



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

CANDIDATE  
NAME

CENTRE  
NUMBER

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**CHEMISTRY**

**0620/23**

Paper 2

**October/November 2014**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

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

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

A copy of the Periodic Table is printed on page 16.

You may lose marks if you do not show your working or if you do not use appropriate units.

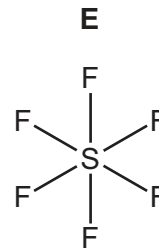
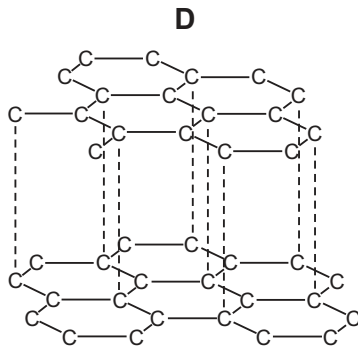
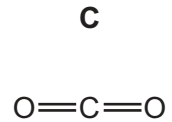
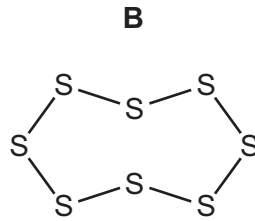
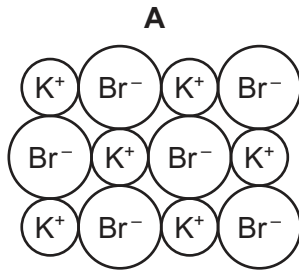
At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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

1 (a) The structures of five substances, **A**, **B**, **C**, **D** and **E**, are shown below.



Answer the following questions about these substances.  
Each substance may be used once, more than once or not at all.

- (i) Which **two** substances are elements? ..... and ..... [2]
- (ii) Which substance has a giant ionic structure? ..... [1]
- (iii) Which substance is a product formed when a hydrocarbon is completely burnt in air?  
..... [1]
- (iv) Which substance, when molten, produces a brown vapour at the anode when electrolysed?  
..... [1]
- (v) Which substance is used as a lubricant? ..... [1]
- (b) Deduce the simplest formula of substance **A**.  
..... [1]
- (c) Calculate the relative molecular mass of substance **E**.  
You must show your working.

[2]

[Total: 9]

2 (a) Use ideas about the movement and arrangement of particles to explain why:

- solids have a definite volume and shape,
- liquids have a definite volume but no definite shape,
- gases have no definite volume or shape.

.....

.....

.....

.....

.....

..... [4]

(b) The table shows some properties of six substances, **A** to **F**, which are either solids or liquids at room temperature.

substance	melting point / °C	electrical conductivity	solubility in water
<b>A</b>	+3550	does not conduct in any state	insoluble
<b>B</b>	+44	does not conduct in any state	insoluble
<b>C</b>	+1660	conducts when solid or liquid	insoluble
<b>D</b>	+681	only conducts when in aqueous solution or liquid	soluble
<b>E</b>	-39	conducts when solid or liquid	insoluble
<b>F</b>	-11	does not conduct in any state	insoluble

(i) Which substance has a giant covalent structure?

..... [1]

(ii) Which **two** substances are liquids at room temperature?

..... [2]

(iii) Which **two** substances are metals?

..... [2]

(iv) Which **two** substances are simple molecules?

..... [2]

(c) Dry air contains mainly nitrogen, noble gases and oxygen.

- (i) Which **one** of the following shows the correct composition of dry air?  
Tick **one** box.

nitrogen 21%, oxygen 78%, noble gases 1%

nitrogen 1%, oxygen 78%, noble gases 21%

nitrogen 69%, oxygen 21%, noble gases 10%

nitrogen 78%, oxygen 21%, noble gases 1%

[1]

- (ii) Metals can be joined together by high temperature welding.  
This process is sometimes carried out in the presence of argon.  
Suggest why welding is carried out in the presence of argon.

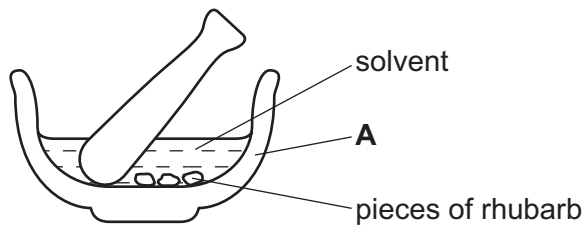
.....

..... [2]

[Total: 14]

3 Rhubarb is a plant which has a red stem.

(a) A student separated the pigments in the rhubarb stem by chromatography. He used the apparatus shown below to extract the pigments.



(i) State the name of the piece of apparatus labelled **A**.

