



Cambridge O Level

CHEMISTRY

5070/11

Paper 1 Multiple Choice

October/November 2022

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.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

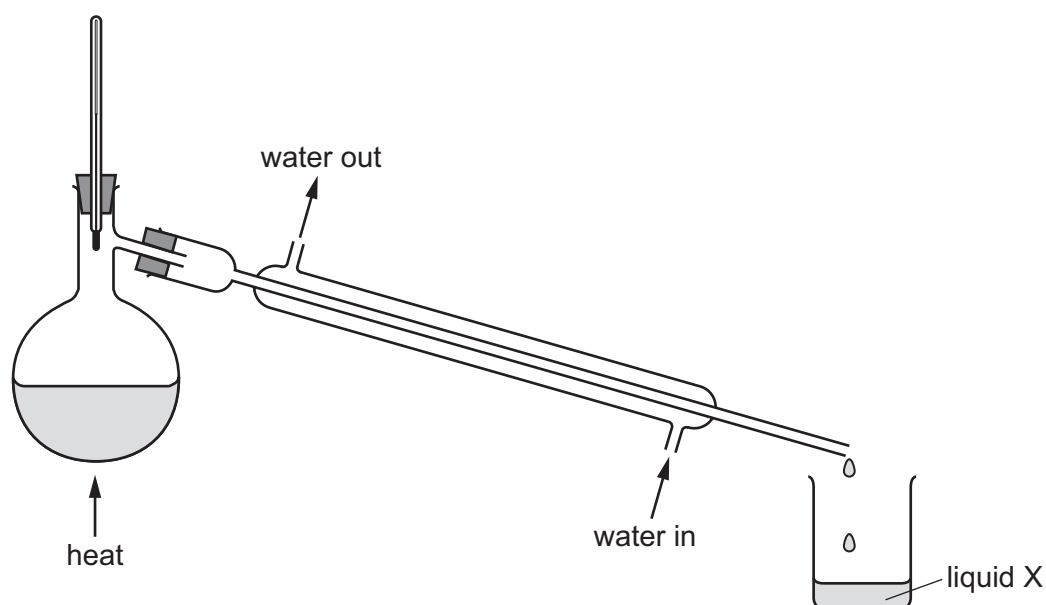
This document has **16** pages. Any blank pages are indicated.



1 Which row shows the most appropriate apparatus for the measurement given?

	quantity	apparatus
A	25.0 cm ³ of solution	measuring cylinder
B	32.7 cm ³ of solution	pipette
C	75 cm ³ of gas	gas syringe
D	80 cm ³ of solution	burette

2 A liquid, X, is distilled from a mixture using the apparatus shown.



During the distillation, the thermometer reads from 157 °C to 160 °C.

Which information about liquid X is correct?

- A** The liquids in X may or may not be miscible (mix with each other).
- B** X is a mixture that can be separated by distillation.
- C** X must contain two liquids with boiling points 157 °C and 160 °C.
- D** X must have been obtained by the fractional distillation of petroleum (crude oil).

- 3 An aqueous solution contains a salt, Y.

Addition of an aqueous solution X results in a precipitate being formed that redissolves when more X is added.

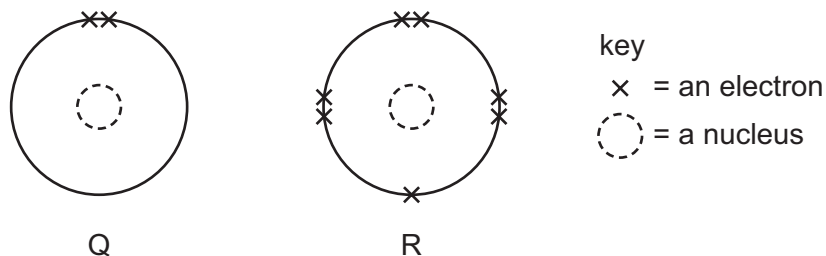
What could solution X and salt Y be?

	solution X	salt Y
A	HCl(aq)	AgNO ₃
B	H ₂ SO ₄ (aq)	Ba(NO ₃) ₂
C	NaOH(aq)	CuSO ₄
D	NaOH(aq)	ZnSO ₄

- 4 Which gas diffuses the fastest at the same pressure?

- A** nitrogen at 25 °C
B nitrogen at 50 °C
C oxygen at 25 °C
D oxygen at 50 °C

- 5 The diagram shows the outer shell electrons of the atoms of two elements, Q and R.



The sulfate of Q is insoluble.

Element R is gaseous at room temperature and pressure.

