



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**CHEMISTRY**

**5070/12**

Paper 1 Multiple Choice

**May/June 2013**

**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.

**DO NOT WRITE IN ANY BARCODES.**

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.

Electronic calculators may be used.

This document consists of **14** printed pages and **2** blank pages.



1 Which mixture could best be separated by using a separating funnel?

- A oil and sand
- B oil and water
- C sodium chloride and sand
- D sodium chloride and water

2 Which process involves boiling a liquid and condensing the vapour?

- A crystallisation
- B distillation
- C evaporation
- D filtration

3 Which compound, when mixed with aqueous barium nitrate, does **not** form a white precipitate?

- A ammonium carbonate
- B dilute sulfuric acid
- C silver nitrate
- D sodium carbonate

4 The structure of metals consists of positive ions in a 'sea of electrons'.

Which statement correctly describes what happens to the particles in the metallic heating element of an electric kettle when the kettle is switched on?

- A Electrons move in both directions in the element.
- B Electrons move in one direction only in the element.
- C Electrons move in one direction and positive ions move in the opposite direction in the element.
- D Positive ions move in one direction only in the element.

5 Naturally-occurring bromine has a relative atomic mass of 80 and consists entirely of two isotopes of relative atomic masses 79 and 81.

What can be deduced about naturally-occurring bromine from this information only?

- A Bromine contains the two isotopes in equal proportions.
- B Bromine has different oxidation states.
- C Bromine isotopes have different numbers of protons.
- D Bromine is radioactive.

- 6 Silicon carbide, SiC, has a structure similar to diamond. Boron nitride, BN, has a structure similar to graphite. Bronze is an alloy of copper and tin.

Which statements about SiC, BN and bronze are correct?

- 1 All are bonded covalently.
- 2 All except silicon carbide conduct electricity when solid.
- 3 All have high melting points.

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

- 7 What can be deduced about two gases that have the same relative molecular mass?

- A** They have the same boiling point.  
**B** They have the same number of atoms in one molecule.  
**C** They have the same rate of diffusion at room temperature and pressure.  
**D** They have the same solubility in water at room temperature.

- 8 Sodium is in Group I of the Periodic Table.

When sodium combines with chlorine, what happens to each sodium atom?

- A** It gains one electron from one chlorine atom.  
**B** It shares one electron with one chlorine atom.  
**C** It transfers one electron to one chlorine atom.  
**D** It transfers two electrons to one chlorine atom.

- 9 Hydrogen and sulfur react to form the compound hydrogen sulfide.

Which row shows the type of bonding between hydrogen and sulfur and the electrical conductivity of liquid hydrogen sulfide?

	type of bonding	electrical conductivity in the liquid state
<b>A</b>	covalent	good
<b>B</b>	covalent	non-conductor
<b>C</b>	ionic	good
<b>D</b>	ionic	non-conductor

10 Which statement about aqueous potassium sulfate is correct?

- A It contains more sulfate ions than potassium ions.
- B It contains two different types of molecule.
- C It does not conduct electricity.
- D It forms a white precipitate when added to aqueous barium nitrate.

11 One volume of a gaseous element  $X_2$  combines with an equal volume of gaseous hydrogen to form two volumes of a gaseous hydride.

What is the formula for the hydride of  $X$ ?

- A  $H_2X$                       B  $HX$                       C  $HX_2$                       D  $H_2X_2$

12 The relative atomic mass of chlorine is 35.5.

What is the mass of 2 moles of chlorine gas?

- A 17.75 g                      B 35.5 g                      C 71 g                      D 142 g

