Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **October/November 2020**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.

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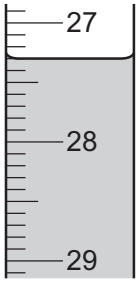
1 During a titration experiment, an acid is transferred into a burette.

The diagrams show part of the burette at the start of the titration and at the end-point.

start of titration / cm^3



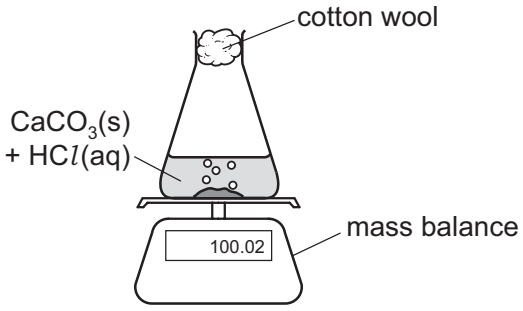
end-point of titration / cm^3

What is the volume of acid used during the titration?

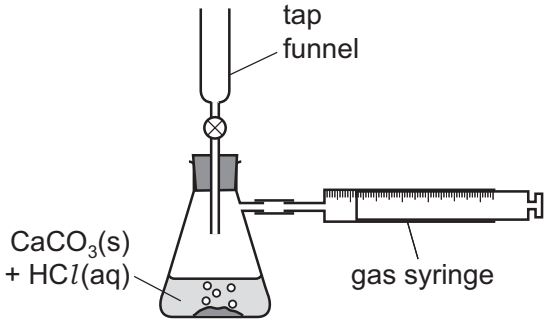
A 3.7 cm^3 **B** 4.9 cm^3 **C** 5.1 cm^3 **D** 6.3 cm^3

2 When calcium carbonate is added to dilute hydrochloric acid, carbon dioxide gas is released.

Three sets of apparatus are shown.



1



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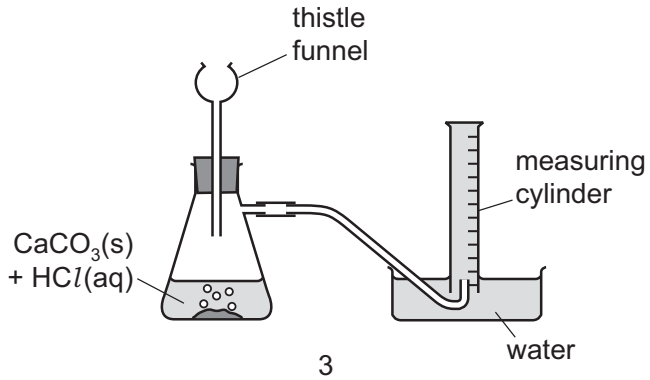

3

Which sets of apparatus are suitable, together with a stop-watch, for following the rate of this reaction?

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

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3 Chromatography can be used to separate and identify dyes present in a mixture.

Which statement is correct?

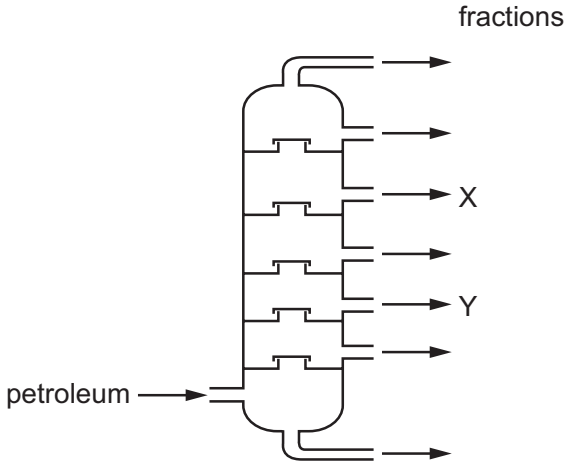
A A dye with an R_f value of 1.2 can be present in a mixture.

B A dye could have a different R_f value if a different solvent was used.

