UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice **October/November 2010**

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, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

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 16.
You may use a calculator.

This document consists of **16** printed pages.

1 In which changes do the particles move further apart?

$$\text{gas} \underset{\text{Y}}{\overset{\text{W}}{\rightleftharpoons}} \text{liquid} \underset{\text{Z}}{\overset{\text{X}}{\rightleftharpoons}} \text{solid}$$

A W and X **B** W and Z **C** X and Y **D** Y and Z

2 The table shows the structure of different atoms and ions.

particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
Mg	12	24	12	W	12
Mg^{2+}	X	24	12	12	10
F	9	19	9	Y	9
F^-	9	19	9	10	Z

What are the values of W, X, Y and Z?

	W	X	Y	Z
A	10	10	9	9
B	10	12	10	9
C	12	10	9	10
D	12	12	10	10

3 Element X has a nucleon (mass) number of 19 and a proton (atomic) number of 9.

To which group in the Periodic Table does it belong?

A I **B** III **C** VII **D** 0

4 A mixture of ethanol and methanol are separated by fractional distillation.

This method of separation depends on a difference in property X of these two alcohols.

What is property X?

A boiling point

B colour

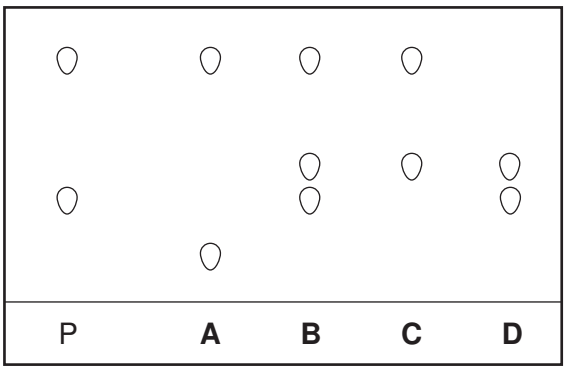
C melting point

D solubility

5 Chromatography is used to find out if a banned dye, P, is present in foodstuffs.

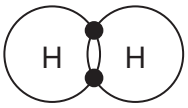
The results are shown in the diagram.

Which foodstuff contains P?



6 Which diagram does **not** show the outer shell electrons in the molecule correctly?

A



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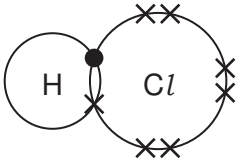

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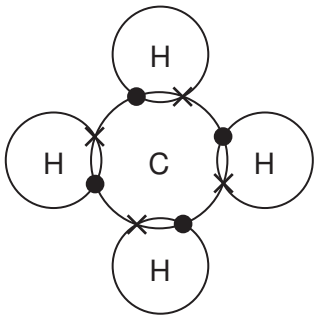
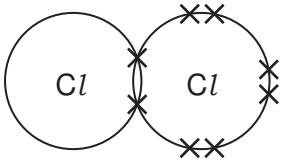
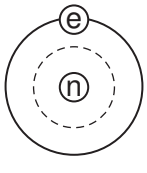
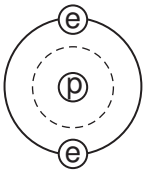
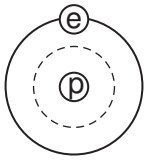
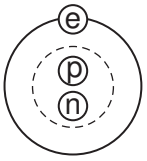
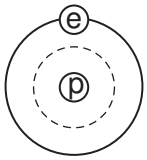
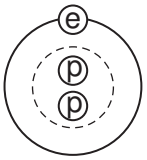
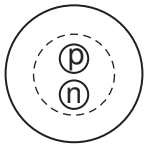
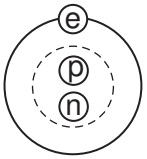


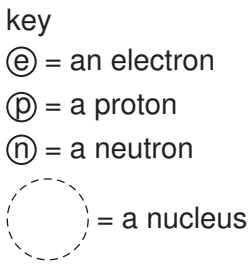
D



7 Two isotopes of hydrogen are $^{1}_{1}H$ and $^{2}_{1}H$.

Which diagram shows the arrangement of particles in the two isotopes?

