Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **October/November 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.

IB20 11_5070_11/5RP
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1 A student needs to measure 17.60 cm^3 of hydrochloric acid. The student has access to the apparatus commonly found in a school laboratory.

Which piece of equipment should be used to measure the 17.60 cm^3 of hydrochloric acid?

A a burette

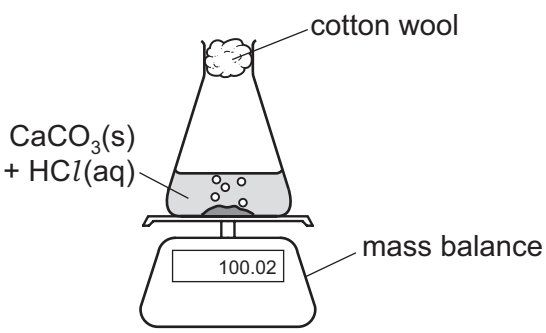
B a gas syringe

C a measuring cylinder

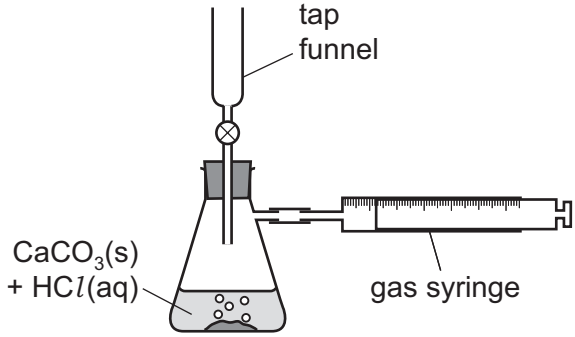
D a pipette

2 When calcium carbonate is added to dilute hydrochloric acid, carbon dioxide gas is released.

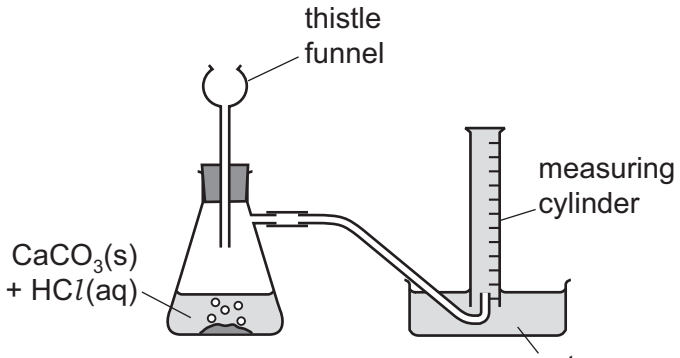
Three sets of apparatus are shown.



1



2



3

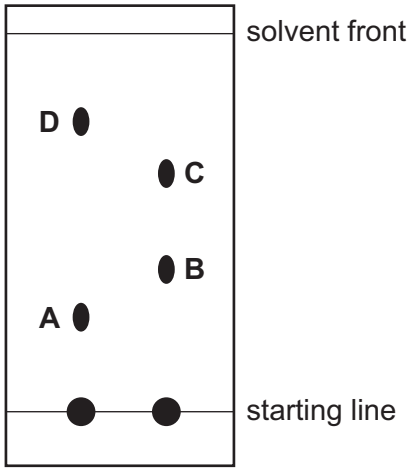
Which sets of apparatus are suitable, together with a stop-watch, for following the rate of this reaction?

