



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY (US)

0439/11

Paper 1 Multiple Choice

October/November 2013

45 Minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Center number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 20.

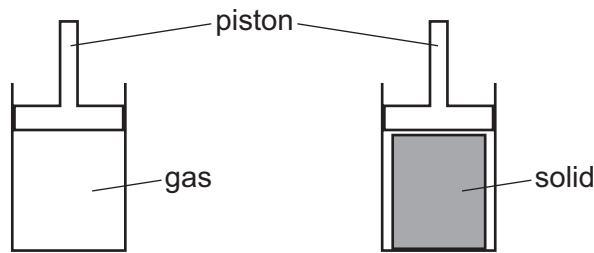
Electronic calculators may be used.

This document consists of **18** printed pages and **2** blank pages.



2

- 1 An attempt was made to compress a gas and a solid using the apparatus shown.



Which substance would be compressed and what is the reason for this?

	substance	reason
A	gas	the gas particles are close together
B	gas	the gas particles are far apart
C	solid	the solid particles are close together
D	solid	the solid particles are far apart

- 2 A student measures the rate of two reactions.

In one reaction, there is a change in mass of the reactants during the reaction.

In the second reaction, there is a change in temperature during the reaction.

Which piece of apparatus would be essential in **both** experiments?

- A** balance
- B** clock
- C** dropper
- D** thermometer

3

3 Diagram 1 shows the paper chromatogram of substance X.

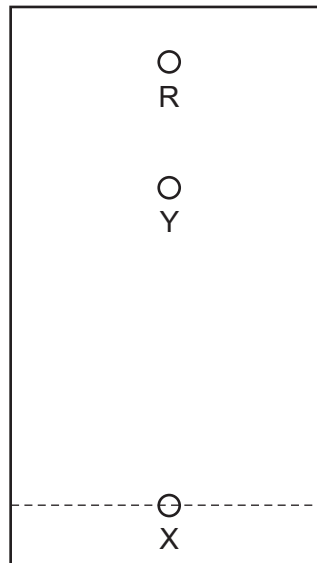


diagram 1

Diagram 2 shows the cooling curve for substance Y.

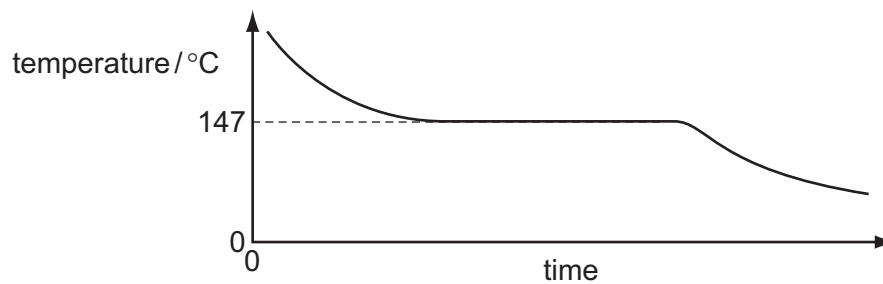


diagram 2

Which statement about X and Y is correct?

- A** X is a mixture and Y is a pure substance.
- B** X is a pure substance and Y is a mixture.
- C** X and Y are mixtures.
- D** X and Y are pure substances.

4

4 Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

- A** Y has more electron shells than X.
B Y has more electrons in its outer shell than X.
C Y is in a different group of the Periodic Table from X.
D Y is in the same period of the Periodic Table as X

5 Which statements about a sodium atom, ${}_{11}^{23}\text{Na}$, are correct?

- 1 The number of protons and neutrons is the same.
 2 The number of protons and electrons is the same.
 3 The number of outer electrons is one.

