Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4462/01

W15-4462-01

SCIENCE A/CHEMISTRY

CHEMISTRY 1
FOUNDATION TIER

A.M. TUESDAY, 13 January 2015

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**7**	
3.	**6**	
4.	**6**	
5.	**8**	
6.	**5**	
7.	**8**	
8.	**10**	
9.	**6**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Do not use gel pen or correction fluid.

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.

If you run out of space, use a standard 4-page continuation booklet. Number the question(s) clearly and put your continuation booklet in this question-and-answer booklet. No other style of answer booklet should be used.

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.

Assessment will take into account the quality of written communication (QWC) in your answer to question **9**.

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.

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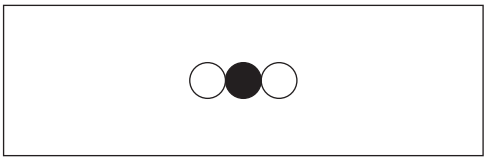
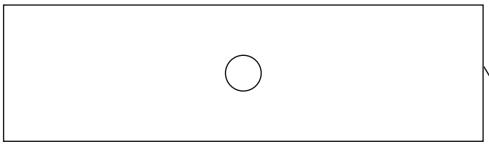
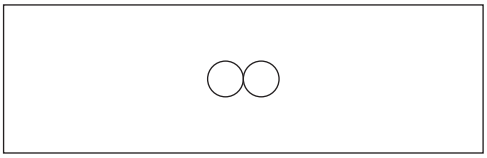
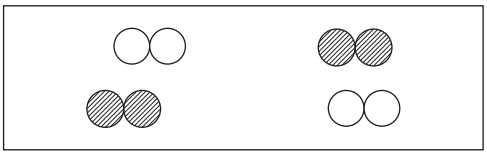
Answer **all** *questions*.

1. *(a)* Draw lines to match each diagram below with the correct description. One has been done for you. [2]

Diagram	Description
	molecule of a compound
	molecule of an element
	mixture of two elements
	atom

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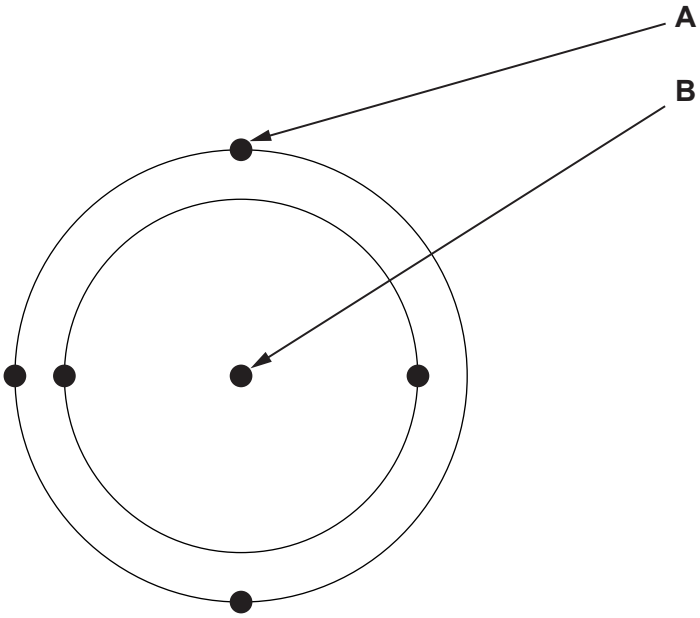
(b) The following diagram shows an atom.



The box below contains some words that could be used in a description of the atom.

neutral	**electron**	**positive**
negative	**nucleus**	**orbit**

Use only words from the box to complete the table. [2]

	Name	Charge
part **A**	.....	.....
part **B**	.....	.....

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Turn over.

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2. It is believed that the Earth's original atmosphere was produced from volcanoes. The following tables show the gases given out by a volcano and the gases present in today's atmosphere.

Gas	Amount given out by a volcano (%)
water vapour	79.0
carbon dioxide	12.0
sulfur dioxide	6.5
nitrogen	1.5
others	1.0

Gas	Amount present in today's atmosphere (%)
nitrogen	78.0
oxygen	21.0
carbon dioxide	0.04
others including water vapour	0.9

(a) Using the information in the tables describe **three** differences between the gases given out by a volcano and today's atmosphere. [3]

.....

.....

.....

.....

(b) Levels of carbon dioxide and oxygen have remained approximately constant for 3500 million years. Name the **two** *natural* processes that have allowed this to happen. [2]

..... and .....

(c) Human activity pollutes the atmosphere which leads to environmental problems. Name the gases responsible for the following problems. [2]

Global warming .....

Acid rain .....

