



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY

5070/11

Paper 1 Multiple Choice

May/June 2011

1 hour

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



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, 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.

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.

This document consists of **13** printed pages and **3** blank pages.



- 1 Copper(II) sulfate crystals are separated from sand using the four processes listed below.

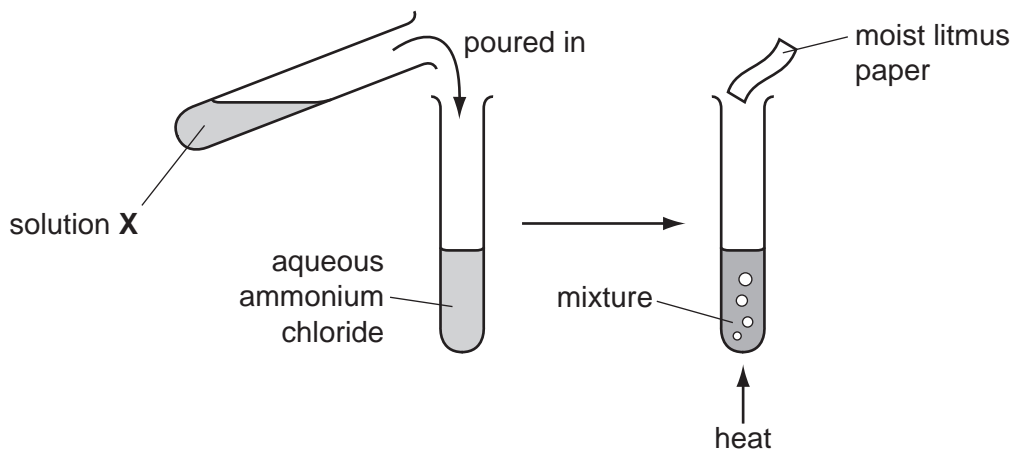
In which order are these processes used?

	1st	2nd	3rd	4th
A	filtering	dissolving	crystallising	evaporating
B	filtering	dissolving	evaporating	crystallising
C	dissolving	evaporating	filtering	crystallising
D	dissolving	filtering	evaporating	crystallising

- 2 A drop of liquid bromine is placed in the bottom of a gas jar. Brown fumes of bromine vapour slowly spread through the covered gas jar.

Why does this happen?

- A** Bromine vapour is less dense than air.
B Bromine molecules and the molecules in air are always moving around.
C Bromine molecules are smaller than the molecules in air.
D Bromine molecules move faster than the molecules in air.
- 3 The diagrams show an experiment with aqueous ammonium chloride.



A gas, **Y**, is produced and the litmus paper changes colour.

What are solution **X** and gas **Y**?

	solution X	gas Y
A	aqueous sodium hydroxide	ammonia
B	aqueous sodium hydroxide	chlorine
C	dilute sulfuric acid	ammonia
D	dilute sulfuric acid	chlorine

- 4 What is the mass of oxygen contained in 72 g of pure water?
[Relative atomic masses: H = 1; O = 16]
- A 16g B 32g C 64g D 70g
- 5 A student tested a solution by adding aqueous sodium hydroxide. A precipitate was not seen because the reagent was added too quickly.
- What could **not** have been present in the solution?
- A Al^{3+} B Ca^{2+} C NH_4^+ D Zn^{2+}
- 6 Which molecule has the **largest** number of electrons involved in covalent bonds?
- A C_2H_4 B CO_2 C CH_3OH D N_2
- 7 In which of the following is there a lattice of positive ions in a 'sea of electrons'?
- A liquid potassium chloride
B sand
C solid graphite
D solid magnesium
- 8 Which statement about both chlorine atoms and chloride ions is correct?
- A They are chemically identical.
B They are isotopes of chlorine.
C They have the same number of protons.
D They have the same physical properties.
- 9 Element X has the electronic structure 2,8,5. Element Y has the electronic structure 2,8,7.
- What is the likely formula of a compound containing only X and Y?
- A XY_3 B X_2Y_3 C X_3Y D X_3Y_2
- 10 A covalent bond is formed by
- A electron sharing between metals and non-metals.
B electron sharing between non-metals.
C electron transfer between non-metals.
D electron transfer from metals to non-metals.