Which row could be correct?

	proton number of Q	relative atomic mass of R
A	12	35.5
B	12	80
C	56	80
D	56	35.5

6 Which statement about iodine atoms and iodide ions is correct?

- A They are both isotopes of iodine.
- B They undergo the same chemical reactions.
- C They have the same number of protons.
- D They have the same physical properties.

7 The element chlorine has two isotopes, $^{35}_{17}\text{Cl}$ and $^{37}_{17}\text{Cl}$.

In the Periodic Table, chlorine is shown as $^{35.5}_{17}\text{Cl}$.

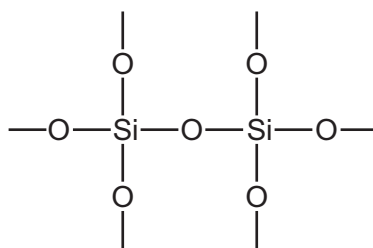
Which row shows the correct percentage of each isotope in a sample of naturally occurring chlorine?

	percentage of $^{35}_{17}\text{Cl}$	percentage of $^{37}_{17}\text{Cl}$
A	25	75
B	40	60
C	50	50
D	75	25

8 What is the nucleon number of the isotope of uranium, $^{235}_{92}\text{U}$?

- A 92 B 143 C 235 D 327

9 Silicon dioxide has a giant structure. Each silicon atom is joined to four oxygen atoms by covalent bonds. Part of the structure is shown.



Which property would silicon dioxide be expected to have?

- A a good conductor of electricity
- B a high melting point
- C reacts with hydrochloric acid
- D soluble in water

- 10 Elements X and Y react to form compound XY. Element Y has more electrons in its outer shell than element X. Compound XY conducts electricity in the molten state.

Which row correctly states the electron change that occurs during the reaction and the type of bonding in compound XY?

	electron change during formation of compound XY	type of bonding in compound XY
A	X donates electrons to Y	ionic
B	X shares electrons with Y	covalent
C	Y donates electrons to X	covalent
D	Y shares electrons with X	ionic

- 11 Which compound has the most single bonds in one molecule?

A CH_3CH_3 **B** $\text{CH}_3\text{CH}_2\text{OH}$ **C** $\text{CH}_3\text{CO}_2\text{H}$ **D** CH_3CHCH_2

- 12 The formula of ammonium metavanadate is NH_4VO_3 . It consists of NH_4 ions and VO_3 ions.

What are the charges on these ions?

	NH_4 ion	VO_3 ion
A	1+	1–
B	2+	2–
C	3+	4–
D	4+	3–

- 13 Which mass of oxygen gas combines with exactly 16 g of sulfur to form sulfur dioxide, SO_2 ?

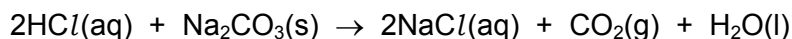
A 4 g **B** 8 g **C** 16 g **D** 32 g

- 14 The atomic number of ruthenium is 44. One of the oxides of ruthenium is a black solid, X. 5.79 g of X contains 1.39 g of oxygen.

What is the empirical formula of X?

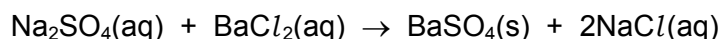
A Ru_2O **B** RuO **C** RuO_2 **D** RuO_4

- 15 250 cm³ of 1.0 mol/dm³ hydrochloric acid reacts with an excess of solid sodium carbonate. The equation is shown.



What is the volume of carbon dioxide produced when measured at room temperature and pressure?

- A 3.0 dm³ B 6.0 dm³ C 12 dm³ D 24 dm³
- 16 When excess aqueous barium chloride is added to 25.0 cm³ of 1.00 mol/dm³ sodium sulfate, a white precipitate of barium sulfate is formed.



The precipitate is filtered off, washed, dried and weighed. 5.36 g barium sulfate is obtained.

What is the percentage yield of barium sulfate?

[*M_r*: Na₂SO₄, 142; BaCl₂, 208; BaSO₄, 233; NaCl, 58.5]

- A 2.3% B 27% C 92% D 97%
- 17 Aqueous copper(II) sulfate is electrolysed using inert electrodes.
- Which statement is correct?
- A Copper is collected at the anode.
B Hydrogen is collected at the cathode.
C Oxygen is collected at the anode.
D Sulfur is collected at the cathode.
- 18 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

Which equation shows the reaction that occurs at the anode?