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3. *(a)* Complete the following table that shows information about some compounds. [4]

Compound	Formula	Number of atoms present	Elements present
aluminium chloride	$AlCl_3$	4	aluminium and chlorine
.....	CaO	2	calcium and oxygen
copper(II) sulfide	CuS	.....	..... and .....
sodium oxide	.....	3	sodium and oxygen

(b) The following diagram represents a molecule of ethanol, C_2H_5OH.

Give the **names** of the atoms represented by the following symbols. [2]

● .....

○ .....

▨ .....

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4. The following table shows the pH of some common substances.

Substance	pH
limewater	10.5
saliva	6.4
lemon juice	2.2
orange juice	2.6
milk of magnesia	10.0

(a) Use only information from the table to answer parts (i) and (ii).

(i) Name the strongest acid. [1]

.....

(ii) Name the substance closest to being neutral. [1]

.....

(b) Milk of magnesia is used to treat indigestion. It contains magnesium hydroxide which reacts with excess hydrochloric acid in the stomach.

(i) Complete the following word equation to show the products formed. [2]

magnesium hydroxide + hydrochloric acid ⟶ ..... + ...

(ii) Another indigestion remedy contains calcium carbonate. Name the gas produced when calcium carbonate reacts with hydrochloric acid and state how this gas can be identified. [2]

Gas produced .....

How this gas can be identified .....

.....

6

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5. *(a)* Crude oil is a mixture of hydrocarbons.

(i) State what is meant by a *hydrocarbon*. [1]

.....

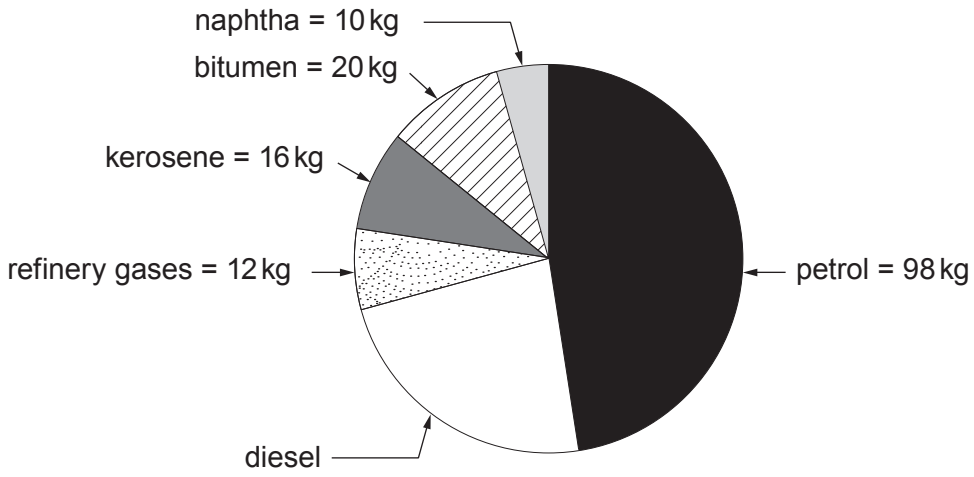
.....

(ii) Describe how crude oil was formed. [2]

.....

.....

(b) The following pie chart shows the mass in kg of each fraction present in 200 kg of crude oil.



(i) Name the **two** fractions that are **not** used as fuels. [1]

..... and .....

(ii) Calculate the percentage of diesel present in this crude oil. [2]

Percentage of diesel = ... %

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(iii) The names of some processes are given in the box below.

cracking	**polymerisation**	**distillation**	**electrolysis**

Name the process by which

I. large hydrocarbon molecules can be made into smaller molecules, [1]

.....

II. small reactive molecules can be joined together to produce long chains. [1]

.....

