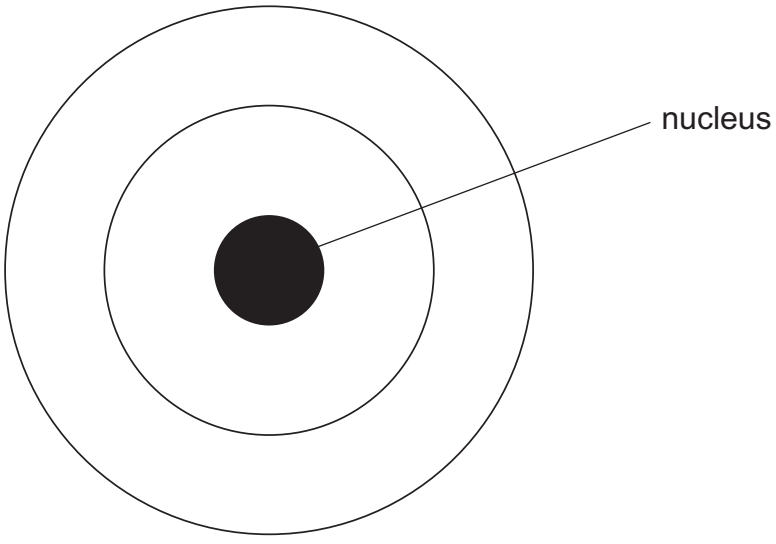
Particle	Number
proton	
electron	
neutron	

[3]

(ii) Which particle named in the table above has **no** charge?

_____ [1]

(iii) Complete the diagram below to show the electron arrangement in a boron atom.



[1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 Coal, oil and gas are fossil fuels that are useful sources of energy.

(a) Complete the following sentences.

The main chemical element in coal is _____.

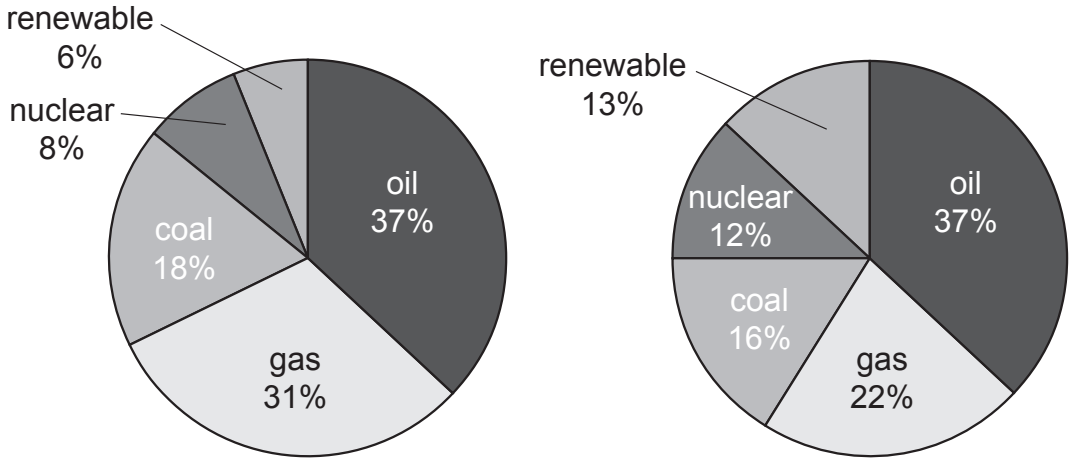
Natural gas (CH_4) contains the elements

_____ and _____.

A molecule containing **only** the two elements found in CH_4 can be

described as a _____. [3]

(b) The pie charts below show the percentage of different energy sources used in the USA and in Europe.



(i) Calculate the total percentage of coal, oil and gas used in **Europe**.

_____ % [1]

(ii) State **one** similarity and **one** difference in the energy sources used in the USA and in Europe as shown in the pie charts above.

