Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/22**

Paper 2 Multiple Choice (Extended) **May/June 2025**

45 minutes

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.

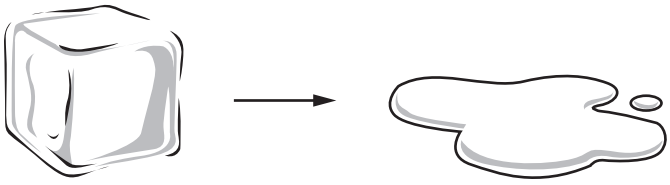
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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1 An ice cube melts.



What happens to the molecules of water in the ice cube?

A They evaporate.

B They dissolve.

C They gain energy.

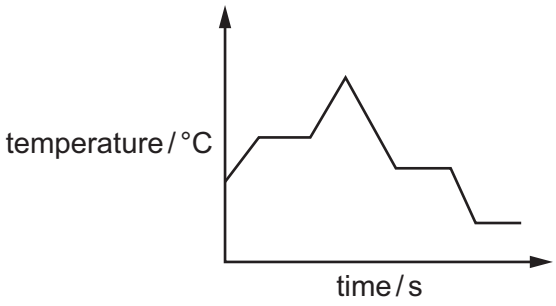
D They lose energy.

2 A sample of a liquid, X, is heated to a temperature above its boiling point.

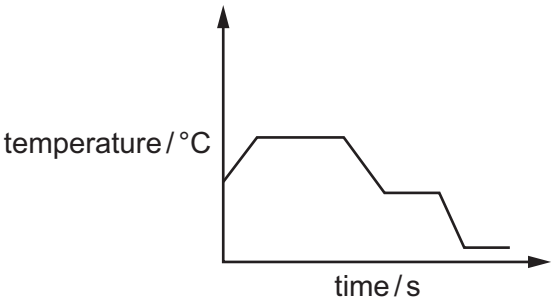
X is then cooled, so that it condenses and then freezes.

Which graph describes the change in temperature of X over time?

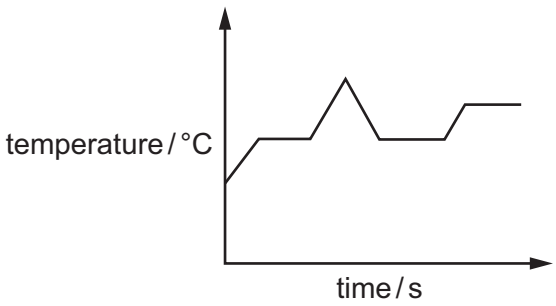
A



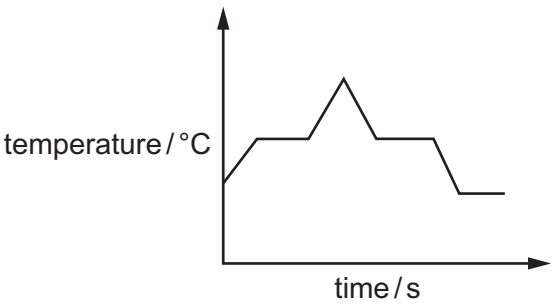
B



C



D



3 Which row gives the number of protons, electrons and neutrons in an atom of zinc?

	protons	electrons	neutrons
A	30	30	35
B	30	35	35
C	35	30	30
D	35	35	30

4 Which particles have the electronic configuration 2,8,8?

1 an argon atom, Ar

2 an aluminium ion, Al^{3+}

3 a sodium ion, Na^{+}

4 a chloride ion, Cl^{-}

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

5 A sample of element Q has two isotopes.

Their relative masses and abundances are shown.

relative mass of isotope	abundance / %
238	66
244	34

What is the relative atomic mass of this sample of Q to three significant figures?

A 240 **B** 241 **C** 242 **D** 243

6 Which statement about silicon(IV) oxide, SiO_2, is correct?

A It conducts electricity because it contains delocalised electrons.

B It has a giant covalent structure with each silicon atom bonded to four oxygen atoms.

