



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

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CHEMISTRY

5070/01

Paper 1 Multiple Choice

October/November 2008

1 hour

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

* 3 9 3 2 8 5 3 7 0 5 *

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 The table shows the boiling points of the elements found in a sample of liquid air.

element	argon	helium	neon	nitrogen	oxygen
boiling point/°C	-186	-269	-246	-196	-183

Which elements would be gaseous at -190°C ?

- A** argon, helium and nitrogen
B argon, nitrogen and oxygen
C helium, neon and nitrogen
D helium, neon and oxygen
- 2 Which method could be used to obtain charcoal from a mixture of powdered charcoal with sodium chloride?
- A** chromatography
B filtration after shaking with water
C heating the mixture
D distillation
- 3 Naturally occurring bromine has a relative atomic mass of 80 and consists entirely of two isotopes of relative isotopic masses 79 and 81.
- What can be deduced about naturally-occurring bromine from this information only?
- A** Bromine isotopes have different numbers of protons.
B Bromine contains the two isotopes in equal proportions.
C Bromine has different oxidation states.
D Bromine is radioactive.
- 4 Which statement describes the conversion of magnesium atoms to magnesium ions?
- A** The change is reduction, because there has been a gain of electrons.
B The change is oxidation, because there has been a loss of electrons.
C The change is reduction, because there has been a loss of electrons.
D The change is oxidation, because there has been a gain of electrons.

- 5 Which property shows that a liquid is pure?
- A** It turns anhydrous copper(II) sulphate blue.
- B** It is colourless and odourless.
- C** It has no effect on red or blue litmus paper.
- D** It boils at a fixed temperature at a given pressure.

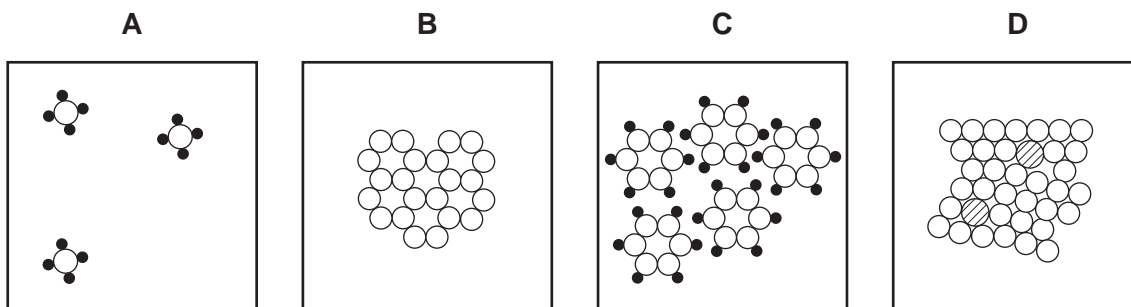
- 6 Solution **X** contains a simple salt.

The table shows the results of some tests on solution **X**.

test	observation
addition of aqueous sodium hydroxide	green precipitate forms
addition of acidified barium nitrate	white precipitate forms

What is the name of the salt in solution **X**?

- A** iron(II) chloride
- B** iron(III) chloride
- C** iron(II) sulphate
- D** iron(III) sulphate
- 7 Which diagram represents the arrangement of particles in a gas?



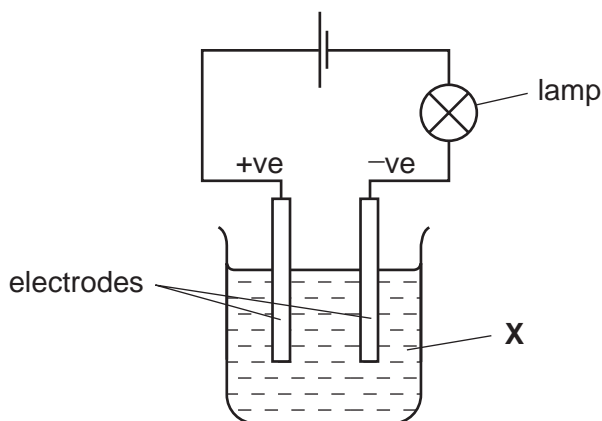
- 8 Which gas diffuses at the same rate as nitrogen gas?
- A** carbon dioxide
- B** carbon monoxide
- C** neon
- D** sulphur dioxide