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

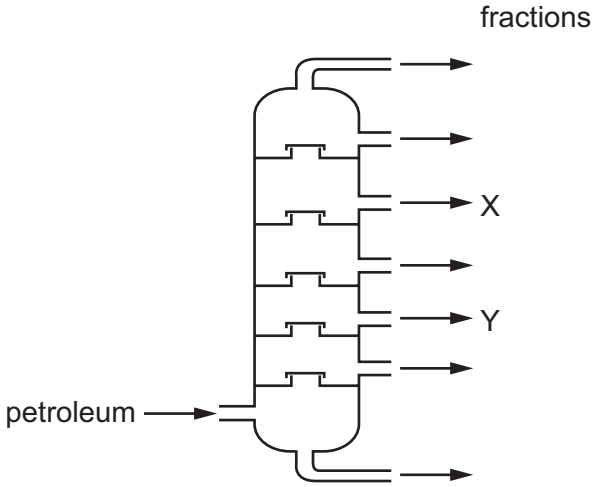
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3 Some substances may be separated using paper chromatography. The diagram shows the results of running two mixtures in a suitable solvent.

Which spot has an R_f value of 0.37?



4 Petroleum (crude oil) is separated into useful fractions by fractional distillation. The positions at which fractions X and Y are collected from the fractionating column are shown.



Which statement is correct?

A The temperature increases up the column.

B X condenses at a lower temperature than Y.

C X has a higher boiling point than Y.

D X has longer chain molecules than Y.

5 Compound X is a crystalline solid at room temperature and pressure. An aqueous solution of X is tested as shown.

test	test result
acidify with dilute nitric acid, then add aqueous barium nitrate	no visible change
add aqueous ammonia	white precipitate, soluble in excess

What could be the identity of X?

A ammonium carbonate

B sodium sulfate

C calcium nitrate

D zinc chloride

6 When aqueous sodium hydroxide is added to a solution, a white precipitate forms which dissolves when excess sodium hydroxide is added.

Which ion could be present in the solution?

A Al^{3+}(aq) **B** Ca^{2+}(aq) **C** Cu^{2+}(aq) **D** Na^{+}(aq)

7 Why does a balloon full of helium gas become smaller as the temperature changes from 30 °C to 10 °C?

A The gas condenses to a liquid and so takes up less space.

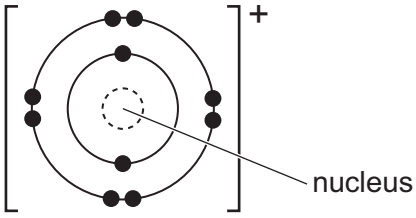
B The gas particles become smaller at lower temperatures.

C The gas particles diffuse through the balloon and escape.

D The gas particles move more slowly so reducing the pressure.

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8 The diagram of an ion is shown.



What can be deduced about the number of protons in this ion?

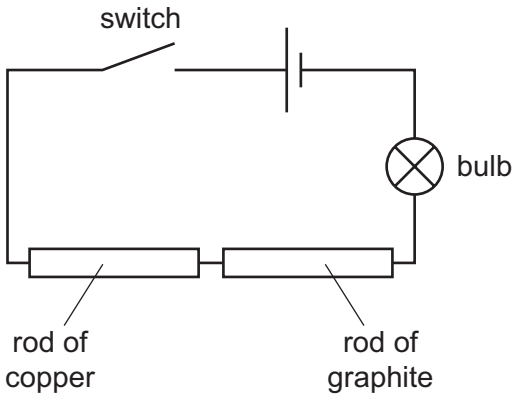
A It has 9 protons.

B It has 10 protons.

C It has 11 protons

D You cannot deduce the number of protons from this diagram.

9 The circuit diagram shows an experiment using a rod of copper and a rod of graphite.



When the switch is closed, the bulb lights because an electric current flows through the copper and the graphite.

Which particles move through these two solids?

	copper ions	electrons	carbon ions
A	✓	✗	✓
B	✗	✓	✗
C	✓	✓	✗
D	✗	✓	✓

10 Which material has the highest melting point?

A ammonia

B methane

C sodium chloride

D water

11 Which statement describes ionic bonds?

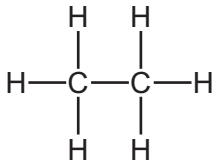
A a lattice of ions in a 'sea of electrons'

B electrostatic attraction between oppositely charged ions

C the sharing of electrons between atoms to gain a noble gas configuration

D the transfer of electrons from atoms of a non-metal to the atoms of a metal

12 The diagram shows the covalent bonds in an organic compound.



The total number of electrons in one molecule of this compound is .....X..... .