	$^{1}_{1}H$	$^{2}_{1}H$
A		
B		
C		
D		



8 The chemical compositions of two substances, W and X, are given.

W $Na(AlSi_3)O_8$

X $Ca(Al_2Si_2)O_8$

Which statements are correct?

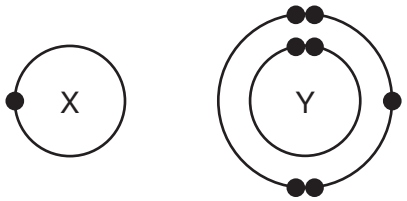
1 W and X contain the same amount of oxygen.

2 W contains three times as much silicon as X.

3 X contains twice as much aluminium as W.

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

9 The electronic structures of atoms X and Y are shown.



X and Y form a covalent compound.

What is its formula?

A XY_5 **B** XY_3 **C** XY **D** X_3Y

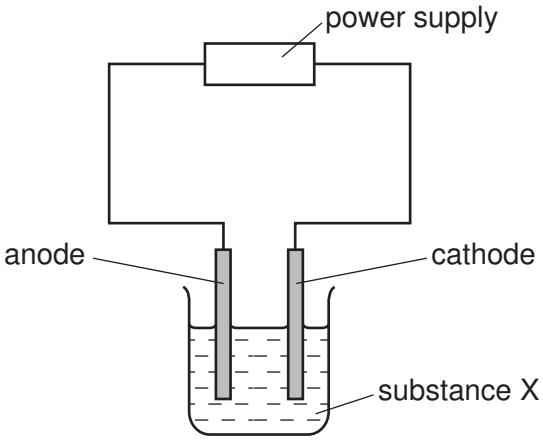
10 Element X is shiny and can be formed into a sheet by hammering.

Which row correctly describes the properties of element X?

	conducts electricity	melts below 25 °C
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

11 Substance X was electrolysed in an electrolytic cell.

A coloured gas was formed at the anode and a metal was formed at the cathode.



What is substance X?

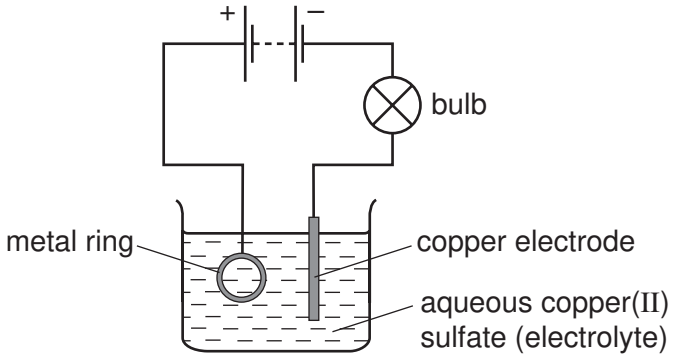
A aqueous sodium chloride

B molten lead bromide

C molten zinc oxide

D solid sodium chloride

12 The diagram shows apparatus used in an attempt to electroplate a metal ring with copper.



The experiment did not work.

What change is needed in the experiment to make it work?

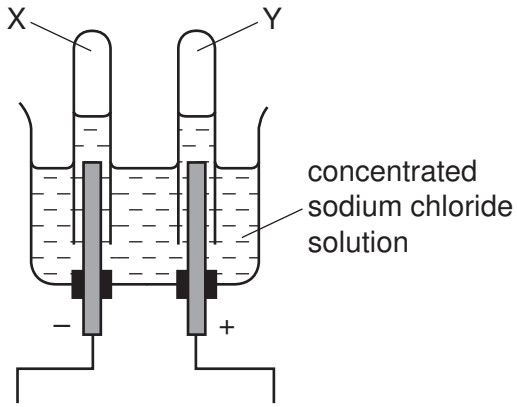
A Add solid copper(II) sulfate to the electrolyte.

B Increase the temperature of the electrolyte.

C Replace the copper electrode by a carbon electrode.

D Reverse the connections to the battery.

13 When concentrated sodium chloride solution is electrolysed, elements X and Y are formed.



What are X and Y?