- 9 Which gas **can** be removed from the exhaust gases of a petrol-powered car by a catalytic converter?
- A carbon monoxide
B carbon dioxide
C nitrogen
D steam
- 10 Which statement about diamond and graphite is correct?
- A Both diamond and graphite are used as abrasives.
B Diamond and graphite have different arrangements of carbon atoms.
C The carbon atoms in graphite have a different number of neutrons from those in diamond.
D The carbon atoms in both graphite and diamond have four covalent bonds.
- 11 A substance **Q** conducts electricity both when solid and molten.
- What is **Q**?
- A an alloy
B a hydrocarbon
C a metal oxide
D a salt
- 12 In one molecule of carbon dioxide, CO_2 , what is the total number of electrons present and how many are involved in bonding between the carbon and oxygen atoms?

	total number of electrons	electrons involved in bonding
A	16	4
B	16	8
C	22	4
D	22	8

- 13 Which statement explains why magnesium oxide has a very high melting point?
- A Magnesium atoms and oxygen atoms are joined by strong covalent bonds.
B The crystal lattice of magnesium oxide resembles that of diamond.
C The magnesium ions are strongly attracted to the oxide ions.
D The reaction between magnesium and oxygen is strongly exothermic.

- 14 When added to 20 cm³ of 0.5 M sulphuric acid, which substance would give a neutral solution?
- A 20 cm³ of 0.5 M sodium hydroxide
 B 10 cm³ of 0.5 M sodium hydroxide
 C 40 cm³ of 1.0 M sodium hydroxide
 D 20 cm³ of 1.0 M sodium hydroxide
- 15 When the experiment shown is set up, the bulb lights, but there are no decomposition products at the electrodes.

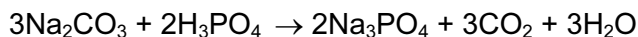


What is **X**?

- A aqueous sodium chloride
 B bromine
 C molten sodium chloride
 D mercury
- 16 What are the products formed at the electrodes during the electrolysis of molten magnesium chloride between carbon electrodes?

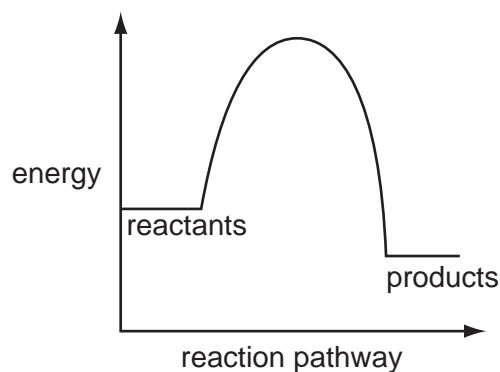
	positive electrode	negative electrode
A	oxygen	magnesium
B	magnesium	chlorine
C	chlorine	magnesium
D	chlorine	hydrogen

- 17 Carbon dioxide can be obtained as shown in the equation.



How many moles of phosphoric acid, H_3PO_4 , are needed to produce 1.5 mol of carbon dioxide?

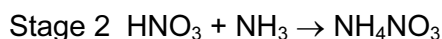
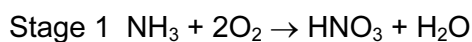
- A** 0.5 **B** 1.0 **C** 1.5 **D** 2.0
- 18 The diagram shows the reaction pathway for a given reaction without the use of a catalyst.



Which information correctly describes the effect of the catalyst on the activation energy and enthalpy change for the reaction?

	activation energy	enthalpy change
A	decrease	decrease
B	increase	no change
C	increase	increase
D	decrease	no change