The total number of electrons in the bonds in one molecule of this compound is .....Y..... .

Which numbers correctly complete gaps X and Y?

	X	Y
A	14	12
B	14	14
C	18	12
D	18	14

13 Which contains the greatest mass of oxygen?

A 0.2 mol of aluminium nitrate, $Al(NO_3)_3$

B 0.3 mol of potassium sulfate, K_2SO_4

C 0.4 mol of sodium nitrate, $NaNO_3$

D 0.5 mol of magnesium carbonate, $MgCO_3$

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14 Compound X has a composition by mass of 63.6 % nitrogen and 36.4 % oxygen.

What is the empirical formula of X?

A N_2O **B** NO **C** NO_2 **D** N_2O_4

15 The table gives the relative formula mass of four compounds and the mass of each compound present in 1 dm^3 of solution.

Which solution has the highest concentration in mol / dm^3?

	solution	relative formula mass	mass of compound in 1 dm^3 of solution / g
A	HC*l*	36.5	3.65
B	H_2SO_4	98	9.80
C	KOH	56	2.80
D	NaOH	40	6.00

16 Which sample contains the most atoms?

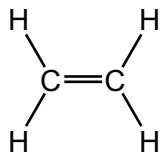
A 0.5 mol of water

B 1.0 mol of carbon dioxide

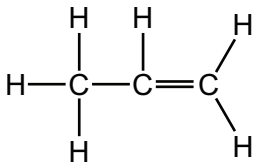
C 1.0 mol of methane

D 2.0 mol of hydrogen chloride

17 The diagrams show the structures of ethene and propene.



ethene



propene

Which statement about equal volumes of ethene gas and propene gas at r.t.p. is correct?

A They contain equal numbers of atoms.

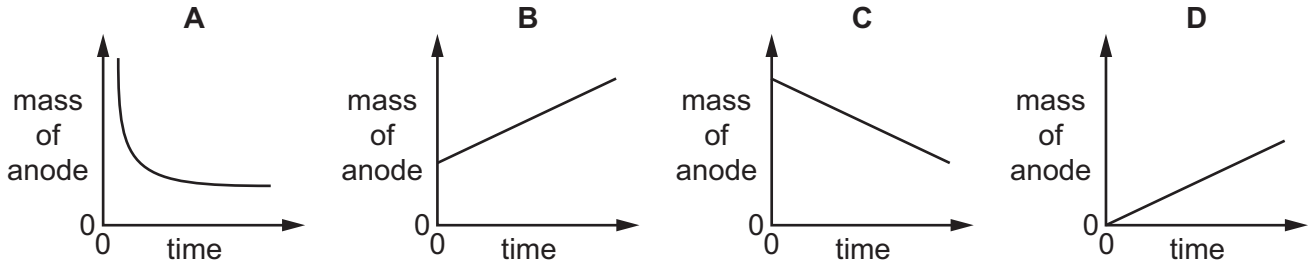
B They give equal volumes of carbon dioxide when burnt completely in oxygen.

C They give equal masses of ethane and propane when reacted with hydrogen.

D They react with equal masses of bromine.

18 Aqueous copper(II) sulfate is electrolysed using copper electrodes. The current is constant and the anode is weighed at regular time intervals.

Which graph is obtained when the mass of the anode is plotted against time?