C It is a simple covalent molecule.

D Its structure is similar to that of graphite.

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7 When 65 g of zinc reacts with 32 g of sulfur, 97 g of zinc sulfide is produced.

When 65 g of zinc reacts with 40 g of sulfur, the mass of zinc sulfide produced is still 97 g.

Which statement explains this observation?

A Some of the zinc sulfide evaporates.

B The reaction rate is slow.

C The reaction stops before it is complete.

D Zinc is the limiting reactant.

8 Aluminium reacts with iron(III) oxide to form aluminium oxide and iron.

Which chemical equation for the reaction between aluminium and iron(III) oxide is correct?

A $Al + FeO \rightarrow AlO + Fe$

B $2Al + Fe_2O \rightarrow Al_2O + 2Fe$

C $Al + Fe_2O_3 \rightarrow Al_2O_3 + Fe$

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

9 The concentration of a solution of aqueous sodium hydroxide is 0.50 mol / dm^3.

Which mass of sodium hydroxide is used to make 500 cm^3 of this solution?

A 10 g **B** 20 g **C** 40 g **D** 160 g

10 Molten zinc oxide is electrolysed using inert electrodes.

Which row identifies the product at each electrode?

	anode	cathode
A	zinc	oxygen
B	hydrogen	oxygen
C	oxygen	zinc
D	oxygen	hydrogen

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11 Dilute aqueous sodium chloride is electrolysed using platinum electrodes.

What is the half-equation for the reaction at the cathode?

A $2H^+ + 2e^- \rightarrow H_2$

B $Na^+ + e^- \rightarrow Na$

C $2Cl^- \rightarrow Cl_2 + 2e^-$

D $4OH^- \rightarrow 2H_2O + O_2 + 4e^-$

12 Hydrogen–oxygen fuel cells can be used to power vehicles.

Which statement about hydrogen–oxygen fuel cells is correct?

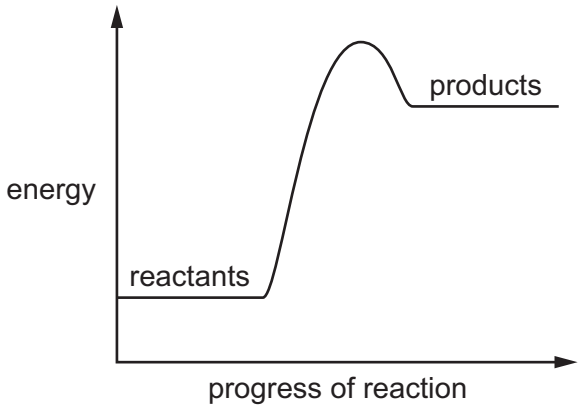
A The equation for the overall reaction is $H_2 + O_2 \rightarrow H_2O_2$.

B The only chemical products are water and carbon dioxide.

C Chemical energy in the fuel is converted into electrical energy.

D The hydrogen used in hydrogen–oxygen fuel cells is a fossil fuel.

13 A reaction pathway diagram is shown.



Which row identifies the type of reaction and how the temperature of the surroundings changes during the reaction?

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

14 The average bond energy for the C–H bond is 413 kJ / mol.

What is the enthalpy change when 1.0 mol of methane molecules is formed from carbon and hydrogen atoms?

A –1652 kJ **B** –413 kJ **C** +413 kJ **D** +1652 kJ

15 Which statement describes the effect of adding a catalyst to a chemical reaction?

A The activation energy, E_a, of the reaction is increased.

B The enthalpy change, ΔH, of the reaction stays unchanged.

C The frequency of collisions between the particles is decreased.

D The kinetic energy of the particles is increased.

