Candidate Name	Centre Number	Candidate Number
		0

GCSE

236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. MONDAY, 18 January 2010

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark awarded**
1.	**5**	
2.	**5**	
3.	**5**	
4.	**10**	
5.	**5**	
6.	**6**	
7.	**4**	
8.	**10**	
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.

Examiner only

Answer **all** *questions*.

1. *(a)* Use the **data** and **key** on the Periodic Table of Elements, shown on the **back page of this examination paper**, to complete the following sentences.

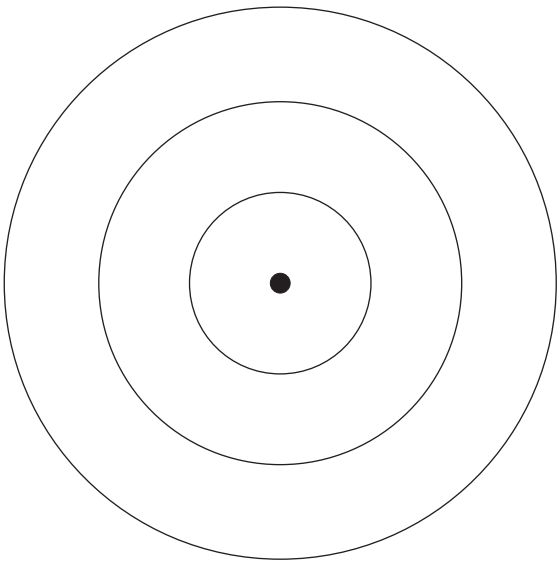
(i) The element which has the chemical symbol S is ..... [1]

(ii) The element with the atomic number 47 is ..... [1]

(iii) The element which has the electronic structure 2,8,8,2 is ..... [1]

(iv) The element which is in Group 0 and Period 1 is ..... [1]

(b) Using **X** to represent an electron, complete the following diagram to show the electronic structure for an atom of silicon. [1]



2. *(a)* The table below shows the amount of carbon dioxide emitted from five countries between 1980 and 2000.

Country	Carbon dioxide emitted per year / million tonnes				
	1980	1985	1990	1995	2000
United States	1263	1208	1315	1421	1626
United Kingdom	160	156	158	155	158
India	95	133	186	250	315
China	403	532	655	873	911
Japan	251	248	292	310	331

The data has been obtained from NASA's Global Climate Change website.

Use only the information from the table above to answer parts (i)-(iii).

(i) Calculate the **increase** in carbon dioxide emission in the United States between 1980 and 2000.

..... million tonnes [1]

(ii) Name the country which had the **biggest increase** in the amount of carbon dioxide emitted between 1980 and 2000. [1]

.....

(iii) Describe the **trend** in carbon dioxide emissions of the United Kingdom between 1980 and 2000. [1]

.....

(b) The increase in the combustion of fossil fuels is one reason for the increase in the amount of carbon dioxide in the atmosphere, which in turn is the main cause of increasing global warming.

(i) State the effect of global warming on polar ice caps. [1]

.....

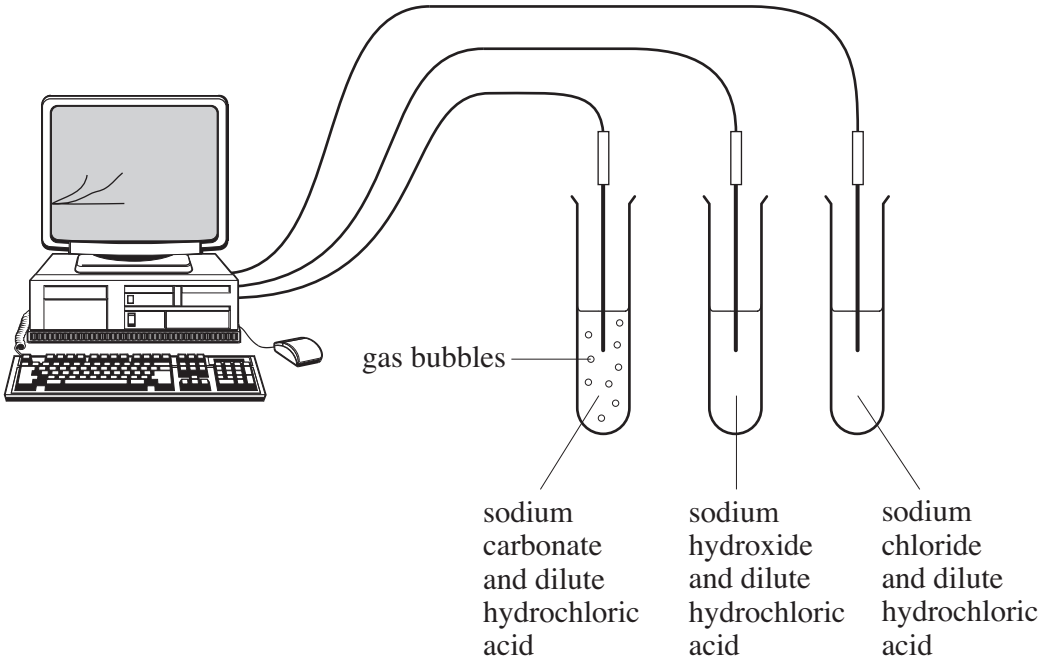
(ii) Give the name of the **natural** process which removes carbon dioxide from the atmosphere. [1]

