Cambridge O Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **May/June 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

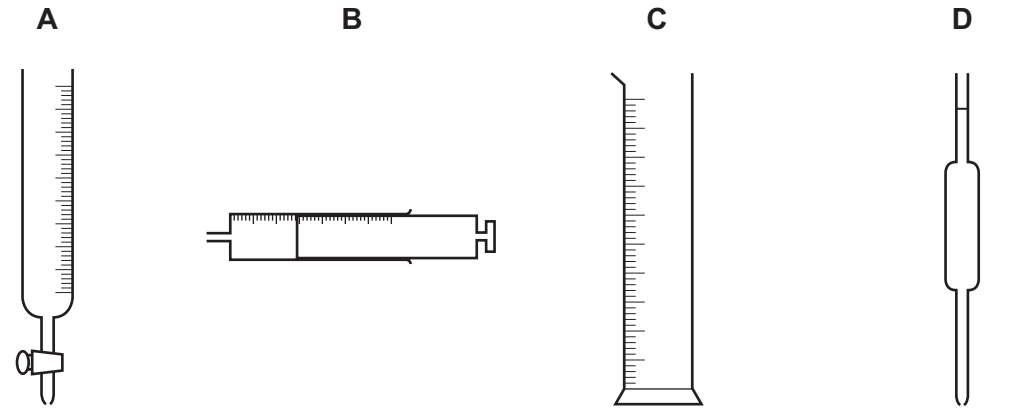
- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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

[Turn over

1 The diagram shows four pieces of apparatus that are used to measure the volume of a gas or liquid.

Which piece of apparatus should always be filled to the same level?



2 Copper(II) sulfate is prepared by reacting excess copper(II) carbonate with dilute sulfuric acid.

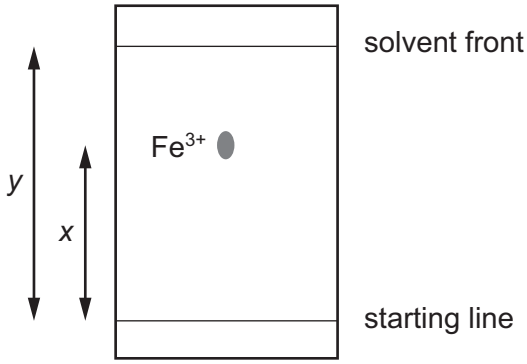
$$CuCO_3(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + CO_2(g) + H_2O(l)$$

Which two pieces of apparatus are needed to obtain copper(II) sulfate crystals by this reaction?

1 thermometer
2 evaporating basin
3 filter funnel
4 gas syringe

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

3 A paper chromatography experiment is carried out to find an R_f value for $Fe^{3+}(aq)$. The result is shown.



To make the spot containing $Fe^{3+}(aq)$ more visible, the paper is sprayed with aqueous sodium hydroxide so that a precipitate of iron(III) hydroxide forms.

Under the conditions of the experiment, the R_f of $Fe^{3+}(aq)$ is given by .....1..... and the colour of the precipitate is .....2..... .

Which row correctly completes gaps 1 and 2?

	gap 1	gap 2
A	$\frac{x}{y}$	red-brown
B	$\frac{x}{y}$	green
C	$\frac{y}{x}$	red-brown
D	$\frac{y}{x}$	green

4 Aluminium chloride is dissolved in water and the resulting solution is divided between three test-tubes.

Which row gives the reagents for three tests which could be used to confirm the presence of aluminium chloride?

	test-tube 1	test-tube 2	test-tube 3
A	aqueous sodium hydroxide	aqueous ammonia	dilute hydrochloric acid and aqueous silver nitrate
B	aqueous sodium hydroxide	dilute nitric acid and aqueous silver nitrate	dilute hydrochloric acid
C	aqueous ammonia	dilute nitric acid and aqueous silver nitrate	nitric acid and barium nitrate
D	aqueous sodium hydroxide	aqueous ammonia	dilute nitric acid and aqueous silver nitrate

[Turn over

5 Which statement about methods of purification and analysis is correct?

A A liquid that boils over a range of temperatures may still be 100% pure.

B An insoluble substance may be separated from water by crystallisation.

C Chromatography may only be used to separate coloured substances.