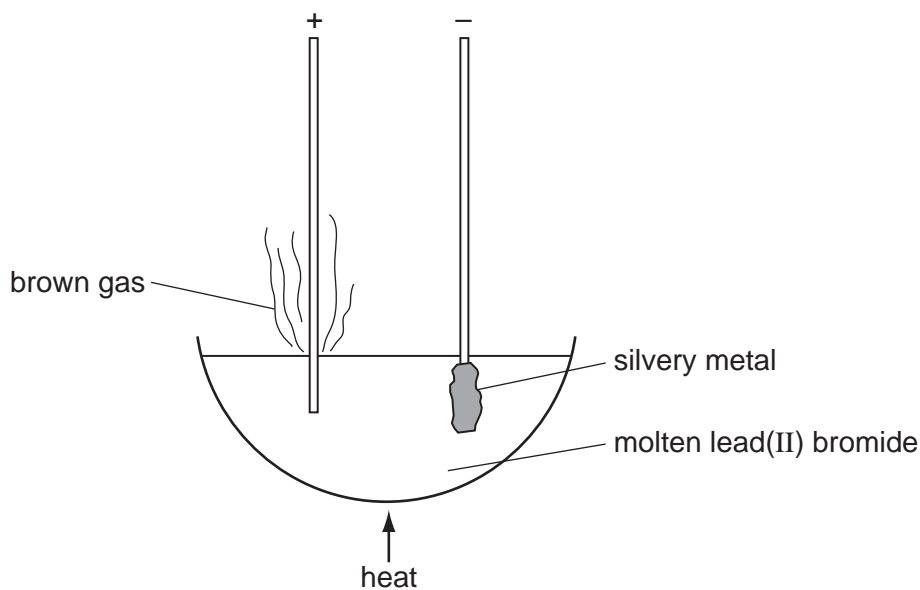
- 11 The equation for the reaction between calcium carbonate and hydrochloric acid is shown.



How many moles of calcium carbonate will give 24 cm³ of carbon dioxide when reacted with an excess of the acid?

(Assume one mole of carbon dioxide occupies 24 dm³.)

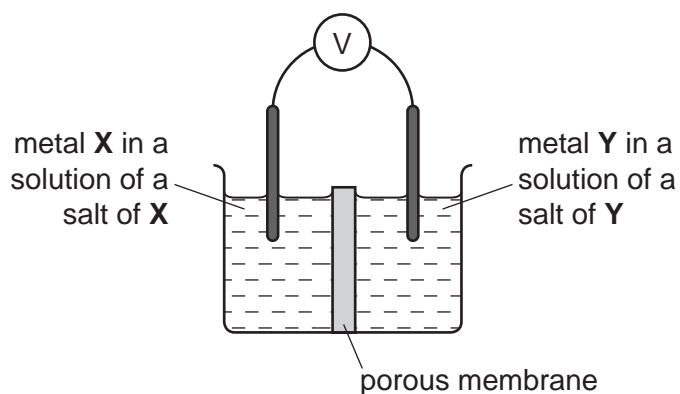
- A** 1 mol **B** 0.1 mol **C** 0.01 mol **D** 0.001 mol
- 12 The empirical formula of a liquid compound is C₂H₄O.
- To find the empirical formula, it is necessary to know the
- A** density of the compound.
B percentage composition of the compound.
C relative molecular mass of the compound.
D volume occupied by 1 mole of the compound.
- 13 The diagram shows the electrolysis of molten lead(II) bromide using inert electrodes.



What happens during this electrolysis?

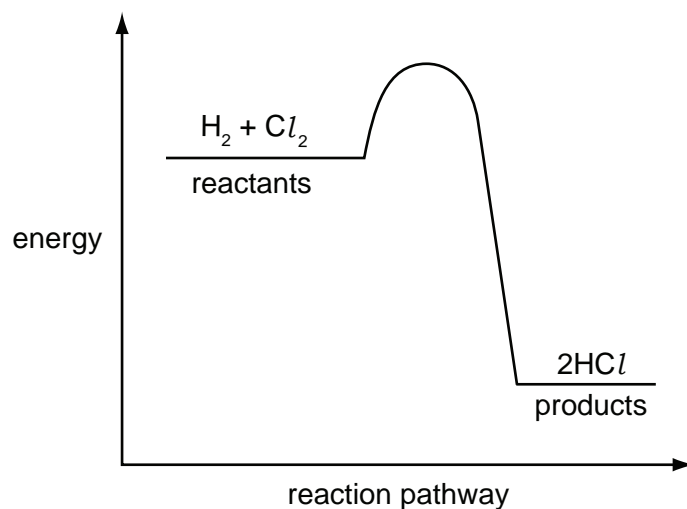
- A** Atoms change to ions.
B Covalent bonds are broken.
C Ions change to atoms.
D New compounds are formed.