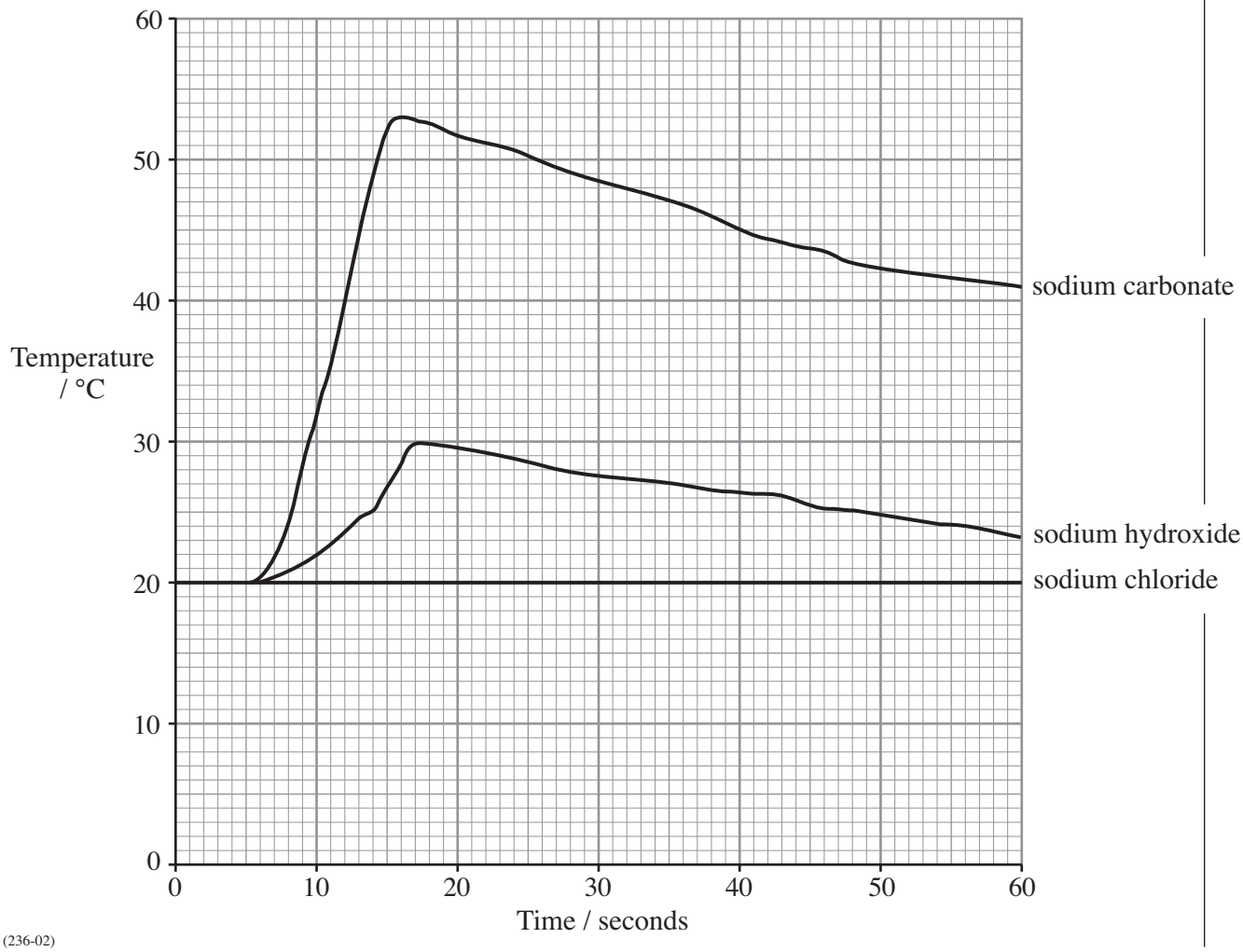
.....

