Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/22**

Paper 2 Multiple Choice (Extended) **February/March 2016**

45 Minutes

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

* 6 4 9 2 0 1 1 2 2 1 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, 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.

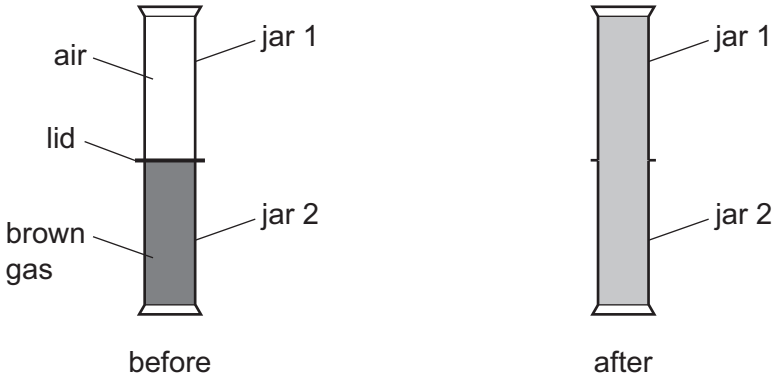
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
Electronic calculators may be used.

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 **15** printed pages and **1** blank page.

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1 Two gas jars are set up as shown.



The lid is removed and the gas jars are left to stand. After some time the contents of both gas jars are brown.

Which process causes this to happen?

A condensation

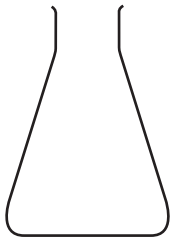
B diffusion

C evaporation

D filtration

2 Which piece of apparatus is used to measure variable quantities of liquid in a titration?

A



B



C



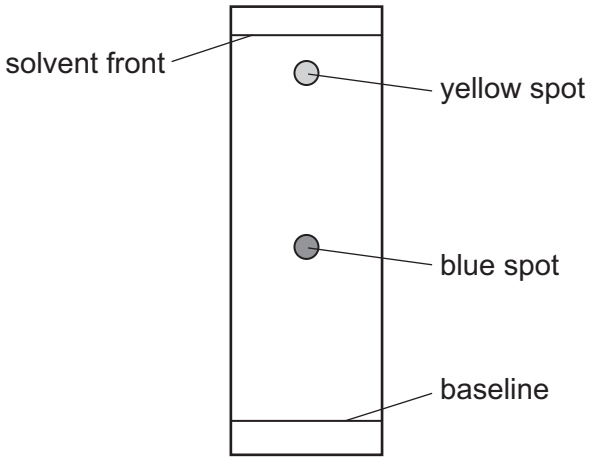
D



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3 A sample of a green food colouring was separated into its component colours using paper chromatography.

The results obtained are shown.



What is the R_f value of the blue spot?

A 0.45 **B** 0.90 **C** 1.10 **D** 2.20

4 In which row are the substances correctly classified?

	element	compound	mixture
A	brass	sulfur	water
B	sulfur	brass	water
C	sulfur	water	brass
D	water	sulfur	brass

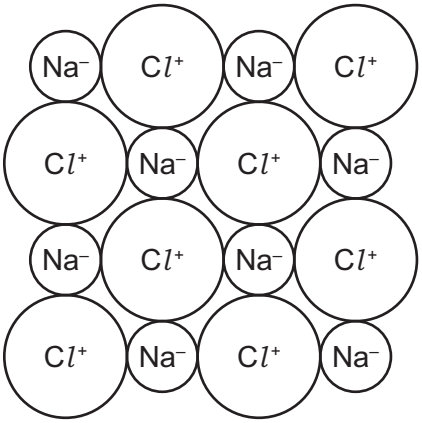
5 Which molecule contains only single covalent bonds?