- 14 Which pair of metals **X** and **Y** will produce the highest voltage when used as electrodes in a simple cell?



	metal X	metal Y
A	copper	silver
B	magnesium	silver
C	magnesium	zinc
D	zinc	copper

- 15 The energy profile diagram for the reaction between hydrogen and chlorine is shown.



What information about this reaction does the diagram show?

	type of reaction	sign of enthalpy change, ΔH
A	endothermic	negative
B	endothermic	positive
C	exothermic	negative
D	exothermic	positive

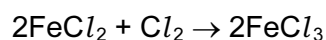
16 The following changes could be made to the conditions in the reaction between zinc and hydrochloric acid.

- 1 increase in concentration of the acid
- 2 increase in particle size of the zinc
- 3 increase in pressure on the system
- 4 increase in temperature of the system

Which pair of changes will increase the rate of reaction?

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

17 The equation shows what happens in a redox reaction between iron(II) chloride and chlorine gas.



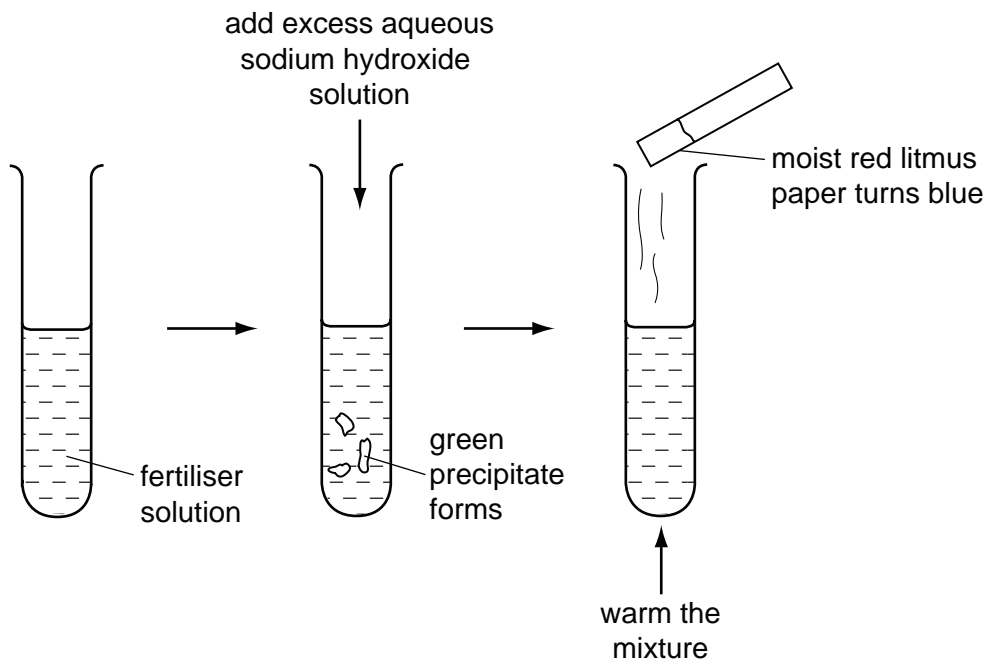
Which equation describes the reduction process in this reaction?

- A** $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
B $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
C $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$
D $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$

18 Which acid and base react together to produce an **insoluble** salt?

- A** hydrochloric acid and sodium hydroxide
B nitric acid and calcium oxide
C sulfuric acid and barium hydroxide
D sulfuric acid and zinc oxide

19 A solution of fertiliser was tested as shown.



Which ions must be present in the fertiliser?

- A Fe^{2+} and SO_4^{2-}
- B Fe^{3+} and NO_3^-
- C NH_4^+ and Fe^{2+}
- D NH_4^+ and NO_3^-

20 Carbon and silicon are both in Group IV of the Periodic Table.

Which statement is correct for both carbon dioxide and silicon dioxide?

- A They are acidic oxides.
- B They are readily soluble in water.
- C They contain ionic bonds.
- D They have giant molecular structures.