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

6 Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

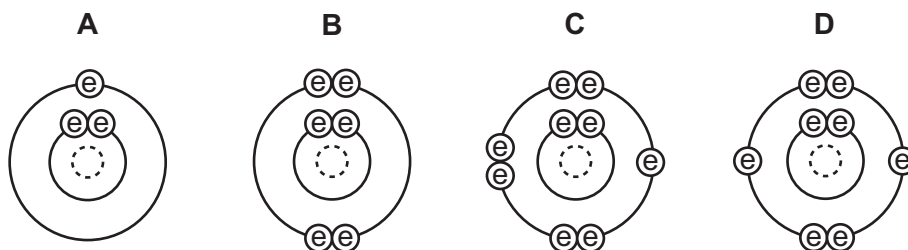
Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

7 The diagrams show the electron arrangements in the atoms of four elements.

Which element does **not** form a covalent bond?



key

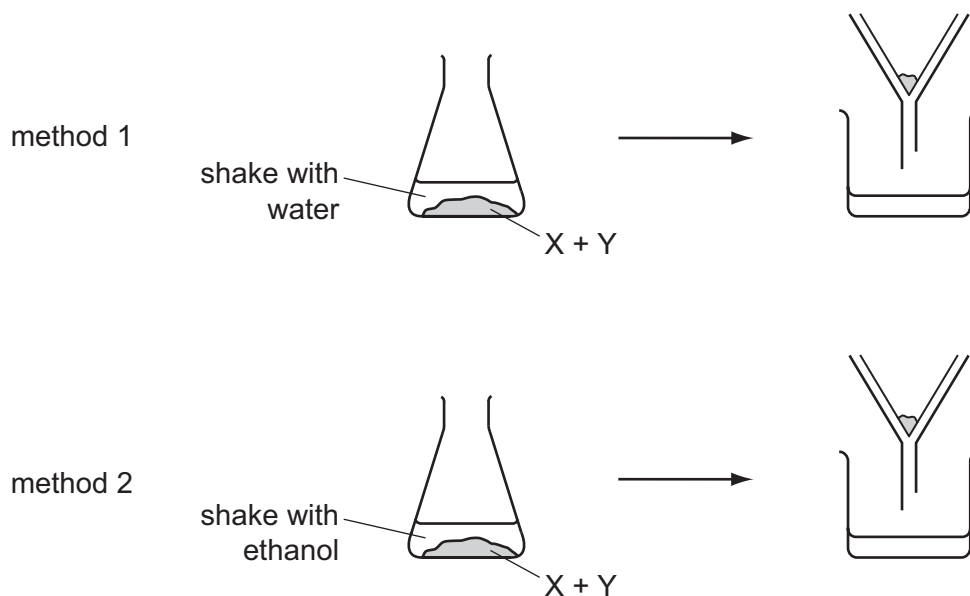
⊖ electron

⊙ nucleus

5

8 A solid mixture contains an ionic salt, X, and a covalent organic compound, Y.

Two students suggest methods of separating the mixture as shown.



Which methods of separation are likely to work?

	1	2
A	✓	✓
B	✓	x
C	x	✓
D	x	x

9 The formulae of compounds W, X and Y are shown.



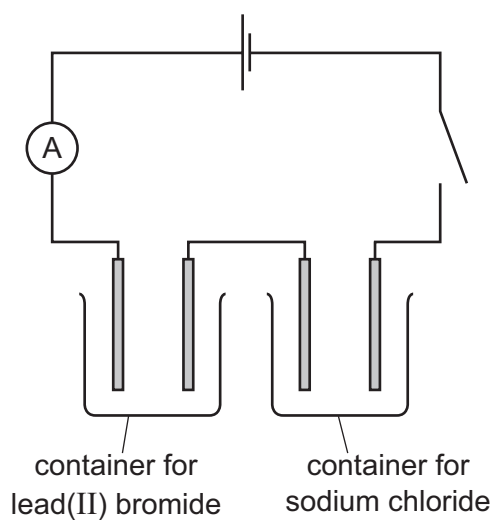
Which statement is correct?

- A** W contains twice as many hydrogen atoms as oxygen atoms.
- B** X contains the most oxygen atoms.
- C** Y contains the most hydrogen atoms.
- D** Y contains the same number of hydrogen and oxygen atoms.

