Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. WEDNESDAY, 17 June 2009

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark awarded**
1.	**7**	
2.	**8**	
3.	**6**	
4.	**4**	
5.	**6**	
6.	**6**	
7.	**9**	
8.	**4**	
Total	**50**	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

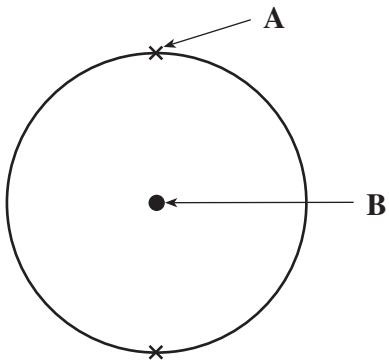
You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Answer **all** *questions*.

1. You may find the Periodic Table of Elements shown on the **back page of this examination paper** helpful when answering this question.

(a) The following diagram shows the structure of an atom of helium.



(i) Name the parts of the atom labelled **A** and **B**. [2]

A .....

B .....

(ii) I. Give the symbol of the element that is in the same group as helium in the Periodic Table but in period 2. [1]

.....

II. Give the electronic structure of this period 2 element. [1]

.....

(iii) Explain why these elements are found in the same group of the Periodic Table. [1]

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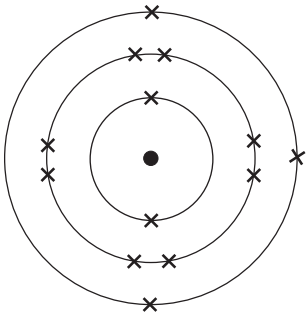
(b) Element **X** is found in period 3 of the Periodic Table. An atom of **X** is shown below.



I. Use the diagram above to explain why this element is to be found in period 3. [1]

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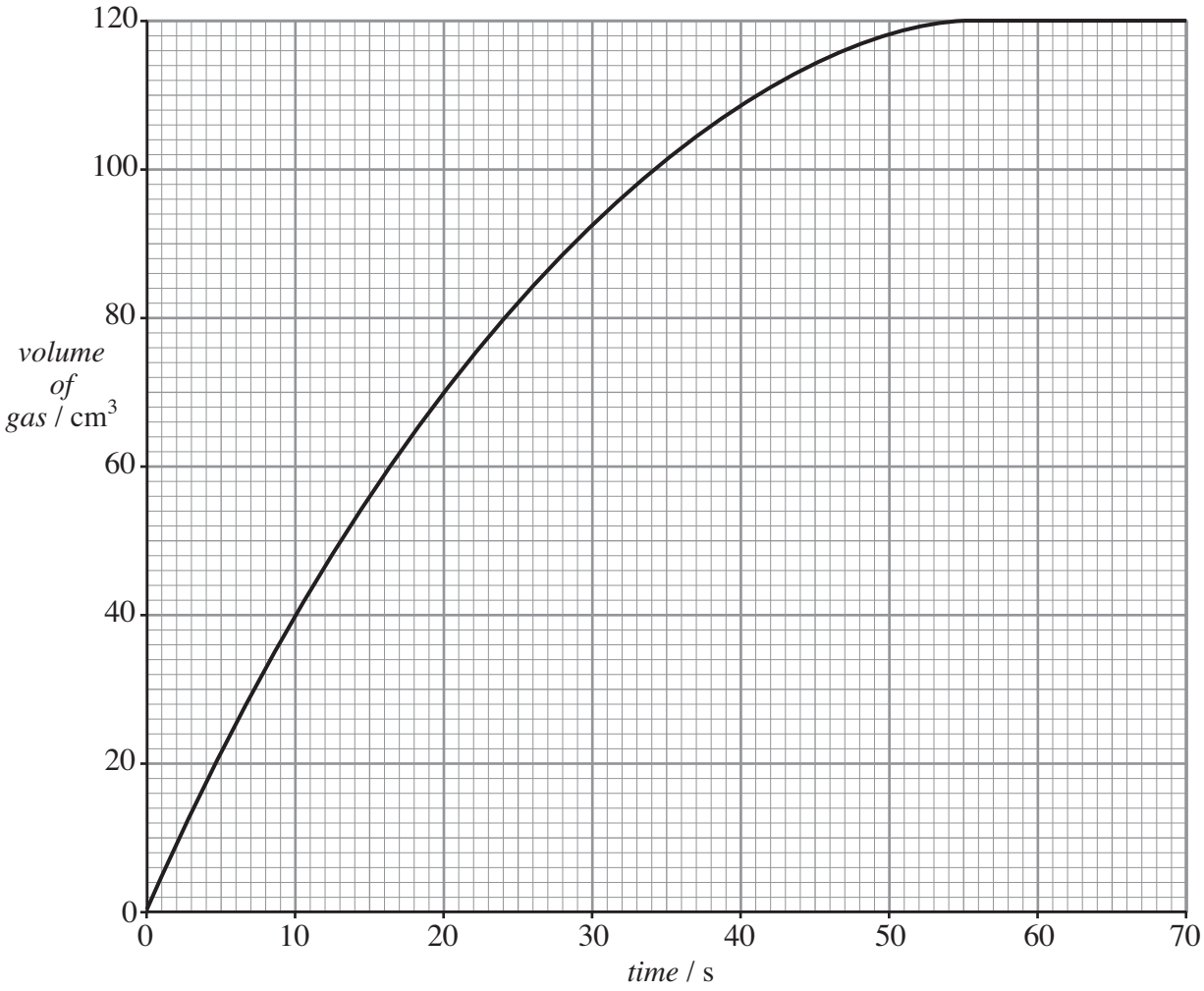
II. Name this element. [1]

