

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/01

Paper 1 Multiple Choice

May/June 2004

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 Some students are asked to describe differences between gases and liquids.

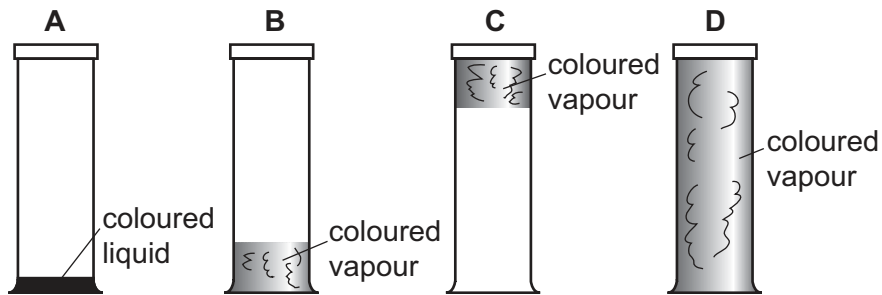
Three of their suggestions are:

1	gas molecules are further apart;
2	gas molecules are smaller;
3	liquid molecules vibrate around fixed positions.

Which suggestions are correct?

- A** 1 only **B** 2 only **C** 3 only **D** 1, 2 and 3
- 2 A coloured liquid vaporises easily at room temperature. Some of the liquid is placed at the bottom of a sealed gas jar.

Which diagram shows the appearance of the jar after several hours?



- 3 Measurements are made on some pure water.

its boiling point, b.p.

its freezing point, f.p.

its pH

Sodium chloride is now dissolved in the water and the measurements repeated.

Which measured values change?

	b.p.	f.p.	pH
A	✓	✓	✓
B	✓	✓	x
C	x	x	✓
D	x	x	x

- 4 The diagram shows a chromatogram obtained from three sweets, X, Y and Z.

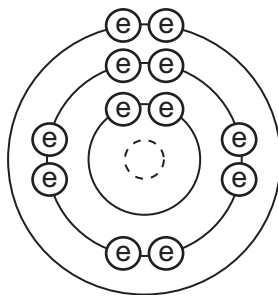
<ul style="list-style-type: none"> ● yellow ● red 	<ul style="list-style-type: none"> ● red ● yellow 	<ul style="list-style-type: none"> ● red ● yellow ● red
sweet X	sweet Y	sweet Z

How many different red dyes are present in the sweets?

- A 1 B 2 C 3 D 4
- 5 Which properties does a Group VI element have?

	forms covalent bonds	forms ionic bonds	conducts electricity when solid
A	✓	✓	✓
B	x	✓	✓
C	✓	✓	x
D	✓	x	x

6 The electronic structure of an element is shown.



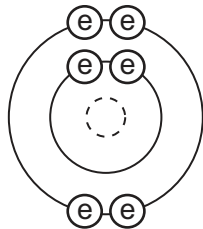
key

⊙ electron

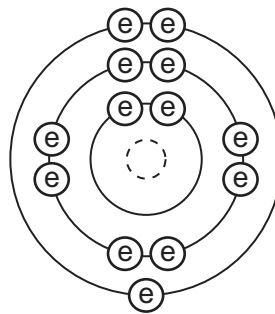
⊖ nucleus

Which diagram shows the electronic structure of another element in the same group in the Periodic Table?

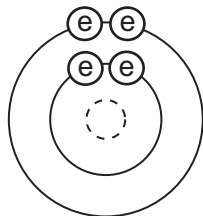
A



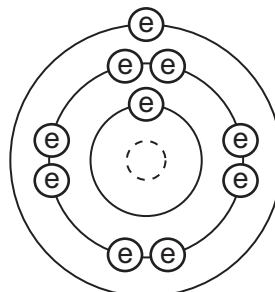
B



C



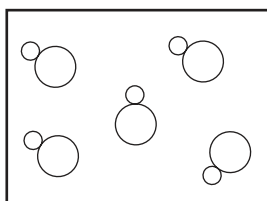
D



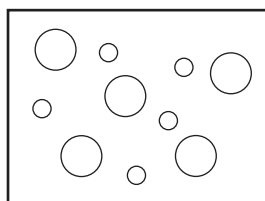
7 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram can represent hydrogen chloride gas?

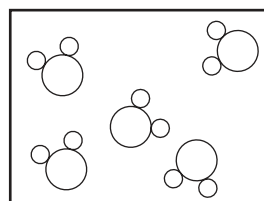
A



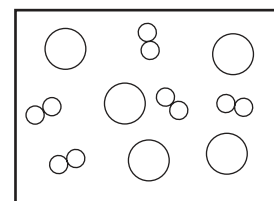
B



C



D



- 8 How many electrons are shared between the atoms in a molecule of methane, CH₄, and in a molecule of water, H₂O?

	methane	water
A	4	2
B	4	4
C	8	2
D	8	4

- 9 The oxide Pb₃O₄ reacts with dilute nitric acid to form lead(II) nitrate, lead(IV) oxide and another product.

What is the equation for this reaction?

- A** $\text{Pb}_3\text{O}_4 + 4\text{HNO}_3 \rightarrow 2\text{Pb}(\text{NO}_3)_2 + \text{PbO}_2 + 2\text{H}_2\text{O}$
- B** $\text{Pb}_3\text{O}_4 + 2\text{HNO}_3 \rightarrow 2\text{PbNO}_3 + \text{PbO}_4 + \text{H}_2$
- C** $\text{Pb}_3\text{O}_4 + 4\text{HNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_4 + 2\text{PbO} + 2\text{H}_2\text{O}$
- D** $2\text{Pb}_3\text{O}_4 + 2\text{HNO}_3 \rightarrow 2\text{Pb}_2\text{NO}_3 + 2\text{PbO}_2 + \text{H}_2$

- 10 The compound ethyl mercaptan, C₂H₅SH, has a very unpleasant smell.

What is its relative molecular mass?

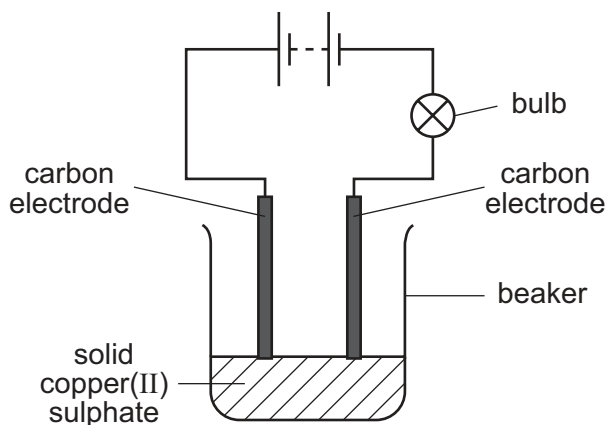
- A** 34 **B** 50 **C** 61 **D** 62

- 11 The proton number of helium is 2.

What information does this give about helium?

- A** Its atom has two electrons.
- B** Its atom is twice as heavy as a hydrogen atom.
- C** It is a Group II element.
- D** Its molecule has two atoms.

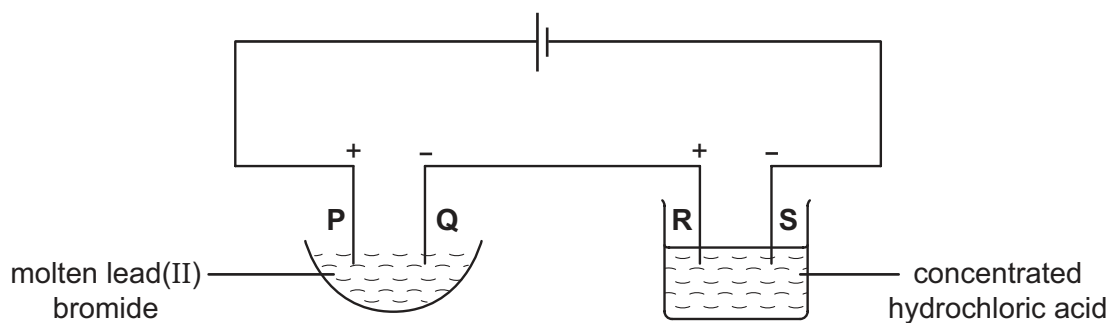
12 In the circuit shown the bulb does not light.



Which change would cause the bulb to light?

- A add more solid copper(II) sulphate to the beaker
- B add water to dissolve the copper(II) sulphate
- C replace the carbon electrodes with copper electrodes
- D reverse the connections to the electrodes

13 The following electrolysis circuit is set up, using inert electrodes **P**, **Q**, **R** and **S**.



At which of the electrodes is a Group VII element produced?

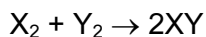
- A P only
- B P and R
- C Q only
- D Q and S

14 When it is used as a fuel, hydrogen combines with substance **X**.

What is **X**?

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

- 15 The table compares the strengths of the bonds for reactions of the type below.



Which reaction is most exothermic?

	bonds in X_2	bonds in Y_2	bonds in XY
A	strong	strong	strong
B	strong	strong	weak
C	weak	weak	strong
D	weak	weak	weak

- 16 In an experiment, copper(II) oxide is changed to copper by a gas **X**.

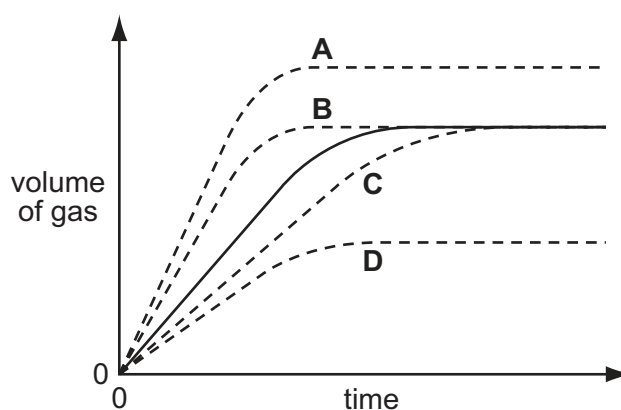
What happens to the copper(II) oxide and what is **X**?

	copper(II) oxide	gas X
A	oxidised	carbon dioxide
B	oxidised	carbon monoxide
C	reduced	carbon dioxide
D	reduced	carbon monoxide

- 17 In an experiment, a 2g lump of zinc and 2g of powdered zinc are added separately to equal volumes of dilute sulphuric acid.

The solid line on the graph shows the volume of gas given off when the 2g lump is used.

Which dotted line is obtained when the zinc is powdered?



18 Which process is endothermic?

- A adding water to anhydrous copper(II) sulphate
- B burning magnesium to make the oxide
- C heating water to make steam
- D neutralising acidic industrial waste

19 An aqueous solution contains either aluminium sulphate or zinc sulphate.

Which aqueous reagent can be used to confirm which salt is present?

- A ammonia
- B barium chloride
- C sodium hydroxide
- D sulphuric acid

20 Compound **X**


- does not dissolve in water,
- does not react with water,
- is used to control soil acidity.


What is **X**?

- A calcium carbonate
- B calcium chloride
- C calcium hydroxide
- D calcium oxide

21 Aqueous sodium hydroxide is added to two different solutions with the results shown.

green precipitate formed

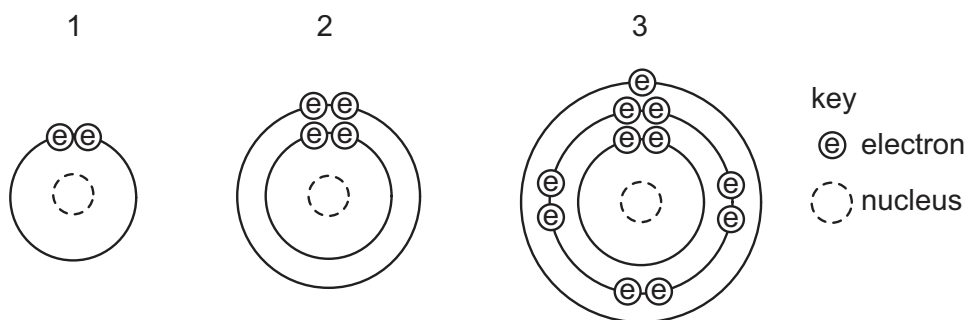
X


Y

light blue precipitate formed

Which cation is present in **X** and in **Y**?

	X	Y
A	ammonium	iron(II)
B	copper(II)	ammonium
C	iron(II)	copper(II)
D	iron(II)	ammonium

22 The diagrams show the arrangement of electrons in three different atoms.



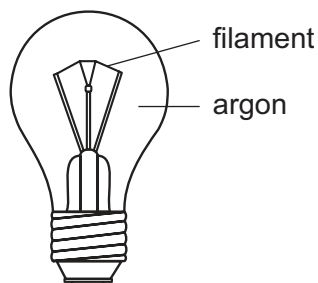
Which atoms are metals?

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

23 Which property do all metals have?

- A** They are hard.
B They conduct electricity.
C They form acidic oxides.
D They react with water.

24 The diagram shows a light bulb.



Why is argon used instead of air in the light bulb?

- A** Argon is a good conductor of electricity.
B Argon is more reactive than air.
C The filament glows more brightly.
D The filament lasts for a longer time.

25 Which element is likely to be a transition metal?

	melting point in °C	density in g/cm ³	colour of oxide
A	98	1.0	white
B	328	11.3	yellow
C	651	1.7	white
D	1240	7.4	black

26 Three metals are extracted as shown in the table.

metal	method of extraction
X	electrolyse molten metal oxide
Y	heat metal oxide with carbon
Z	occurs naturally as the metal

What is the order of reactivity of the metals?

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

27 Haematite is reduced to iron in the blast furnace.



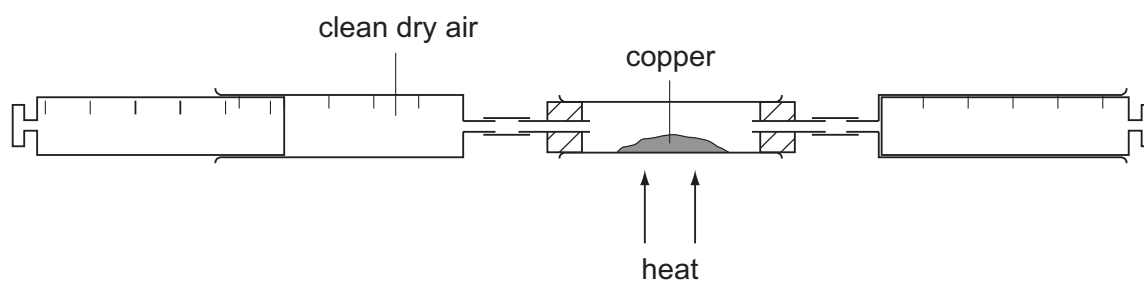
What is **X**?

- A** carbon
- B** carbon dioxide
- C** hydrogen
- D** oxygen

28 Which object is **least** likely to contain aluminium?

- A** a bicycle frame
- B** a hammer
- C** a saucepan
- D** an aeroplane body

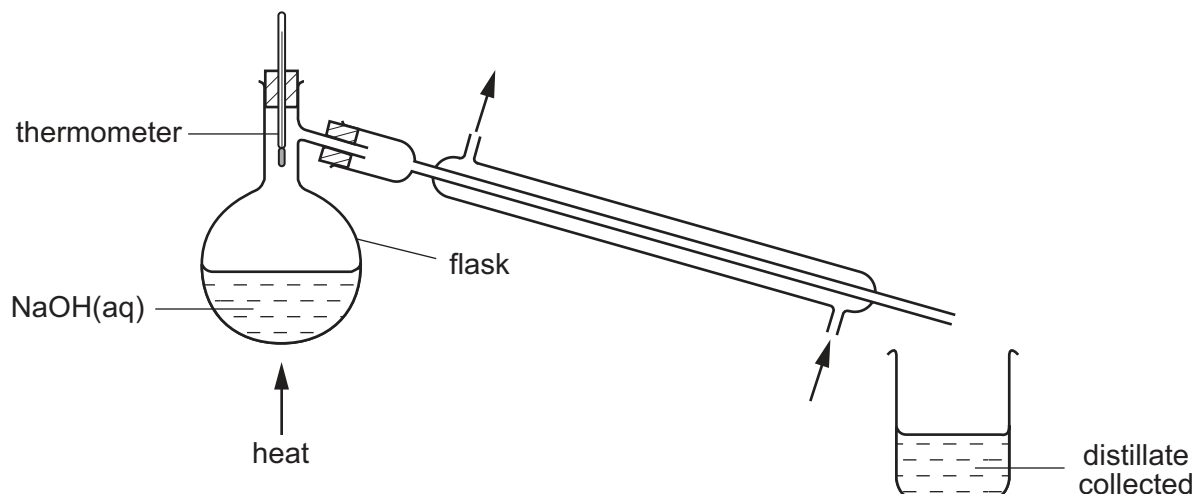
- 29 A sample of clean, dry air is passed over hot copper until **all** the oxygen in the air reacts with the copper.



The volume of air decreases by 30 cm^3 .

What was the starting volume of the sample of air?

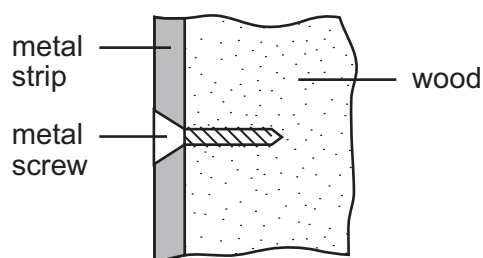
- A 60 cm^3 B 100 cm^3 C 150 cm^3 D 300 cm^3
- 30 The pH of some aqueous sodium hydroxide is measured. The solution is then distilled as shown.



How do the pH values of the distillate and of the solution left in the flask compare with the original?

	pH of the distillate	pH of the solution left in the flask
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

- 31 Which two gases produced from the burning of petrol in motor vehicles contribute to the formation of acid rain?
- A** carbon dioxide and carbon monoxide
B carbon monoxide and sulphur dioxide
C carbon monoxide and nitrogen dioxide
D nitrogen dioxide and sulphur dioxide
- 32 An old railway carriage is being restored. Metal strips are secured on to the outside of the wooden carriage by means of screws. After a few weeks open to the wind and rain, the screws are heavily corroded but the metal strips are not.

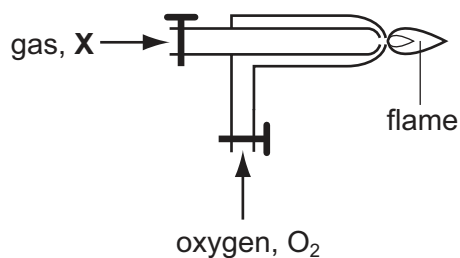


Aluminium is more reactive than both steel and copper.

Which two metals would give this result?

	screws	strips
A	aluminium	steel
B	copper	aluminium
C	copper	steel
D	steel	aluminium

- 33 The diagram shows how oxygen is used in welding.



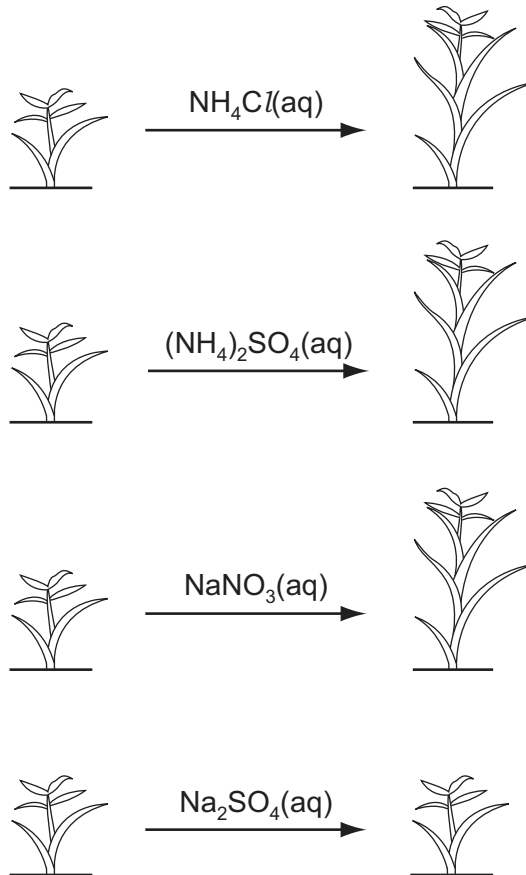
What is gas **X**?

- A** acetylene
B argon
C neon
D nitrogen

34 The diagrams show the growth of four plants.

before treatment

after treatment



Which element is acting as a fertiliser?

A Cl

B N

C Na

D S

35 Gas is released in all of the examples below.



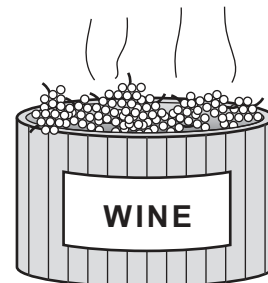
acid rain on a limestone statue



a candle burning



a dog panting



fermenting grapes

Which gas do they **all** produce?

- A carbon dioxide
- B hydrogen
- C methane
- D oxygen

36 What is formed when calcium carbonate is heated?

- A calcium and carbon
- B calcium and carbon dioxide
- C calcium oxide and carbon
- D calcium oxide and carbon dioxide

37 Which compound contains three elements?

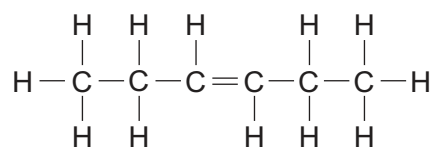
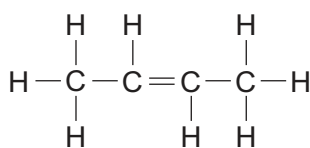
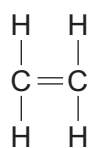
- A ethanol
- B ethene
- C methane
- D poly(ethene)

38 Four fractions obtained from crude oil (petroleum) are listed below.

Which fraction is paired with a correct use?

	fraction	use
A	bitumen	making waxes
B	diesel	fuel for aircraft
C	lubricating	making roads
D	paraffin	fuel for oil stoves

39 The structures of three compounds are shown.



Why do these substances all belong to the same homologous series?

- A** They all contain an even number of carbon atoms.
- B** They all contain the same functional group.
- C** They are all hydrocarbons.
- D** They are all saturated.

40 The table shows some suggested reactions involving ethanol.

Which suggestions about the reactants and products are correct?

reaction	reactants	products
A	ethanol and oxygen	carbon dioxide and water
B	ethene and steam	ethanol and hydrogen
C	glucose and oxygen	ethanol and carbon dioxide
D	glucose and water	ethanol and oxygen

DATA SHEET
The Periodic Table of the Elements

		Group																																																																																																																																																																																																																			
I	II	III	IV	V	VI	VII	0																																																																																																																																																																																																														
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 N Nitrogen 7	15 O Oxygen 8	16 F Fluorine 9	17 Ne Neon 10	18 Ar Argon 18	19 Cl Chlorine 17	20 He Helium 2																																																																																																																																																																																																									
23 Na Sodium 11	24 Mg Magnesium 12	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Ca Calcium 20	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54																																																																																																																																																																																						
55 Fr Francium 87	88 Ra Radium 88	89 La Lanthanum 57	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	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	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103	104 Rf Rutherfordium 104	105 Db Dubnium 105	106 Sg Seaborgium 106	107 Bh Bohrium 107	108 Hs Hassium 108	109 Mt Meitnerium 109	110 Ds Darmstadtium 110	111 Rg Roentgenium 111	112 Cn Copernicium 112	113 Nh Nihonium 113	114 Fl Flerovium 114	115 Mc Moscovium 115	116 Lv Livermorium 116	117 Ts Tennessine 117	118 Og Oganesson 118	119 Uu Ununennium 119	120 Uub Unbibium 120	121 Uut Untrium 121	122 Uuq Unquadrium 122	123 Uub Unpentium 123	124 Uuq Unsextium 124	125 Uub Unseptium 125	126 Uuq Unoctium 126	127 Uub Unnennium 127	128 Uuq Undecium 128	129 Uub Undecium 129	130 Uuq Untrium 130	131 Uuq Unquadrium 131	132 Uub Unpentium 132	133 Uuq Unsextium 133	134 Uub Unseptium 134	135 Uuq Unoctium 135	136 Uub Unnennium 136	137 Uuq Undecium 137	138 Uub Undecium 138	139 Uub Unpentium 139	140 Uuq Unsextium 140	141 Uub Unseptium 141	142 Uuq Unoctium 142	143 Uub Unnennium 143	144 Uuq Undecium 144	145 Uub Undecium 145	146 Uub Unpentium 146	147 Uuq Unsextium 147	148 Uub Unseptium 148	149 Uuq Unoctium 149	150 Uub Unnennium 150	151 Uuq Undecium 151	152 Uub Undecium 152	153 Uub Unpentium 153	154 Uuq Unsextium 154	155 Uub Unseptium 155	156 Uuq Unoctium 156	157 Uub Unnennium 157	158 Uuq Undecium 158	159 Uub Undecium 159	160 Uuq Unpentium 160	161 Uuq Unsextium 161	162 Uub Unseptium 162	163 Uuq Unoctium 163	164 Uub Unnennium 164	165 Uuq Undecium 165	166 Uub Undecium 166	167 Uub Unpentium 167	168 Uuq Unsextium 168	169 Uub Unseptium 169	170 Uuq Unoctium 170	171 Uub Unnennium 171	172 Uuq Undecium 172	173 Uub Undecium 173	174 Uub Unpentium 174	175 Uuq Unsextium 175	176 Uub Unseptium 176	177 Uuq Unoctium 177	178 Uub Unnennium 178	179 Uuq Undecium 179	180 Uub Undecium 180	181 Uub Unpentium 181	182 Uuq Unsextium 182	183 Uub Unseptium 183	184 Uuq Unoctium 184	185 Uub Unnennium 185	186 Uuq Undecium 186	187 Uub Undecium 187	188 Uub Unpentium 188	189 Uuq Unsextium 189	190 Uub Unseptium 190	191 Uuq Unoctium 191	192 Uub Unnennium 192	193 Uuq Undecium 193	194 Uub Undecium 194	195 Uub Unpentium 195	196 Uuq Unsextium 196	197 Uub Unseptium 197	198 Uuq Unoctium 198	199 Uub Unnennium 199	200 Uuq Undecium 200	201 Uub Undecium 201	202 Uub Unpentium 202	203 Uuq Unsextium 203	204 Uub Unseptium 204	205 Uuq Unoctium 205	206 Uub Unnennium 206	207 Uuq Undecium 207	208 Uub Undecium 208	209 Uub Unpentium 209	210 Uuq Unsextium 210	211 Uub Unseptium 211	212 Uuq Unoctium 212	213 Uub Unnennium 213	214 Uuq Undecium 214	215 Uub Undecium 215	216 Uub Unpentium 216	217 Uuq Unsextium 217	218 Uub Unseptium 218	219 Uuq Unoctium 219	220 Uub Unnennium 220	221 Uuq Undecium 221	222 Uub Undecium 222	223 Uub Unpentium 223	224 Uuq Unsextium 224	225 Uub Unseptium 225	226 Uub Unoctium 226	227 Uub Unnennium 227	228 Uub Undecium 228	229 Uub Undecium 229	230 Uub Unpentium 230	231 Uuq Unsextium 231	232 Uub Unseptium 232	233 Uuq Unoctium 233	234 Uub Unnennium 234	235 Uuq Undecium 235	236 Uub Undecium 236	237 Uub Unpentium 237	238 Uuq Unsextium 238	239 Uub Unseptium 239	240 Uuq Unoctium 240	241 Uub Unnennium 241	242 Uuq Undecium 242	243 Uub Undecium 243	244 Uub Unpentium 244	245 Uuq Unsextium 245	246 Uub Unseptium 246	247 Uuq Unoctium 247	248 Uub Unnennium 248	249 Uuq Undecium 249	250 Uub Undecium 250	251 Uub Unpentium 251	252 Uuq Unsextium 252	253 Uub Unseptium 253	254 Uuq Unoctium 254	255 Uub Unnennium 255	256 Uuq Undecium 256	257 Uub Undecium 257	258 Uub Unpentium 258	259 Uuq Unsextium 259	260 Uub Unseptium 260	261 Uuq Unoctium 261	262 Uub Unnennium 262	263 Uuq Undecium 263	264 Uub Undecium 264	265 Uub Unpentium 265	266 Uuq Unsextium 266	267 Uub Unseptium 267	268 Uuq Unoctium 268	269 Uub Unnennium 269	270 Uuq Undecium 270	271 Uub Undecium 271	272 Uub Unpentium 272	273 Uuq Unsextium 273	274 Uub Unseptium 274	275 Uuq Unoctium 275	276 Uub Unnennium 276	277 Uuq Undecium 277	278 Uub Undecium 278	279 Uub Unpentium 279	280 Uuq Unsextium 280	281 Uub Unseptium 281	282 Uuq Unoctium 282	283 Uub Unnennium 283	284 Uuq Undecium 284	285 Uub Undecium 285	286 Uub Unpentium 286	287 Uuq Unsextium 287	288 Uub Unseptium 288	289 Uuq Unoctium 289	290 Uub Unnennium 290	291 Uuq Undecium 291	292 Uub Undecium 292	293 Uub Unpentium 293	294 Uuq Unsextium 294	295 Uub Unseptium 295	296 Uuq Unoctium 296	297 Uub Unnennium 297	298 Uuq Undecium 298	299 Uub Undecium 299	300 Uub Unpentium 300

*58-71 Lanthanoid series
90-103 Actinoid series

Key

a	X
b	

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

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