10 Which relative molecular mass, M_r , is **not** correct for the molecule given?

	molecule	M_r
A	ammonia, NH_3	17
B	carbon dioxide, CO_2	44
C	methane, CH_4	16
D	oxygen, O_2	16

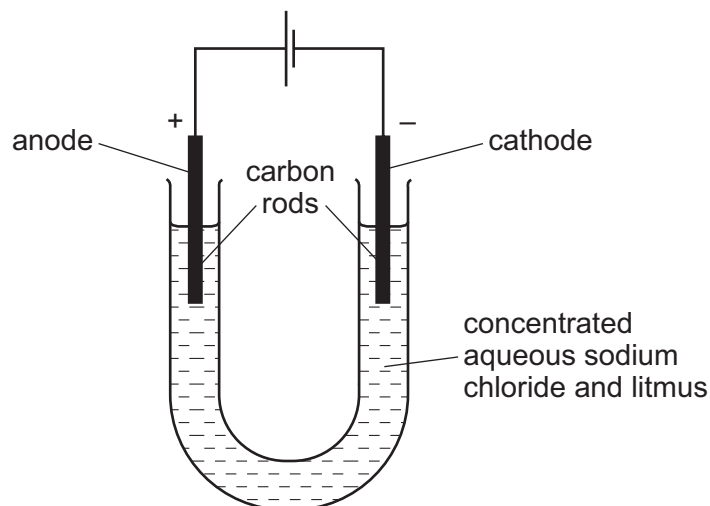
11 The diagram shows the circuit for electrolyzing lead(II) bromide and sodium chloride to liberate the metal.



In what form are these salts electrolyzed for liberating the metal?

	lead(II) bromide	sodium chloride
A	concentrated solution	concentrated solution
B	concentrated solution	molten
C	molten	concentrated solution
D	molten	molten

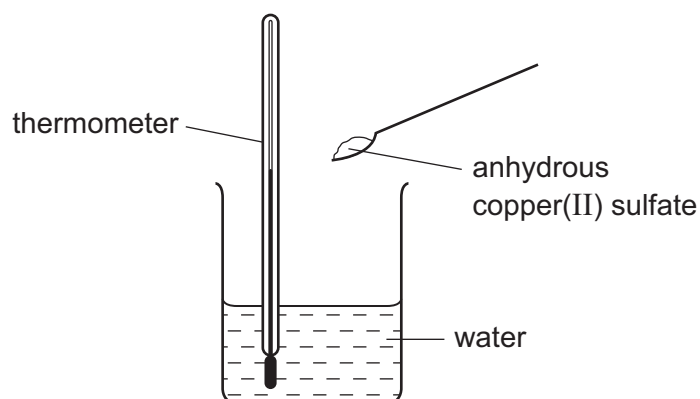
- 12 The diagram shows the electrolysis of concentrated aqueous sodium chloride.



What is the color of the litmus at each electrode after five minutes?

	color at anode	color at cathode
A	blue	red
B	red	blue
C	red	colorless
D	colorless	blue

- 13 When anhydrous copper(II) sulfate is added to water a solution is formed and heat is given out.



Which row correctly shows the temperature change and the type of reaction taking place?

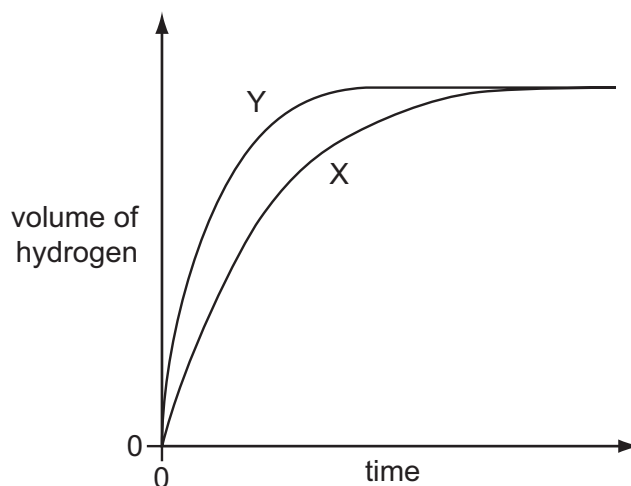
	temperature change	type of reaction
A	decreases	endothermic
B	decreases	exothermic
C	increases	endothermic
D	increases	exothermic

14 Which fuel does **not** produce carbon dioxide when it burns?

- A coal
- B hydrogen
- C methane
- D petrol

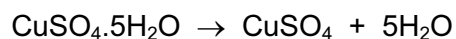
15 A student investigates the rate of reaction between zinc and an excess of sulfuric acid.