.....

2. The following graph shows the volume of carbon dioxide produced when excess limestone is added to 100 cm^3 of hydrochloric acid at room temperature.



(i) Use the graph to find

I. the volume of carbon dioxide produced after 20 seconds, [1]

..... cm^3

II. the time taken for the reaction to stop. [1]

..... seconds

(ii) I. On the grid above, draw the curve you would expect if the reaction were repeated using exactly the same volume and concentration of acid at a **higher temperature** with the limestone still in excess.
Label the graph **A**. [2]

II. Give a reason, in terms of particles, for the difference in the rate of reaction. [2]

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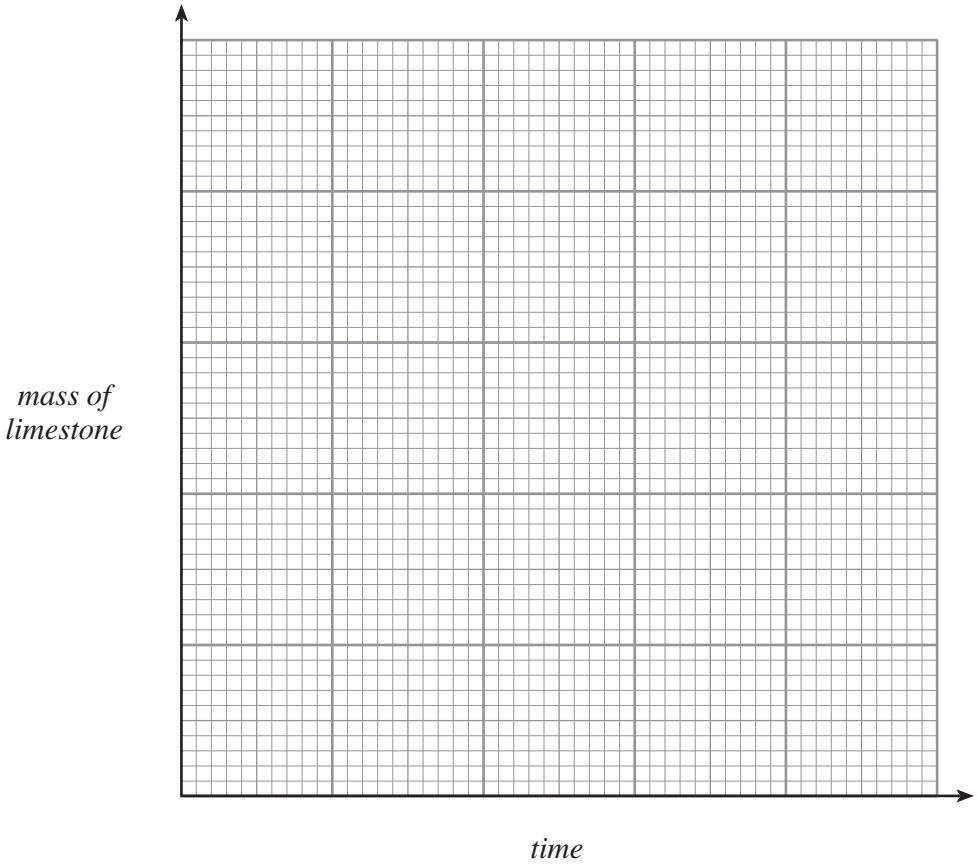
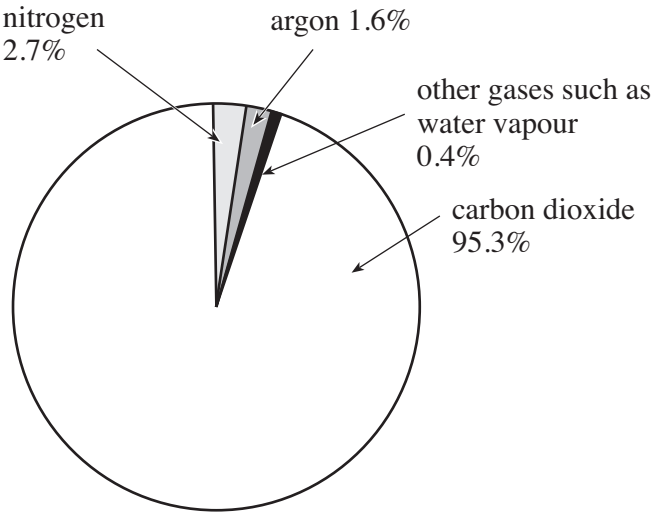
.....

(iii) On the grid below, draw a curve to show how the mass of limestone would change during the reaction. [2]