16 Which row describes the conditions used in the manufacture of sulfuric acid by the Contact process?

	catalyst	pressure	temperature
A	iron	high	high
B	iron	low	low
C	vanadium(V) oxide	high	low
D	vanadium(V) oxide	low	high

17 Which equations show the underlined species acting as a reducing agent?

1 $\underline{Fe_2O_3} + 3CO \rightarrow 2Fe + 3CO_2$

2 $\underline{Fe} + CuSO_4 \rightarrow FeSO_4 + Cu$

3 $\underline{5Fe^{2+}} + MnO_4^- + 8H^+ \rightarrow 5Fe^{3+} + Mn^{2+} + 4H_2O$

4 $\underline{Fe(OH)_2} + H_2SO_4 \rightarrow FeSO_4 + 2H_2O$

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

18 A farmer incorrectly adds two substances to the soil at the same time.

They react together to form a gas which turns damp red litmus paper blue.

What are the two substances?

A a basic oxide and a potassium salt

B a basic oxide and an ammonium salt

C an acidic oxide and a potassium salt

D an acidic oxide and an ammonium salt

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19 Which row shows the equations for the dissociation of hydrochloric acid and of ethanoic acid in aqueous solution?

	hydrochloric acid	ethanoic acid
A	$HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$	$CH_3COOH(aq) \rightleftharpoons H^+(aq) + CH_3COO^-(aq)$
B	$HCl(aq) \rightleftharpoons H^+(aq) + Cl^-(aq)$	$CH_3COOH(aq) \rightleftharpoons H^+(aq) + CH_3COO^-(aq)$
C	$HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$	$CH_3COOH(aq) \rightarrow H^+(aq) + CH_3COO^-(aq)$
D	$HCl(aq) \rightleftharpoons H^+(aq) + Cl^-(aq)$	$CH_3COOH(aq) \rightarrow H^+(aq) + CH_3COO^-(aq)$

20 Which three oxides are **all** acidic?

A CaO, NO_2, SO_2

B CaO, CO_2, Na_2O

C CO_2, NO_2, SO_2

D CO_2, Na_2O, SO_2

21 The table shows some properties of noble gases.

noble gas	density in g / dm^3	boiling point in °C
helium	0.2	–269
neon	0.9	–246
argon	1.8	–186
krypton		
xenon	5.9	–108

Which row predicts the density and the boiling point of krypton?

	density in g / dm^3	boiling point in °C
A	1.4	–75
B	2.4	–195
C	3.8	–153
D	8.5	–213

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[Turn over

22 Sodium is a Group I metal.

What is a physical property of sodium?

A non-conductor of electricity

B high melting point

C high density

D malleable

23 Tennessine (atomic number 117) is a manufactured element that is below astatine in Group VII of the Periodic Table.

What is the expected state of tennessine at room temperature and pressure?

A a diatomic gas

B a liquid

C a monatomic gas

D a solid

24 When chlorine is bubbled into aqueous sodium bromide, a displacement reaction occurs.

Which description of this reaction is correct?

A Chloride displaces bromide.

B Chlorine displaces bromine.

C Chloride displaces bromine.

D Chlorine displaces bromide.

25 Brass is an alloy of copper.

Which statement about brass or copper is correct?

A Brass does **not** conduct electricity because it is a compound.

B Copper conducts electricity because its atoms are free to move.

C Brass is harder than copper because its layers of atoms **cannot** easily slide over each other.

D Copper is stronger than brass because it is a pure metal.

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26 The ionic equations for some reactions between metals and aqueous metal ions are shown.

$$Cu + 2Ag^{+} \rightarrow 2Ag + Cu^{2+}$$

$$Mg + Zn^{2+} \rightarrow Mg^{2+} + Zn$$

$$Zn + Cu^{2+} \rightarrow Cu + Zn^{2+}$$

$$Sn + Cu^{2+} \rightarrow Sn^{2+} + Cu$$

Which further information can be used to place copper, magnesium, silver, tin and zinc in order of their reactivity?

A Zinc reacts with Sn^{2+} ions.

B Copper does **not** react with Sn^{2+} ions.

C Magnesium reacts with Cu^{2+} ions.

D Magnesium reacts with Ag^{+} ions.

27 Zinc is used to galvanise iron to prevent it from rusting.

Which statements are correct?