C All blue dyes have the same R_f value.

D Chromatography can only be used for coloured substances such as dyes.

4 Petroleum (crude oil) is separated into useful fractions by fractional distillation. The positions at which fractions X and Y are collected from the fractionating column are shown.



Which statement is correct?

A The temperature increases up the column.

B X condenses at a lower temperature than Y.

C X has a higher boiling point than Y.

D X has longer chain molecules than Y.

5 Aqueous zinc chloride is tested with various reagents.

Which observation is correct?

A Aqueous ammonia gives a white precipitate which is soluble in excess reagent.

B Copper turnings give a precipitate of zinc.

C Acidified aqueous silver nitrate gives a yellow precipitate.

D Acidified aqueous barium nitrate gives a white precipitate.

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6 When aqueous sodium hydroxide is added to a solution, a white precipitate forms which dissolves when excess sodium hydroxide is added.

Which ion could be present in the solution?

A $Al^{3+}(aq)$ **B** $Ca^{2+}(aq)$ **C** $Cu^{2+}(aq)$ **D** $Na^{+}(aq)$

7 A sample of a gas occupies a volume of 2.0 dm^3 at room temperature and pressure.

Which changes in the conditions would both decrease the volume occupied by the gas?

	temperature	pressure
A	decreased	decreased
B	increased	decreased
C	decreased	increased
D	increased	increased

8 An ion contains 20 electrons and has a charge of +3.

From which element was the ion formed?

A aluminium

B calcium

C iron

D vanadium

9 Which statement is correct?

A Diamond conducts electricity while graphite does not.

B Graphite has delocalised ions between its layers.

C In diamond, each carbon atom is joined to three other carbon atoms only.

D The layered structure of graphite makes it slippery.

10 Which material has the highest melting point?

A ammonia

B methane

C sodium chloride

D water

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11 Which statement describes ionic bonds?

A a lattice of ions in a 'sea of electrons'

B electrostatic attraction between oppositely charged ions

C the sharing of electrons between atoms to gain a noble gas configuration

D the transfer of electrons from atoms of a non-metal to the atoms of a metal

12 Which substances contain at least one double bond?

1 C_2H_4

2 O_2

3 C_2H_6

4 CO_2

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

13 Magnesium will react with aqueous copper(II) sulfate to form copper and aqueous magnesium sulfate.

What is the correct equation for this reaction?

A $Mg + CuSO_4 \rightarrow Cu + MgSO_4$

B $Mg + Cu_2SO_4 \rightarrow 2Cu + MgSO_4$

C $2Mg + CuSO_4 \rightarrow Cu + Mg_2SO_4$

D $2Mg + Cu_2SO_4 \rightarrow 2Cu + Mg_2SO_4$

14 A sample of magnesium hydroxide has a mass of 4.63 g.

How many moles of magnesium hydroxide are present?

A 0.0617 **B** 0.0798 **C** 0.113 **D** 0.154

15 Which statement is correct?

A The concentration of a solution is expressed in dm^3 / mol.

B The empirical formula of a compound always gives the actual numbers of each type of atom in one molecule.

C The molecular formula of a compound always contains more atoms than the empirical formula.

D The relative atomic mass of an element is $\frac{\text{the average mass of one atom of the element}}{\frac{1}{12}\text{ the mass of one atom of carbon-12}}$.

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16 Which sample contains the most atoms?

A 0.5 mol of water

B 1.0 mol of carbon dioxide

C 1.0 mol of methane

D 2.0 mol of hydrogen chloride

17 The equation shows the production of iron by the reduction of iron(III) oxide.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

80 tonnes of iron(III) oxide produces 50 tonnes of iron.

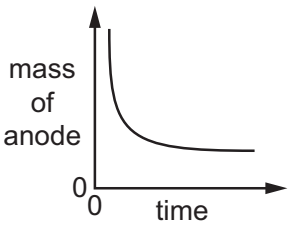
What is the percentage yield?