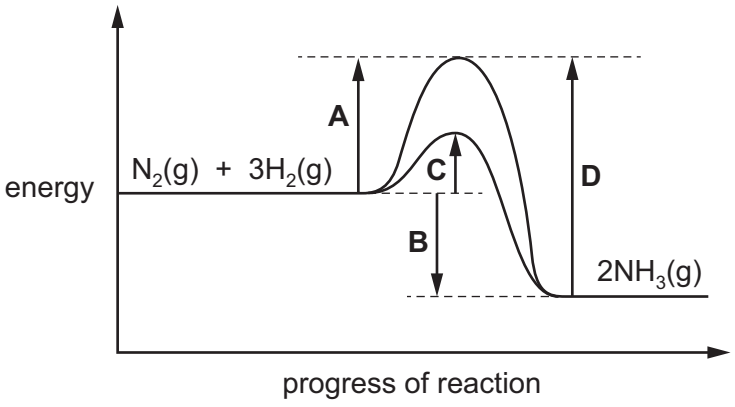
19 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

Which row shows what happens in this electrolysis and why it happens?

	change occurring	explanation
A	oxygen is discharged at the anode	$OH^-(aq)$ loses electrons more easily than does $Cl^-(aq)$
B	during electrolysis the pH of the electrolyte increases	the electrolysis in aqueous solution involves the discharge of $H^+(aq)$ ions
C	solid sodium is discharged at the cathode	$Na^+(aq)$ is present in aqueous solution
D	the products stay the same if the aqueous sodium chloride is replaced by molten sodium chloride	Na^+ and Cl^- are present in both molten and aqueous sodium chloride

20 The energy profile diagram for both the catalysed and uncatalysed reactions between N_2 and H_2, in the Haber process, is shown.

What is the activation energy for the formation of NH_3 in the presence of a catalyst?



21 Which statement describes the conversion of magnesium atoms to magnesium ions?

A The change is reduction because there has been a gain of electrons.

B The change is oxidation because there has been a loss of electrons.

C The change is reduction because there has been a loss of electrons.

D The change is oxidation because there has been a gain of electrons.

22 When water is liquid, it ionises slightly.

$$H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$$

The forward reaction is endothermic.

When the temperature of water is increased, which changes take place?

1 The water becomes acidic.

2 The water becomes alkaline.

3 More water molecules form ions.

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

23 Which row correctly describes the solubilities of both ammonium sulfate and sodium carbonate in water?

	solubility of ammonium sulfate	solubility of sodium carbonate
A	insoluble	insoluble
B	insoluble	soluble
C	soluble	insoluble
D	soluble	soluble

24 Lead(II) chloride is an insoluble salt.

Which two reagents are used to prepare a pure sample of lead(II) chloride?

A lead(II) carbonate and dilute hydrochloric acid

B lead metal and dilute hydrochloric acid

C aqueous lead(II) nitrate and dilute hydrochloric acid

D lead(II) oxide and dilute hydrochloric acid

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25 The Haber process is used to make ammonia.

Which catalyst is used in the Haber process?

A iron

B nickel

C platinum

D vanadium(V) oxide

26 Some compounds containing nitrogen are used as fertilisers.

The table shows some nitrogen-containing compounds, whether they are used as a fertiliser or not and a reason for this.

Which row is correct?

	compound	used as a fertiliser	reason
A	aqueous ammonia, $NH_3(aq)$	yes	lowers the pH of the soil
B	ammonium carbonate, $(NH_4)_2CO_3$	no	is insoluble in water
C	ammonium chloride, NH_4Cl	yes	is made from the products of the Haber process and the Contact process
D	ammonium nitrate, NH_4NO_3	yes	is soluble in water

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

A calcium

B krypton

C rubidium

D selenium

28 Metals are elements that have many similar properties because of their structure.

Which statement about metals is correct?

A Metals are malleable because the layers of atoms can slide over each other.

B Metals conduct electricity because their ions vibrate and pass on energy to each other.

C The melting point of metals depends on the strength of the intermolecular forces in the lattice.

D To form an alloy of two metals, the metals must have very similar ionic radii.

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29 What happens when a strip of silver is immersed in aqueous copper(II) sulfate?