Examiner only

3. The apparatus below was used to investigate the reaction of dilute hydrochloric acid with solutions of sodium carbonate, sodium hydroxide and sodium chloride.

$20\ cm^3$ of dilute hydrochloric acid was added to equal volumes and concentrations of sodium carbonate, sodium hydroxide and sodium chloride. The temperature of the three mixtures was recorded using a sensor.





(i) Use the graphs to give the **maximum increase** in temperature, ***if any***, during the reaction between dilute hydrochloric acid and:

I. sodium chloride solution ..... °C [1]

II. sodium hydroxide solution ..... °C [1]

(ii) State the **term** used to describe the type of reaction which gives out heat. [1]

.....

(iii) Using the information from the diagram and the graph for sodium carbonate, state **two** pieces of evidence which indicate that a chemical reaction takes place between sodium carbonate and dilute hydrochloric acid. [2]

1. .....

2. .....

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4. *(a)* The table below shows some physical properties of Group 1 elements.

Element	Melting point / °C	Boiling point / °C	Density / g cm^{-3}	Electrical conductivity
lithium	180	1340	0·50	good
sodium	98	880	0·97	good
potassium	63	766	0·86	good
rubidium	39	686	1·50	good
caesium	29	669	1·90	good

Use the information in the table above to answer parts (i)-(iii).

(i) State **one** property of Group 1 elements which is:

I. common to **all** metals; ..... [1]

II. **not** common to all metals. ..... [1]

(ii) Francium lies below caesium in Group 1. Predict the approximate value for the melting point of francium. Give the reason for your choice of value. [1]

Melting point ..... °C

Reason .....

(iii) Describe the **general** trend in the density of Group 1 metals going down the group. [1]

.....

(b) (i) When a freshly cut piece of potassium is exposed to air, its cut surface immediately reacts with oxygen, O_2, forming potassium oxide.

Write a balanced **symbol** equation for this reaction. [3]

..... + ... ⟶ .....

(ii) State how this change is normally prevented when storing potassium in the laboratory. [1]

.....

(c) A flame test and silver nitrate solution can be used to identify potassium iodide.

State what you would expect to **see** if:

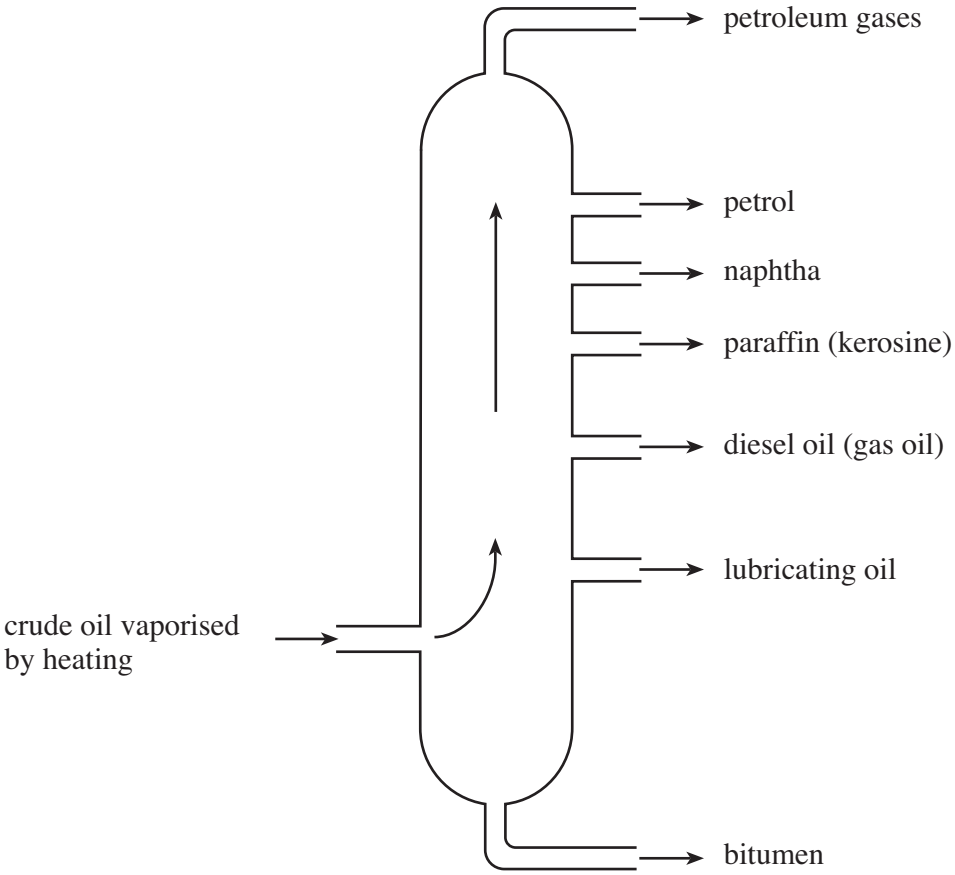
(i) a flame test is carried out on a sample of potassium iodide; [1]