The graph shows the results of two experiments, X and Y.



Which change explains the difference between X and Y?

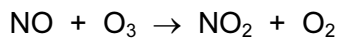
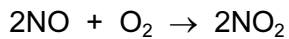
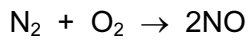
- A A catalyst is added in Y.
 - B A lower temperature is used in Y.
 - C Larger pieces of zinc are used in Y.
 - D Less concentrated acid is used in Y.
- 16 Anhydrous copper(II) sulfate can be made by heating hydrated copper(II) sulfate.



What can be added to anhydrous copper(II) sulfate to turn it into hydrated copper(II) sulfate?

- A concentrated sulfuric acid
- B sodium hydroxide powder
- C sulfur dioxide
- D water

17 The reactions shown may occur in the air during a thunder storm.



Which row shows what happens to the reactant molecules in each of these reactions?

	N_2	NO	O_3
A	oxidized	oxidized	oxidized
B	oxidized	oxidized	reduced
C	reduced	reduced	oxidized
D	reduced	reduced	reduced

18 Which are properties of an acid?

- 1 reacts with ammonium sulfate to form ammonia
- 2 turns red litmus blue

	1	2
A	✓	✓
B	✓	x
C	x	✓
D	x	x

19 Which of the following are properties of the oxides of nonmetals?

	property 1	property 2
A	acidic	covalent
B	acidic	ionic
C	basic	covalent
D	basic	ionic

20 Compound X is tested and the results are shown in the table.

test	result
aqueous sodium hydroxide is added, then heated gently	gas given off which turns damp red litmus paper blue
dilute hydrochloric acid is added	effervescence, gas given off which turns limewater milky

Which ions are present in compound X?

- A ammonium ions and carbonate ions
 - B ammonium ions and chloride ions
 - C calcium ions and carbonate ions
 - D calcium ions and chloride ions
- 21 Calcium, on the left of Period 4 of the Periodic Table, is more metallic than bromine on the right of this period.

Why is this?

Calcium has

- A fewer electrons.
 - B fewer protons.
 - C fewer full shells of electrons.
 - D fewer outer shell electrons.
- 22 The diagrams show the labels of four bottles.

Which label is **not** correct?

A	B	C	D
Bromine Br ₂ Harmful liquid. Do not spill.	Iodine I ₂ Danger Avoid breathing vapor from the solid.	Potassium K Danger Store under water.	Sodium Na Danger Store under oil.

26 M is a shiny silver metal. It has a melting point of 1455 °C. Many of its compounds are

What is metal M?

- A aluminum
- B copper
- C mercury
- D nickel

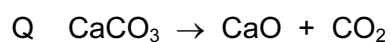
27 Reactions of three metals and their oxides are listed in the table.

metal	reacts with cold water	metal oxide reacts with carbon
W	no	no
X	no	yes
Y	yes	no

What is the order of reactivity of the metals?

	least reactive	→	most reactive
A	W	X	Y
B	X	W	Y
C	X	Y	W
D	Y	W	X

28 Equations P and Q represent two reactions which occur inside a blast furnace.



Which type of reactions are P and Q?

	P	Q
A	redox	redox
B	redox	thermal decomposition
C	thermal decomposition	redox
D	thermal decomposition	thermal decomposition

29 Which row describes the uses of mild steel and stainless steel?

	mild steel	stainless steel
A	car bodies, cutlery	chemical plant, machinery
B	car bodies, machinery	chemical plant, cutlery
C	chemical plant, cutlery	car bodies, machinery
D	chemical plant, machinery	car bodies, cutlery

30 In which process is carbon dioxide **not** formed?

- A** burning of natural gas
- B** fermentation
- C** heating lime
- D** respiration

31 Farmers add calcium oxide (lime) and ammonium salts to their fields.

The compounds are not added at the same time because they react with each other.