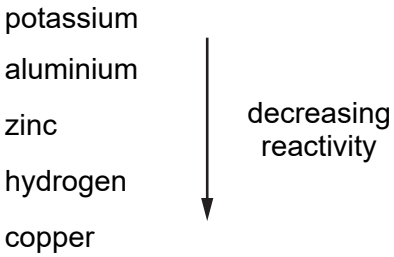
A Bubbles of gas will appear.

B No reaction occurs.

C Pink copper will be deposited on the silver strip.

D The silver strip will start to dissolve.

30 Four metals and hydrogen are arranged in order of decreasing reactivity.



Which statement about these elements is correct?

A Aluminium is formed when aluminium oxide is heated with hydrogen.

B Copper displaces zinc from aqueous zinc sulfate.

C Copper is formed when copper(II) oxide is heated with hydrogen.

D When added to water, aluminium forms positive ions more readily than potassium forms positive ions.

31 Iron is extracted from haematite in a blast furnace. Coke and limestone are added to the blast furnace.

What is the function of the limestone?

A It decomposes and neutralises acidic impurities.

B It is a fuel which heats the furnace.

C It oxidises the iron in haematite.

D It releases oxygen allowing the coke to burn.

32 Carbon dioxide, methane and oxygen are gases involved in the carbon cycle.

Which of these gases may contribute to global warming?

A carbon dioxide only

B carbon dioxide and methane

C carbon dioxide and oxygen

D methane only

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33 Two statements about the water in lakes are given.

statement 1 Fish are unable to live in some lakes because there is insufficient oxygen in the water.

statement 2 Fertilisers can be washed into lakes where they cause eutrophication.

What is correct?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is incorrect.

D Statement 2 is correct but statement 1 is incorrect.

34 Chlorine reacts with methane.

Which row is correct?

	chemical equation	conditions required
A	$Cl_2 + CH_4 \rightarrow CH_2Cl_2 + H_2$	methane and chlorine gases are mixed in the presence of ultraviolet light
B	$Cl_2 + CH_4 \rightarrow CH_2Cl_2 + H_2$	methane is bubbled into concentrated aqueous chlorine
C	$Cl_2 + CH_4 \rightarrow CH_3Cl + HCl$	methane and chlorine gases are mixed in the presence of ultraviolet light
D	$Cl_2 + CH_4 \rightarrow CH_3Cl + HCl$	methane is bubbled into concentrated aqueous chlorine

35 Which statements about alkenes are correct?

1 They have the general formula of C_nH_{2n}.

2 They undergo addition reactions with steam.

3 They burn in air to form carbon dioxide and water.

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

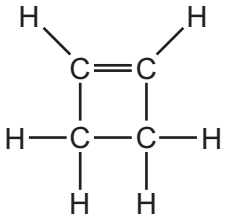
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36 X is a branched hydrocarbon with the ratio of carbon atoms to hydrogen atoms being 1 : 2.

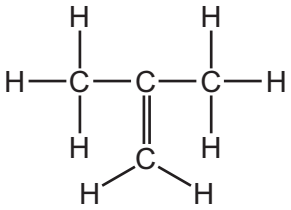
X has a relative molecular mass of 56.

What is the identity of X?