1 Galvanising is an example of a barrier method.

2 If the zinc is scratched, the iron will rust very quickly.

3 Galvanising is an example of sacrificial protection.

4 Zinc is more reactive than iron and so accepts electrons more readily.

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

28 Which equation represents a reaction that occurs in a blast furnace during the extraction of iron from hematite?

A $Ca + CO_2 \rightarrow CaO + CO$

B $Fe_2O_3 + 3Ca \rightarrow 2Fe + 3CaO$

C $Ca(OH)_2 \rightarrow CaO + H_2O$

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

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29 Water is added separately to anhydrous copper(II) sulfate and to anhydrous cobalt(II) chloride.

Which row shows the colour changes?

	anhydrous copper(II) sulfate	anhydrous cobalt(II) chloride
A	blue to white	blue to pink
B	blue to white	pink to blue
C	white to blue	blue to pink
D	white to blue	pink to blue

30 Gases which cause acid rain form in car engines.

These gases can be removed using a catalytic converter.

Which equation represents the removal of one of these gases using a catalytic converter?

A $CO_2 + C \rightarrow 2CO$

B $2CO + 2NO \rightarrow 2CO_2 + N_2$

C $N_2 + 2O_2 \rightarrow 2NO_2$

D $2NO + O_2 \rightarrow 2NO_2$

31 Which statements about carbon dioxide are correct?

1 Carbon dioxide absorbs thermal energy from the Earth.

2 Carbon dioxide increases the thermal energy loss to space.

3 The level of carbon dioxide in the atmosphere has increased due to the burning of fossil fuels.

4 Carbon dioxide is the only gas that causes global warming.

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

32 What is the structural formula of butan-2-ol?

A $CH_3CH_2CH_2OH$

B $CH_3CH(OH)CH_3$

C $CH_3CH_2CH_2CH_2OH$

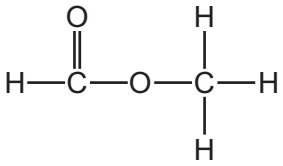
D $CH_3CH_2CH(OH)CH_3$

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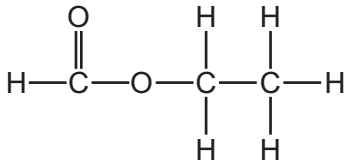
33 Methanol reacts with ethanoic acid to form an ester.

What is the displayed formula for this ester?

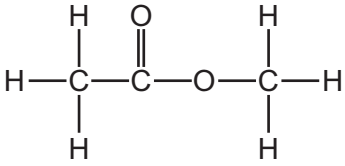
A



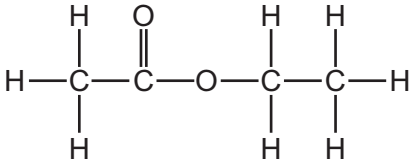
B



C



D



34 Petroleum can be separated into useful fractions by fractional distillation.

Which row shows a correct use of the named fraction?

	fraction	use
A	bitumen	lubricant
B	naphtha	fuel for home heating
C	kerosene	jet fuel
D	refinery gas	making chemicals

35 Ethane reacts with chlorine in the presence of ultraviolet light.

Which products are formed?

A $Cl CH_2CH_2Cl$ and H_2

B $2CH_3Cl$ and H_2

C C_2H_5Cl and HCl

D $CH_2{=}CH_2$ and $2HCl$

36 Ethanol can be made by the fermentation of aqueous glucose and by the catalytic addition of steam to ethene.

What are two advantages of making ethanol by the catalytic addition of steam to ethene rather than by the fermentation of aqueous glucose?