Which gas is produced in this reaction?

- A** ammonia
- B** carbon dioxide
- C** hydrogen
- D** nitrogen

32 The diagrams show four uses of iron.

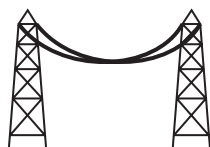
In which of these uses is the iron most likely to rust?

A



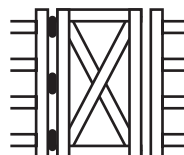
iron bucket
electroplated
with zinc

B



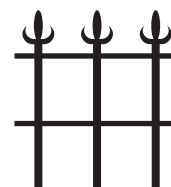
iron cored
aluminium
electricity cables

C



iron hinges
on a gate

D



painted
iron fence

33 Which air pollutant is **not** made when coal burns in a power station?

- A carbon monoxide
- B lead compounds
- C nitrogen oxides
- D sulfur dioxide

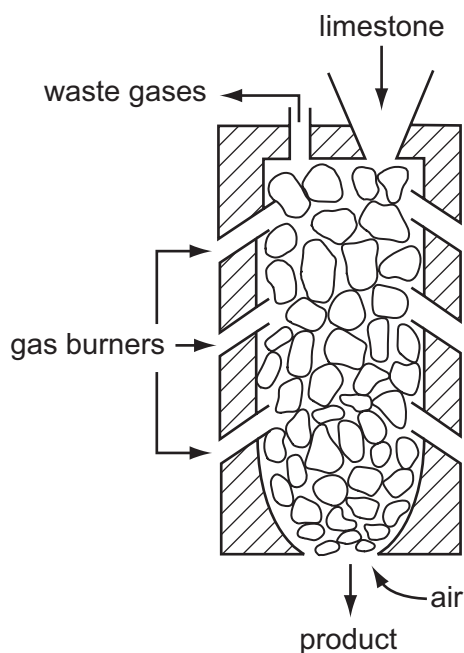
34 In many countries river water is used for the washing of clothes.

The same water is not considered to be safe for drinking.

Why is it **not** safe for drinking?

- A because river water contains dissolved salts
- B because river water may contain harmful bacteria
- C because river water may contain small particles of sand
- D because river water may contain soap from washing clothes

35 The diagram shows a kiln used to heat limestone.



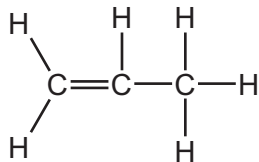
What is the product and what waste gas is formed?

	product	waste gas
A	lime, CaO	carbon monoxide
B	lime, CaO	carbon dioxide
C	slaked lime, Ca(OH) ₂	carbon monoxide
D	slaked lime, Ca(OH) ₂	carbon dioxide

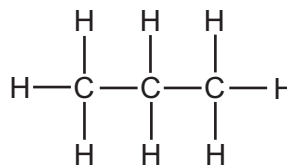
36 Three types of organic compound are alkanes, alkenes and alcohols.

Which structure does **not** belong to any of these three types of compound?