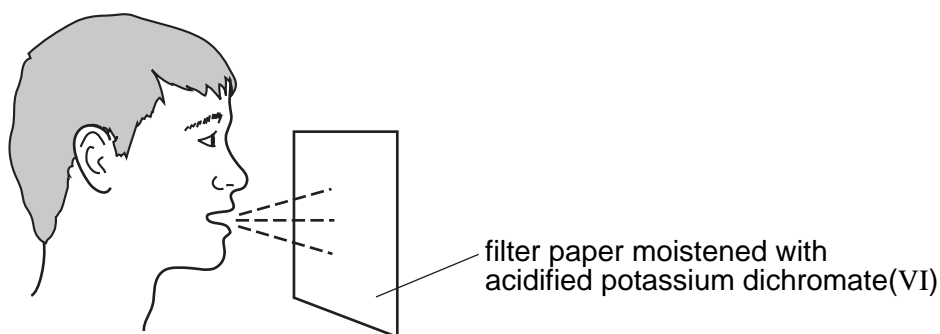
- 19 The fertiliser ammonium nitrate (NH_4NO_3 , $M_r = 80$) is manufactured from ammonia (NH_3 , $M_r = 17$) by a two-stage process.



What is the maximum mass of fertiliser that can be made if only 17 tonnes of ammonia is available?

- A** 34 tonnes **B** 40 tonnes **C** 80 tonnes **D** 97 tonnes

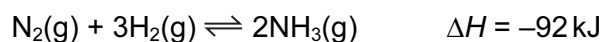
- 20 Acidified potassium dichromate(VI) can be used to detect the presence of ethanol in the breath of a person who has consumed an ethanol-containing drink.



A colour change from orange to green is observed if ethanol is present.

This shows that ethanol is

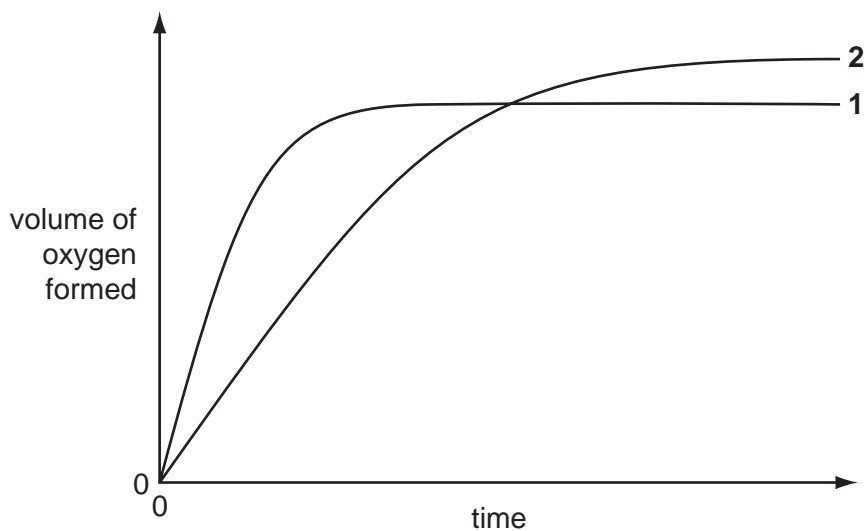
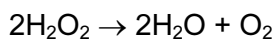
- A an alkali.
 - B an indicator.
 - C an oxidising agent.
 - D a reducing agent.
- 21 In the Haber process, nitrogen and hydrogen react to form ammonia.



Which factor increases **both** the speed of reaction **and** the amount of ammonia produced?

- A addition of a catalyst
- B decreasing the temperature
- C increasing the pressure
- D increasing the temperature

- 22 In the graph, curve 1 was obtained by observing the decomposition of 100 cm³ of hydrogen peroxide solution, catalysed by manganese(IV) oxide.



Which alteration to the original experimental conditions would produce curve 2?

- A lowering the temperature
 - B adding some 0.1 mol/dm³ hydrogen peroxide solution
 - C using less manganese(IV) oxide
 - D using a different catalyst
- 23 In which reaction is sulphur dioxide acting as an oxidising agent?
- A $\text{SO}_2 + 2\text{H}_2\text{O} + \text{Cl}_2 \rightarrow \text{H}_2\text{SO}_4 + 2\text{HCl}$
 - B $\text{SO}_2 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$
 - C $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$
 - D $\text{SO}_2 + 2\text{H}_2\text{S} \rightarrow 2\text{H}_2\text{O} + 3\text{S}$
- 24 Which element will burn in oxygen to form an acidic oxide?
- A calcium
 - B carbon
 - C iron
 - D magnesium

25 Which process does **not** involve either oxidation or reduction?

- A formation of ammonium sulphate from ammonia and sulphuric acid
- B formation of nitrogen monoxide from ammonia
- C formation of sulphuric acid from sulphur
- D formation of zinc from zinc blende (ZnS)

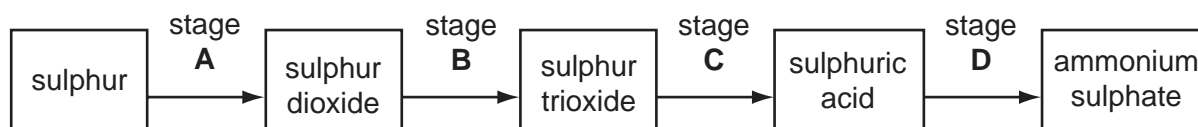
26 Different solids were added to separate portions of warm dilute sulphuric acid.

For which solid is the observation correct?

	solid	observation
A	ammonium sulphate	alkaline gas produced
B	copper	gas evolved ignited with a pop
C	magnesium oxide	solid dissolved with no effervescence
D	zinc carbonate	gas evolved relights glowing splint

27 Ammonium sulphate is an important fertiliser.

During which stage in the manufacture of ammonium sulphate does a neutralisation reaction occur?



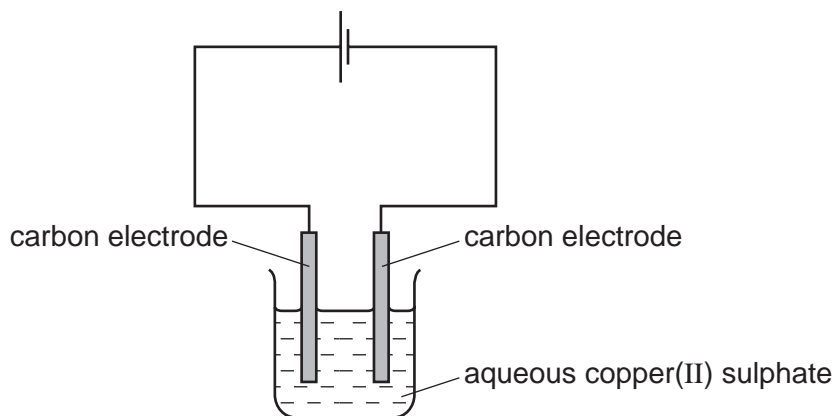
28 One mole of compound **X** gives three moles of ions in aqueous solution. **X** reacts with ammonium carbonate to give an acidic gas.

What is compound **X**?

- A calcium hydroxide
- B ethanoic acid
- C sodium hydroxide
- D sulphuric acid

- 29 Which property would all the hydrogen compounds of the Group VII elements possess?
- A be covalent
 - B be solids at room temperature
 - C form alkaline aqueous solutions
 - D conduct electricity when molten

- 30 Aqueous copper(II) sulphate is electrolysed using inert electrodes as shown.



Which ionic equations show the reactions at the electrodes?

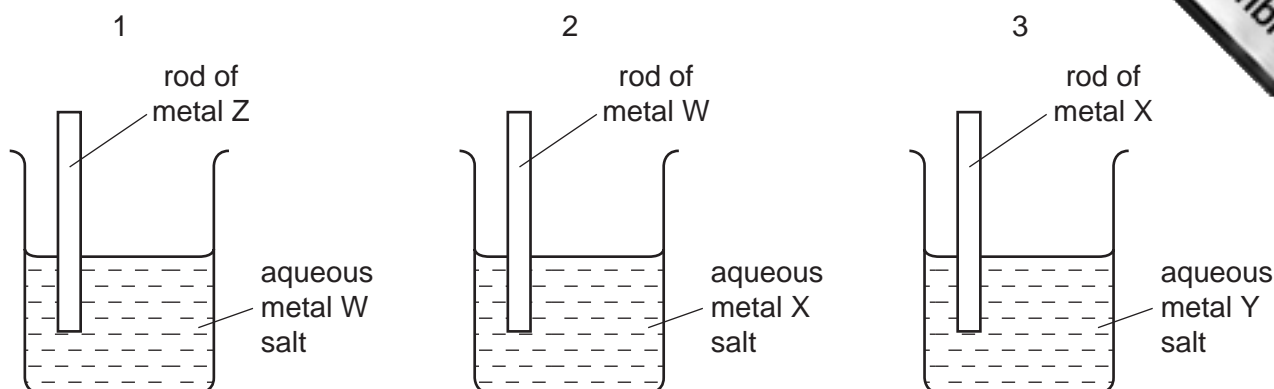
- 1 $\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$
- 2 $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$
- 3 $2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_2$
- 4 $4\text{OH}^{-} \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^{-}$

- A 1 and 2 only B 1 and 4 only C 2 and 3 only D 3 and 4 only
- 31 The element chromium liberates hydrogen from dilute hydrochloric acid although it does not react with cold water. When a piece of chromium is placed in lead(II) nitrate solution, crystals of lead appear.

What is the order of **decreasing** reactivity of the metals lead, calcium and chromium?

- A calcium, chromium, lead
- B calcium, lead, chromium
- C chromium, calcium, lead
- D lead, chromium, calcium

32 Three different beakers are set up as shown.



In beaker 1 metal W is displaced from solution.

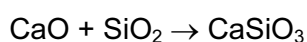
In beaker 2 metal X is displaced from solution.

In beaker 3 metal Y is displaced from solution.

What is the order of **decreasing** reactivity of the four metals?

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

33 What is the function of silica, SiO_2 , in the equation shown below?



- A** a basic oxide
- B** a reducing agent
- C** an acidic oxide
- D** an oxidising agent

34 Alloys are usually harder than the metals from which they are made.

Which difference between the metals explains the greater hardness of alloys?

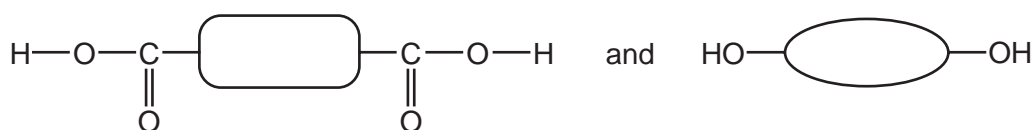
- A** atomic radius
- B** boiling point
- C** density
- D** malleability

35 Information about the gases present in the atmospheres of four planets is given below.

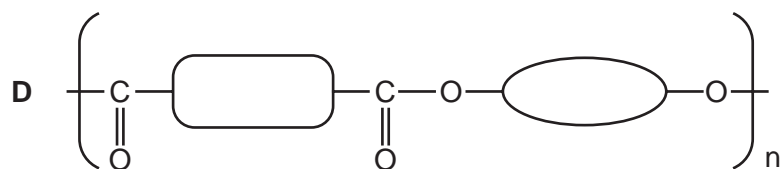
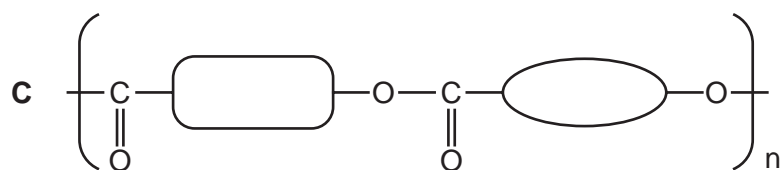
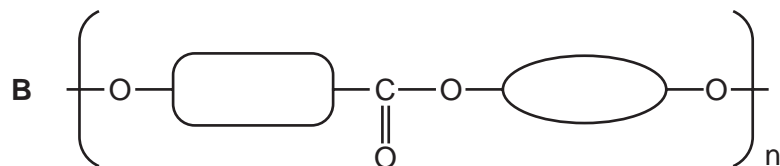
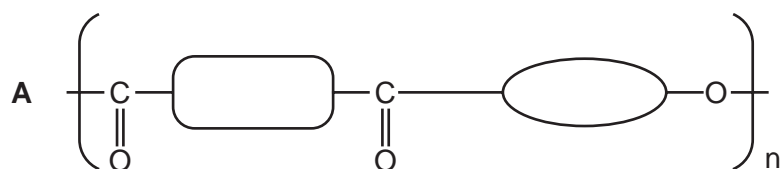
Which planet's atmosphere contains the four elements found in all proteins?

	composition of atmosphere		
A	CH ₄	NH ₃	HCl
B	CH ₄	NH ₃	H ₂ O
C	CH ₄	SO ₂	HCl
D	SO ₂	NH ₃	H ₂ O

36 *Terylene* (a polyester) is made by condensation polymerisation of the two monomers shown.



What is the repeat unit of the polymer?



37 Which molecule does **not** undergo an addition reaction with alkenes?

- A** ammonia, NH₃
- B** bromine, Br₂
- C** hydrogen, H₂
- D** steam, H₂O

38 Which set of information describes the formation of ethanol by the process of fermentation?

	substances fermented	gas evolved during fermentation
A	carbohydrates	carbon dioxide
B	carbohydrates	carbon monoxide
C	hydrocarbons	carbon dioxide
D	hydrocarbons	carbon monoxide

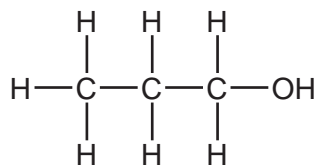
39 The following stages happen during eutrophication.

- 1 increase in growth of algae
- 2 increase in nitrate concentration
- 3 death of aquatic plants
- 4 decrease in dissolved oxygen

In which order do these stages occur?

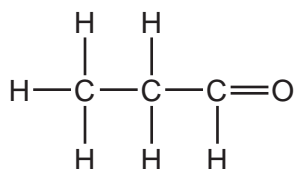
- A** 1 → 2 → 3 → 4
- B** 1 → 2 → 4 → 3
- C** 2 → 1 → 3 → 4
- D** 2 → 1 → 4 → 3

40 This is the structure of propan-1-ol.

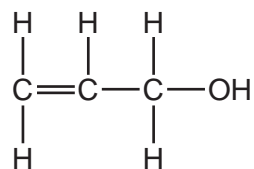


Which of the following is an isomer of propan-1-ol?

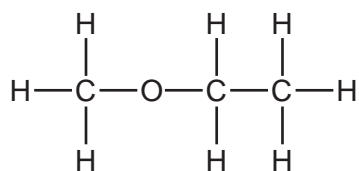
A



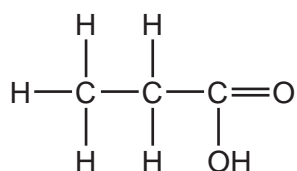
B



C



D



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											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 Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18																									
39 K Potassium 19	40 Ca Calcium 20	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	65 Zn Zinc 30	64 Cu Copper 29	59 Ni Nickel 28	112 Cd Cadmium 48	127 I Iodine 53	131 Xe Xenon 54																									
133 Cs Caesium 55	137 Ba Barium 56	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Hg Mercury 80	210 Po Polonium 84	210 Rn Radon 86																									
226 Ra Radium 88	227 Ac Actinium 89																															
*58-71 Lanthanoid series												169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71																		
†90-103 Actinoid series												167 Er Erbium 68	168 Fm Fermium 100	102 No Nobelium 102																		
<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">b</td> <td style="text-align: center;">†</td> </tr> </table>												a	X	b	†	162 Dy Dysprosium 66	165 Ho Holmium 67	169 Md Mendelevium 101														
a	X																															
b	†																															
<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="text-align: center;">a = relative atomic mass</td> <td style="text-align: center;">X = atomic symbol</td> </tr> <tr> <td style="text-align: center;">b = proton (atomic) number</td> <td style="text-align: center;">† = neutron (atomic) number</td> </tr> </table>												a = relative atomic mass	X = atomic symbol	b = proton (atomic) number	† = neutron (atomic) number	159 Tb Terbium 65	157 Gd Gadolinium 64	152 Eu Europium 63	150 Sm Samarium 62	144 Nd Neodymium 60	141 Pr Praseodymium 59	140 Ce Cerium 58	232 Th Thorium 90	238 U Uranium 92	238 Pa Protactinium 91	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100
a = relative atomic mass	X = atomic symbol																															
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The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).