- A $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
B $2\text{Cl}^- + 2\text{e}^- \rightarrow \text{Cl}_2$
C $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
D $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$

- 19 Which pair of equations correctly represents the reactions taking place at the anode and at the cathode during the electrolysis of molten silver bromide?

	anode	cathode
A	$2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$	$\text{Ag}^{2+} + 2\text{e}^- \rightarrow \text{Ag}$
B	$\text{Br}^{2-} \rightarrow \text{Br}_2 + 2\text{e}^-$	$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$
C	$2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$	$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$
D	$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$	$2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$

- 20 Which two processes are both endothermic?

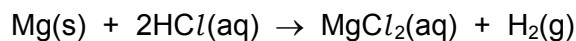
- A** combustion and cracking
- B** combustion and fermentation
- C** cracking and photosynthesis
- D** respiration and photosynthesis

- 21 A sample of sulfuric acid is added to 10 g of zinc granules. A reaction occurs and a gas is produced. The rate of the reaction is increased if a small amount of copper is added. The copper is unchanged after the reaction.

Which statement about this reaction is correct?

- A** Copper acts as a biological catalyst in this reaction.
- B** Copper lowers the activation energy of this reaction.
- C** The rate of the reaction is greater as the particle size of the zinc is greater.
- D** The rate of the reaction is greater if the pressure is increased.

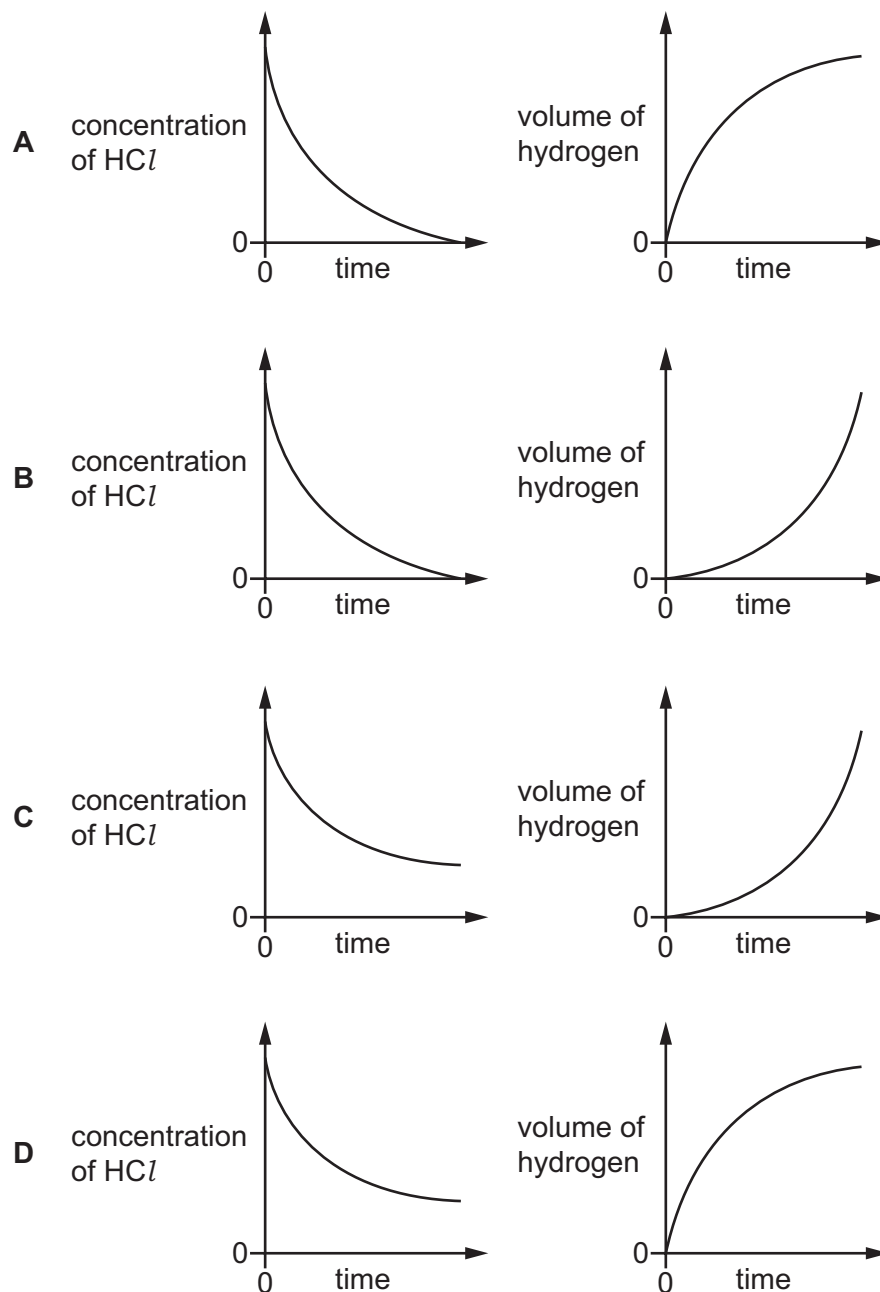
- 22 The rate of reaction between magnesium and dilute hydrochloric acid is investigated. The equation is shown.



