



COMBINED SCIENCE

0653/02

Paper 2 Multiple Choice (Extended)

For Examination from 2017

SPECIMEN PAPER

45 minutes

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, 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.

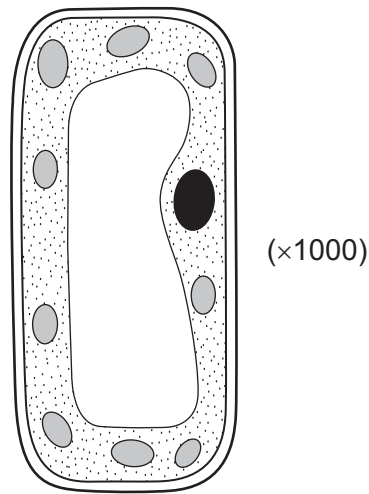
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 18.

Electronic calculators may be used.

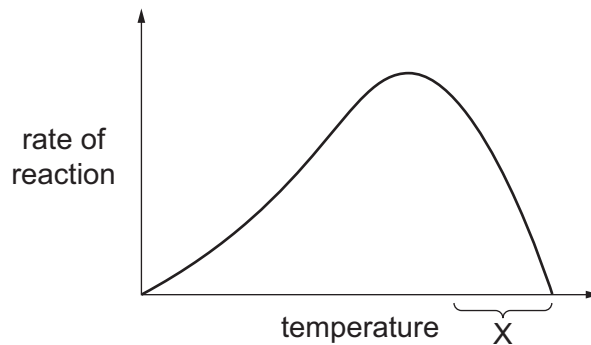
This document consists of **17** printed pages and **1** blank page.

- 1 The width of the plant cell in the diagram is 30 mm when it is magnified by a microscope (magnification shown in brackets).



What is the actual width of the cell?

- A** 0.003 mm **B** 0.03 mm **C** 0.3 mm **D** 30 mm
- 2 The graph shows how the rate of an enzyme-controlled reaction changes with temperature. What explains the shape of the graph within the temperature range marked X?



- A** The higher temperature breaks down the enzyme's substrate.
B The higher temperature changes the shape of the enzyme.
C The higher temperature decreases the kinetic energy of the enzyme.
D The higher temperature helps the enzyme to function as a biological catalyst.

- 3 A healthy plant has been in the light. A leaf is taken from it, decolourised and then tested with iodine solution.

What colour does the iodine solution become?

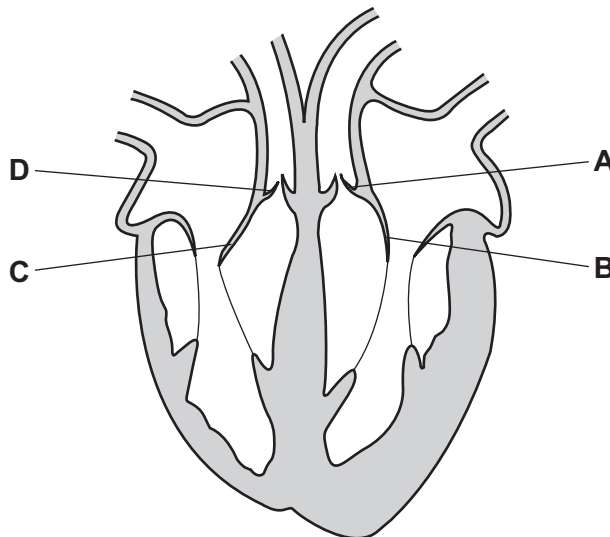
- A black
 - B brick red
 - C green
 - D pale blue
- 4 A man reduces the amount of salt, saturated fat and fibre in his diet.

How could these changes affect the risk of developing the following conditions?

	constipation	coronary heart disease	obesity
A	reduced risk	increased risk	reduced risk
B	reduced risk	reduced risk	increased risk
C	increased risk	reduced risk	reduced risk
D	increased risk	increased risk	increased risk

- 5 The diagram shows a section through the human heart.

Which structure is the tricuspid valve?



- 6 The table shows some of the features of respiration.