D Liquid air can be fractionally distilled, giving oxygen as one of the products.

6 Which changes in pressure and temperature would both result in a decrease in the volume of a fixed mass of gas?

A Decrease the pressure and decrease the temperature.

B Decrease the pressure and increase the temperature.

C Increase the pressure and decrease the temperature.

D Increase the pressure and increase the temperature.

7 Which definition of isotopes is correct?

A atoms of different elements which have the same number of electrons

B atoms of different elements which have the same number of neutrons

C atoms of the same element which have different numbers of electrons

D atoms of the same element which have different numbers of neutrons

8 Which ion has the most shells that contain electrons?

A Al^{3+} **B** Be^{2+} **C** N^{3-} **D** S^{2-}

9 Which substance conducts electricity both when solid and when molten?

A an alloy

B a hydrocarbon

C a metal oxide

D a salt

10 Which substance is an ionic compound?

A ammonia

B calcium chloride

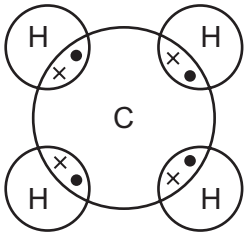
C ethanoic acid

D hydrogen chloride

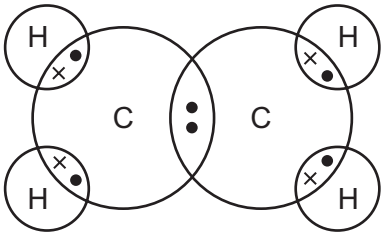
11 The dot-and-cross diagrams for four compounds are shown.

Which diagram is correct? (Note that only the outer shell electrons are shown.)

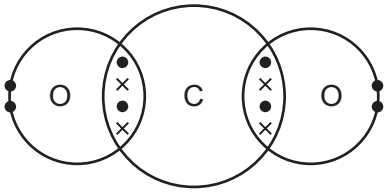
A



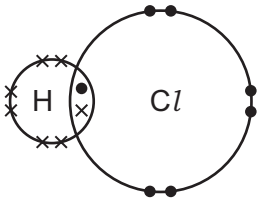
B



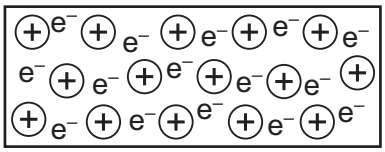
C



D



12 Element X has a lattice of positive ions and a 'sea of electrons'.



Which property will X have?

A It conducts electricity by the movement of ions and electrons.

B It has a high melting point.

C It is decomposed by an electric current.

D It is not malleable.

13 A chicken egg has a mass of 60 g. The egg shell is 10% of the total mass. The egg shell is made of calcium carbonate.

What is the mass of calcium in the egg shell?

A 0.24 g **B** 0.40 g **C** 2.4 g **D** 4.0 g

14 Ethanol can be made by the reaction shown.

$$C_2H_5Br + NaOH \rightarrow C_2H_5OH + NaBr$$

If 5.00 g of C_2H_5Br produces 1.59 g of ethanol, what is the **molar** percentage yield of ethanol?
[M_r: C_2H_5Br, 109; C_2H_5OH, 46]

A 13% **B** 32% **C** 42% **D** 75%

15 An aqueous solution contains 0.01 mol of $Zn^{2+}(aq)$ and 0.01 mol of $Cu^{2+}(aq)$.

Aqueous sodium hydroxide is added until in excess.

After shaking, the mixture is filtered.

What remains on the filter paper?

A 0.01 mol of a white hydroxide and 0.01 mol of a blue hydroxide

B 0.01 mol of a white hydroxide

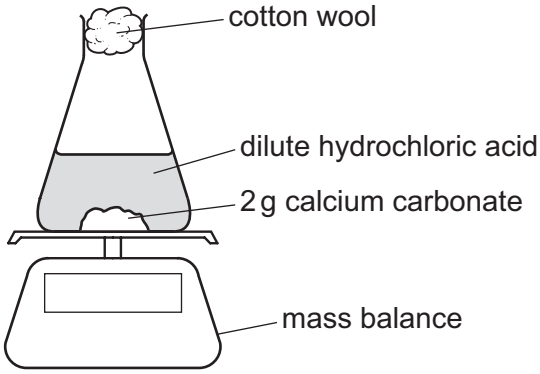
C 0.01 mol of a blue hydroxide

D no solid residue

16 Which arrangement is used to electroplate copper onto a steel key?

	electrolyte	anode (positive electrode)	cathode (negative electrode)
A	aqueous copper(II) sulfate	piece of pure copper	steel key
B	aqueous copper(II) sulfate	steel key	piece of pure copper
C	dilute sulfuric acid	piece of pure copper	steel key
D	dilute sulfuric acid	steel key	piece of pure copper