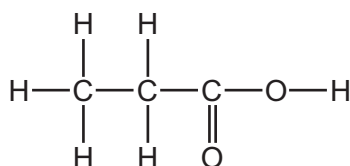
A



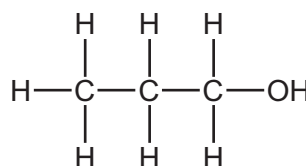
B



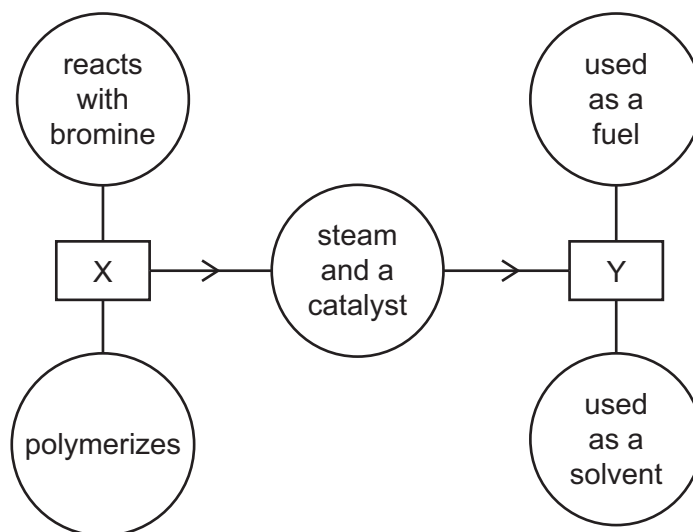
C



D



37 The diagram shows some properties of two organic compounds X and Y.



What are X and Y?

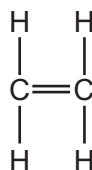
	X	Y
A	ethane	ethanoic acid
B	ethane	ethanol
C	ethene	ethanoic acid
D	ethene	ethanol

38 Petroleum is a mixture of hydrocarbons which can be separated into fractions using fractional distillation.

Which fraction is used as fuel in jet engines?

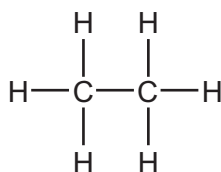
- A bitumen
- B gasoline
- C kerosene
- D naphtha

39 The diagram represents ethene.

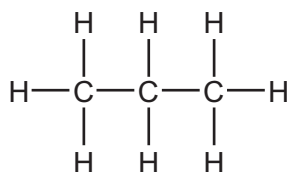


Which compound has chemical properties similar to those of ethene?

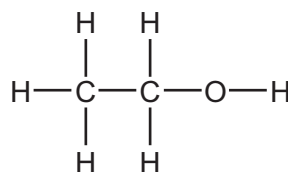
A



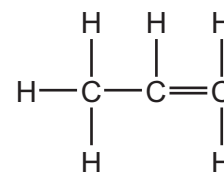
B



C



D



DATA SHEET
The Periodic Table of the Elements

		Group																					
		I	II	III	IV	V	VI	VII	VIII	IX	X												
		1 H Hydrogen 1																					
7	9	Li Lithium 3	Be Beryllium 4																				
23	24	Na Sodium 11	Mg Magnesium 12																				
39	40	K Potassium 19	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	88	Rb Rubidium 37	Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Ru Ruthenium 44	101 Rh Rhodium 45	103 Pd Palladium 46	106 Ag Silver 47	108 Cd Cadmium 48	112 In Indium 49	115 Sn Tin 50	119 Sb Antimony 51	122 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54					
133	137	Cs Caesium 55	Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	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	210 Rn Radon 86					
87	226	Fr Francium 87	Ra Radium 88	227 Ac Actinium 89																			
												*58-71 Lanthanoid series											
												†90-103 Actinoid series											
		<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px;">a</td> <td style="padding: 2px;">X</td> </tr> <tr> <td style="padding: 2px;">b</td> <td style="padding: 2px;"></td> </tr> </table>		a	X	b												<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px;">a = relative atomic mass</td> <td style="padding: 2px;">X = atomic symbol</td> </tr> <tr> <td style="padding: 2px;">b = proton (atomic) number</td> <td style="padding: 2px;"></td> </tr> </table>		a = relative atomic mass	X = atomic symbol	b = proton (atomic) number	
a	X																						
b																							
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140	141	144	150	152	157	159	162	165	167	169	173	175	175	175	175	175	175	175	175	175	175		
Ce Cerium 58	Pr Praseodymium 59	Nd Neodymium 60	Sm Samarium 62	Pm Promethium 61	Gd Gadolinium 64	Tb Terbium 65	Dy Dysprosium 66	Ho Holmium 67	Er Erbium 68	Tm Thulium 69	Yb Ytterbium 70	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71		
232	232	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238		
Th Thorium 90	Pa Protactinium 91	U Uranium 92	Pu Plutonium 94	Np Neptunium 93	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103	Lr Lawrencium 103	Lr Lawrencium 103	Lr Lawrencium 103	Lr Lawrencium 103	Lr Lawrencium 103	Lr Lawrencium 103	Lr Lawrencium 103	Lr Lawrencium 103		

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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