A 45% **B** 63% **C** 68% **D** 89%

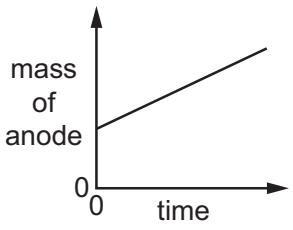
18 Aqueous copper(II) sulfate is electrolysed using copper electrodes. The current is constant and the anode is weighed at regular time intervals.

Which graph is obtained when the mass of the anode is plotted against time?

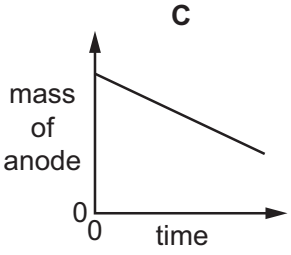
A



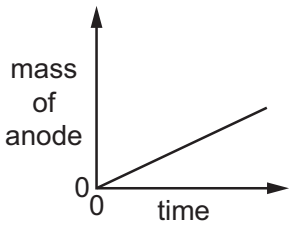
B



C



D



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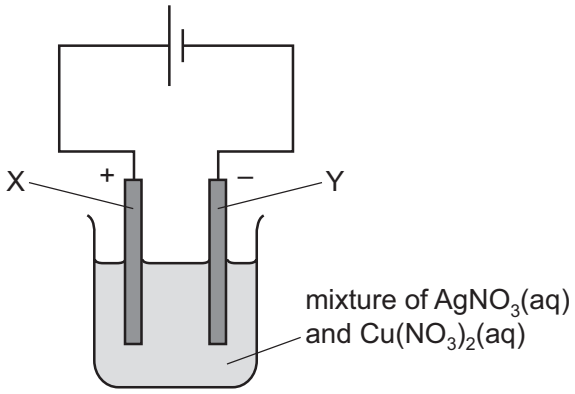
19 The diagram shows the electrolysis of a mixture of aqueous copper(II) nitrate, $Cu(NO_3)_2(aq)$, and aqueous silver nitrate, $AgNO_3(aq)$. Electrodes X and Y are inert.



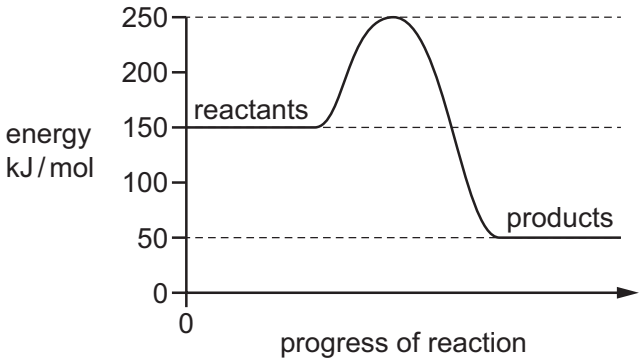
Copper is above silver in the reactivity series.

It can be deduced that .....1..... is initially deposited at electrode .....2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	copper	X
B	copper	Y
C	silver	X
D	silver	Y

20 The energy profile diagram of a chemical reaction is shown.



What is the value of the activation energy of the reaction?

A –200 kJ / mol **B** –100 kJ / mol **C** +100 kJ / mol **D** +200 kJ / mol

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21 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.

22 When water is liquid, it ionises slightly.

$$H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$$

The forward reaction is endothermic.

When the temperature of water is increased, which changes take place?

1 The water becomes acidic.

2 The water becomes alkaline.

3 More water molecules form ions.

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

23 Which salts could be prepared by precipitation?

1 barium sulfate

2 lead chloride

3 copper(II) chloride

4 zinc sulfate

A 1 and 2 **B** 3 and 4 **C** 1 and 3 **D** 2 and 4

24 Silver is below hydrogen in the reactivity series.

Which row describes the chemicals used and the method of separation used to prepare a pure sample of silver chloride?

	chemicals used	method of separation of product
A	silver and hydrochloric acid	crystallisation
B	silver and hydrochloric acid	filtration
C	silver nitrate and hydrochloric acid	crystallisation
D	silver nitrate and hydrochloric acid	filtration

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25 Ammonia is manufactured by the Haber process.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

The forward reaction is exothermic.

Which statement about the Haber process is correct?

A A low pressure is used to shift the position of the equilibrium to the right.

B A high temperature is used to shift the position of the equilibrium to the right.

C An iron catalyst is used to shift the position of the equilibrium to the right.

D The nitrogen used is obtained from the air.

26 The table contains some facts about sulfur dioxide and sulfuric acid and comments on these facts.

Which row is correct?

	fact	comment
A	In the manufacture of sulfuric acid, sulfur reacts with oxygen to make sulfur trioxide.	The equation for this reaction is $2S(s) + 3O_2(g) \rightleftharpoons 2SO_3(g)$.
B	Nickel is used as the catalyst in the Contact process.	Catalysts speed up a reaction by lowering the activation energy, E_a.
C	Sulfuric acid is used in car batteries.	This increases the efficiency of the petrol engine.
D	The use of low sulfur petrol is beneficial because it minimises the formation of acid rain.	Sulfur dioxide is acidic because it is the oxide of a non-metal.

27 An atom of which element has the same electronic configuration as an atom of an ion of strontium?

A calcium

B krypton

C rubidium

D selenium

28 Metals have high melting points.

What is the reason for this?

A Their atoms are joined by strong covalent bonds in a giant lattice.

B They have strong forces of attraction between negative ions and delocalised electrons.

C They have strong forces of attraction between negative ions and positive ions.

D They have strong forces of attraction between positive ions and delocalised electrons.

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29 What happens when a strip of silver is immersed in aqueous copper(II) sulfate?

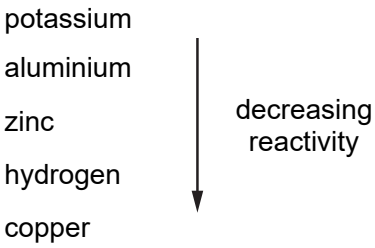
A Bubbles of gas will appear.

B No reaction occurs.

C Pink copper will be deposited on the silver strip.

D The silver strip will start to dissolve.

30 Four metals and hydrogen are arranged in order of decreasing reactivity.



Which statement about these elements is correct?

A Aluminium is formed when aluminium oxide is heated with hydrogen.

B Copper displaces zinc from aqueous zinc sulfate.

C Copper is formed when copper(II) oxide is heated with hydrogen.

D When added to water, aluminium forms positive ions more readily than potassium forms positive ions.

31 Aluminium is extracted from its ore using electrolysis.

Which statement about the electrodes used is correct?

A The anode is made of graphite.

B The anode is made of steel.

C The cathode is made of bauxite.

D The cathode is made of cryolite.

32 Gas X is present in dry air and may contribute to global warming.

What is X?

A carbon monoxide

B methane

C nitrogen oxide

D sulfur dioxide

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33 Four processes are used during the purification of water.

- use of carbon
- desalination
- chlorination
- filtration

The purposes, W, X, Y and Z, for these processes are listed.

W disinfection

X removal of solids

Y removal of dissolved salts

Z removal of tastes and odours

What is the purpose for each process?

	use of carbon	desalination	chlorination	filtration
A	Y	Z	W	X
B	Z	Y	W	X
C	Z	Y	X	W
D	Y	Z	X	W

34 Propane undergoes substitution reactions when mixed with chlorine gas in the presence of ultraviolet light.

Which compound could be formed when propane and chlorine are mixed in the presence of ultraviolet light?

A $CH_3CCl_2CH_3$

B CH_2ClCH_2Cl

C $CH_3CH_2CH_3Cl$

D $CH_3CHClCH_2CH_3$

35 The hydrocarbon CH_3CHCH_2 will undergo a number of chemical reactions.

In which reaction will the carbon to carbon single bond be broken?

A combustion with oxygen

B hydrogenation

C polymerisation

D reaction with steam

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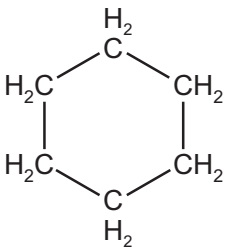
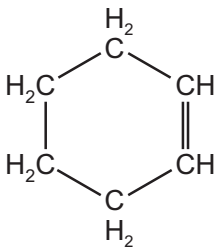
36 Hydrocarbon compounds can form rings of carbon atoms as well as chains.

The structures of two hydrocarbon rings are shown.

P



Q



Which of P and Q is unsaturated and which reacts with aqueous bromine?

	is unsaturated	reacts with aqueous bromine
A	P	P
B	P	Q
C	Q	P
D	Q	Q

37 A sample of aqueous glucose is fermented with yeast at 37 °C in the absence of air.

The main organic product, X, is purified by fractional distillation. X is then oxidised, by heating under reflux with acidified potassium manganate(VII), to give a final product Y.

What is the identity of Y?

A ethanoic acid

B ethene

C propanoic acid

D propene

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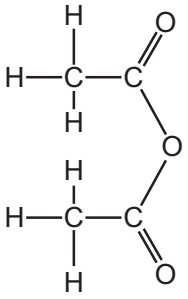
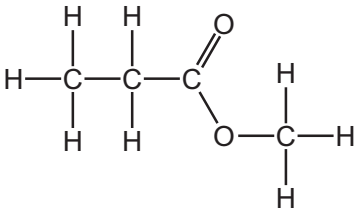
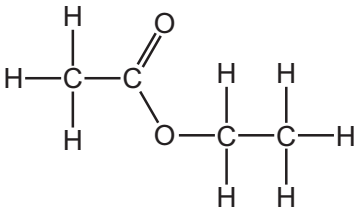
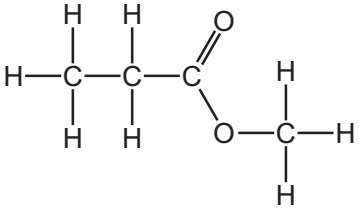
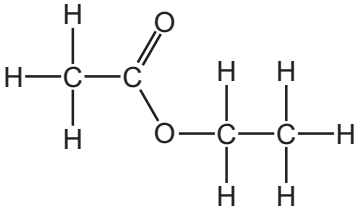
38 The diagram shows the structure of a compound called ethanoic anhydride.



1 mol of ethanoic anhydride reacts with water to form 2 mol of a carboxylic acid only. This carboxylic acid reacts with ethanol to form an ester.

How many moles of water react with 1 mol of the ethanoic anhydride and what is the structure of the ester?

	number of moles of water	structure of the ester
A	1	
B	1	
C	2	
D	2	

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39 Burning polymers can cause atmospheric pollution.

Which polymer, on burning, could produce nitrogen oxides?

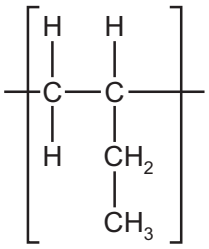
A nylon

B poly(ethene)

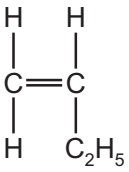
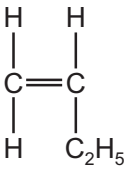
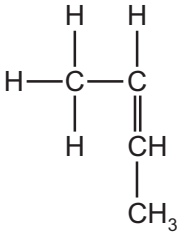
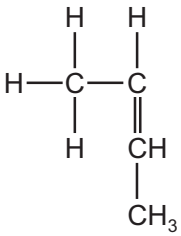
C starch

D *Terylene*

40 The diagram shows the repeat unit of a polymer.



Which row correctly identifies the monomer and type of polymerisation involved in making this polymer?

	monomer	type of polymerisation
A		addition
B		condensation
C		addition
D		condensation

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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.).

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