13 How could a sample of potassium be obtained from potassium chloride,  $KCl$ ?

method 1 adding zinc to a solution of  $KCl$

method 2 electrolysis of an aqueous solution of  $KCl$

method 3 electrolysis of molten  $KCl$

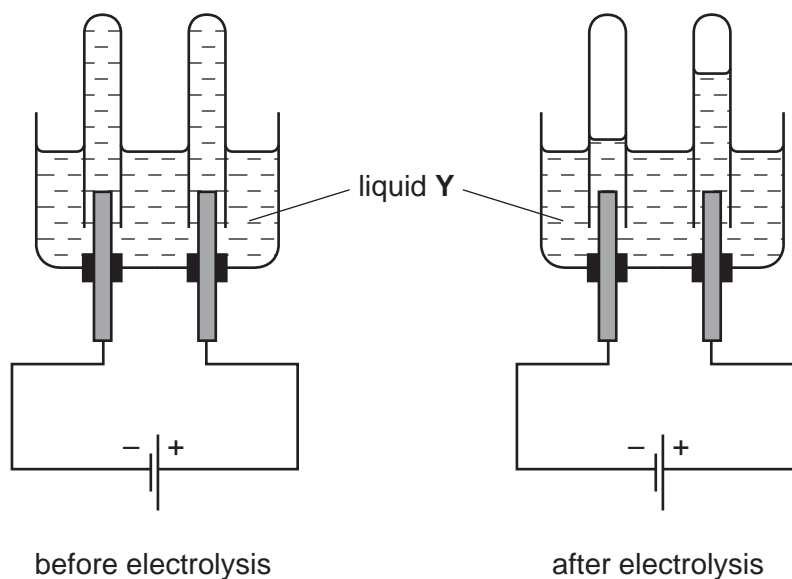
- A method 1 only
- B methods 1 and 2
- C methods 2 and 3
- D method 3 only

14 A concentrated aqueous solution of copper(II) chloride is electrolysed using inert electrodes.

What is the product at the positive electrode?

- A chlorine
- B copper
- C hydrogen
- D oxygen

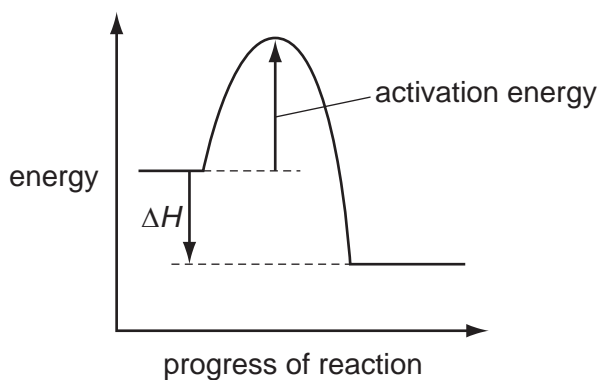
15 The diagrams show an electrolysis experiment using inert electrodes.



Which could be liquid **Y**?

- A aqueous copper(II) sulfate
- B concentrated aqueous sodium chloride
- C dilute sulfuric acid
- D ethanol

16 The energy profile for the forward direction of a reversible reaction is shown.



Which row correctly shows both the sign of the activation energy and the type of the enthalpy change for the **reverse** reaction?

	sign of activation energy	enthalpy change
<b>A</b>	negative	endothermic
<b>B</b>	negative	exothermic
<b>C</b>	positive	endothermic
<b>D</b>	positive	exothermic

17 Which ionic equation describes a redox reaction?

- A  $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$   
 B  $2\text{H}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
 C  $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$   
 D  $\text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s})$

18 Four separate mixtures of a solution and a solid are made, as given in the table.

The mixtures are warmed.

In which mixtures does gas form?

	NaOH(aq) and NH <sub>4</sub> Cl(s)	NaOH(aq) and Mg(s)	H <sub>2</sub> SO <sub>4</sub> (aq) and NH <sub>4</sub> Cl(s)	H <sub>2</sub> SO <sub>4</sub> (aq) and Mg(s)
<b>A</b>	✓	x	✓	x
<b>B</b>	✓	x	x	✓
<b>C</b>	x	✓	✓	x
<b>D</b>	x	✓	x	✓

key

✓ = gas forms

x = no gas forms

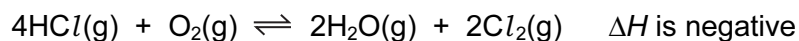
19 Four oxides are added separately to aqueous sodium hydroxide.

- 1 aluminium oxide
- 2 carbon dioxide
- 3 copper(II) oxide
- 4 magnesium oxide

Which oxides react with aqueous sodium hydroxide?

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

20 Chlorine can be manufactured by the following reaction.



A mixture in dynamic equilibrium is formed.

Which change to the mixture will increase the amount of chlorine at equilibrium?