3. Scientists have been studying the planet Mars and believe that its atmosphere is the same as that which was originally present on the Earth. They have also found that ice exists in craters there.

The following pie chart shows the composition of the atmosphere on Mars.



(i) Give **two** substances named above that were also the **main** gases present in the Earth's **early** atmosphere. [2]

..... and .....

(ii) It is believed that the ice in craters on Mars may have been formed from its atmosphere. Explain how this may have happened. [2]

.....

.....

(iii) Give **two** differences in the composition of the atmosphere of Mars and that present on the Earth today. [2]

Difference 1 .....

.....

Difference 2 .....

.....

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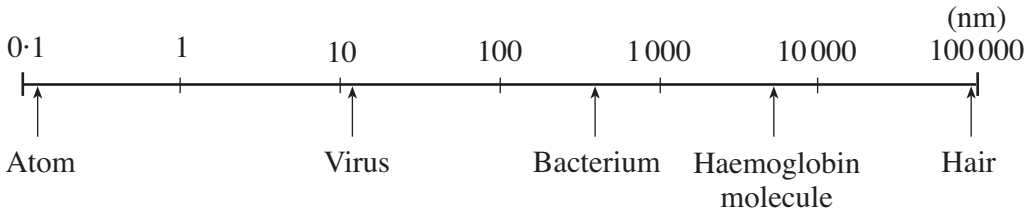
4. The following diagram shows the sizes of objects on a nanometre scale.



(i) From the scale above, give the range of nano-sized particles used in nanotechnology. [1]

..... nm.

(ii) Name the object shown above that is considered to be nano-sized. [1]

.....