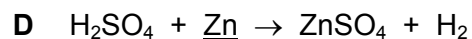
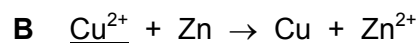
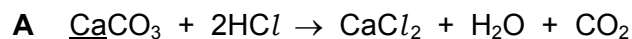
A known mass of magnesium is added to an excess of dilute hydrochloric acid.

The concentration of the hydrochloric acid and the volume of hydrogen produced is measured at regular time intervals.

Which pair of graphs correctly shows the experimental results?



23 In which reaction is the underlined substance reduced?



24 Which change involves reduction?

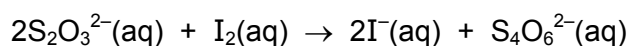
A calcium carbonate to calcium oxide

B copper to brass

C ethene to poly(ethene)

D sand to silicon

25 Thiosulfate ions, $\text{S}_2\text{O}_3^{2-}$, react with iodine, I_2 , in aqueous solution.

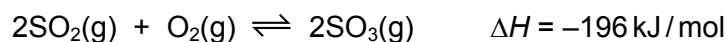


In this reaction, the $\text{S}_2\text{O}_3^{2-}$ ions1..... electrons and are2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	gain	oxidised
B	gain	reduced
C	lose	oxidised
D	lose	reduced

26 The equation shows a reaction in the Contact process.



Which change would move the position of equilibrium to the left?

A adding more O_2

B increasing the pressure

C increasing the temperature

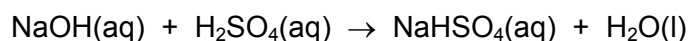
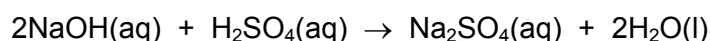
D removing SO_3 from the reacting mixture

- 27** Some medicines contain the magnesium salt of a fatty acid. The fatty acids are members of the homologous series of carboxylic acids and contain one carboxylic acid group.

What is the carboxylic acid functional group and how many moles of a fatty acid react with one mole of magnesium?

	functional group	moles of fatty acid
A	$-\text{CO}_2\text{H}$	1
B	$-\text{CO}_2\text{H}$	2
C	$-\text{CH}_2\text{OH}$	1
D	$-\text{CH}_2\text{OH}$	2

- 28** Sodium sulfate, Na_2SO_4 , and sodium hydrogensulfate, NaHSO_4 , can both be prepared using aqueous sodium hydroxide and sulfuric acid.



50 cm³ of 1 mol/dm³ sodium hydroxide is used each time.

Which row shows the correct volumes of 1 mol/dm³ sulfuric acid required to prepare a sample of sodium sulfate and a sample of sodium hydrogensulfate?

	volume of sulfuric acid required to make sodium sulfate / cm ³	volume of sulfuric acid required to make sodium hydrogensulfate / cm ³
A	25	50
B	25	12.5
C	50	12.5
D	50	25

- 29** Which substance reacts with dilute sulfuric acid in the preparation of a pure sample of lead(II) sulfate?

- A** aqueous lead(II) nitrate
- B** lead foil
- C** powdered lead(II) carbonate
- D** powdered lead(II) oxide

30 Which statement about sulfuric acid is correct?

- A In the manufacture of sulfuric acid, iron is used as the catalyst in the Contact process.
- B Sulfuric acid is used in some batteries.
- C Sulfuric acid is used as a fertiliser.
- D Sulfuric acid is used as a food preservative.

31 Two statements are given.

- statement 1 Going down Group I and Group VII, the melting point of the elements increases.
- statement 2 Chlorine can displace iodine from aqueous potassium iodide but cannot displace bromine from aqueous potassium bromide.

Which statements are correct?

- A both statement 1 and statement 2
- B statement 1 only
- C statement 2 only
- D neither statement 1 nor statement 2

32 A reversible reaction involves a solid reacting with hydrogen.

Which of the metals, aluminium and iron, would catalyse the reaction and what is their effect on the position of equilibrium?

	act as a catalyst	position of equilibrium
A	both aluminium and iron	moves to the right
B	both aluminium and iron	no change
C	iron only	moves to the right
D	iron only	no change

33 Iron is obtained in the blast furnace from the ore haematite.

Which statement is correct?