.....

(ii) silver nitrate solution is added to potassium iodide solution. [1]

.....

5. Crude oil is a mixture of compounds called hydrocarbons, which can be separated into fractions.



(i) Give the name of the process which separates crude oil into fractions. [1]

.....

(ii) Vaporised crude oil enters the base of the column.

I. State the **physical property** of hydrocarbons that determines how high up the column each fraction is collected. [1]

.....

II. Name the **physical process** occurring inside the column, that allows the fractions to be collected at different levels in the column. [1]

.....

(iii) Explain why the process of separating crude oil involves physical changes, and not chemical changes. [1]

.....

(iv) Name the elements present in all the fractions. [1]

..... and .....

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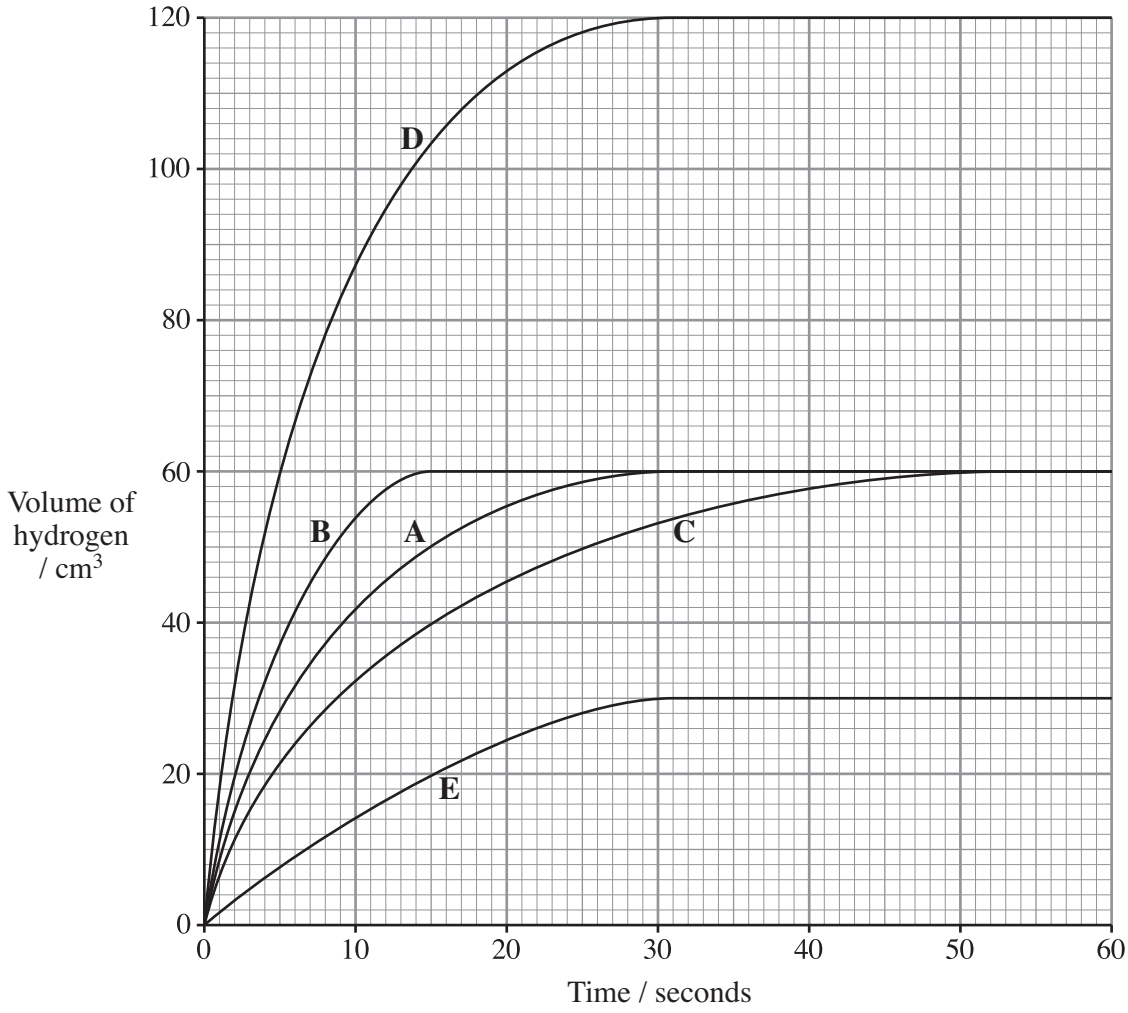
6. Graph **A** below, shows the volume of hydrogen formed during the reaction between 0·06 g of magnesium ribbon and ***excess*** dilute hydrochloric acid at 20°C.