17 The rate of reaction between calcium carbonate and hydrochloric acid is measured in three separate experiments.

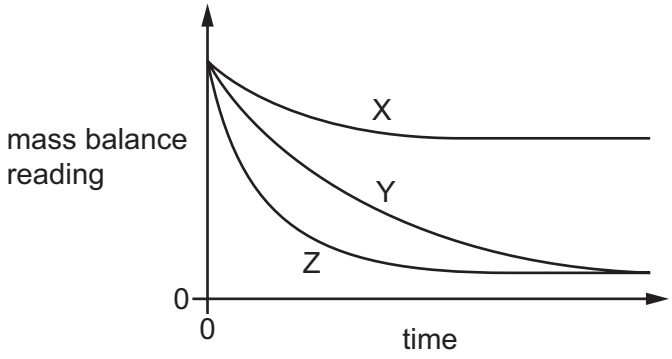


In experiment 1, the calcium carbonate is powdered and an excess of hydrochloric acid is used.

In experiment 2, the calcium carbonate is in lumps and an excess of hydrochloric acid is used.

In experiment 3, the calcium carbonate is in lumps but insufficient hydrochloric acid is used.

The results of these experiments are shown.



Which statement is correct?

A Experiment 1 is shown by curve X.

B Experiment 1 is shown by curve Y.

C Experiment 2 is shown by curve Y.

D Experiment 3 is shown by curve Z.

18 Pieces of zinc are added to aqueous copper(II) sulfate.

$$Cu^{2+}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Cu(s)$$

Which statement is correct?

A $Cu^{2+}(aq)$ is oxidised to Cu(s) by gaining electrons.

B $Cu^{2+}(aq)$ is reduced to Cu(s) by losing electrons.

C Zn(s) is oxidised to $Zn^{2+}(aq)$ by losing electrons.

D Zn(s) is reduced to $Zn^{2+}(aq)$ by gaining electrons.

19 The oxide of element X reacts with acids to form salts.

Which statement about element X or its oxide is correct?

A X conducts electricity.

B X is a non-metal.

C The oxide is a gas at room temperature and pressure.

D The oxide is covalent.

20 Nitrogenous fertilisers promote plant growth and crop yield.

Which compound contains the greatest mass of nitrogen in 100 g of fertiliser?

A KNO_3 **B** NH_4NO_3 **C** $(NH_4)_2SO_4$ **D** $(NH_4)_2HPO_4$

21 Which aqueous reagent liberates ammonia from ammonium nitrate on warming?

A calcium nitrate

B potassium hydroxide

C sodium chloride

D sulfuric acid

22 Which statement about sulfuric acid is correct?

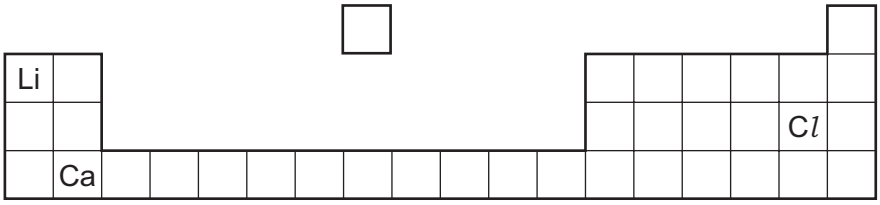
A It is manufactured by heating hydrogen, oxygen and sulfur together.

B It is used as a battery acid.

C It is used as a detergent.

D It is used to neutralise alkaline soils.

23 The diagram shows part of the Periodic Table.



Which element has the highest proton number and which element has the largest number of valence electrons?

	highest proton number	highest number of valence electrons
A	Ca	Ca
B	Ca	Cl
C	Li	Ca
D	Li	Cl

24 A lump of element X can be cut by a knife.

During its reaction with water, X floats and melts.

What is X?

A calcium

B copper

C magnesium

D potassium

25 Which statement about the properties of some elements is correct?

A All noble gases are unreactive due to having eight electrons in their outer shells.

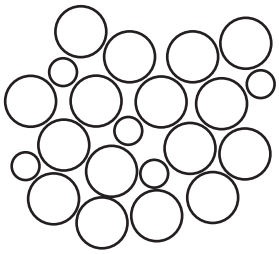
B The Group VII element astatine, At_2, is expected to be a black solid at room temperature.

C The reactivity of the elements in both Group I and Group VII increases down the group.

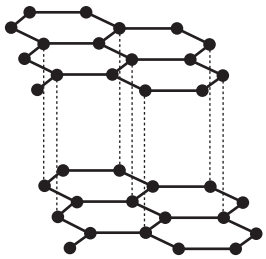
D When aqueous chlorine is added to aqueous potassium bromide there is no change in colour.

26 Which diagram shows the structure of an alloy?

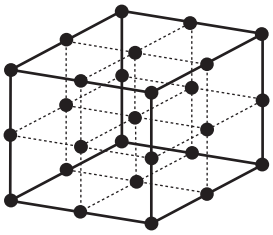
A



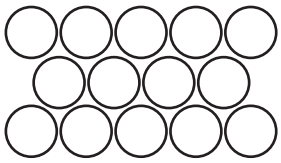
B



C



D



27 Which element can only be extracted from its ore using electrolysis?

A calcium

B copper

C lead

D silver

28 The equations show reactions taking place in the blast furnace.

In which reaction is an acidic impurity, present in iron ore, removed?

A $C + O_2 \rightarrow CO_2$

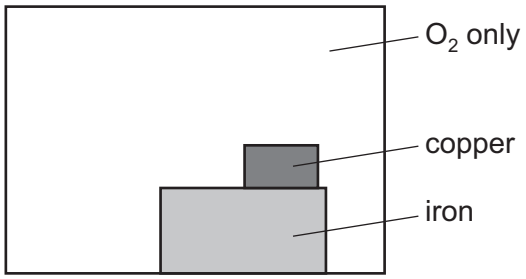
B $C + CO_2 \rightarrow 2CO$

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

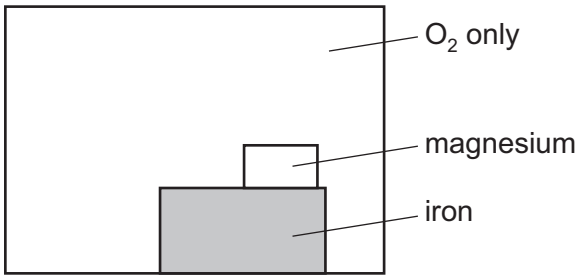
D $CaCO_3 + SiO_2 \rightarrow CaSiO_3 + CO_2$

29 Which diagram correctly shows the conditions necessary for the rusting of iron and also the metal that can be used to prevent rusting by sacrificial protection?

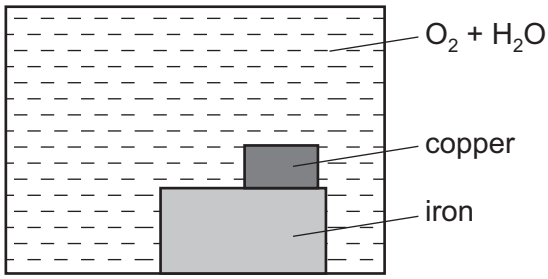
A



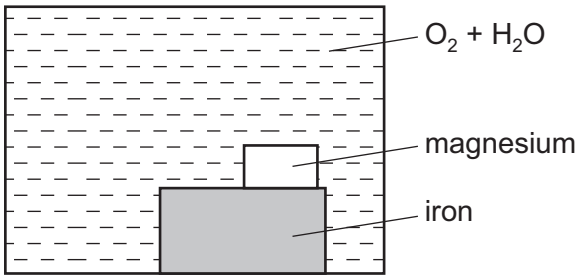
B



C



D



30 In the electrolysis of molten aluminium oxide, which statement is correct?

A The molar ratio of aluminium to oxygen gas formed is 1 : 2.

B The molar ratio of aluminium to oxygen gas formed is 3 : 4.

C Oxygen gas is formed at the anode.

D Reduction occurs at the anode.

31 Which row correctly compares carbon dioxide and methane?

	both contain carbon	both are described as a greenhouse gas	both lower the pH of water when they dissolve in it
A	✓	✗	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

32 Sea water is not safe to drink. It can be converted into drinkable water by desalination.

What does desalination involve?

A adding chlorine to kill bacteria

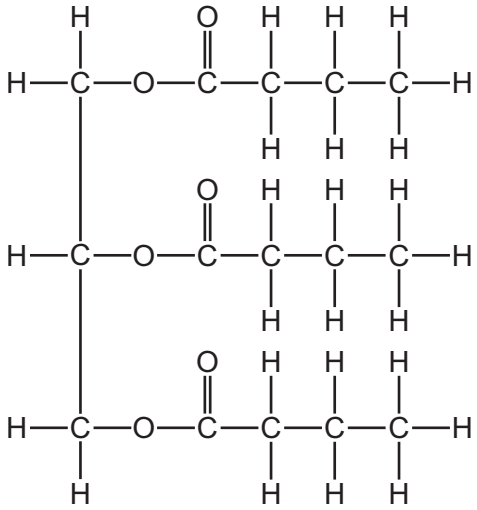
B boiling the water to sterilise it

C removing the salt by filtration

D separating the water by distillation

33 Fats are essential components of the human diet.

The diagram shows a fat molecule.



Which description of this fat molecule is correct?

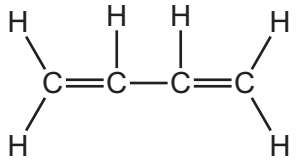
A saturated carboxylic acid

B saturated ester

C unsaturated carboxylic acid

D unsaturated ester

34 A molecule of the compound C_4H_6 is shown.



This molecule undergoes an addition reaction with excess bromine and an addition reaction with steam.

One molecule of C_4H_6 reacts with .....1..... of bromine.

When C_4H_6 reacts with steam, ...2..... is formed.

Which words complete gaps 1 and 2?

	1	2
A	one molecule	an alcohol
B	one molecule	a carboxylic acid
C	two molecules	an alcohol
D	two molecules	a carboxylic acid

35 The molecules of two hydrocarbon compounds X and Y each contain only four carbon atoms.

X is saturated and Y is unsaturated.

Which statements are correct?

1 Under suitable conditions Y polymerises.

2 The complete combustion of 1 mole of Y produces more carbon dioxide than the complete combustion of 1 mole of X.

3 One molecule of Y contains more hydrogen atoms than one molecule of X.

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

36 Which conversions involve oxidation?

1 ethanol → carbon dioxide + water

2 ethanol → ethanoic acid

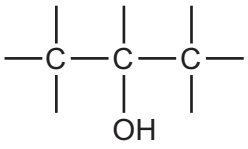
3 ethene → poly(ethene)

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

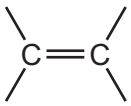
37 Compound T reacts with magnesium, aqueous sodium hydroxide and ethanol.

Which group does T contain?

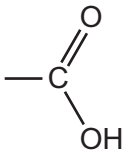
A



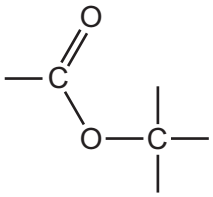
B



C



D



38 Which type of reaction could be used in the polymerisation of ethene?

A addition

B condensation

C cracking

D esterification

39 Insulin is a protein made in the human body.

Which statements about insulin are correct?

1 It is a condensation polymer.

2 It is a synthetic polymer.

3 When hydrolysed it produces only one monomer.

4 It contains amide linkages.

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

40 Which statement about polymers is correct?

A Nylon and *Terylene* are produced by addition polymerisation.

B Nylon and *Terylene* both contain the amide linkages.

C Simple sugars are produced by hydrolysing proteins.

D Starch contains the elements carbon, hydrogen and oxygen.

BLANK PAGE

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.).