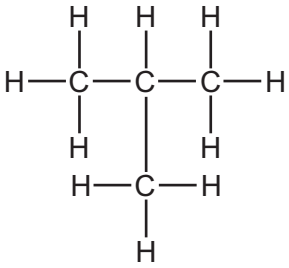
A



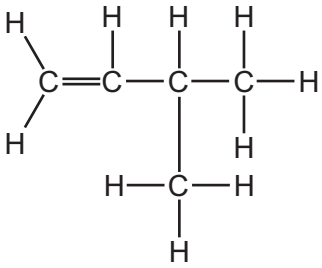
B



C



D



37 The reactions listed all involve ethanol.

1 $C_2H_5OH + O_2 \rightarrow CH_3COOH + H_2O$

2 $C_2H_5OH + CH_3COOH \rightarrow CH_3COOC_2H_5 + H_2O$

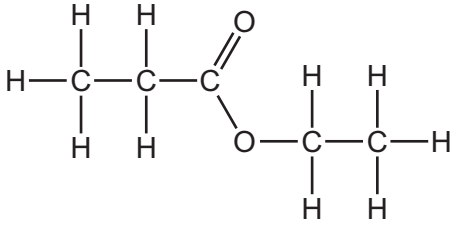
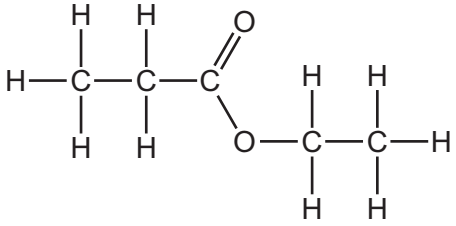
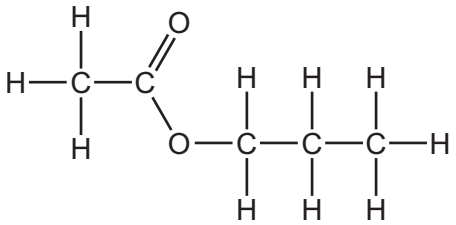
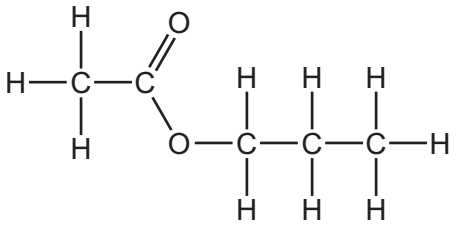
3 $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

Which row correctly describes each reaction?

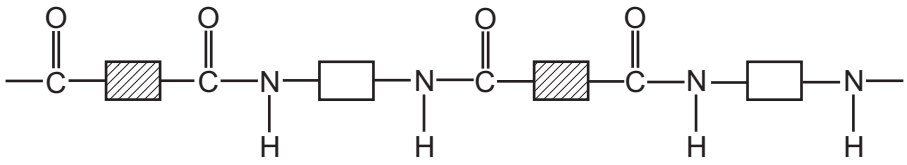
	1	2	3
A	combustion	acidification	fermentation
B	combustion	esterification	addition
C	oxidation	acidification	addition
D	oxidation	esterification	fermentation

38 Ethanoic acid is reacted with propanol.

What is the name and what is the structure of the ester produced?

	name	structure
A	propyl ethanoate	
B	ethyl propanoate	
C	propyl ethanoate	
D	ethyl propanoate	

39 The diagram shows the partial structure of a polymer.



Which type of polymer does it represent?

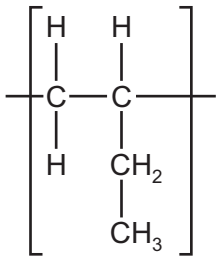
A polyamide

B polyester

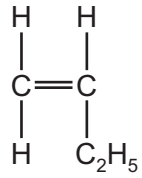
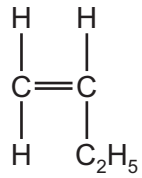
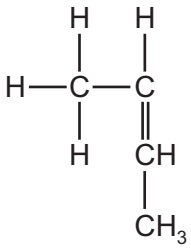
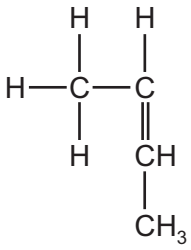
C poly(ethene)

D polysaccharide

40 The diagram shows the repeat unit of a polymer.



Which row correctly identifies the monomer and type of polymerisation involved in making this polymer?

	monomer	type of polymerisation
A		addition
B		condensation
C		addition
D		condensation

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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 –		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.).