..... [1]

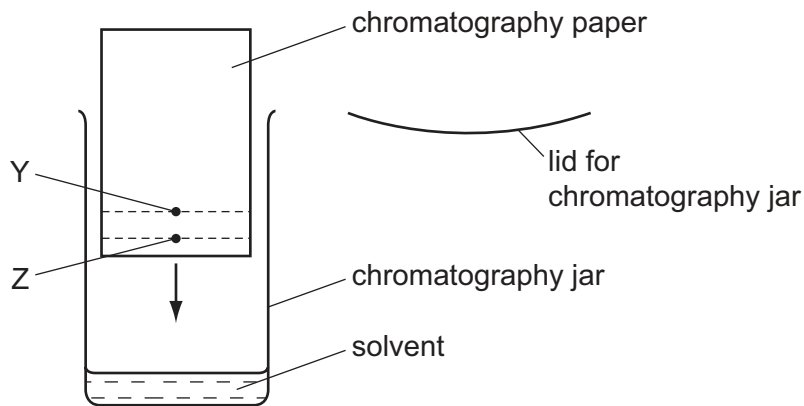
(ii) Suggest a suitable solvent, other than water, that he could use to extract the pigments.

..... [1]

(iii) The solution of pigments was not concentrated enough to use for chromatography. Suggest how the student could make the solution more concentrated.

..... [1]

(b) The student carried out chromatography using the apparatus shown below.



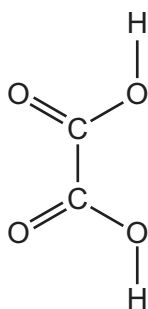
(i) A spot of the pigment mixture was placed at Y. Explain why a spot of the mixture was not placed at Z.

..... [1]

(ii) Describe how the rest of the procedure was carried out.

.....  
 .....  
 ..... [2]

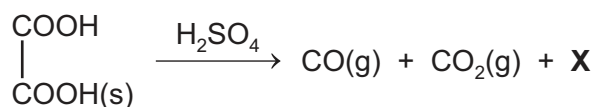
- (c) Rhubarb leaves contain ethanedioic acid.  
The structure of ethanedioic acid is shown below.



- (i) On the structure above, put a ring around a carboxylic acid group. [1]
- (ii) Deduce the molecular formula of ethanedioic acid.

..... [1]

- (d) A teacher heated ethanedioic acid with concentrated sulfuric acid.  
The equation for the reaction is:



- (i) Deduce the formula of compound **X**. [1]
- ..... [1]

- (ii) At the end of the reaction, the contents of the test-tube contained diluted sulfuric acid only.  
Explain why. [1]
- ..... [1]

- (iii) Carbon dioxide is a product of this reaction.  
State **one** common source of the carbon dioxide in the atmosphere. [1]
- ..... [1]

- (iv) Explain why an increase in the concentration of carbon dioxide in the atmosphere is harmful to the environment. [2]
- ..... [2]
- ..... [2]

[Total: 13]

4 A mixture of soil and water was shaken and then filtered.

- (a) Draw a labelled diagram of the apparatus you would use for separating the insoluble particles of soil from the solution.

[2]

- (b) The filtrate was then evaporated.

The table shows the composition and mass of each compound obtained by evaporating the filtrate.

compound	ions present in the compound	mass of compound / g
calcium carbonate	$\text{Ca}^{2+}$ and $\text{CO}_3^{2-}$	4.0
calcium sulfate	$\text{Ca}^{2+}$ and $\text{SO}_4^{2-}$	5.0
magnesium sulfate	$\text{Mg}^{2+}$ and $\text{SO}_4^{2-}$	2.8
	$\text{K}^+$ and $\text{NO}_3^-$	1.2
potassium sulfate	$\text{K}^+$ and $\text{SO}_4^{2-}$	2.4
sodium carbonate		3.0
sodium chloride	$\text{Na}^+$ and $\text{Cl}^-$	1.6

- (i) State the name of the compound which contains  $\text{K}^+$  and  $\text{NO}_3^-$  ions.

..... [1]

- (ii) Write the symbols for the ions present in sodium carbonate.

..... [1]

- (iii) Which compound with a singly charged negative ion has the highest mass in the mixture?

..... [1]

The table from page 7 is repeated below:

compound	ions present in the compound	mass of compound / g
calcium carbonate	$\text{Ca}^{2+}$ and $\text{CO}_3^{2-}$	4.0
calcium sulfate	$\text{Ca}^{2+}$ and $\text{SO}_4^{2-}$	5.0
magnesium sulfate	$\text{Mg}^{2+}$ and $\text{SO}_4^{2-}$	2.8
	$\text{K}^+$ and $\text{NO}_3^-$	1.2
potassium sulfate	$\text{K}^+$ and $\text{SO}_4^{2-}$	2.4
sodium carbonate		3.0
sodium chloride	$\text{Na}^+$ and $\text{Cl}^-$	1.6

(iv) Calculate:

the total mass of all the compounds present in the mixture,

..... [1]

the percentage of magnesium sulfate by mass in the mixture.

[1]

(c) Calcium carbonate decomposes when heated.

(i) Complete the symbol equation for this reaction.



[1]

(ii) Calcium oxide, CaO, reacts with water to form a strongly alkaline solution.

Which **one** of the following pH values is strongly alkaline?

Put a ring around the correct answer.

**pH 3**

**pH 7**

**pH 8**

**pH 12**

[1]

[Total: 9]



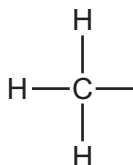
- 5 Methanol reacts with excess hydrochloric acid to form chloromethane and water.