- A adding a catalyst
- B adding more  $\text{HCl}(\text{g})$
- C decreasing the pressure
- D increasing the temperature

21 Which is a use of sulfuric acid?

- A as a bleach
- B in the manufacture of ammonia
- C in the manufacture of fertilisers
- D in the manufacture of sulfur trioxide

22 Which statement about ammonia is correct?

- A It is a colourless, odourless gas.
- B It is a gas which turns damp blue litmus paper red.
- C It is formed when potassium nitrate is heated with aqueous sodium hydroxide and aluminium.
- D It is manufactured using vanadium(V) oxide as a catalyst.

23 Which property is common to calcium, potassium and sodium?

- A Their atoms all have more neutrons than protons.
- B Their ions all have eight electrons in their outer shell.
- C They all sink when added to water.
- D They are all deposited at the positive electrode when their molten chloride is electrolysed.

24 The table shows the solubility of some compounds of metal Q in cold water.

salt	solubility in cold water
carbonate	insoluble
chloride	soluble
sulfate	insoluble

What is metal Q?

- A barium
- B lead
- C magnesium
- D sodium

25 Which two statements indicate that metal *M* may have a proton number between 21 and 30?

- 1 It conducts electricity.
- 2 It does not react with water.
- 3 It forms two basic oxides with formulae  $MO$  and  $M_2O_3$ .
- 4 It forms two coloured sulfates.

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

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

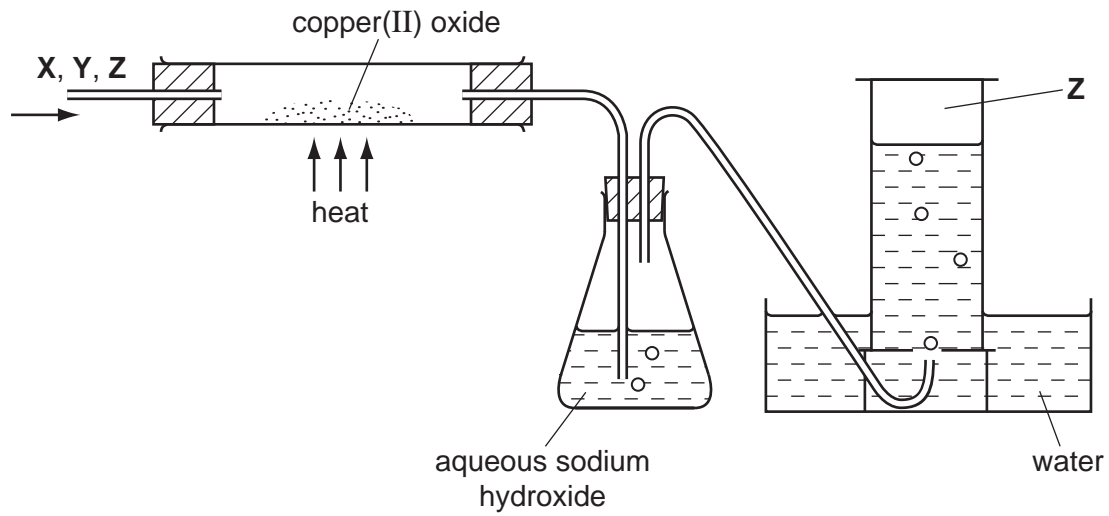
- A calcium
- B krypton
- C rubidium
- D selenium

27 Which substance, in the given physical state, is found at the bottom of the blast furnace?

	substance	physical state
A	calcium carbonate	solid
B	calcium silicate	liquid
C	carbon	liquid
D	iron	solid



- 28 Gas Z is to be separated from a mixture of gases X, Y and Z by the apparatus shown in the diagram.



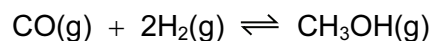
For which mixture will this system work successfully?

	X	Y	Z
A	hydrogen	carbon dioxide	nitrogen
B	oxygen	hydrogen	carbon monoxide
C	nitrogen	oxygen	hydrogen
D	carbon dioxide	nitrogen	oxygen

- 29 Magnesium can be obtained by heating magnesium oxide with which element?