(iii) A biodegradable plastic tube, coated with nano-sized silver particles, can be inserted into a person's urinary tract to treat infections.

I. State the property of nano-silver particles that allows them to be used in this way. [1]

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II. Give **one** *other* use of nano-silver particles that relies on this property. [1]

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5. *(a)* A student is given three solutions, **A**, **B** and **C**. He carries out tests to identify each. The results of the tests are shown below.

	Test		
Solution	*Flame test*	*Addition of dilute acid*	*Addition of silver nitrate solution*
A	Orange-yellow flame	Carbon dioxide gas produced	Not carried out
B	Orange-yellow flame	No reaction	White precipitate
C	Lilac flame	No reaction	Yellow precipitate

Use the results above to identify the compound present in each solution. [3]

A .....

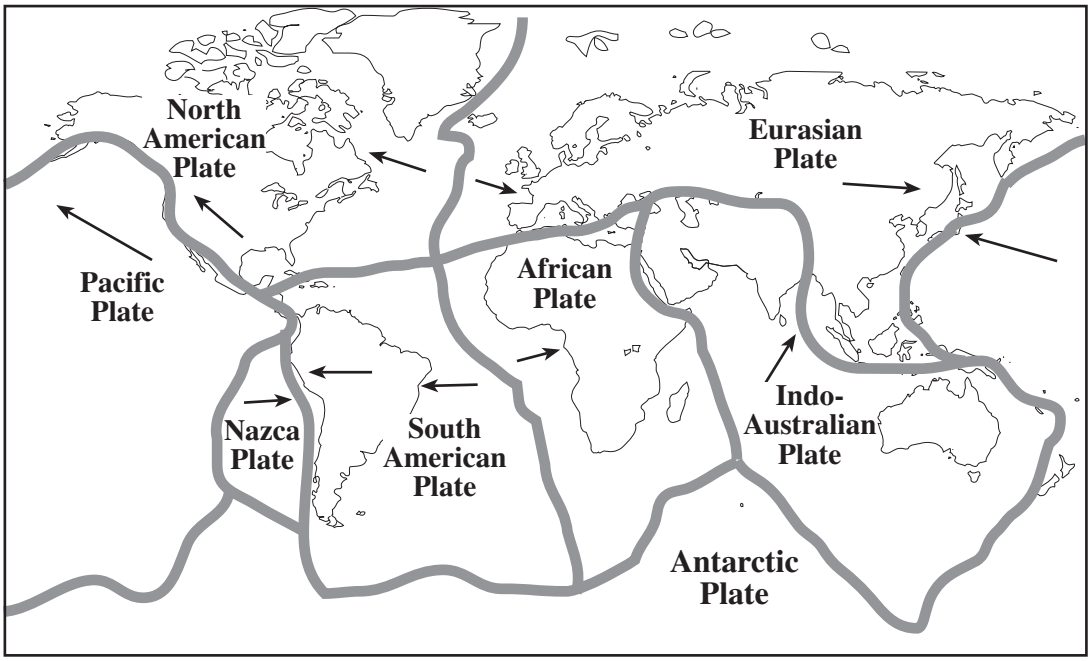
B .....

C .....

(b) When chlorine is added to potassium iodide solution, the solution turns brown. Complete and balance the following **symbol** equation for this reaction. [3]

..... Cl_2 + ... ⟶ ..... + ...

6. The following is a simplified diagram showing the Earth's tectonic plate boundaries.



(i) Explain how the movement of the South American and African plates leads to the formation of new igneous rock. [3]

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(ii) Place **X** on the diagram to show where the movement of **two** plates could result in the denser plate being driven downward. [1]

(iii) Alfred Wegener proposed the idea of continental drift in 1915. However, other scientists did not accept his idea until the 1960's.