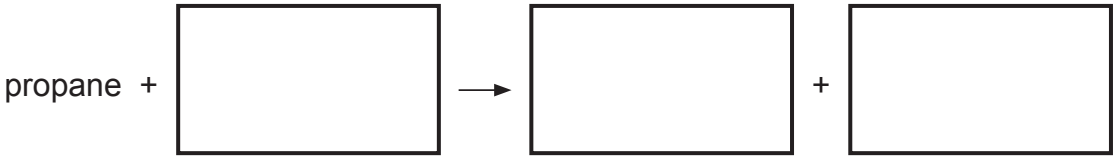
Similarity _____

_____

Difference _____

_____ [2]

(c) Propane can be used as a fuel. Complete the word equation below for the combustion of propane.



[2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 Thermochromic plastic is an example of a smart material, it changes colour as temperature changes. It is used in making baby bottles and forehead thermometers.

(a) What is meant by the term **smart material**?

_____

_____ [2]

(b) The table below gives information about the colour changes of four thermochromic plastics (**P**, **Q**, **R** and **S**) as they are heated.

	Temperature at which colour changes/°C			
Plastic	**Red**	**Green**	**Blue**	**Black**
P	20	21	25	41
Q	36	39	41	45
R	25	70	100	105
S	34	36	38	40

A child's temperature is normally around 36°C, but when they are ill it can go as high as 38°C.

(i) Which plastic (**P**, **Q**, **R** or **S**) would be most suitable to make a forehead thermometer to show if a child is ill?

_____ [1]

Examiner Only	
Marks	Remark

The following instructions were given to make up a bottle of powdered milk for a baby.

1. Boil water in a kettle to 100°C to kill the bacteria that cause illness.
2. Fill the baby bottle with the boiled water.
3. Allow the water to cool, but not below 70°C.
4. Add the powdered milk to the bottle.
5. Leave to cool to room temperature.

© TEK Image / Science Photo Library

(ii) Explain fully why the colour changes of plastic **R** would make it most suitable to manufacture baby bottles.

_____

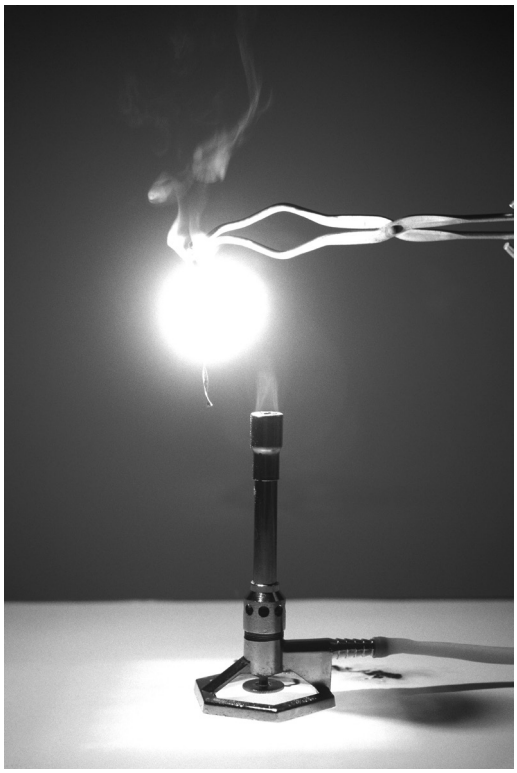
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

9 **(a)** Magnesium burns in oxygen to form magnesium oxide as shown in the photograph below.



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(i) Describe the appearance of magnesium **before** it is burnt.

_____ [1]

(ii) Describe **one** observation that could be made during this reaction.

_____ [1]

(iii) Describe the appearance of magnesium oxide **after** the reaction.

_____ [1]

(b) In this reaction oxygen is added to magnesium. What name is given to this **type** of reaction?

_____ [1]

10 Describe how you could carry out an investigation to determine if a sample of water was temporary hard water.

Your answer should include:

- the name of **one** metal ion that causes hard water
- how to make the investigation a fair test
- the result you would expect for temporary hard water

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

[6]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

113159

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