- A carbon
- B hydrogen
- C sodium
- D zinc

30 Methanol is manufactured using the following reaction.



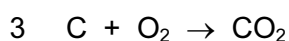
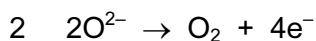
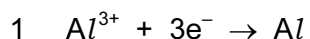
The usual conditions are 30 atmospheres and 300 °C.

At 400 °C the percentage of methanol in the equilibrium mixture is lower than at 300 °C.

What could be the explanation for this?

- A All the molecules are gaseous.
- B The forward reaction is exothermic.
- C The reaction is slower at 400 °C.
- D There are fewer product molecules than reactant molecules.

31 In the electrolysis of molten aluminium oxide for the extraction of aluminium, the following three reactions take place.



Which reactions take place at the positive electrode?

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

32 An alloy of copper and zinc is added to an excess of dilute hydrochloric acid. The resulting mixture is then filtered.

Which observations are correct?

	filtrate	residue
<b>A</b>	colourless solution	none
<b>B</b>	colourless solution	red-brown
<b>C</b>	blue solution	grey
<b>D</b>	blue solution	none

33 The compounds  $\text{CO}(\text{NH}_2)_2$  and  $\text{NH}_4\text{NO}_3$  are used as fertilisers.

The proportion of nitrogen by mass in  $\text{CO}(\text{NH}_2)_2$  is .....1..... that in  $\text{NH}_4\text{NO}_3$ .

The proportion of nitrogen by mole in  $\text{CO}(\text{NH}_2)_2$  is .....2..... that in  $\text{NH}_4\text{NO}_3$ .

Which words correctly complete gaps 1 and 2?

	1	2
<b>A</b>	equal to	equal to
<b>B</b>	higher than	equal to
<b>C</b>	higher than	higher than
<b>D</b>	lower than	lower than

34 Which method will remove salt from seawater?

- A** chlorination
- B** distillation
- C** filtration
- D** use of carbon

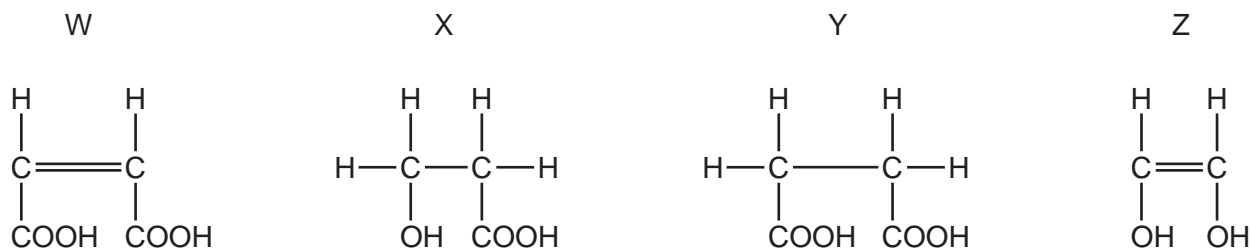
35 Which organic compound requires the least oxygen for the complete combustion of one mole of the compound?

- A**  $\text{C}_3\text{H}_7\text{OH}$       **B**  $\text{C}_3\text{H}_7\text{COOH}$       **C**  $\text{C}_3\text{H}_8$       **D**  $\text{C}_4\text{H}_8$

36 Which polymer contains only three elements?

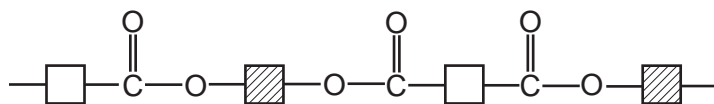
- A** protein
- B** poly(ethene)
- C** poly(propene)
- D** starch