21 Which calcium compound does **not** increase the pH of acidic soils?

- A calcium carbonate
- B calcium hydroxide
- C calcium oxide
- D calcium sulfate

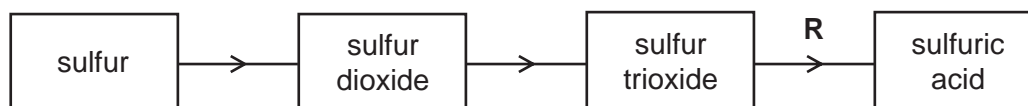
22 Which deduction about the element astatine, At, can be made from its position in Group VII?

- A It forms covalent compounds with sodium.
- B It is a gas.
- C It is displaced from aqueous potassium astatide, KAt, by chlorine.
- D It is more reactive than iodine.

23 Which pair of properties are **both** correct for a typical transition element?

	property 1	property 2
A	forms coloured compounds	soluble in water
B	high density	has variable oxidation states
C	low density	high melting point
D	low melting point	can act as a catalyst

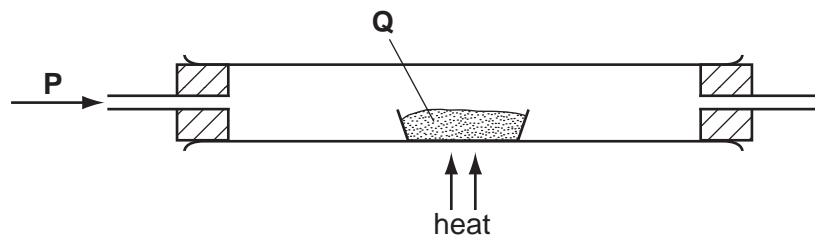
24 The diagram represents the manufacture of sulfuric acid by the Contact process.



What is used in step **R**?

- A concentrated sulfuric acid followed by water
 - B vanadium(V) oxide
 - C water followed by concentrated sulfuric acid
 - D water only
- 25 What happens when zinc foil is placed in an aqueous solution of copper(II) sulfate?
- A Copper(II) ions are oxidised.
 - B There is no reaction.
 - C Zinc atoms are oxidised.
 - D Zinc sulfate is precipitated.

26 In the apparatus shown, gas **P** is passed over solid **Q**.



No reaction occurs if **P** and **Q** are

	P	Q
A	hydrogen	lead(II) oxide
B	hydrogen	magnesium oxide
C	oxygen	carbon
D	oxygen	sulfur

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

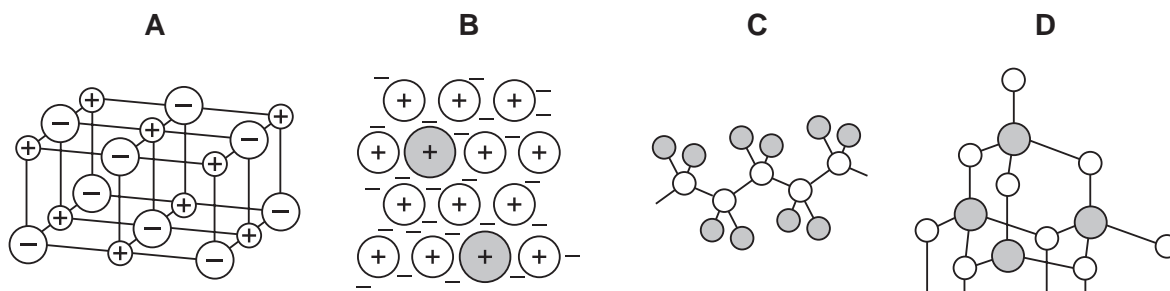
- A** calcium
- B** copper
- C** lead
- D** silver

28 Scrap iron is often recycled.

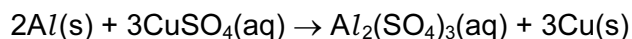
Which reason for recycling is **not** correct?

- A** It reduces the amount of pollution at the site of the ore extraction.
- B** It reduces the amount of waste taken to landfill sites.
- C** It reduces the need to collect the scrap iron.
- D** It saves natural resources.

29 Which diagram represents the structure of an alloy?



- 30 Aluminium is higher than copper in the reactivity series so the following displacement reaction should be feasible.



The reaction does not take place at room temperature.

What is the reason for this?

- A Aluminium has an inert coating all over it.
 - B The compound aluminium sulfate does not exist.
 - C The reaction is exothermic.
 - D The reaction needs to be warmed to take place.
- 31 The gases coming from a car's exhaust contain oxides of nitrogen.