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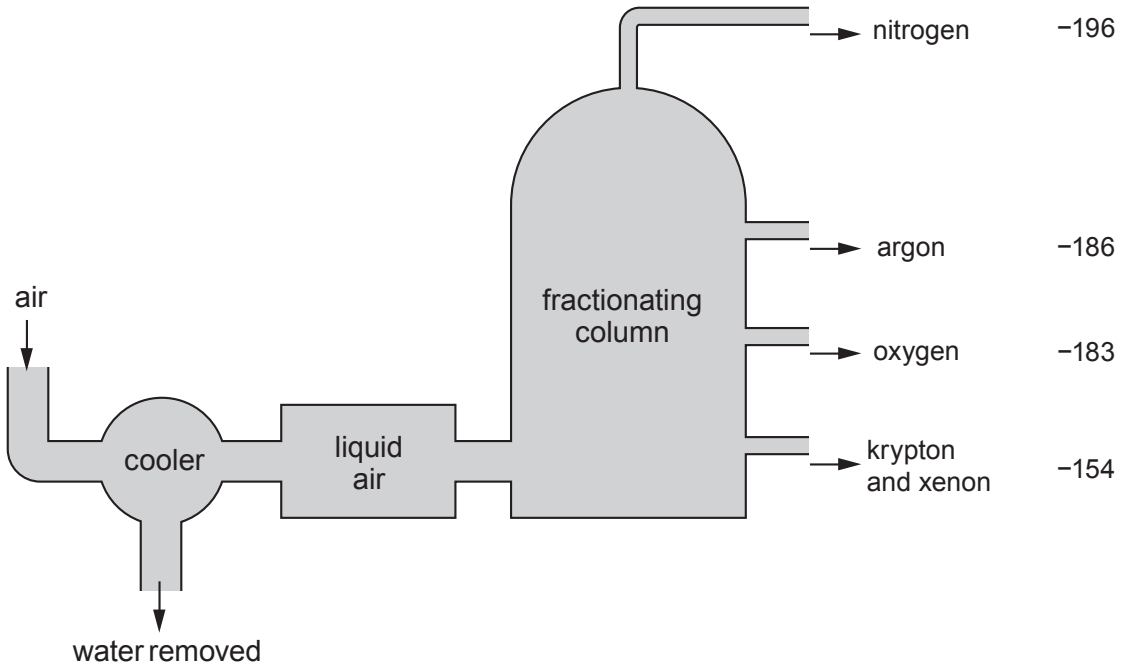
6. Fractional distillation of liquid air is similar to that of crude oil.

The diagram below shows the apparatus used to separate the gases in air.



(a) From the diagram, name the gas that has the lowest boiling point. [1]

.....

(b) Suggest a reason why krypton and xenon cannot be separated by this process. [1]

.....

.....

(c) Air is cooled to −200 °C. Give the state (solid, liquid or gas) of the water removed at this temperature and give a reason for your answer. [2]

State of water removed .....

Reason .....

.....

(d) Argon is used in light bulbs to prevent the filament from burning. State what property of argon makes it useful for this purpose. [1]

.....

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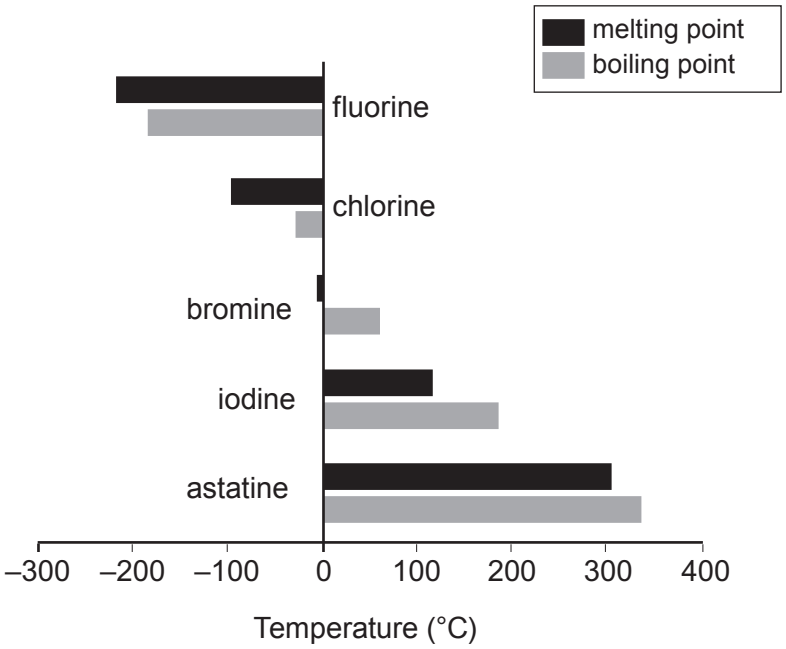
7. *(a)* The following chart shows the melting points and boiling points of the elements in Group 7.



Give the state (solid, liquid or gas) of bromine at room temperature giving the reasons for your answer. [2]

.....

.....

.....

(b) The following table shows the observations made when some Group 7 elements react with hydrogen.

Element	Observations
chlorine	explodes in sunlight
bromine	violent reaction when heated
iodine	reacts when heated strongly

Describe the trend in reactivity within the group and use this trend to predict how astatine would react with hydrogen. [2]

.....

.....

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(c) Group 7 elements also react with iron. Balance the following symbol equation that shows the reaction of iron and fluorine. [1]

$$\square\ Fe + \square\ F_2 \longrightarrow \square\ FeF_3$$

(d) Chlorine and iodine can be extracted from seawater by electrolysis.