A Cl_2 **B** CO_2 **C** N_2 **D** O_2

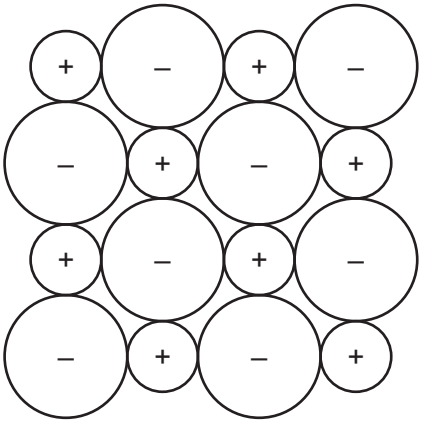
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6 Which structure represents the sodium chloride lattice?

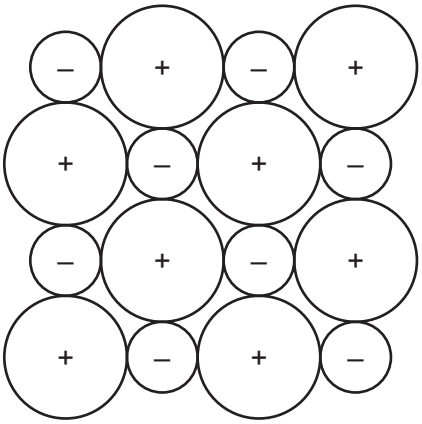
A



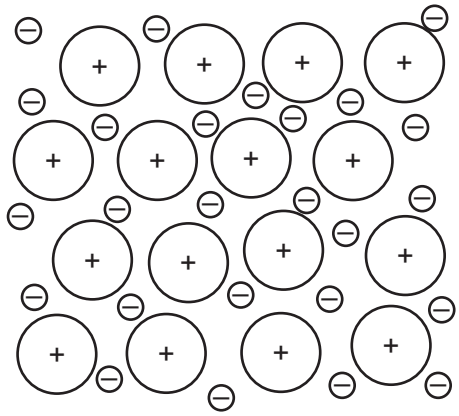
B



C



D



7 X and Y are isotopes of the same element.

Which statement is correct?

A X and Y have atoms with different numbers of electron shells.

B X and Y have atoms with the same nucleon number.

C X and Y have atoms with the same number of outer shell electrons.

D X and Y have different chemical properties.

8 Which quantities of chemicals will react exactly with no reactants left over?

A 12 g of carbon and 12 g of oxygen

B 12 g of carbon and 48 g of oxygen

C 12 g of magnesium and 16 g of oxygen

D 24 g of magnesium and 16 g of oxygen

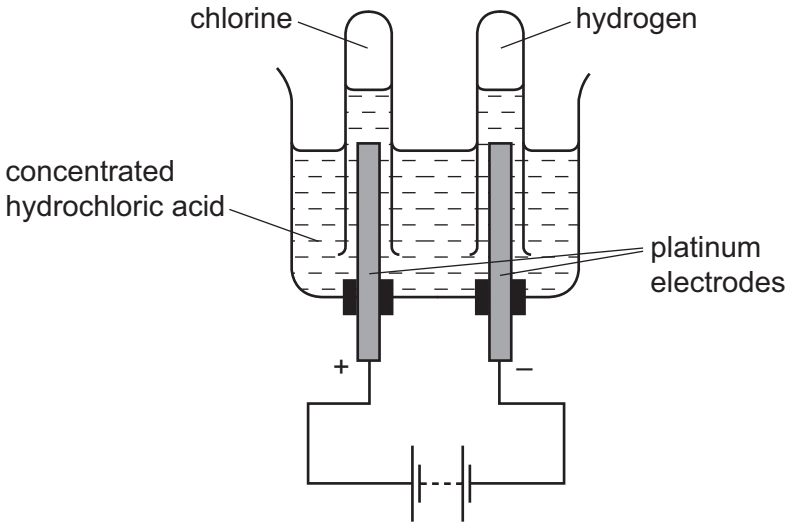
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9 Magnesium nitride is formed when magnesium burns in air. Magnesium nitride is an ionic compound.

What is the formula of magnesium nitride?

A MgN_2 **B** Mg_2N_2 **C** Mg_2N_3 **D** Mg_3N_2

10 The electrolysis of concentrated hydrochloric acid is shown.



Which statement describes what happens to the electrons during the electrolysis?