	X	Y
A	chlorine	hydrogen
B	hydrogen	chlorine
C	hydrogen	oxygen
D	oxygen	hydrogen

14 Calcium carbonate was reacted with hydrochloric acid in a conical flask. The flask was placed on a balance and the mass of the flask and contents was recorded as the reaction proceeded.

During the reaction, carbon dioxide gas was given off.

The reaction was carried out at two different temperatures.

Which row is correct?

	change in mass	temperature at which mass changed more quickly
A	decrease	higher temperature
B	decrease	lower temperature
C	increase	higher temperature
D	increase	lower temperature

15 Which is an endothermic process?

A burning hydrogen

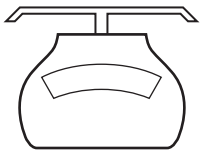
B distilling petroleum

C reacting potassium with water

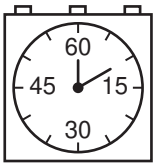
D using petrol in a motor car engine

16 The diagrams show some pieces of laboratory equipment.

1
balance



2
stop-clock



3
thermometer

Which equipment is needed to find out whether dissolving salt in water is an endothermic process?

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

17 Which reaction will result in a decrease in pH?

A adding calcium hydroxide to acid soil

B adding citric acid to sodium hydrogen carbonate solution

C adding sodium chloride to silver nitrate solution

D adding sodium hydroxide to hydrochloric acid

18 When pink crystals of cobalt(II) chloride are heated, steam is given off and the colour of the solid changes to blue.

$$CoCl_2.6H_2O \rightleftharpoons CoCl_2 + 6H_2O$$

What happens when water is added to the blue solid?

	colour	temperature
A	changes to pink	decreases
B	changes to pink	increases
C	remains blue	decreases
D	remains blue	increases

19 The red colour in some pottery glazes may be formed as a result of the reactions shown.

$$CuCO_3 \xrightarrow{\text{heat}} CuO + CO_2$$

$$CuO + SnO \longrightarrow Cu + SnO_2$$

These equations show that ……1…… is oxidised and ……2…… is reduced.

Which substances correctly complete gaps 1 and 2 in the above sentence?

	1	2
A	CO_2	SnO_2
B	$CuCO_3$	CuO
C	CuO	SnO
D	SnO	CuO

20 Some barium iodide is dissolved in water.

Aqueous lead(II) nitrate is added to the solution until no more precipitate forms.

This precipitate, X, is filtered off.

Dilute sulfuric acid is added to the filtrate and another precipitate, Y, forms.

What are the colours of precipitates X and Y?

	X	Y
A	white	white
B	white	yellow
C	yellow	white
D	yellow	yellow

21 The table shows some reactions of the halogens.

Which reaction is the most likely to be explosive?

reaction	chlorine gas	bromine gas	iodine gas
reaction with hydrogen	**A**	**B**	**C**
reaction with iron	very vigorous	less vigorous	**D**

22 Which compound is likely to be coloured?

A $KMnO_4$ **B** KNO_3 **C** K_2CO_3 **D** K_2SO_4

23 A salt is made by adding an excess of an insoluble metal oxide to an acid.

How can the excess metal oxide be removed?

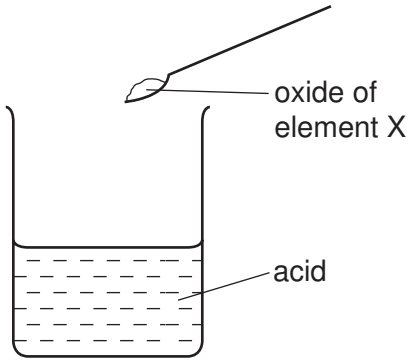
A chromatography

B crystallisation

C distillation

D filtration

24 The oxide of element X was added to an acid. It reacted to form a salt and water.

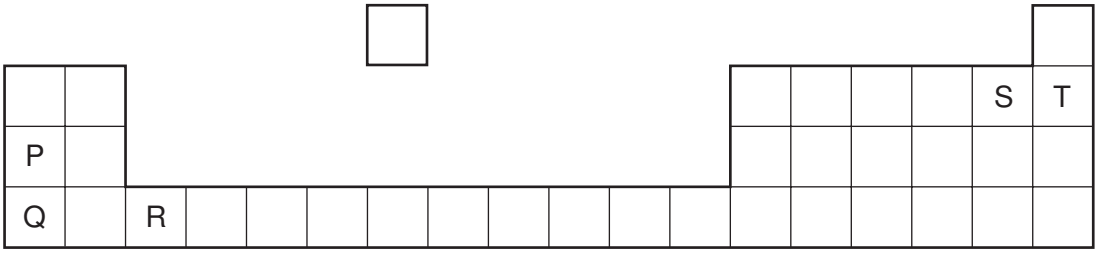


What is the pH of the acid before the reaction and what type of element is X?