37 What are the reactions of compounds W, X, Y and Z?

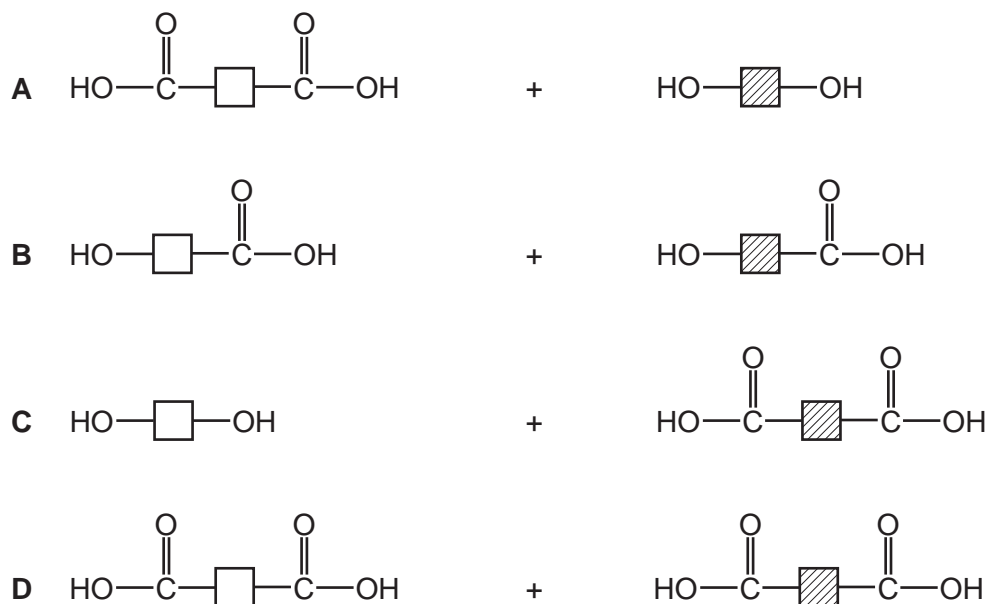


	decolourises aqueous bromine	has a pH of less than 7	reacts with a carboxylic acid to form an ester
<b>A</b>	X and Y	W, X and Y	W, X, Y and Z
<b>B</b>	X and Y	X and Z	X and Z
<b>C</b>	W and Z	W, X and Y	X and Z
<b>D</b>	W and Z	X and Z	W, X and Y

38 The diagram shows the partial structure of *Terylene*.



From which pair of compounds is it made?



39 Which straight chain hydrocarbon can form a polymer by addition polymerisation?

- A**  $\text{C}_6\text{H}_{14}$       **B**  $\text{C}_7\text{H}_{14}$       **C**  $\text{C}_8\text{H}_{18}$       **D**  $\text{C}_9\text{H}_{20}$

40 Which information is correct regarding the formation of ethanol by the process of fermentation?

	substances fermented	gas evolved during fermentation
<b>A</b>	carbohydrates	carbon dioxide
<b>B</b>	carbohydrates	carbon monoxide
<b>C</b>	hydrocarbons	carbon dioxide
<b>D</b>	hydrocarbons	carbon monoxide





**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																																																																	
		I	II	III	IV	V	VI	VII	VIII	IX	X																																																																								
		1 <b>H</b> Hydrogen 1																																																																																	
7	9	<b>Li</b> Lithium 3	<b>Be</b> Beryllium 4																																																																																
23	24	<b>Na</b> Sodium 11	<b>Mg</b> Magnesium 12																																																																																
39	40	<b>K</b> Potassium 19	<b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36																																																																
85	88	<b>Rb</b> Rubidium 37	<b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	101 <b>Rh</b> Rhodium 45	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54																																																																
133	137	<b>Cs</b> Caesium 55	<b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86																																																																	
	226	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89																																																																															
		*58-71 Lanthanoid series										†90-103 Actinoid series																																																																							
		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">a</td> <td style="padding: 2px;"><b>X</b></td> </tr> <tr> <td style="padding: 2px;">b</td> <td style="padding: 2px;"></td> </tr> </table>										a	<b>X</b>	b		a = relative atomic mass X = atomic symbol b = proton (atomic) number																																																																			
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140	<b>Ce</b>	141	<b>Pr</b>	144	<b>Nd</b>	150	<b>Sm</b>	152	<b>Eu</b>	157	<b>Gd</b>	162	<b>Dy</b>	165	<b>Ho</b>	167	<b>Er</b>	169	<b>Tm</b>	173	<b>Yb</b>	175	<b>Lu</b>																																																												
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90	Thorium	91	Protactinium	92	Uranium	94	Plutonium	95	Americium	96	Curium	98	Californium	99	Einsteinium	100	Fermium	101	Mendelevium	102	Nobelium	103	Lawrencium																																																												

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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