A They are added to chloride ions.

B They are added to hydrogen ions.

C They move through the circuit from positive to negative.

D They move through the solution from negative to positive.

11 Which reaction does **not** occur in the extraction of aluminium?

A $Al^{3+} + 3e^- \rightarrow Al$

B $2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$

C $2O^{2-} \rightarrow O_2 + 4e^-$

D $C + O_2 \rightarrow CO_2$

12 Which substance could **not** be used as a fuel to heat water in a boiler?

A ethanol

B hydrogen

C methane

D oxygen

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13 Which row describes an endothermic reaction?

	energy needed to break bonds / kJ	energy released by forming bonds / kJ	temperature
A	400	200	decreases
B	400	800	decreases
C	600	200	increases
D	600	800	increases

14 A reversible reaction is shown.

$$2NO_2(g) \rightleftharpoons N_2O_4(g) \qquad \Delta H = -58\,kJ/mol$$

Which statement about an equilibrium mixture of NO_2 and N_2O_4 is correct?

A If the pressure is decreased the amount of N_2O_4 increases.

B If the temperature is increased the amount of N_2O_4 increases.

C The rates of formation and decomposition of N_2O_4 are not the same.

D The decomposition of N_2O_4 is an endothermic reaction.

15 Which statement about catalysts in chemical reactions is **not** correct?

A Catalysts are not used up in the reaction.

B Catalysts increase the energy of the reacting particles.

C Catalysts increase the rate of the reaction.

D Catalysts lower the activation energy.

16 Zinc is extracted from zinc blende by roasting it in air to form zinc oxide.

The zinc oxide is then heated with carbon to form zinc.

The equations for the reactions are shown.

1 $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$

2 $ZnO + C \rightarrow Zn + CO$

Which statement about reactions 1 and 2 is **not** correct?

A In reaction 1 the oxidation state of sulfur increases and it is oxidised.

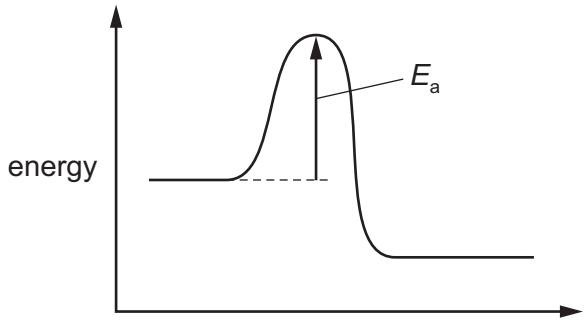
B In reaction 1 the oxidation state of zinc increases and it is oxidised.

C In reaction 2 the carbon acts as a reducing agent and it is oxidised.

D In reaction 2 the oxidation state of zinc decreases and it is reduced.

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17 The diagram shows an energy level diagram for a reaction.



The diagram shows that the reaction is .....1..... .

Increasing the temperature increases the rate of reaction. A reason for this is that the .....2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	endothermic	activation energy decreases
B	endothermic	collision rate increases
C	exothermic	activation energy decreases
D	exothermic	collision rate increases

18 Concentrated hydrochloric acid is a *strong acid*.

What is meant by the terms 'strong' and 'acid'?

	strong	acid
A	contains a low proportion of water	accepts protons
B	contains a low proportion of water	donates protons
C	fully ionised	accepts protons
D	fully ionised	donates protons

19 Which oxide is amphoteric?

A aluminium oxide

B calcium oxide

C carbon monoxide

D sodium oxide

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[Turn over

20 A salt is made by adding an excess of an insoluble metal oxide to an acid.

How is the excess metal oxide removed from the mixture?

A chromatography

B crystallisation

C distillation

D filtration

21 A substance is heated with aluminium foil in aqueous sodium hydroxide. A gas is produced which turns damp, red litmus paper blue.

Which anion is present in the substance?

A carbonate

B iodide

C nitrate

D sulfate

22 An element does not conduct electricity and exists as diatomic molecules.

Where in the Periodic Table is the element found?



23 In the Periodic Table, how does the metallic character of the elements vary from left to right across a period?

A It decreases.

B It increases.

C It increases then decreases.

D It stays the same.

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24 The elements in a group of the Periodic Table show the following trends.

1 The element with the lowest proton number has the lowest reactivity.

2 All the elements in the group form basic oxides.

3 The density of the elements increases down the group.

4 The melting point of the elements decreases down the group.

In which group are the elements found?

A I **B** IV **C** VI **D** VII

25 Brass is an alloy of two metals.

Which row gives a correct use for the two metals from which brass is made?

	metal 1	metal 2
A	used for electrical wiring	used for galvanising steel
B	used for galvanising steel	used for making aircraft
C	used for making aircraft	used for making cutlery
D	used for making cooking pans	used for electrical wiring

26 Iron is extracted from hematite in the blast furnace.

The hematite contains silicon(IV) oxide (sand) as an impurity.

What reacts with this impurity to remove it?

A calcium oxide

B carbon

C carbon dioxide

D slag

27 The reaction below is called the 'thermite reaction'.

$$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$$

Which pair of substances reacts in a similar way?

A Fe and MgO

B Fe and ZnO

C Mg and CuO

D Zn and Al_2O_3

28 One method of preventing the rusting of iron is to keep oxygen away from the surface of the metal.

Which way of rust prevention does **not** use this method?

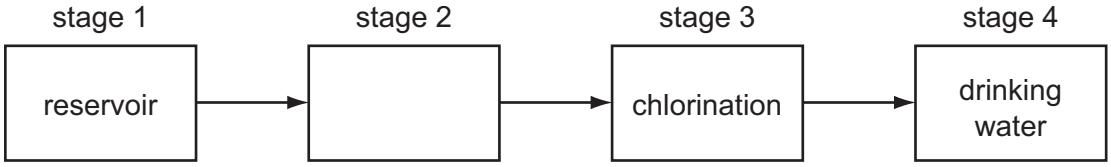
A coating the iron with grease

B connecting the iron to a more reactive metal

C covering the iron with plastic

D painting the iron

29 The diagram shows how water is treated to make it suitable for drinking.



What happens in stage 2?

A condensation

B distillation

C evaporation

D filtration

30 Nitrogen monoxide is produced in a car engine when petrol is burnt.

The gases from the car engine are passed through a catalytic converter.

In the catalytic converter the nitrogen monoxide reacts with carbon monoxide to form nitrogen and carbon dioxide.

Which statement is **not** correct?

A Carbon monoxide is oxidised in the catalytic converter.

B Carbon monoxide is produced by the complete combustion of petrol.

C Nitrogen monoxide is formed by the reaction of nitrogen and oxygen.

D Nitrogen monoxide is reduced in the catalytic converter.

31 Which pollutant gas can be produced as a result of incomplete combustion of octane, C_8H_{18}?

A carbon

B carbon dioxide

C carbon monoxide

D methane

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32 Fertilisers are used to provide three elements needed to increase the yield of crops.

Which two compounds would provide all three of these elements?

A ammonium nitrate and calcium phosphate

B ammonium nitrate and potassium sulfate

C potassium nitrate and calcium phosphate

D potassium nitrate and potassium sulfate

33 What is a property of concentrated sulfuric acid but **not** of dilute sulfuric acid?

A It is a dehydrating agent.

B It neutralises alkalis.

C It produces a white precipitate with barium nitrate.

D It reacts with metals to give a salt and hydrogen.

34 Why does a farmer put lime (calcium oxide) on the soil?

A to act as a fertiliser

B to kill pests

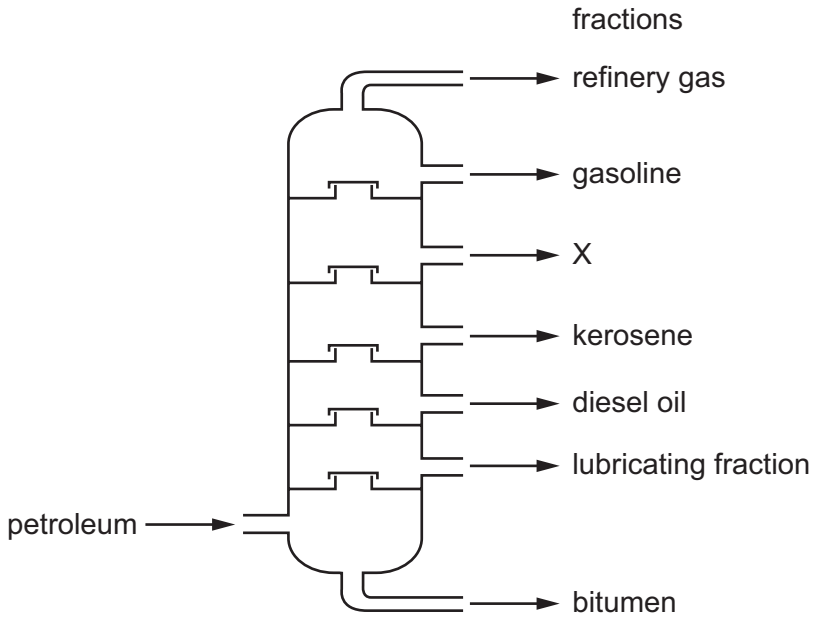
C to make the soil less acidic

D to make the soil less alkaline

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[Turn over

35 What is the name of fraction X?



A alcohol

B fuel oil

C naphtha

D paraffin

36 Which compounds are alkanes?

compound	W	X	Y	Z
formula	C_4H_{10}	C_5H_{10}	C_6H_{12}	C_6H_{14}

A W and X **B** W and Z **C** X and Y **D** Y and Z

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37 The statements below are about the alcohol homologous series.

The alcohols have the same .....1..... formula.

The alcohols have .....2..... chemical properties because they have the same .....3..... .

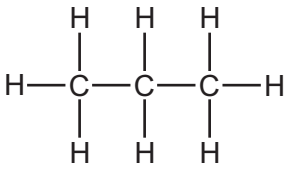
The melting points of the alcohols .....4..... as the number of carbon atoms increases.

Which words correctly complete gaps 1–4?

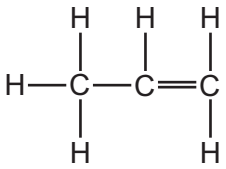
	1	2	3	4
A	general	different	functional group	decrease
B	general	similar	electronic structure	increase
C	general	similar	functional group	increase
D	molecular	similar	functional group	increase

38 Which structure represents a compound that dissolves in water to form an acidic solution?

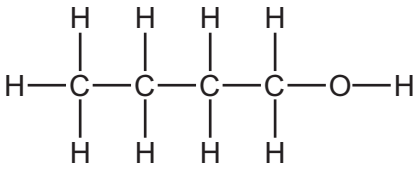
A



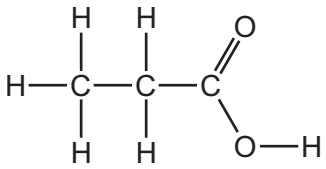
B



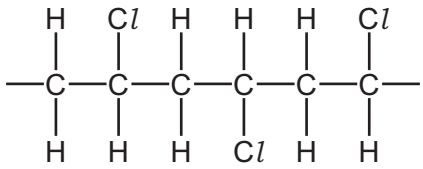
C



D

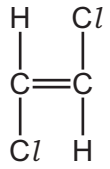


39 The partial structure of an addition polymer is shown.

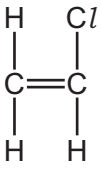


What is the structure of the monomer used to make this polymer?

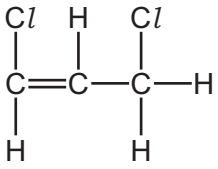
A



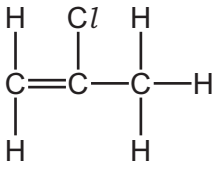
B



C



D



40 Which statement about polymers is correct?

A Addition polymers are all biodegradable.

B Condensation polymers can all be hydrolysed to give amino acids.

C Condensation polymers only exist in nature.

D Forming addition polymers produces only one product.

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

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