	pH	type of element X
A	greater than 7	metal
B	greater than 7	non-metal
C	less than 7	metal
D	less than 7	non-metal

25 The diagram shows the positions of elements P, Q, R, S and T in the Periodic Table.

These letters are not the chemical symbols for the elements.



Which statement about the properties of these elements is correct?

A P reacts more vigorously with water than does Q.

B P, Q and R are all metals.

C T exists as diatomic molecules.

D T is more reactive than S.

26 The table compares the properties of Group I elements with those of transition elements.

Which entry in the table is correct?

	property	Group I elements	transition elements
A	catalytic activity	low	high
B	density	high	low
C	electrical conductivity	low	high
D	melting point	high	low

27 Which pollutant, found in car exhaust fumes, does **not** come from the fuel?

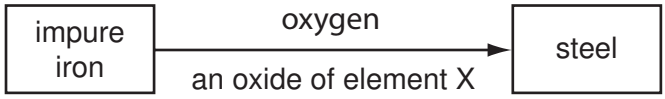
A carbon monoxide

B hydrocarbons

C lead compounds

D nitrogen oxides

28 The diagram shows the materials used in the production of steel from impure iron.



What could element X be?

A calcium

B carbon

C nitrogen

D sulfur

29 Which property do **all** metals have?

A Their boiling points are low.

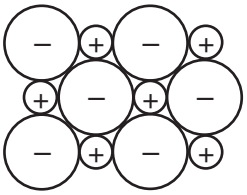
B Their densities are low.

C They conduct electricity.

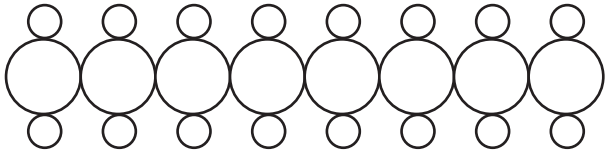
D They react with water.

30 Which diagram could represent the structure of an alloy?

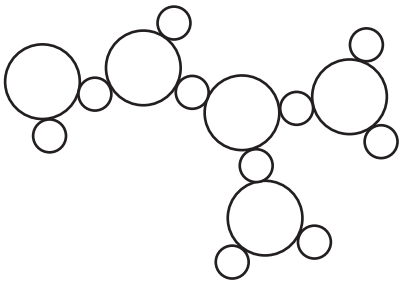
A



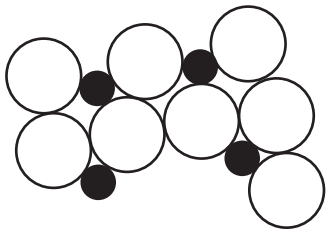
B



C



D



31 Some metals react readily with dilute hydrochloric acid.

Some metals can be extracted by heating their oxides with carbon.

For which metal are **both** statements correct?

A calcium

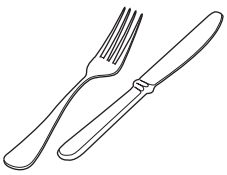
B copper

C iron

D magnesium

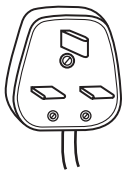
32 Which diagram shows a common use of stainless steel?

A



B

C



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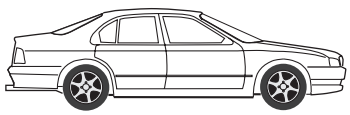


33 Why is chlorination used in water treatment?

A to kill bacteria in the water

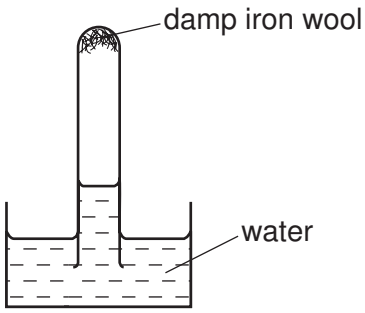
B to make the water neutral

C to make the water taste better

D to remove any salt in the water

34 A test-tube containing damp iron wool is inverted in water.

After three days, the water level inside the test-tube has risen.



Which statement explains this rise?

A Iron oxide has been formed.

B Iron wool has been reduced.

C Oxygen has been formed.

D The temperature of the water has risen.

35 A bag of fertiliser 'Watch it grow' contains ammonium sulfate and potassium sulfate.

Which of the three elements N, P and K does 'Watch it grow' contain?

	N	P	K
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

36 Which information about carbon dioxide and methane is correct?

		carbon dioxide	methane
A	formed when vegetation decomposes	✓	✗
B	greenhouse gas	✓	✓
C	present in unpolluted air	✗	✗
D	produced during respiration	✗	✓

37 Ethene reacts with Y to produce ethanol.

$$\text{ethene} + Y \rightarrow \text{ethanol}$$

What is Y?

A hydrogen

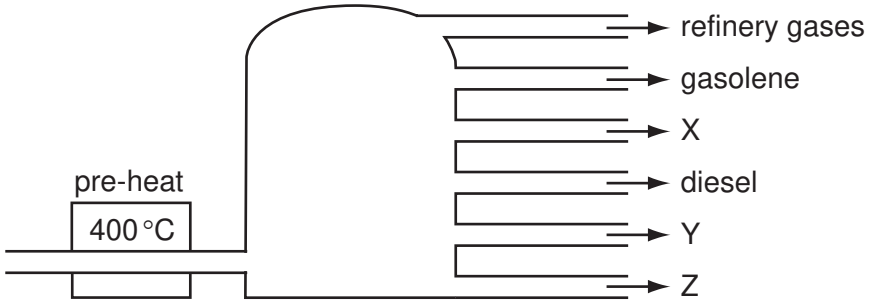
B oxygen

C steam

D yeast

38 In an oil refinery, crude oil is separated into useful fractions.

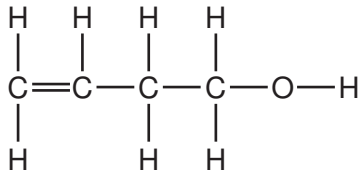
The diagram shows some of these fractions.



What are fractions X, Y and Z?

	X	Y	Z
A	fuel oil	bitumen	paraffin (kerosene)
B	fuel oil	paraffin (kerosene)	bitumen
C	paraffin (kerosene)	bitumen	fuel oil
D	paraffin (kerosene)	fuel oil	bitumen

39 The diagram shows the structure of a compound.

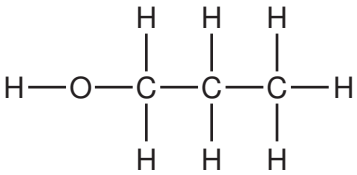


To which classes of compound does this molecule belong?

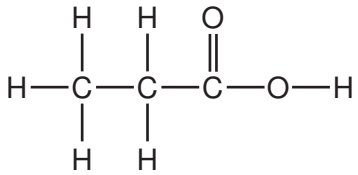
	alkane	alkene	alcohol
A	no	no	no
B	no	yes	yes
C	yes	no	yes
D	yes	yes	yes

40 Which structures show compounds that are members of the same homologous series?

1



2



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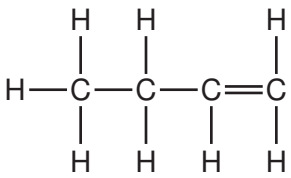

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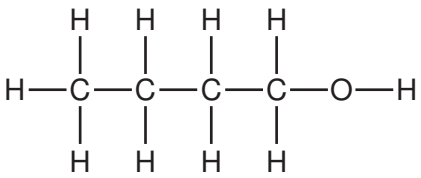

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

DATA SHEET
The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	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	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	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	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	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	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

*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a = relative atomic mass; **X** = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).