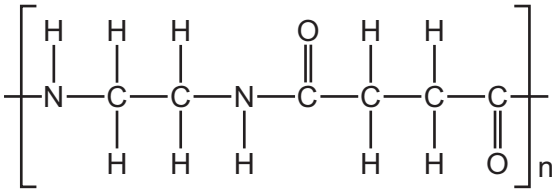
A faster reaction and renewable raw materials

B purer product and faster reaction

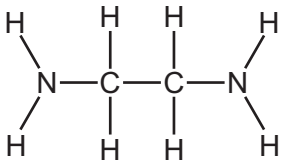
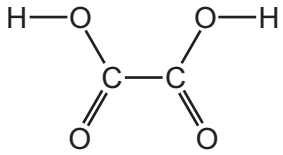
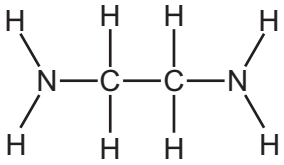
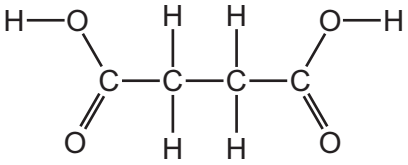
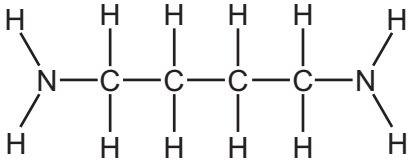
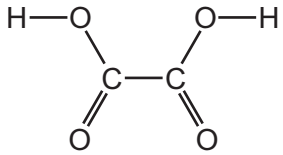
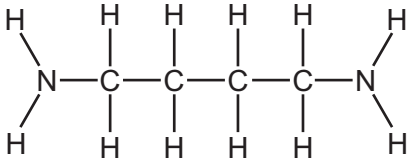
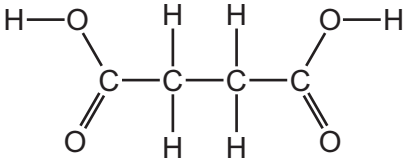
C renewable raw materials and continuous process

D uses more energy and forms a purer product

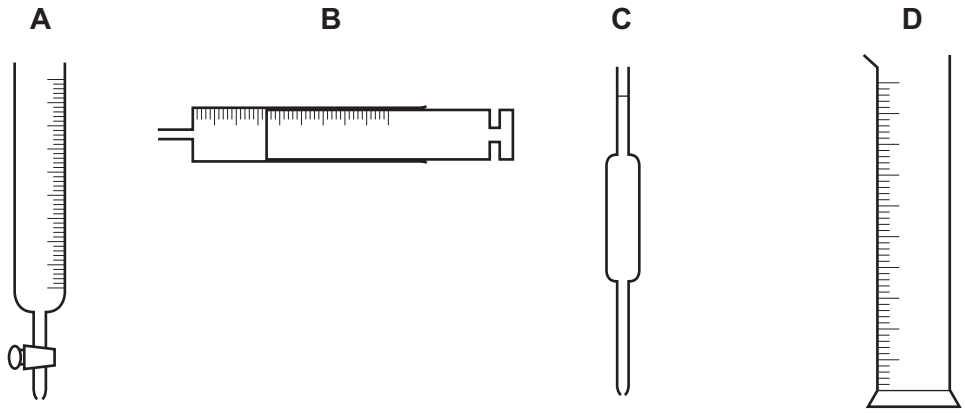
37 The structure of a polymer repeat unit is shown.



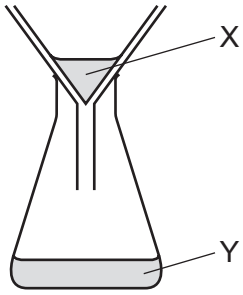
Which pair of monomers is used to make this polymer?

	monomer 1	monomer 2
A		
B		
C		
D		

38 Which item of apparatus is used to measure exactly 26.3 cm^3 of a liquid?



39 A mixture containing an aqueous salt and an insoluble salt is filtered.



Which row describes X and Y?

	X	Y
A	solute	pure water
B	solute	filtrate
C	residue	pure water
D	residue	filtrate

40 Pure ethanol has a melting point of –114 °C and a boiling point of 78 °C.

What are the melting and boiling points of a sample of ethanol with glucose dissolved in it?

	melting point / °C	boiling point / °C
A	–116	77
B	–116	79
C	–112	77
D	–112	79

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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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).