How are these oxides formed?

- A Nitrogen reacts with carbon dioxide.
 - B Nitrogen reacts with carbon monoxide.
 - C Nitrogen reacts with oxygen.
 - D Nitrogen reacts with petrol.
- 32 When a volcano erupts, which gas is produced in significant amounts?
- A carbon monoxide
 - B chlorofluorocarbons
 - C methane
 - D sulfur dioxide
- 33 Compound X is a hydrocarbon. It reacts with steam to form an alcohol.

Which type of compound is X and what would be its effect on bromine water?

	type of compound	effect on bromine water
A	alkane	turns from brown to colourless
B	alkane	turns from colourless to brown
C	alkene	turns from brown to colourless
D	alkene	turns from colourless to brown

34 Useful fractions are obtained by the fractional distillation of petroleum.

Which fraction is matched by its use?

	fraction	use
A	bitumen	fuel in cars
B	lubricating oils	for making waxes and polishes
C	paraffin (kerosene)	for making roads
D	petrol (gasolene)	aircraft fuel

35 Which statement about ethanoic acid is correct?

- A** It contains three carbon atoms per molecule.
- B** It contains five hydrogen atoms per molecule.
- C** It is insoluble in water.
- D** It reacts with ethanol to form a sweet-smelling compound.

36 Which bond is present in both nylon and *Terylene*?

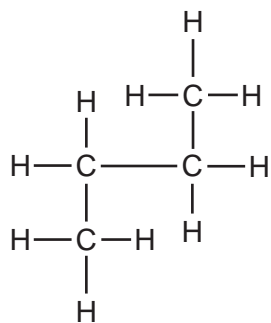
- A** C – O **B** C = O **C** N – C **D** N – H

37 Compounds X and Y are both alkanes. Compound X has a higher boiling point than compound Y.

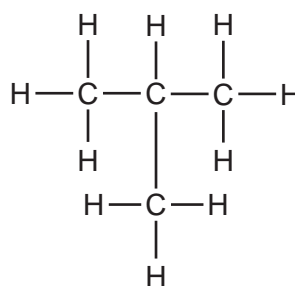
What could be the formulae of compounds X and Y?

	compound X	compound Y
A	C_8H_{16}	C_9H_{18}
B	C_8H_{18}	C_9H_{20}
C	C_9H_{18}	C_8H_{16}
D	C_9H_{20}	C_8H_{18}

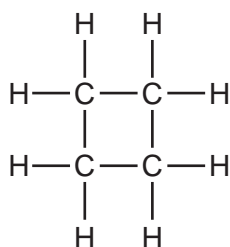
38 Four hydrocarbon structures are shown.



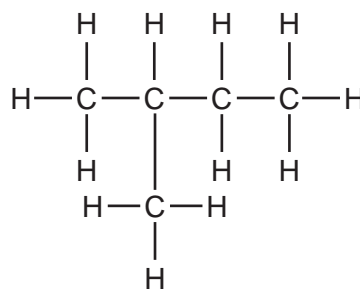
1



2



3



4

Which hydrocarbons are isomers of each other?

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

39 With which substance will ethene react to form more than one product?

- A** bromine
B hydrogen
C oxygen
D steam

40 When a compound X is reacted with sodium carbonate, carbon dioxide gas is evolved.

What could be the formula of compound X?

- A** $\text{C}_2\text{H}_5\text{CO}_2\text{CH}_3$ **B** $\text{C}_3\text{H}_7\text{CO}_2\text{H}$ **C** $\text{CH}_3\text{CO}_2\text{C}_2\text{H}_5$ **D** $\text{C}_4\text{H}_9\text{OH}$

DATA SHEET
The Periodic Table of the Elements

		Group												
I	II	III	IV	V	VI	VII	O							
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1										4 He Helium 2		
23 Na Sodium 11	24 Mg Magnesium 12	11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10	27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18	
39 K Potassium 19	40 Ca Calcium 20	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	91 Zr Zirconium 40	96 Mo Molybdenum 42	101 Ru Ruthenium 44	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54	137 Cs Caesium 55
133 Cs Caesium 55	137 Ba Barium 56	181 Ta Tantalum 73	184 W Tungsten 74	190 Os Osmium 76	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86	226 Fr Francium 87
226 Ra Radium 88	227 Ac Actinium 89	140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
		232 Th Thorium 90	238 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

a	X
b	

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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