$$Mg + \underset{\textit{excess}}{2HCl} \longrightarrow MgCl_2 + H_2$$



State and explain, using ***particle theory***, which graph, **B**, **C**, **D** or **E** could represent the results obtained if:

(i) the **same mass** of magnesium ribbon as for graph **A** had been added to ***excess*** hydrochloric acid of the same concentration at 40°C;

Graph ..... [1]

Explanation .....

.....

..... [2]

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(ii) **0·03 g** of magnesium ribbon had been added to ***excess*** hydrochloric acid of the same concentration at 20°C.

Graph ..... [1]

Explanation .....

.....

..... [2]

6

7. Since the 1960s, scientists have accepted the ***'theory of plate tectonics'***.

(i) Briefly describe and explain the theory of plate tectonics. [2]

.....

.....

.....

(ii) Scientists located the positions of plate boundaries by natural events such as volcanic eruptions and features such as mountain ranges.
Give **one** other type of natural event which was used to locate plate boundaries.

..... [1]

(iii) In terms of the **rock cycle**, state **one** change that could happen to rocks at a plate boundary. [1]

.....

4

Turn over.

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8. *(a)* The table below shows some physical properties of the Group 7 elements chlorine, bromine and iodine.

Element	Melting point / °C	Boiling point / °C	Density / g cm^{-3}
chlorine	–101	–35	0·0029
bromine	–7	59	3·1
iodine	114	184	4·9

Give the state *(solid*, *liquid* or *gas)* of:

(i) bromine at 60°C; .....

(ii) chlorine at –40°C. ..... [2]

(b) **A**, **B** and **C** represent the halogens chlorine, bromine and iodine, but not necessarily in that order. Each unknown halogen was added separately to solutions containing sodium chloride, sodium bromide and sodium iodide.
The table below shows the results obtained from the series of experiments.

Halogen	Solution of halide ion		
	sodium chloride, NaCl	sodium bromide, NaBr	sodium iodide, NaI
A	no reaction	no reaction	no reaction
B	no reaction	solution turns orange	solution turns brown
C	no reaction	no reaction	solution turns brown

(i) Use the information in the table above to give the chemical name for the halogen: [1]

A .....

B .....

C .....

(ii) Write a balanced **symbol** equation for the reaction between chlorine and sodium iodide solution. [3]

..... + ... ⟶ ..... + ...

Examiner only

(c) Both the chlorination and fluoridation of drinking water occurs in some areas of Britain.

(i) Give the reason why each process is carried out. [2]

Chlorination: .....

Fluoridation: .....

(ii) Give a reason why: [2]

I. chlorination is accepted by nearly everybody;

.....

II. fluoridation is unacceptable to many.

.....

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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: