



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY

5070/01

Paper 1 Multiple Choice

May/June 2009

1 hour

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.

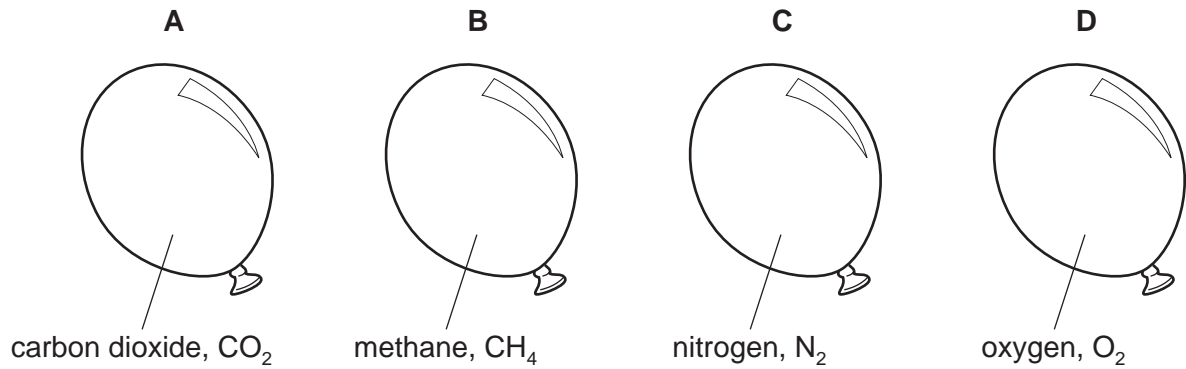
This document consists of **15** printed pages and **1** blank page.



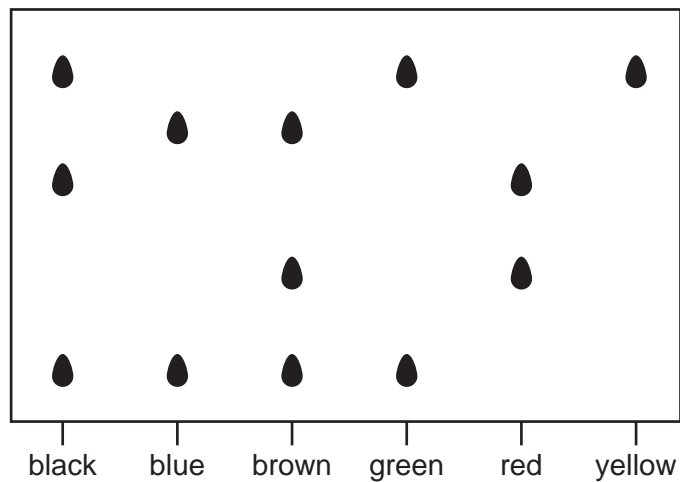
- 1 An inflated balloon goes down because gas molecules can diffuse through the rubber.

Four balloons are filled with different gases at the same temperature and pressure.

Which balloon would go down quickest?



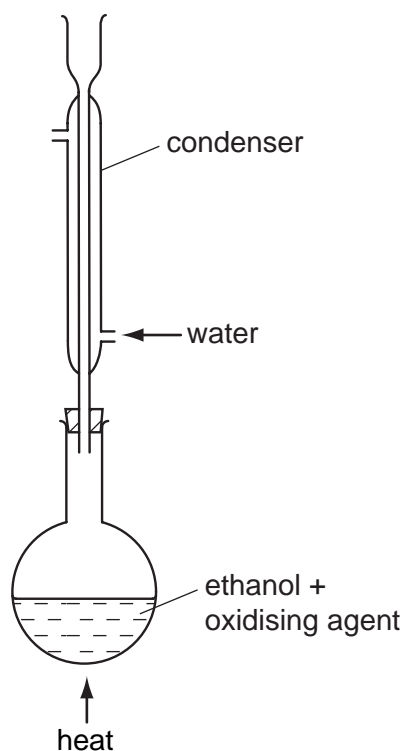
- 2 The diagram shows a chromatogram of several inks.



Which statement is correct?

- A** Black ink can be made by mixing green, red and yellow inks.
B Brown ink can be made by mixing blue and red inks.
C Yellow ink can be used to make brown ink.
D Yellow ink may be present in green ink.

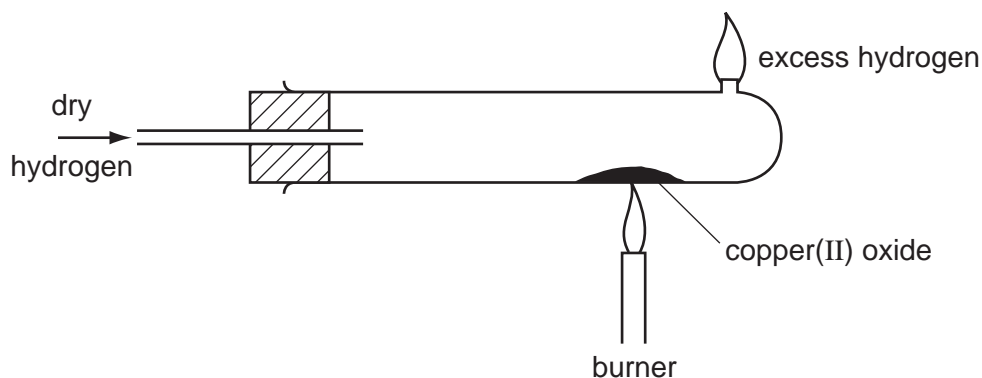
3 The oxidation of ethanol to ethanoic acid is often carried out in the apparatus shown.



What is the purpose of the condenser?

- A** to prevent air reacting with the ethanoic acid
- B** to prevent any ethanol from escaping
- C** to prevent the ethanoic acid changing back to ethanol
- D** to prevent the ethanoic acid reacting with the ethanol

- 4 The diagram shows copper(II) oxide being reduced, by hydrogen, to copper. After reduction is complete, the burner is turned off but the flow of hydrogen is continued until the tube is cool.



Why is the hydrogen allowed to flow through the tube during cooling?

- A to allow the tube to cool slowly
 - B to lessen the risk of explosion in the hot tube
 - C to prevent the copper from reacting with the air
 - D to remove any traces of water left in the tube
- 5 A coin is analysed by dissolving it in nitric acid. To the resulting solution an excess of aqueous ammonia is added and the mixture is filtered.

A brown precipitate remains in the filter paper and a deep blue solution is obtained as the filtrate.

Which metals does the coin contain?

- A aluminium and copper
 - B copper and iron
 - C iron and lead
 - D lead and zinc
- 6 An element X forms a positive ion with the electronic structure 2,8,8.

What is the proton (atomic) number of X?

- A 16
- B 17
- C 18
- D 19

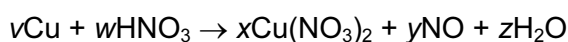
- 7 Which two substances are elements with a giant molecular structure?

- A diamond and graphite
- B diamond and sand
- C methane and iodine
- D methane and sand

- 8 Which compound has both ionic and covalent bonds?
- A ammonium chloride
 B carbon dioxide
 C ethyl ethanoate
 D sodium chloride
- 9 Which statement about the numbers of particles in atoms is correct?

Apart from hydrogen, most atoms contain

- A more neutrons than protons.
 B more protons than neutrons.
 C more electrons than protons.
 D more protons than electrons.
- 10 Which gas contains the same number of molecules as 9 g of water?
- A 2 g of hydrogen
 B 14 g of nitrogen
 C 32 g of oxygen
 D 44 g of carbon dioxide
- 11 The equation for the reaction between copper and nitric acid is shown.



v , w , x , y and z are whole numbers.

Which values of v , w , x , y and z balance the equation?

	v	w	x	y	z
A	1	2	1	1	1
B	1	4	1	2	2
C	3	4	3	2	2
D	3	8	3	2	4

- 12 The mass of one mole of a chloride formed by a metal Y is 74.5 g.

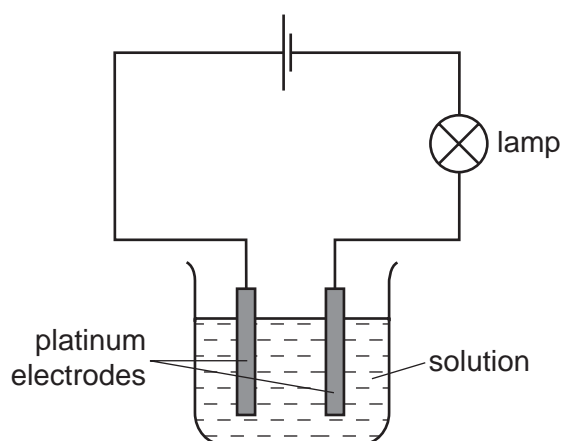
What is the formula of the chloride?

- A Y_3Cl B Y_2Cl C YCl D YCl_2

- 13 Which reactions take place during the electrolysis of aqueous copper(II) sulfate with copper electrodes?

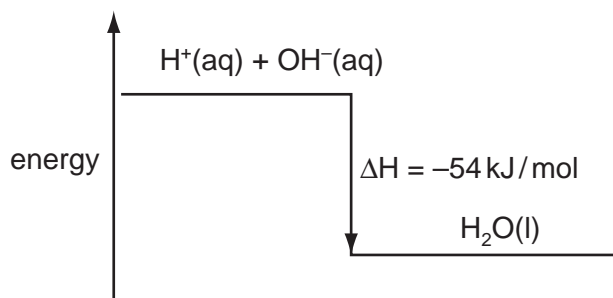
	reaction at positive electrode	reaction at negative electrode
A	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$	$\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$
B	$4\text{OH}^{-} \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^{-}$	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$
C	$\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$	$2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_2$
D	$\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$

- 14 The diagram shows apparatus used to investigate the conductivity of different solutions.



Which substance, in aqueous solution of concentration 1 mol/dm^3 , would cause the lamp to give the brightest light?

- A** ammonia
B ethanoic acid
C ethanol
D sulfuric acid
- 15 The energy diagram for the reaction between sodium hydroxide and hydrochloric acid is shown.



Which quantity of heat is liberated when 100 cm^3 of 1 mol/dm^3 hydrochloric acid reacts with 100 cm^3 of 1 mol/dm^3 sodium hydroxide?

- A** 0.54 kJ **B** 2.70 kJ **C** 5.40 kJ **D** 10.8 kJ

16 The equation shows a reversible reaction.



The forward reaction is endothermic.

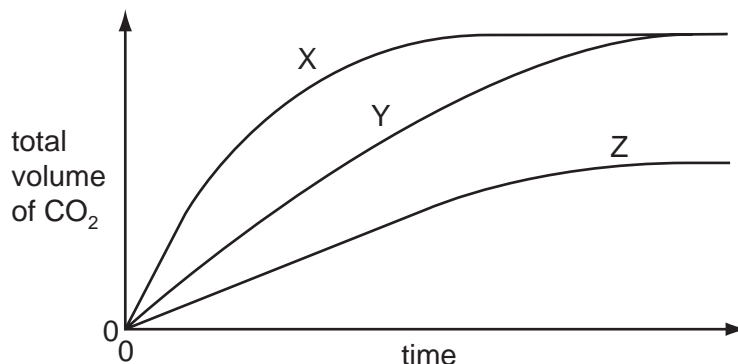
Which of these changes will increase the yield of NO_2 ?

	pressure	temperature
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

17 In experiment 1, an excess of finely powdered marble is added to 20 cm^3 of dilute hydrochloric acid.

In experiment 2, carried out under the same conditions of temperature and pressure, an excess of marble chips is added to 20 cm^3 of dilute hydrochloric acid of the same concentration.

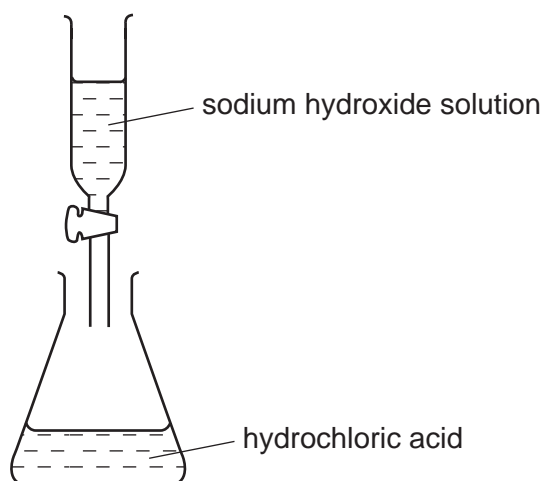
The total volumes of carbon dioxide given off are determined at intervals and plotted against time.



Which pair of curves is obtained in the two experiments?

	experiment 1	experiment 2
A	X	Z
B	X	Y
C	Y	Z
D	Y	X

- 18 What is **not** an example of oxidation?
- A converting iron(III) salts into iron(II) salts
 - B converting magnesium atoms into magnesium ions
 - C dissolving of a copper anode during electrolysis
 - D liberating chlorine from a chloride
- 19 Which metal has a soluble carbonate, chloride and sulfate?
- A barium
 - B calcium
 - C copper
 - D potassium
- 20 Sodium hydroxide solution was added to dilute hydrochloric acid. The pH of the solution in the flask was measured at intervals until no further change of pH took place.



What would be the pH change in this reaction?

- A decrease to 1
 - B decrease to 7
 - C increase to 7
 - D increase to 12
- 21 Why is nickel used in the addition of hydrogen to alkenes?
- A It increases the yield of products.
 - B It lowers the activation energy of the reaction.
 - C It makes the reaction more exothermic.
 - D It prevents a reverse reaction from occurring.

- 25 In the electrolysis of aluminium oxide to extract pure aluminium a compound called cryolite is first added to the oxide.

What is the reason for adding the cryolite?

- A to reduce the corrosion of the carbon electrodes by oxygen
- B to reduce energy costs
- C to enable the aluminium ions and oxygen ions to move to the electrodes
- D to prevent the aluminium formed from being oxidised back to aluminium oxide

- 26 Iron is extracted from its ore haematite, Fe_2O_3 , by a reduction process in the blast furnace.

Which equation for reactions in the blast furnace shows the formation of the reducing agent?

- A $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- B $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$
- C $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$
- D $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$

- 27 The steel bodies of cars can be protected from rusting by spraying them with zinc.

Why is zinc used?

- A Zinc does not react with acidic exhaust fumes.
- B Zinc forms a stable compound with iron.
- C Zinc has a high melting point.
- D Zinc is higher in the reactivity series than iron.

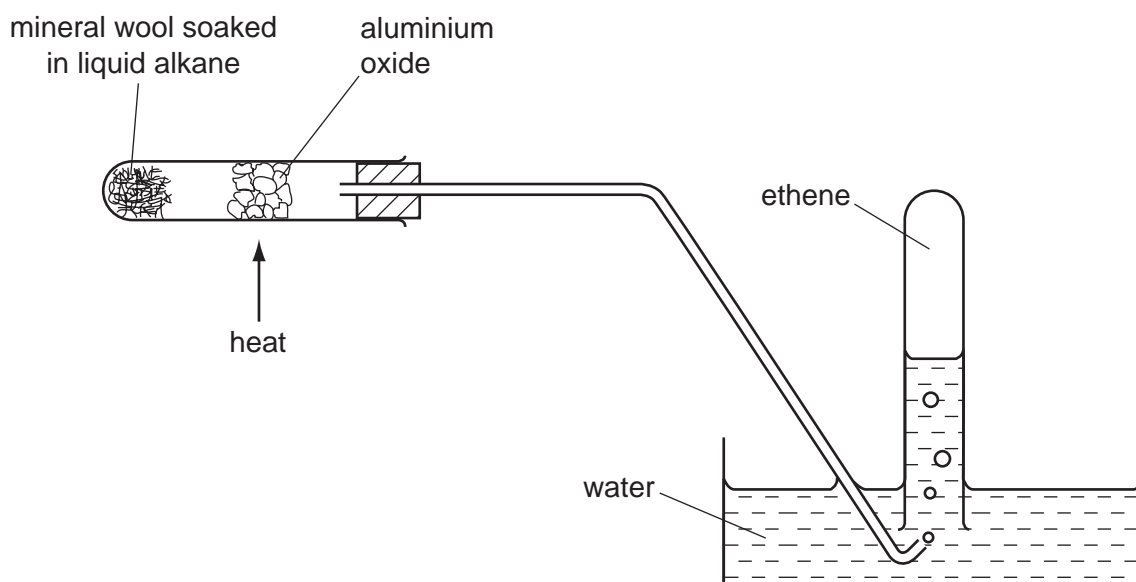
- 28 Solid Y is insoluble in water. It gives off a gas when heated and also when reacted with dilute sulfuric acid.

What is Y?

- A copper(II) carbonate
- B sodium carbonate
- C sodium nitrate
- D zinc oxide

- 29 What is the **ionic** equation for the reaction between zinc and aqueous copper(II) sulfate?
- A $\text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s}) \rightarrow \text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq})$
- B $\text{Zn}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{ZnSO}_4(\text{s})$
- C $\text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}(\text{s})$
- D $\text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s})$
- 30 Which gas reacts with sulfuric acid to form a fertiliser?
- A ammonia, NH_3
- B carbon dioxide, CO_2
- C hydrogen, H_2
- D nitrogen, N_2
- 31 In the Contact process, the sulfur trioxide formed is
- A passed into concentrated sulfuric acid.
- B passed into dilute sulfuric acid.
- C passed into oleum ($\text{H}_2\text{S}_2\text{O}_7$).
- D passed into water.
- 32 Which gas, present in pond water, decreases in concentration during eutrophication?
- A carbon dioxide
- B methane
- C nitrogen
- D oxygen
- 33 Methane is a greenhouse gas.
- Which process releases methane into the air?
- A combustion of petrol
- B decay of vegetable matter
- C photosynthesis
- D volcanic activity

- 34 Carbon dioxide and carbon monoxide are both
- A absorbed by sodium hydroxide.
 - B colourless.
 - C inflammable in air.
 - D lighter than air.
- 35 Which hydrocarbon will burn completely in oxygen to give equal numbers of moles of carbon dioxide and water?
- A C_2H_6
 - B C_3H_6
 - C C_4H_{10}
 - D C_5H_{12}
- 36 The diagram shows the breakdown of an alkane to ethene.



The ethene is then tested with aqueous bromine.

Which information about ethene is correct?

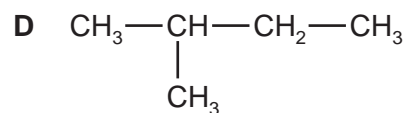
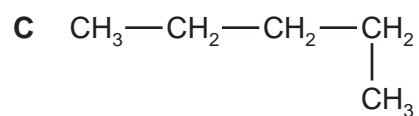
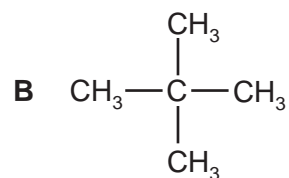
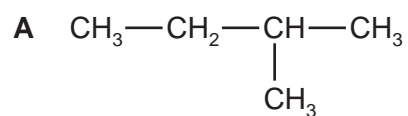
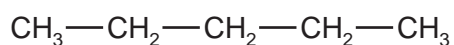
	solubility of ethene gas	action on aqueous bromine
A	insoluble	decolourised
B	insoluble	no reaction
C	soluble	decolourised
D	soluble	no reaction

37 Carbohydrates, proteins, fats and *Terylene* are macromolecules.

Which element is found **in only one** of these macromolecules?

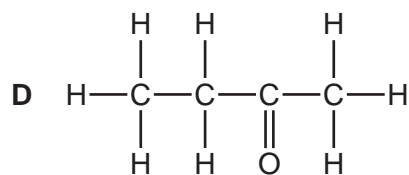
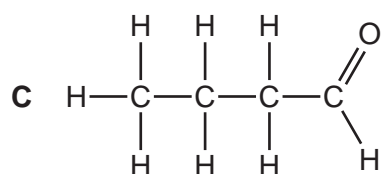
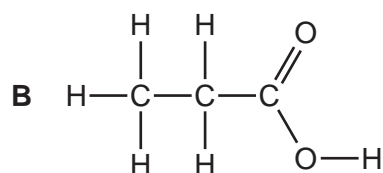
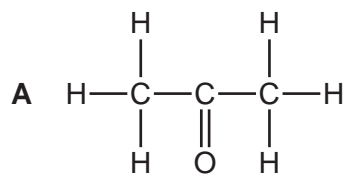
- A carbon
- B hydrogen
- C nitrogen
- D oxygen

38 Which structure is **not** an isomer of the structure shown?

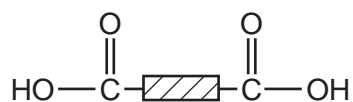


39 Alcohols can be oxidised to form another homologous series of compounds.

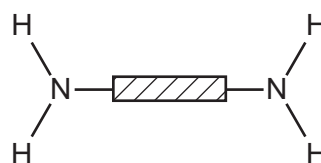
What would be the product of the oxidation of propanol?



40 A polymer X is hydrolysed and the two products are



and



What can be deduced about X?

- A** It is a condensation polymer.
- B** It is made by addition polymerisation.
- C** It is starch.
- D** It is *Terylene*.

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											20 Ne Neon 10																																
23 Na Sodium 11	24 Mg Magnesium 12	5 B Boron 5	11 Al Aluminium 13	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	17 F Fluorine 9	35.5 Cl Chlorine 17	18 Ar Argon 18																																			
39 K Potassium 19	40 Ca Calcium 20	27 Al Aluminium 13	28 Si Silicon 14	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	65 Zn Zinc 30	64 Cu Copper 29	66 Ag Silver 47	106 Pd Palladium 46	108 Cd Cadmium 48	112 In Indium 49	127 I Iodine 53	131 Xe Xenon 54																																			
133 Cs Caesium 55	137 Ba Barium 56	59 Co Cobalt 27	56 Fe Iron 26	101 Ru Ruthenium 44	103 Rh Rhodium 45	190 Os Osmium 76	192 Ir Iridium 77	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 Rn Radon 86																																
226 Ra Radium 88	227 Ac Actinium 89	51 V Vanadium 23	55 Mn Manganese 25	186 Re Rhenium 75	188 W Tungsten 74	190 Os Osmium 76	192 Ir Iridium 77	201 Hg Mercury 80	204 Tl Thallium 81	209 Bi Bismuth 83	210 Po Polonium 84	210 Rn Radon 86																																
<p>*58-71 Lanthanoid series †90-103 Actinoid series</p>																																												
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%;"></td> <td style="width: 5%; text-align: center;">a</td> <td style="width: 5%; text-align: center;">X</td> <td style="width: 5%; text-align: center;">b</td> <td style="width: 5%;"></td> <td style="width: 5%; text-align: center;">140 Ce Cerium 58</td> <td style="width: 5%; text-align: center;">141 Pr Praseodymium 59</td> <td style="width: 5%; text-align: center;">144 Nd Neodymium 60</td> <td style="width: 5%; text-align: center;">150 Sm Samarium 62</td> <td style="width: 5%; text-align: center;">152 Eu Europium 63</td> <td style="width: 5%; text-align: center;">157 Gd Gadolinium 64</td> <td style="width: 5%; text-align: center;">162 Dy Dysprosium 66</td> <td style="width: 5%; text-align: center;">165 Ho Holmium 67</td> <td style="width: 5%; text-align: center;">167 Er Erbium 68</td> <td style="width: 5%; text-align: center;">169 Tm Thulium 69</td> <td style="width: 5%; text-align: center;">173 Yb Ytterbium 70</td> <td style="width: 5%; text-align: center;">175 Lu Lutetium 71</td> <td style="width: 5%;"></td> <td style="width: 5%; text-align: center;">232 Th Thorium 90</td> <td style="width: 5%; text-align: center;">238 U Uranium 92</td> <td style="width: 5%; text-align: center;">238 Pa Protactinium 91</td> <td style="width: 5%; text-align: center;">238 Np Neptunium 93</td> <td style="width: 5%; text-align: center;">238 Pu Plutonium 94</td> <td style="width: 5%; text-align: center;">238 Am Americium 95</td> <td style="width: 5%; text-align: center;">238 Cm Curium 96</td> <td style="width: 5%; text-align: center;">238 Bk Berkelium 97</td> <td style="width: 5%; text-align: center;">238 Cf Californium 98</td> <td style="width: 5%; text-align: center;">238 Es Einsteinium 99</td> <td style="width: 5%; text-align: center;">238 Fm Fermium 100</td> <td style="width: 5%; text-align: center;">238 Md Mendelevium 101</td> <td style="width: 5%; text-align: center;">238 No Nobelium 102</td> <td style="width: 5%; text-align: center;">238 Lr Lawrencium 103</td> </tr> </table>														a	X	b		140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	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	238 U Uranium 92	238 Pa Protactinium 91	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103
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<p>Key</p> <p>a = relative atomic mass X = atomic symbol b = proton (atomic) number</p>																																												

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

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