(i) Balance the following electrode equation showing how chlorine is formed. [1]

$$\square\ Cl^- - \square\ e^- \longrightarrow Cl_2$$

(ii) Chlorides make up 55% of the salts present in seawater and it is therefore economically viable to extract chlorine from seawater. Suggest a reason why iodine is no longer extracted in this way. [1]

.....

.....

(iii) State the property of chlorine and iodine that make them suitable for use in disinfectants and antiseptics. [1]

.....

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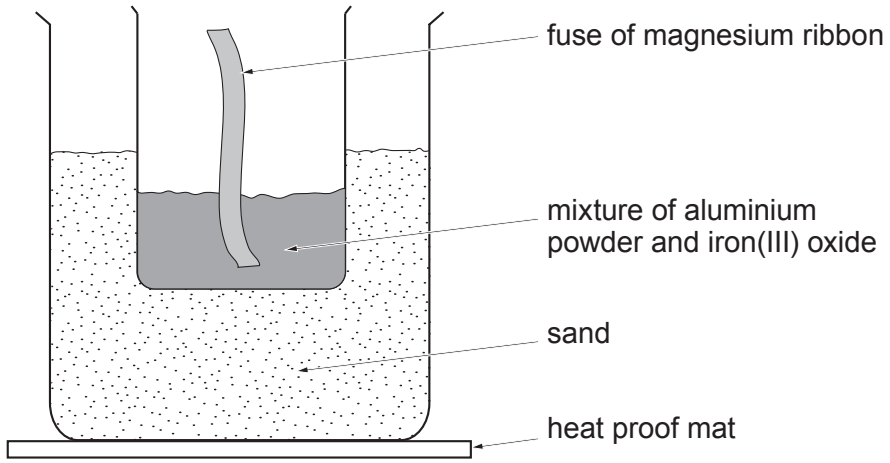
8. *(a)* When a mixture of iron(III) oxide and aluminium powder (thermite) is heated in the apparatus shown below, there is a violent reaction. There is a bright flame, sparks are produced and molten iron is formed.



(i) Write a **word** equation for the reaction taking place. [2]

..... + ... ⟶ ..... + ...

(ii) Explain this reaction in terms of reactivity. [2]

.....

.....

.....

(iii) State how the observations would be different if the mixture were replaced with a mixture of copper powder and aluminium oxide. [1]

.....

.....

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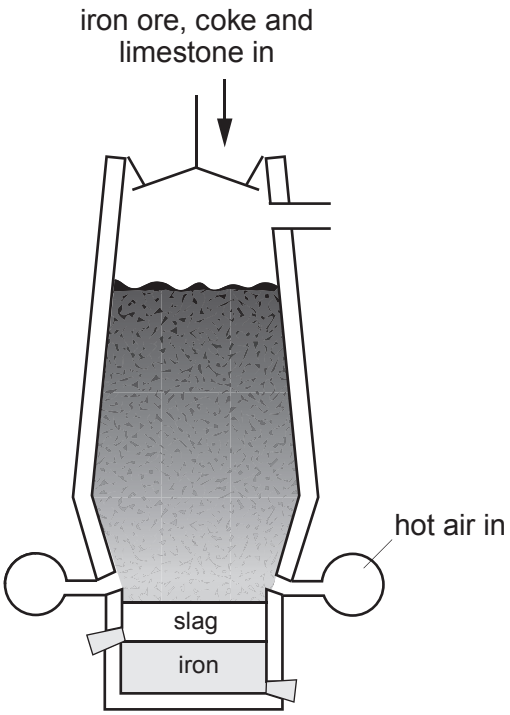
(b) Iron is extracted from its ore in a blast furnace.



(i) State the purpose of the following raw materials. [3]

Iron ore

.....

.....

Coke

.....

.....

Limestone

.....

.....

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(ii) The following equation shows the reaction taking place.

$$Fe_2O_3 + \square\ CO \longrightarrow \square\ Fe + \square\ CO_2$$

I. Balance the equation. [1]

II. Iron(III) oxide is reduced during the reaction. Give the meaning of *reduction*. [1]

.....

.....

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9. Describe the properties of metals and relate these properties to the uses of **two** metals of your choice. [6 QWC]

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END OF PAPER

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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^{+}	Sulfate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		
Zinc	Zn^{2+}		

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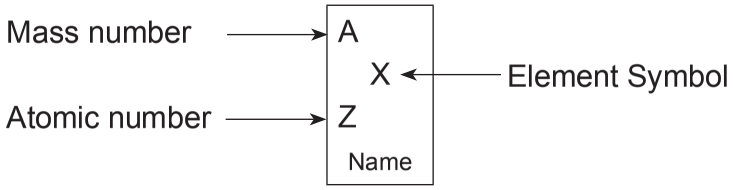
PERIODIC TABLE OF ELEMENTS

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 Sulfur	$^{35}_{17}$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:



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