- A Calcium carbonate is used to remove acidic impurities.
- B Coke is reduced to carbon dioxide.
- C Haematite is oxidised by carbon monoxide.
- D Haematite undergoes thermal decomposition.

34 Three statements about the carbon cycle are given.

- 1 The carbon cycle regulates the amount of carbon dioxide in the atmosphere.
- 2 During photosynthesis, carbon dioxide is produced.
- 3 Combustion of hydrocarbons requires oxygen.

Which statements are correct?

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

35 Carbon is used in the purification of the water supply.

What is the reason for this?

- A** to remove mud and other insoluble solids
B to remove nitrates caused by the excessive use of fertiliser
C to remove tastes and odours
D to sterilise the water by removing harmful bacteria

36 Octane is an alkane with eight carbon atoms per molecule.

What is the molecular formula of octane, and how does its boiling point compare with that of butane?

	molecular formula of octane	boiling point of octane
A	C_8H_{16}	higher than butane
B	C_8H_{16}	lower than butane
C	C_8H_{18}	lower than butane
D	C_8H_{18}	higher than butane

37 Which equation for the reaction between propane and chlorine is correct?

- A** $C_3H_6 + Cl_2 \rightarrow C_3H_6Cl_2$
B $C_3H_8 + Cl_2 \rightarrow C_3H_6Cl_2 + H_2$
C $C_3H_8 + Cl_2 \rightarrow CH_3Cl + C_2H_5Cl$
D $C_3H_8 + Cl_2 \rightarrow C_3H_7Cl + HCl$

- 38** Propanoic acid reacts with calcium carbonate. The products of this reaction are calcium propanoate, carbon dioxide and water.

What is the equation for this reaction?

- A** $2\text{C}_2\text{H}_5\text{COOH} + \text{Ca}_2\text{CO}_3 \rightarrow 2\text{C}_2\text{H}_5\text{COOCa} + \text{CO}_2 + \text{H}_2\text{O}$
- B** $2\text{C}_2\text{H}_5\text{COOH} + \text{CaCO}_3 \rightarrow (\text{C}_2\text{H}_5\text{COO})_2\text{Ca} + \text{CO}_2 + \text{H}_2\text{O}$
- C** $2\text{C}_3\text{H}_7\text{COOH} + \text{Ca}_2\text{CO}_3 \rightarrow 2\text{C}_3\text{H}_7\text{COOCa} + \text{CO}_2 + \text{H}_2\text{O}$
- D** $2\text{C}_3\text{H}_7\text{COOH} + \text{CaCO}_3 \rightarrow (\text{C}_3\text{H}_7\text{COO})_2\text{Ca} + \text{CO}_2 + \text{H}_2\text{O}$

- 39** The monomer, $\text{CH}_3\text{CH}=\text{CHCH}_3$, can be used to make an addition polymer.

This addition polymer has a chain of carbon atoms joined to each other by C–C single bonds.

Each of these carbon atoms is also bonded to at least one other atom or group of atoms. These are called side groups.

Which statement describes the carbon atoms in the polymer chain made from $\text{CH}_3\text{CH}=\text{CHCH}_3$?

- A** Every carbon atom in the chain has one $-\text{CH}_3$ and one hydrogen atom as side groups.
- B** Every carbon atom in the chain is joined to a $\text{CH}_3-\text{CH}-$ side group.
- C** Every carbon atom in the chain is joined to either two $-\text{CH}_3$ or to two hydrogen atoms as side groups.
- D** Every carbon atom in the chain is joined to hydrogen atoms only as side groups.

40 Which row correctly shows the structure of a polymer and the monomers from which it is made?

	monomers	polymer
A	$\text{HO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{[]}-\text{NH}_2$	$-\overset{\text{O}}{\parallel}{\text{C}}-\text{[]}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}-\text{[]}-\text{NH}-$
B	$\begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C} & =\text{C} & -\text{C}-\text{H} \\ & & \\ & & \text{H} \end{array}$	$\begin{array}{c} \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\ & & & & & & \\ -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & - \\ & & & & & & \\ \text{H} & & \text{H} & \text{H} & & \text{H} & \end{array}$
C	$\begin{array}{c} \text{HO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{[]}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} \\ \text{H}_2\text{N}-\text{[]}-\text{NH}_2 \end{array}$	$-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{[]}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{NH}-\text{[]}-\text{NH}-$
D	$\begin{array}{c} \text{HO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{[]}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} \\ \text{HO}-\text{[]}-\text{OH} \end{array}$	$-\overset{\text{O}}{\parallel}{\text{C}}-\text{[]}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{[]}-\text{O}-$

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The Periodic Table of Elements

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	euporium	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
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	femium	—	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.).