- (a) To which homologous series does methanol belong?

..... [1]

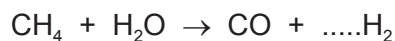
- (b) Complete the structure of methanol below to show its functional group.



[1]

- (c) Methanol can be made from synthesis gas which contains carbon monoxide and hydrogen. Synthesis gas is made from methane.

- (i) Complete the symbol equation for this reaction.

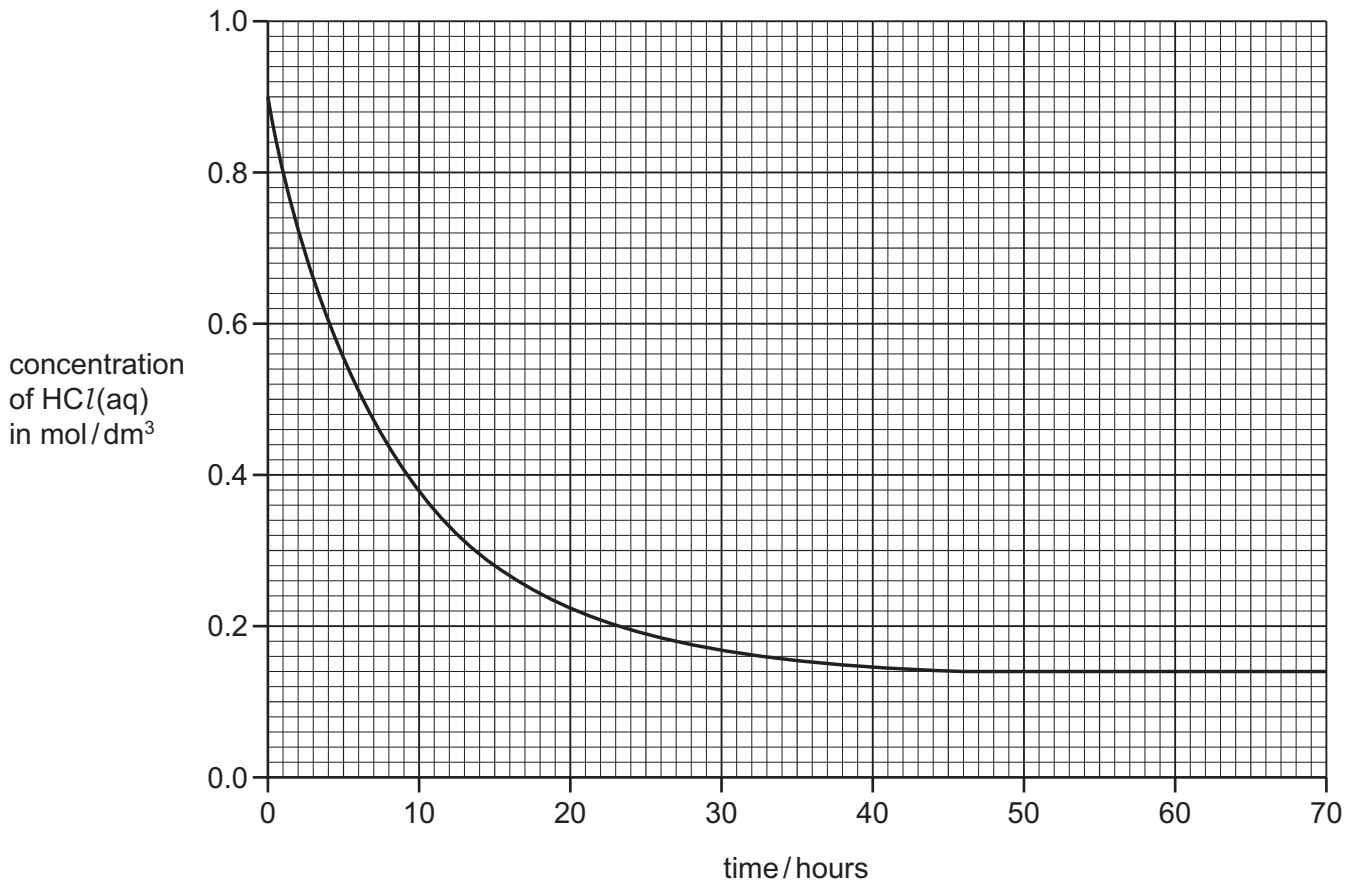


[1]

- (ii) Suggest **two** hazards associated with the products of this reaction.

.....  
 ..... [2]

- (d) A student investigated the rate of reaction of methanol with hydrochloric acid. The graph below shows how the concentration of hydrochloric acid changes with time.



- (i) Describe how the concentration of hydrochloric acid changes with time.

.....  
 ..... [2]

- (ii) Deduce the concentration of hydrochloric acid when the reaction had proceeded for 15 hours.

..... [1]

- (iii) At what time was the reaction just complete?

..... [1]

- (iv) On the grid above, draw a line to show how the concentration of hydrochloric acid changes with time when the reaction takes place at a higher temperature. [2]

- (e) Hydrochloric acid is formed when hydrogen chloride gas is dissolved in water.  
Draw a dot-and-cross diagram to show the electron arrangement in a molecule of hydrogen chloride.  
Show only the outer electron shells.  
Show hydrogen electrons as x.  
Show chlorine electrons as ●.

[2]

[Total: 13]

6 Sulfur burns in air to form sulfur dioxide.

(a) (i) Is sulfur dioxide an acidic or basic oxide?

Give a reason for your answer.

.....  
 ..... [1]

(ii) Sulfur dioxide is an atmospheric pollutant.

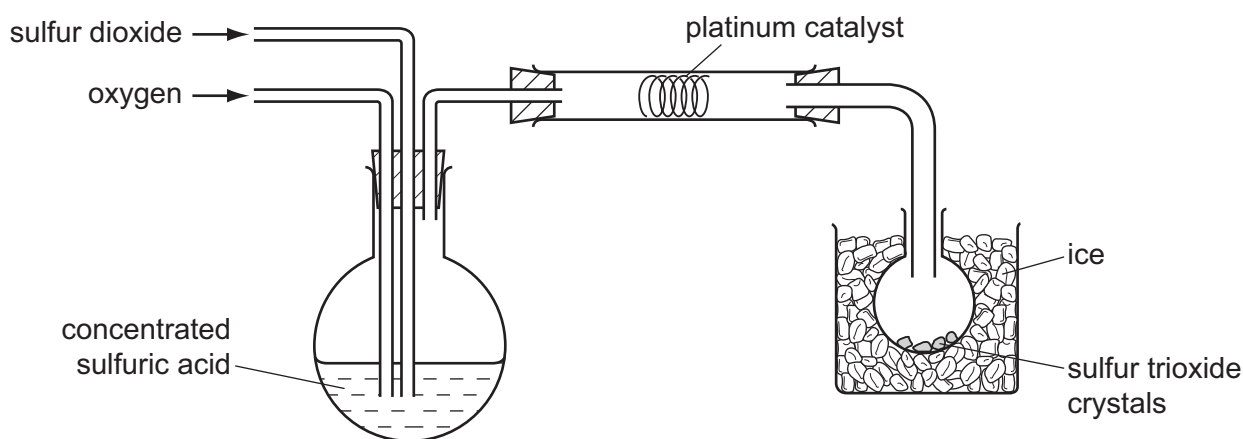
Explain why sulfur dioxide in the atmosphere can erode buildings made of limestone.

.....  
 .....  
 ..... [3]

(b) Sulfur dioxide reacts with oxygen to form sulfur trioxide.

Sulfur trioxide can be made in the laboratory using the apparatus shown below.

Sulfur trioxide has a melting point of 17 °C and a boiling point of 45 °C.



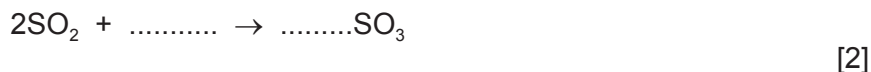
(i) Suggest **one** safety precaution when carrying out this experiment.

..... [1]

(ii) What is the purpose of the platinum catalyst?

..... [1]

(iii) Complete the symbol equation for the reaction.



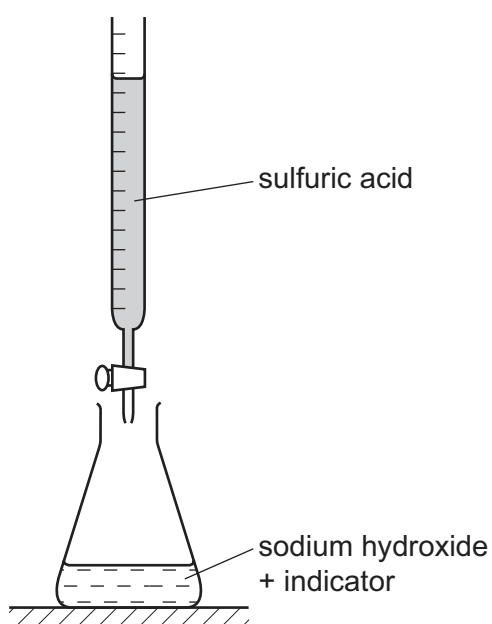
(iv) Suggest why the sulfur trioxide is collected in a flask surrounded by ice.

..... [1]

- (v) When 64 g of sulfur dioxide react with excess oxygen, 80 g of sulfur trioxide is formed. Calculate the mass of sulfur trioxide formed from 160 g of sulfur dioxide.

mass = ..... g [1]

- (c) Sulfur trioxide reacts with water to form sulfuric acid.  
A student used the apparatus shown below to determine the concentration of a solution of sodium hydroxide.



- (i) Which **one** of these pieces of apparatus should the student use to put 25.0 cm<sup>3</sup> of sodium hydroxide into the flask.  
Tick **one** box.

beaker

measuring cylinder

test-tube

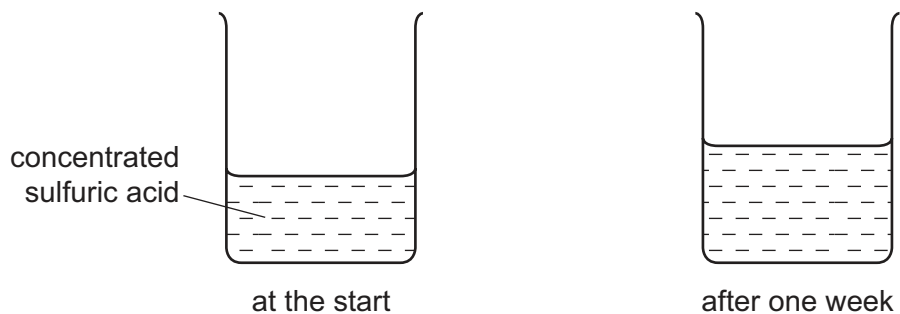
volumetric pipette

[1]

- (ii) How would the student know when the sulfuric acid had neutralised the sodium hydroxide?

..... [1]

- (d) Clean air contains mainly nitrogen, noble gases, oxygen and water vapour. A teacher left a beaker of concentrated sulfuric acid open to the air for a week. After a week, the concentration of sulfuric acid in the beaker had decreased.



Explain these results by referring to one or more of the substances present in the air.

.....  
..... [1]

[Total: 13]

7 (a) Describe the properties of chlorine, bromine and iodine.

In your answer, include the trends in:

- their state,
- their colour,
- their reactivity.

.....

.....

.....

.....

..... [4]

(b) A molecule of chlorine can be written as  $Cl-Cl$ .  
Which **one** of the following words describes this molecule?  
Put a ring around the correct answer.

**diatomic      giant      ionic      monatomic**

[1]

(c) Draw the electronic structure of a fluorine atom.

[2]

(d) The equation below describes the reaction of a halogen with a halide.



Write a word equation for this reaction.

[2]

[Total: 9]

**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																																																																																																																																																																																																																																																																																																																																																																								
I	II	III	IV	V	VI	VII	0																																																																																																																																																																																																																																																																																																																																																																																			
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	13 <b>Al</b> Aluminium 13	14 <b>N</b> Nitrogen 7	15 <b>O</b> Oxygen 8	16 <b>F</b> Fluorine 9	17 <b>Ne</b> Neon 10	18 <b>Ar</b> Argon 18	19 <b>K</b> Potassium 19	20 <b>Ca</b> Calcium 20	21 <b>Sc</b> Scandium 21	22 <b>Ti</b> Titanium 22	23 <b>V</b> Vanadium 23	24 <b>Cr</b> Chromium 24	25 <b>Mn</b> Manganese 25	26 <b>Fe</b> Iron 26	27 <b>Co</b> Cobalt 27	28 <b>Ni</b> Nickel 28	29 <b>Cu</b> Copper 29	30 <b>Zn</b> Zinc 30	31 <b>Ga</b> Gallium 31	32 <b>Ge</b> Germanium 32	33 <b>As</b> Arsenic 33	34 <b>Se</b> Selenium 34	35 <b>Br</b> Bromine 35	36 <b>Kr</b> Krypton 36	37 <b>Rb</b> Rubidium 37	38 <b>Sr</b> Strontium 38	39 <b>Y</b> Yttrium 39	40 <b>Zr</b> Zirconium 40	41 <b>Nb</b> Niobium 41	42 <b>Mo</b> Molybdenum 42	43 <b>Tc</b> Technetium 43	44 <b>Ru</b> Ruthenium 44	45 <b>Rh</b> Rhodium 45	46 <b>Pd</b> Palladium 46	47 <b>Ag</b> Silver 47	48 <b>Cd</b> Cadmium 48	49 <b>In</b> Indium 49	50 <b>Sn</b> Tin 50	51 <b>Sb</b> Antimony 51	52 <b>Te</b> Tellurium 52	53 <b>I</b> Iodine 53	54 <b>Xe</b> Xenon 54	55 <b>Cs</b> Caesium 55	56 <b>Ba</b> Barium 56	57 <b>La</b> Lanthanum 57	72 <b>Hf</b> Hafnium 72	73 <b>Ta</b> Tantalum 73	74 <b>W</b> Tungsten 74	75 <b>Re</b> Rhenium 75	76 <b>Os</b> Osmium 76	77 <b>Ir</b> Iridium 77	78 <b>Pt</b> Platinum 78	79 <b>Au</b> Gold 79	80 <b>Hg</b> Mercury 80	81 <b>Tl</b> Thallium 81	82 <b>Pb</b> Lead 82	83 <b>Bi</b> Bismuth 83	84 <b>Po</b> Polonium 84	85 <b>At</b> Astatine 85	86 <b>Rn</b> Radon 86	87 <b>Fr</b> Francium 87	88 <b>Ra</b> Radium 88	89 <b>Ac</b> Actinium 89	90 <b>Th</b> Thorium 90	91 <b>Pa</b> Protactinium 91	92 <b>U</b> Uranium 92	93 <b>Np</b> Neptunium 93	94 <b>Pu</b> Plutonium 94	95 <b>Am</b> Americium 95	96 <b>Cm</b> Curium 96	97 <b>Bk</b> Berkelium 97	98 <b>Cf</b> Californium 98	99 <b>Es</b> Einsteinium 99	100 <b>Fm</b> Fermium 100	101 <b>Md</b> Mendelevium 101	102 <b>No</b> Nobelium 102	103 <b>Lr</b> Lawrencium 103	104 <b>Rf</b> Rutherfordium 104	105 <b>Db</b> Dubnium 105	106 <b>Sg</b> Seaborgium 106	107 <b>Bh</b> Bohrium 107	108 <b>Hs</b> Hassium 108	109 <b>Mt</b> Meitnerium 109	110 <b>Ds</b> Darmstadtium 110	111 <b>Rg</b> Roentgenium 111	112 <b>Cn</b> Copernicium 112	113 <b>Nh</b> Nihonium 113	114 <b>Fl</b> Flerovium 114	115 <b>Mc</b> Moscovium 115	116 <b>Lv</b> Livermorium 116	117 <b>Ts</b> Tennessine 117	118 <b>Og</b> Oganesson 118	119 <b>Uu</b> Ununennium 119	120 <b>Uub</b> Unbinilium 120	121 <b>Uut</b> Untrium 121	122 <b>Uuq</b> Unquadium 122	123 <b>Uuq</b> Unquadium 123	124 <b>Uuq</b> Unquadium 124	125 <b>Uuq</b> Unquadium 125	126 <b>Uuq</b> Unquadium 126	127 <b>Uuq</b> Unquadium 127	128 <b>Uuq</b> Unquadium 128	129 <b>Uuq</b> Unquadium 129	130 <b>Uuq</b> Unquadium 130	131 <b>Uuq</b> Unquadium 131	132 <b>Uuq</b> Unquadium 132	133 <b>Uuq</b> Unquadium 133	134 <b>Uuq</b> Unquadium 134	135 <b>Uuq</b> Unquadium 135	136 <b>Uuq</b> Unquadium 136	137 <b>Uuq</b> Unquadium 137	138 <b>Uuq</b> Unquadium 138	139 <b>Uuq</b> Unquadium 139	140 <b>Uuq</b> Unquadium 140	141 <b>Uuq</b> Unquadium 141	142 <b>Uuq</b> Unquadium 142	143 <b>Uuq</b> Unquadium 143	144 <b>Uuq</b> Unquadium 144	145 <b>Uuq</b> Unquadium 145	146 <b>Uuq</b> Unquadium 146	147 <b>Uuq</b> Unquadium 147	148 <b>Uuq</b> Unquadium 148	149 <b>Uuq</b> Unquadium 149	150 <b>Uuq</b> Unquadium 150	151 <b>Uuq</b> Unquadium 151	152 <b>Uuq</b> Unquadium 152	153 <b>Uuq</b> Unquadium 153	154 <b>Uuq</b> Unquadium 154	155 <b>Uuq</b> Unquadium 155	156 <b>Uuq</b> Unquadium 156	157 <b>Uuq</b> Unquadium 157	158 <b>Uuq</b> Unquadium 158	159 <b>Uuq</b> Unquadium 159	160 <b>Uuq</b> Unquadium 160	161 <b>Uuq</b> Unquadium 161	162 <b>Uuq</b> Unquadium 162	163 <b>Uuq</b> Unquadium 163	164 <b>Uuq</b> Unquadium 164	165 <b>Uuq</b> Unquadium 165	166 <b>Uuq</b> Unquadium 166	167 <b>Uuq</b> Unquadium 167	168 <b>Uuq</b> Unquadium 168	169 <b>Uuq</b> Unquadium 169	170 <b>Uuq</b> Unquadium 170	171 <b>Uuq</b> Unquadium 171	172 <b>Uuq</b> Unquadium 172	173 <b>Uuq</b> Unquadium 173	174 <b>Uuq</b> Unquadium 174	175 <b>Uuq</b> Unquadium 175	176 <b>Uuq</b> Unquadium 176	177 <b>Uuq</b> Unquadium 177	178 <b>Uuq</b> Unquadium 178	179 <b>Uuq</b> Unquadium 179	180 <b>Uuq</b> Unquadium 180	181 <b>Uuq</b> Unquadium 181	182 <b>Uuq</b> Unquadium 182	183 <b>Uuq</b> Unquadium 183	184 <b>Uuq</b> Unquadium 184	185 <b>Uuq</b> Unquadium 185	186 <b>Uuq</b> Unquadium 186	187 <b>Uuq</b> Unquadium 187	188 <b>Uuq</b> Unquadium 188	189 <b>Uuq</b> Unquadium 189	190 <b>Uuq</b> Unquadium 190	191 <b>Uuq</b> Unquadium 191	192 <b>Uuq</b> Unquadium 192	193 <b>Uuq</b> Unquadium 193	194 <b>Uuq</b> Unquadium 194	195 <b>Uuq</b> Unquadium 195	196 <b>Uuq</b> Unquadium 196	197 <b>Uuq</b> Unquadium 197	198 <b>Uuq</b> Unquadium 198	199 <b>Uuq</b> Unquadium 199	200 <b>Uuq</b> Unquadium 200	201 <b>Uuq</b> Unquadium 201	202 <b>Uuq</b> Unquadium 202	203 <b>Uuq</b> Unquadium 203	204 <b>Uuq</b> Unquadium 204	205 <b>Uuq</b> Unquadium 205	206 <b>Uuq</b> Unquadium 206	207 <b>Uuq</b> Unquadium 207	208 <b>Uuq</b> Unquadium 208	209 <b>Uuq</b> Unquadium 209	210 <b>Uuq</b> Unquadium 210	211 <b>Uuq</b> Unquadium 211	212 <b>Uuq</b> Unquadium 212	213 <b>Uuq</b> Unquadium 213	214 <b>Uuq</b> Unquadium 214	215 <b>Uuq</b> Unquadium 215	216 <b>Uuq</b> Unquadium 216	217 <b>Uuq</b> Unquadium 217	218 <b>Uuq</b> Unquadium 218	219 <b>Uuq</b> Unquadium 219	220 <b>Uuq</b> Unquadium 220	221 <b>Uuq</b> Unquadium 221	222 <b>Uuq</b> Unquadium 222	223 <b>Uuq</b> Unquadium 223	224 <b>Uuq</b> Unquadium 224	225 <b>Uuq</b> Unquadium 225	226 <b>Uuq</b> Unquadium 226	227 <b>Uuq</b> Unquadium 227	228 <b>Uuq</b> Unquadium 228	229 <b>Uuq</b> Unquadium 229	230 <b>Uuq</b> Unquadium 230	231 <b>Uuq</b> Unquadium 231	232 <b>Uuq</b> Unquadium 232	233 <b>Uuq</b> Unquadium 233	234 <b>Uuq</b> Unquadium 234	235 <b>Uuq</b> Unquadium 235	236 <b>Uuq</b> Unquadium 236	237 <b>Uuq</b> Unquadium 237	238 <b>Uuq</b> Unquadium 238	239 <b>Uuq</b> Unquadium 239	240 <b>Uuq</b> Unquadium 240	241 <b>Uuq</b> Unquadium 241	242 <b>Uuq</b> Unquadium 242	243 <b>Uuq</b> Unquadium 243	244 <b>Uuq</b> Unquadium 244	245 <b>Uuq</b> Unquadium 245	246 <b>Uuq</b> Unquadium 246	247 <b>Uuq</b> Unquadium 247	248 <b>Uuq</b> Unquadium 248	249 <b>Uuq</b> Unquadium 249	250 <b>Uuq</b> Unquadium 250	251 <b>Uuq</b> Unquadium 251	252 <b>Uuq</b> Unquadium 252	253 <b>Uuq</b> Unquadium 253	254 <b>Uuq</b> Unquadium 254	255 <b>Uuq</b> Unquadium 255	256 <b>Uuq</b> Unquadium 256	257 <b>Uuq</b> Unquadium 257	258 <b>Uuq</b> Unquadium 258	259 <b>Uuq</b> Unquadium 259	260 <b>Uuq</b> Unquadium 260	261 <b>Uuq</b> Unquadium 261	262 <b>Uuq</b> Unquadium 262	263 <b>Uuq</b> Unquadium 263	264 <b>Uuq</b> Unquadium 264	265 <b>Uuq</b> Unquadium 265	266 <b>Uuq</b> Unquadium 266	267 <b>Uuq</b> Unquadium 267	268 <b>Uuq</b> Unquadium 268	269 <b>Uuq</b> Unquadium 269	270 <b>Uuq</b> Unquadium 270	271 <b>Uuq</b> Unquadium 271	272 <b>Uuq</b> Unquadium 272	273 <b>Uuq</b> Unquadium 273	274 <b>Uuq</b> Unquadium 274	275 <b>Uuq</b> Unquadium 275	276 <b>Uuq</b> Unquadium 276	277 <b>Uuq</b> Unquadium 277	278 <b>Uuq</b> Unquadium 278	279 <b>Uuq</b> Unquadium 279	280 <b>Uuq</b> Unquadium 280	281 <b>Uuq</b> Unquadium 281	282 <b>Uuq</b> Unquadium 282	283 <b>Uuq</b> Unquadium 283	284 <b>Uuq</b> Unquadium 284	285 <b>Uuq</b> Unquadium 285	286 <b>Uuq</b> Unquadium 286	287 <b>Uuq</b> Unquadium 287	288 <b>Uuq</b> Unquadium 288	289 <b>Uuq</b> Unquadium 289	290 <b>Uuq</b> Unquadium 290	291 <b>Uuq</b> Unquadium 291	292 <b>Uuq</b> Unquadium 292	293 <b>Uuq</b> Unquadium 293	294 <b>Uuq</b> Unquadium 294	295 <b>Uuq</b> Unquadium 295	296 <b>Uuq</b> Unquadium 296	297 <b>Uuq</b> Unquadium 297	298 <b>Uuq</b> Unquadium 298	299 <b>Uuq</b> Unquadium 299	300 <b>Uuq</b> Unquadium 300	301 <b>Uuq</b> Unquadium 301	302 <b>Uuq</b> Unquadium 302	303 <b>Uuq</b> Unquadium 303	304 <b>Uuq</b> Unquadium 304	305 <b>Uuq</b> Unquadium 305	306 <b>Uuq</b> Unquadium 306	307 <b>Uuq</b> Unquadium 307	308 <b>Uuq</b> Unquadium 308	309 <b>Uuq</b> Unquadium 309	310 <b>Uuq</b> Unquadium 310	311 <b>Uuq</b> Unquadium 311	312 <b>Uuq</b> Unquadium 312	313 <b>Uuq</b> Unquadium 313	314 <b>Uuq</b> Unquadium 314	315 <b>Uuq</b> Unquadium 315	316 <b>Uuq</b> Unquadium 316	317 <b>Uuq</b> Unquadium 317	318 <b>Uuq</b> Unquadium 318	319 <b>Uuq</b> Unquadium 319	320 <b>Uuq</b> Unquadium 320	321 <b>Uuq</b> Unquadium 321	322 <b>Uuq</b> Unquadium 322	323 <b>Uuq</b> Unquadium 323	324 <b>Uuq</b> Unquadium 324	325 <b>Uuq</b> Unquadium 325	326 <b>Uuq</b> Unquadium 326	327 <b>Uuq</b> Unquadium 327	328 <b>Uuq</b> Unquadium 328	329 <b>Uuq</b> Unquadium 329	330 <b>Uuq</b> Unquadium 330	331 <b>Uuq</b> Unquadium 331	332 <b>Uuq</b> Unquadium 332	333 <b>Uuq</b> Unquadium 333	334 <b>Uuq</b> Unquadium 334	335 <b>Uuq</b> Unquadium 335	336 <b>Uuq</b> Unquadium 336	337 <b>Uuq</b> Unquadium 337	338 <b>Uuq</b> Unquadium 338	339 <b>Uuq</b> Unquadium 339	340 <b>Uuq</b> Unquadium 340	341 <b>Uuq</b> Unquadium 341	342 <b>Uuq</b> Unquadium 342	343 <b>Uuq</b> Unquadium 343	344 <b>Uuq</b> Unquadium 344	345 <b>Uuq</b> Unquadium 345	346 <b>Uuq</b> Unquadium 346	347 <b>Uuq</b> Unquadium 347	348 <b>Uuq</b> Unquadium 348	349 <b>Uuq</b> Unquadium 349	350 <b>Uuq</b> Unquadium 350	351 <b>Uuq</b> Unquadium 351	352 <b>Uuq</b> Unquadium 352	353 <b>Uuq</b> Unquadium 353	354 <b>Uuq</b> Unquadium 354	355 <b>Uuq</b> Unquadium 355	356 <b>Uuq</b> Unquadium 356	357 <b>Uuq</b> Unquadium 357	358 <b>Uuq</b> Unquadium 358	359 <b>Uuq</b> Unquadium 359	360 <b>Uuq</b> Unquadium 360	361 <b>Uuq</b> Unquadium 361	362 <b>Uuq</b> Unquadium 362	363 <b>Uuq</b> Unquadium 363	364 <b>Uuq</b> Unquadium 364	365 <b>Uuq</b> Unquadium 365	366 <b>Uuq</b> Unquadium 366	367 <b>Uuq</b> Unquadium 367	368 <b>Uuq</b> Unquadium 368	369 <b>Uuq</b> Unquadium 369	370 <b>Uuq</b> Unquadium 370	371 <b>Uuq</b> Unquadium 371	372 <b>Uuq</b> Unquadium 372	373 <b>Uuq</b> Unquadium 373	374 <b>Uuq</b> Unquadium 374	375 <b>Uuq</b> Unquadium 375	376 <b>Uuq</b> Unquadium 376	377 <b>Uuq</b> Unquadium 377	378 <b>Uuq</b> Unquadium 378	379 <b>Uuq</b> Unquadium 379	380 <b>Uuq</b> Unquadium 380	381 <b>Uuq</b> Unquadium 381	382 <b>Uuq</b> Unquadium 382	383 <b>Uuq</b> Unquadium 383	384 <b>Uuq</b> Unquadium 384	385 <b>Uuq</b> Unquadium 385	386 <b>Uuq</b> Unquadium 386	387 <b>Uuq</b> Unquadium 387	388 <b>Uuq</b> Unquadium 388	389 <b>Uuq</b> Unquadium 389	390 <b>Uuq</b> Unquadium 390	391 <b>Uuq</b> Unquadium 391	392 <b>Uuq</b> Unquadium 392	393 <b>Uuq</b> Unquadium 393	394 <b>Uuq</b> Unquadium 394	395 <b>Uuq</b> Unquadium 395	396 <b>Uuq</b> Unquadium 396	397 <b>Uuq</b> Unquadium 397	398 <b>Uuq</b> Unquadium 398	399 <b>Uuq</b> Unquadium 399	400 <b>Uuq</b> Unquadium 400

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

Key  

a	<b>X</b>
b	

  
 a = relative atomic mass  
 x = atomic symbol  
 b = proton (atomic) number

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

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