I. Give **one** piece of evidence that Wegener used to support his idea. [1]

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II. Give the main reason why his ideas were not immediately accepted. [1]

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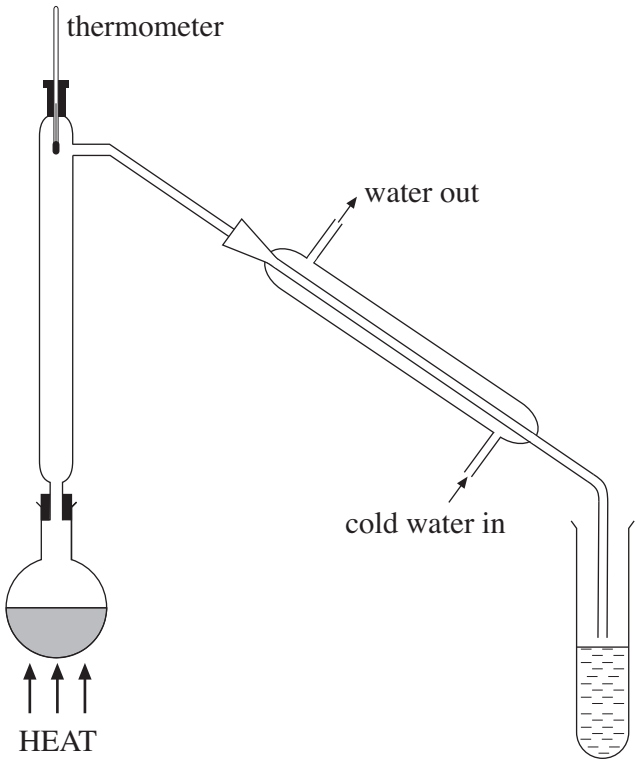
7. *(a)* Crude oil is a mixture of compounds known as hydrocarbons. The following apparatus is used in the laboratory to separate crude oil into its fractions.



Explain how this process works. [3]

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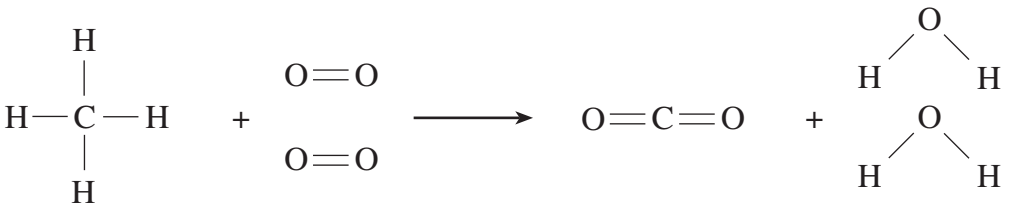
(b) The combustion of methane is shown in the equation below.



(i) This reaction is exothermic and has an overall energy change of 818 kJ. Explain why this reaction is exothermic. [1]

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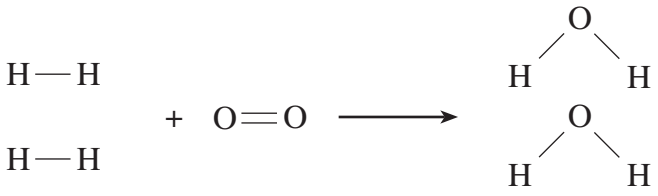
(ii) Hydrogen is another good fuel. The following equation shows how it burns.



The relative amounts of energy needed to break the bonds in the above diagram are shown in the table.

Bond	*Amount of energy needed to break the bond* / kJ
H—H	?
O=O	496
O—H	464

Note: The amount of energy released in making a bond is equal and opposite to that needed to break the bond.

I. The overall energy released during this reaction is 488 kJ.
Using this figure and the table above, calculate the amount of energy needed to break the H – H bond. [4]

.....

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Energy needed to break H – H bond is ..... kJ.

II. Give **one** reason why burning hydrogen is considered better for the environment than burning methane. [1]

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8. A technician found that the labels had come off bottles containing the alkali metals lithium, sodium and potassium. Describe a simple test she could carry out in order to identify the metals. Give a safety precaution she must take and describe the expected observations for each metal. [4]

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		

Turn over.

PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key: