



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/12

Paper 1 Multiple Choice

October/November 2013

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.

DO NOT WRITE IN ANY BARCODES.

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.

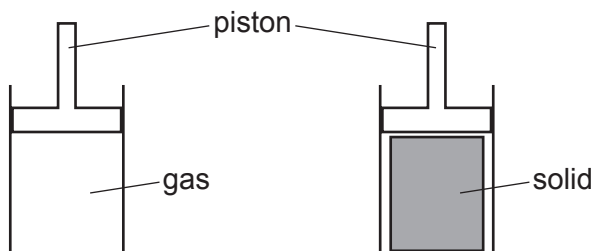
A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

This document consists of **18** printed pages and **2** blank pages.



- 1 An attempt was made to compress a gas and a solid using the apparatus shown.



Which substance would be compressed and what is the reason for this?

	substance	reason
A	gas	the gas particles are close together
B	gas	the gas particles are far apart
C	solid	the solid particles are close together
D	solid	the solid particles are far apart

- 2 A student measures the rate of two reactions.

In one reaction, there is a change in mass of the reactants during the reaction.

In the second reaction, there is a change in temperature during the reaction.

Which piece of apparatus would be essential in **both** experiments?

- A** balance
- B** clock
- C** pipette
- D** thermometer

- 3 Diagram 1 shows the paper chromatogram of substance X.

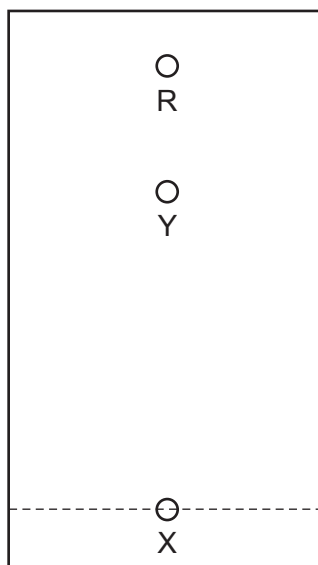


diagram 1

Diagram 2 shows the cooling curve for substance Y.

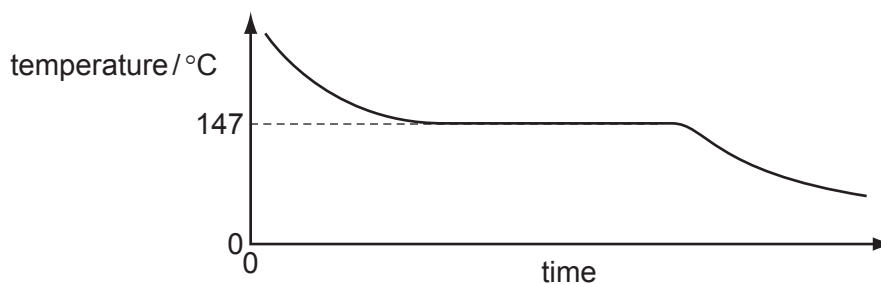


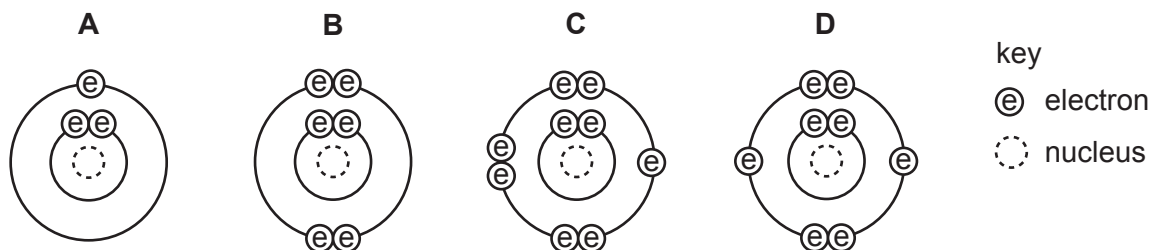
diagram 2

Which statement about X and Y is correct?

- A** X is a mixture and Y is a pure substance.
B X is a pure substance and Y is a mixture.
C X and Y are mixtures.
D X and Y are pure substances.
- 4 Which statements about a sodium atom, $^{23}_{11}\text{Na}$, are correct?
- 1 The number of protons and neutrons is the same.
 - 2 The number of protons and electrons is the same.
 - 3 The number of outer electrons is one.
- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

- 5 The diagrams show the electron arrangements in the atoms of four elements.

Which element does **not** form a covalent bond?



- 6 Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

- 7 Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

- A** Y has more electron shells than X.
B Y has more electrons in its outer shell than X.
C Y is in a different group of the Periodic Table from X.
D Y is in the same period of the Periodic Table as X

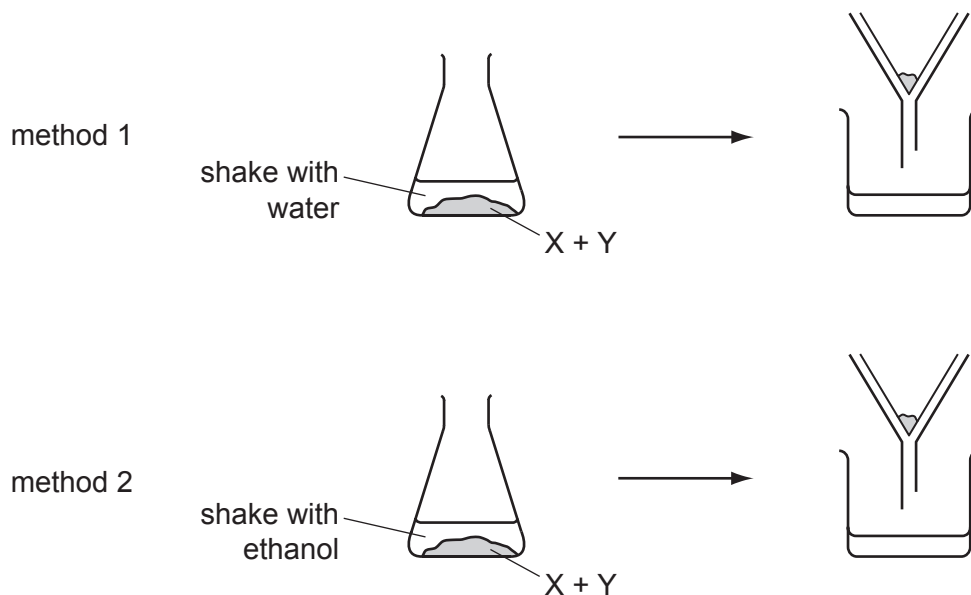
- 8 The formulae of compounds W, X and Y are shown.



Which statement is correct?

- A** W contains twice as many hydrogen atoms as oxygen atoms.
B X contains the most oxygen atoms.
C Y contains the most hydrogen atoms.
D Y contains the same number of hydrogen and oxygen atoms.
- 9 A solid mixture contains an ionic salt, X, and a covalent organic compound, Y.

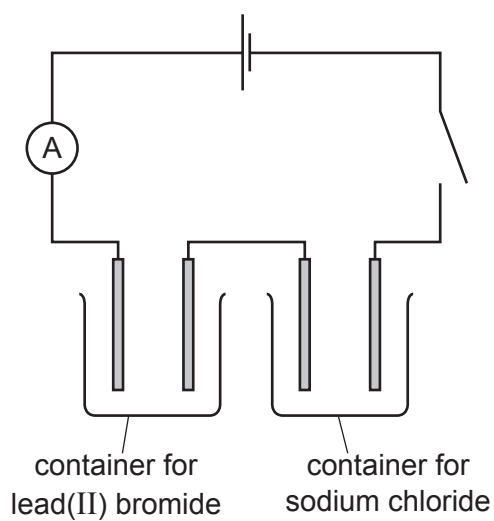
Two students suggest methods of separating the mixture as shown.



Which methods of separation are likely to work?

	1	2
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 10 The diagram shows the circuit for electrolysis of lead(II) bromide and sodium chloride to liberate the metal.



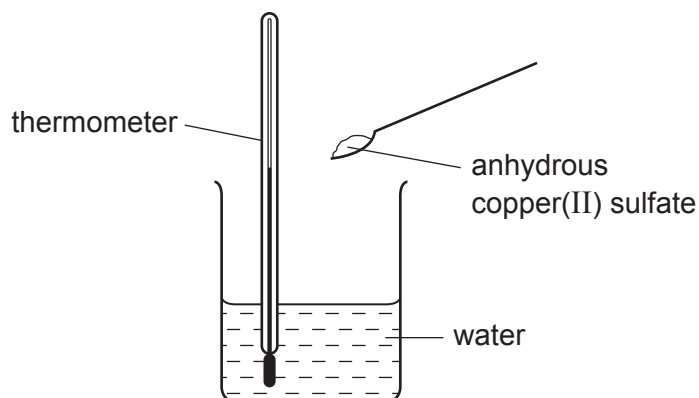
In what form are these salts electrolysed for liberating the metal?

	lead(II) bromide	sodium chloride
A	concentrated solution	concentrated solution
B	concentrated solution	molten
C	molten	concentrated solution
D	molten	molten

- 11 Which relative molecular mass, M_r , is **not** correct for the molecule given?

	molecule	M_r
A	ammonia, NH_3	17
B	carbon dioxide, CO_2	44
C	methane, CH_4	16
D	oxygen, O_2	16

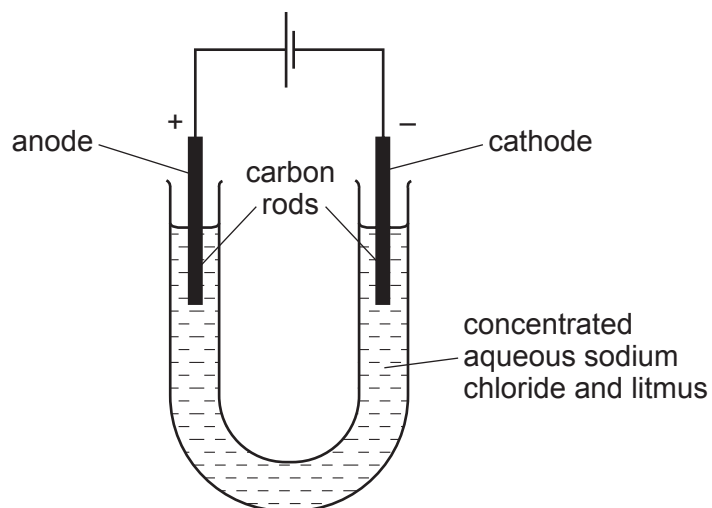
- 12 When anhydrous copper(II) sulfate is added to water a solution is formed and heat is given out.



Which row correctly shows the temperature change and the type of reaction taking place?

	temperature change	type of reaction
A	decreases	endothermic
B	decreases	exothermic
C	increases	endothermic
D	increases	exothermic

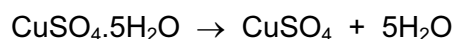
- 13 The diagram shows the electrolysis of concentrated aqueous sodium chloride.



What is the colour of the litmus at each electrode after five minutes?

	colour at anode	colour at cathode
A	blue	red
B	red	blue
C	red	colourless
D	colourless	blue

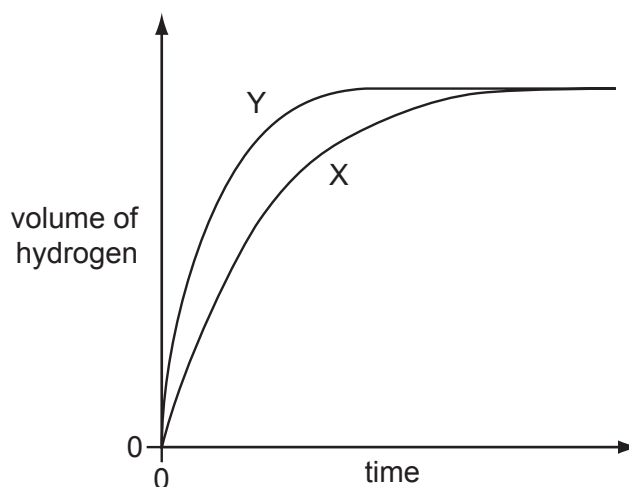
- 14 Anhydrous copper(II) sulfate can be made by heating hydrated copper(II) sulfate.



What can be added to anhydrous copper(II) sulfate to turn it into hydrated copper(II) sulfate?

- A concentrated sulfuric acid
 - B sodium hydroxide powder
 - C sulfur dioxide
 - D water
- 15 Which fuel does **not** produce carbon dioxide when it burns?
- A coal
 - B hydrogen
 - C methane
 - D petrol
- 16 A student investigates the rate of reaction between zinc and an excess of sulfuric acid.

The graph shows the results of two experiments, X and Y.



Which change explains the difference between X and Y?

- A A catalyst is added in Y.
- B A lower temperature is used in Y.
- C Larger pieces of zinc are used in Y.
- D Less concentrated acid is used in Y.

17 Which are properties of an acid?

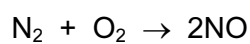
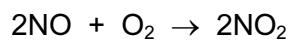
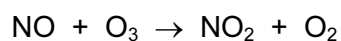
- 1 reacts with ammonium sulfate to form ammonia
2 turns red litmus blue

	1	2
A	✓	✓
B	✓	x
C	x	✓
D	x	x

18 Which of the following are properties of the oxides of non-metals?

	property 1	property 2
A	acidic	covalent
B	acidic	ionic
C	basic	covalent
D	basic	ionic

19 The reactions shown may occur in the air during a thunder storm.



Which row shows what happens to the reactant molecules in each of these reactions?

	N_2	NO	O_3
A	oxidised	oxidised	oxidised
B	oxidised	oxidised	reduced
C	reduced	reduced	oxidised
D	reduced	reduced	reduced

- 20** Calcium, on the left of Period 4 of the Periodic Table, is more metallic than bromine on the right of this period.

Why is this?

Calcium has

- A** fewer electrons.
 - B** fewer protons.
 - C** fewer full shells of electrons.
 - D** fewer outer shell electrons.
- 21** Compound X is tested and the results are shown in the table.

test	result
aqueous sodium hydroxide is added, then heated gently	gas given off which turns damp red litmus paper blue
dilute hydrochloric acid is added	effervescence, gas given off which turns limewater milky

Which ions are present in compound X?

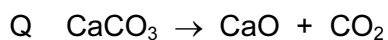
- A** ammonium ions and carbonate ions
 - B** ammonium ions and chloride ions
 - C** calcium ions and carbonate ions
 - D** calcium ions and chloride ions
- 22** Some properties of four elements W, X, Y and Z are listed.

- 1 W melts at 1410 °C and forms an acidic oxide.
- 2 X has a high density and is easily drawn into wires.
- 3 Y acts as a catalyst and its oxide reacts with acids.
- 4 Z is a red-brown solid used to make alloys.

Which of the elements are metals?

- A** 1 and 3
- B** 2, 3 and 4
- C** 2 and 3 only
- D** 2 and 4 only

26 Equations P and Q represent two reactions which occur inside a blast furnace.



Which type of reactions are P and Q?

	P	Q
A	redox	redox
B	redox	thermal decomposition
C	thermal decomposition	redox
D	thermal decomposition	thermal decomposition

27 Farmers add calcium oxide (lime) and ammonium salts to their fields.

The compounds are not added at the same time because they react with each other.

Which gas is produced in this reaction?

- A** ammonia
- B** carbon dioxide
- C** hydrogen
- D** nitrogen

28 Which row describes the uses of mild steel and stainless steel?

	mild steel	stainless steel
A	car bodies, cutlery	chemical plant, machinery
B	car bodies, machinery	chemical plant, cutlery
C	chemical plant, cutlery	car bodies, machinery
D	chemical plant, machinery	car bodies, cutlery

29 Reactions of three metals and their oxides are listed in the table.

metal	reacts with cold water	metal oxide reacts with carbon
W	no	no
X	no	yes
Y	yes	no

What is the order of reactivity of the metals?

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

30 The diagrams show four uses of iron.

In which of these uses is the iron most likely to rust?

A



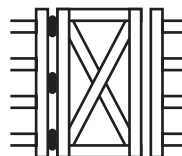
iron bucket
electroplated
with zinc

B



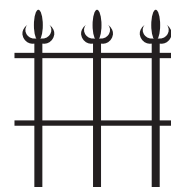
iron cored
aluminium
electricity cables

C



iron hinges
on a gate

D



painted
iron fence

31 In which process is carbon dioxide **not** formed?

- A** burning of natural gas
- B** fermentation
- C** heating lime
- D** respiration

- 32** M is a shiny silver metal. It has a melting point of 1455 °C. Many of its compounds are green.

What is metal M?

- A** aluminium
- B** copper
- C** mercury
- D** nickel

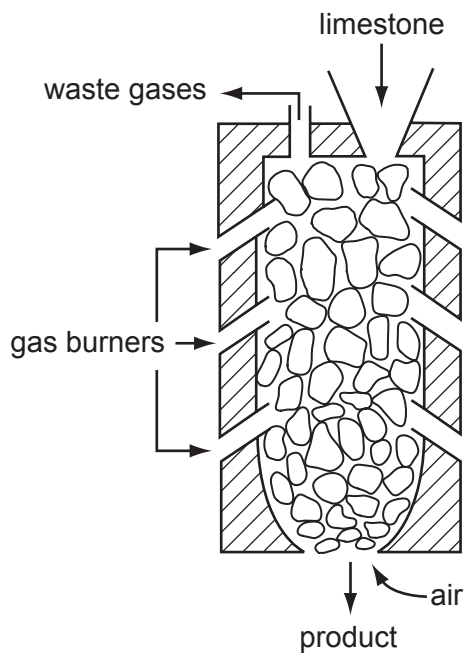
- 33** In many countries river water is used for the washing of clothes.

The same water is not considered to be safe for drinking.

Why is it **not** safe for drinking?

- A** because river water contains dissolved salts
- B** because river water may contain harmful bacteria
- C** because river water may contain small particles of sand
- D** because river water may contain soap from washing clothes

34 The diagram shows a kiln used to heat limestone.



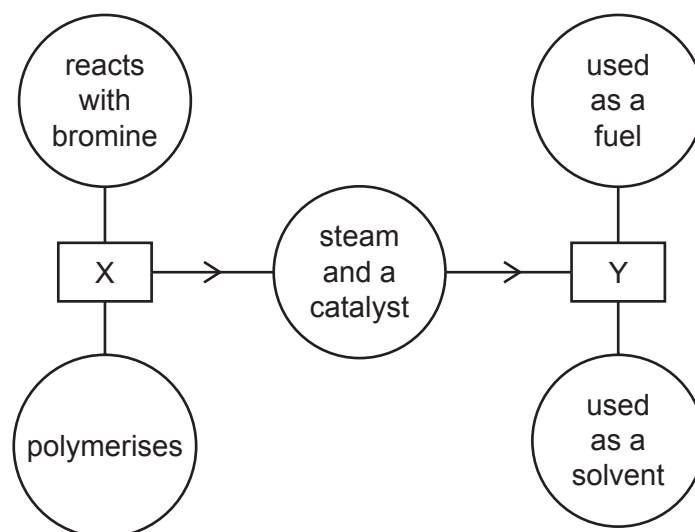
What is the product and what waste gas is formed?

	product	waste gas
A	lime, CaO	carbon monoxide
B	lime, CaO	carbon dioxide
C	slaked lime, Ca(OH)_2	carbon monoxide
D	slaked lime, Ca(OH)_2	carbon dioxide

35 Which air pollutant is **not** made when coal burns in a power station?

- A** carbon monoxide
- B** lead compounds
- C** nitrogen oxides
- D** sulfur dioxide

36 The diagram shows some properties of two organic compounds X and Y.



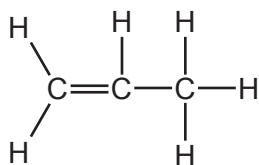
What are X and Y?

	X	Y
A	ethane	ethanoic acid
B	ethane	ethanol
C	ethene	ethanoic acid
D	ethene	ethanol

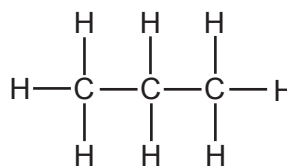
37 Three types of organic compound are alkanes, alkenes and alcohols.

Which structure does **not** belong to any of these three types of compound?

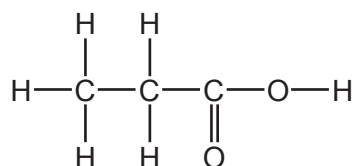
A



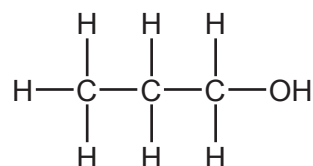
B



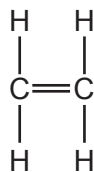
C



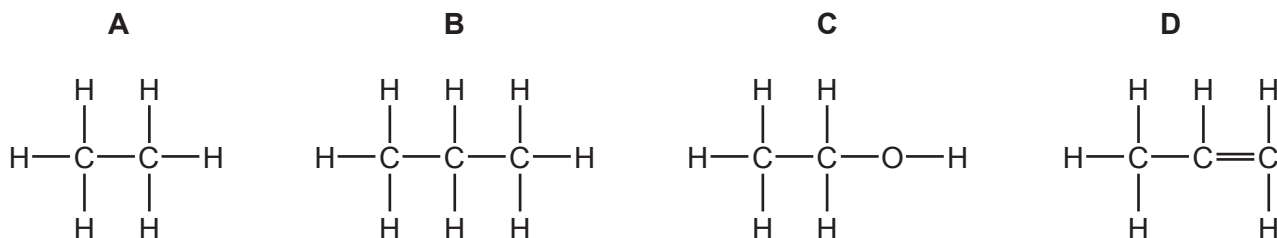
D



38 The diagram represents ethene.



Which compound has chemical properties similar to those of ethene?

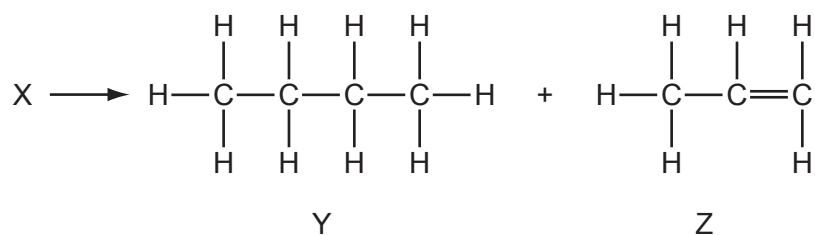


39 Petroleum is a mixture of hydrocarbons which can be separated into fractions using fractional distillation.

Which fraction is used as fuel in jet engines?

- A** bitumen
- B** gasoline
- C** kerosene
- D** naphtha

40 A chemist carried out a cracking reaction on a hydrocarbon, X, and obtained two products, Y and Z.



The chemist then wrote the following statements in his notebook.

- 1 A molecule of X has 7 carbon atoms.
- 2 Y is unsaturated.
- 3 Z will decolourise bromine water.

Which statements are correct?

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

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II	III						IV	V	VI	VII	0					
		<div>1 H Hydrogen</div>															
<div>7 Li Lithium</div> <div>3</div>	<div>9 Be Beryllium</div> <div>4</div>											<div>11 B Boron</div> <div>5</div>	<div>12 C Carbon</div> <div>6</div>	<div>14 N Nitrogen</div> <div>7</div>	<div>16 O Oxygen</div> <div>8</div>	<div>19 F Fluorine</div> <div>9</div>	<div>20 Ne Neon</div> <div>10</div>
	<div>23 Na Sodium</div> <div>11</div>	<div>24 Mg Magnesium</div> <div>12</div>											<div>27 Al Aluminium</div> <div>13</div>	<div>28 Si Silicon</div> <div>14</div>	<div>31 P Phosphorus</div> <div>15</div>	<div>32 S Sulfur</div> <div>16</div>	<div>35.5 Cl Chlorine</div> <div>17</div>
<div>39 K Potassium</div> <div>19</div>	<div>40 Ca Calcium</div> <div>20</div>	<div>45 Sc Scandium</div> <div>21</div>	<div>48 Ti Titanium</div> <div>22</div>	<div>51 V Vanadium</div> <div>23</div>	<div>52 Cr Chromium</div> <div>24</div>	<div>55 Mn Manganese</div> <div>25</div>	<div>56 Fe Iron</div> <div>26</div>	<div>59 Co Cobalt</div> <div>27</div>	<div>59 Ni Nickel</div> <div>28</div>	<div>64 Cu Copper</div> <div>29</div>	<div>65 Zn Zinc</div> <div>30</div>	<div>70 Ga Gallium</div> <div>31</div>	<div>73 Ge Germanium</div> <div>32</div>	<div>75 As Arsenic</div> <div>33</div>	<div>79 Se Selenium</div> <div>34</div>	<div>80 Br Bromine</div> <div>35</div>	<div>84 Kr Krypton</div> <div>36</div>
<div>85 Rb Rubidium</div> <div>37</div>	<div>88 Sr Strontium</div> <div>38</div>	<div>89 Y Yttrium</div> <div>39</div>	<div>91 Zr Zirconium</div> <div>40</div>	<div>93 Nb Niobium</div> <div>41</div>	<div>96 Mo Molybdenum</div> <div>42</div>	<div>101 Ru Ruthenium</div> <div>44</div>	<div>101 Rh Rhodium</div> <div>45</div>	<div>106 Pd Palladium</div> <div>46</div>	<div>108 Ag Silver</div> <div>47</div>	<div>112 Cd Cadmium</div> <div>48</div>	<div>115 In Indium</div> <div>49</div>	<div>119 Sn Tin</div> <div>50</div>	<div>122 Sb Antimony</div> <div>51</div>	<div>128 Te Tellurium</div> <div>52</div>	<div>127 I Iodine</div> <div>53</div>	<div>131 Xe Xenon</div> <div>54</div>	
<div>133 Cs Caesium</div> <div>55</div>	<div>137 Ba Barium</div> <div>56</div>	<div>139 La Lanthanum</div> <div>57</div>	<div>178 Hf Hafnium</div> <div>72</div>	<div>181 Ta Tantalum</div> <div>73</div>	<div>184 W Tungsten</div> <div>74</div>	<div>186 Re Rhenium</div> <div>75</div>	<div>190 Os Osmium</div> <div>76</div>	<div>192 Ir Iridium</div> <div>77</div>	<div>195 Pt Platinum</div> <div>78</div>	<div>197 Au Gold</div> <div>79</div>	<div>201 Hg Mercury</div> <div>80</div>	<div>204 Tl Thallium</div> <div>81</div>	<div>207 Pb Lead</div> <div>82</div>	<div>209 Bi Bismuth</div> <div>83</div>	<div>210 Po Polonium</div> <div>84</div>	<div>210 At Astatine</div> <div>85</div>	<div>210 Rn Radon</div> <div>86</div>
<div>226 Fr Francium</div> <div>87</div>	<div>227 Ra Radium</div> <div>88</div>	<div>227 Ac Actinium</div> <div>89</div>															
58-71 Lanthanoid series													90-103 Actinoid series				
a = relative atomic mass													X = atomic symbol				
b = proton (atomic) number																	
Key	X																

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

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.).

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