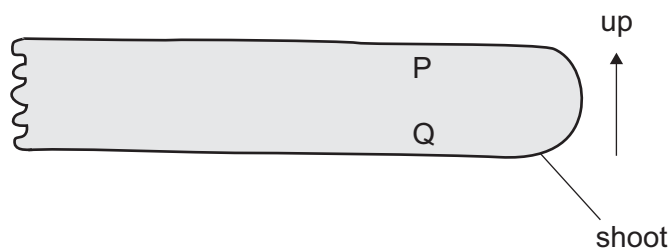
Which row in the table is correct for aerobic respiration?

	amount of energy released per glucose molecule	occurs when oxygen is present	releases carbon dioxide
A	high	yes	always
B	low	yes	sometimes
C	high	no	sometimes
D	low	no	always

- 7 One of the effects of tobacco smoke on the gas exchange system is that haemoglobin carries oxygen around the body less efficiently.

Which component of tobacco smoke is responsible for this effect?

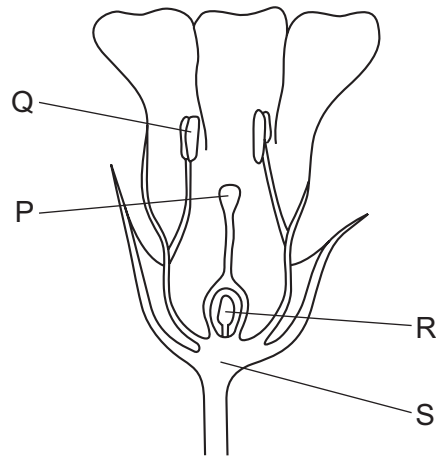
- A carbon monoxide
 - B nicotine
 - C smoke particles
 - D tar
- 8 The diagram shows a plant that has been placed on its side. The shoot begins to grow upwards.



What causes the shoot to grow upwards?

- A less auxin present at P and increased cell elongation at P
- B more auxin present at P and increased cell elongation at P
- C less auxin present at Q and increased cell elongation at Q
- D more auxin present at Q and increased cell elongation at Q

- 9 The diagram shows a section through a flower.



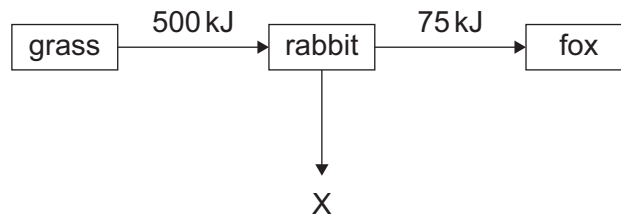
In which parts of the flower are pollen grains produced and received?

	pollen grains produced	pollen grains received
A	P	S
B	Q	P
C	R	Q
D	S	R

- 10 Which row in the table correctly describes a female gamete compared with a male gamete?

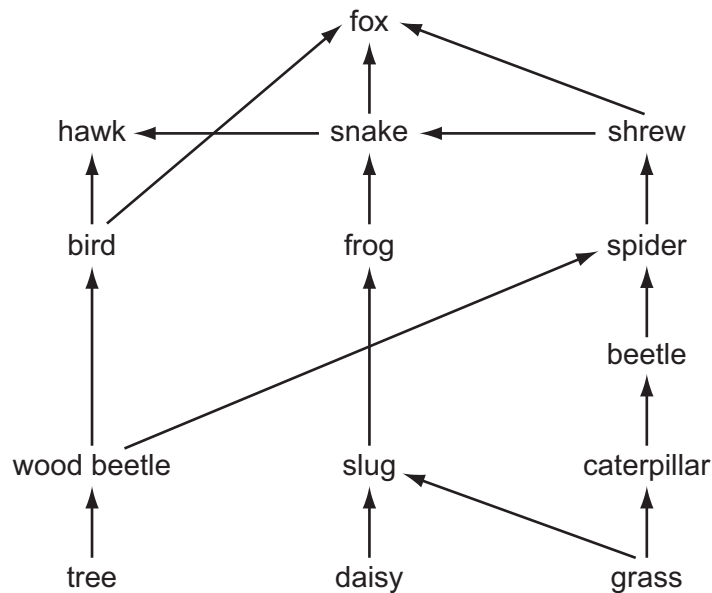
	size	number produced	mobility
A	larger	greater	more mobile
B	larger	fewer	less mobile
C	smaller	greater	less mobile
D	smaller	fewer	more mobile

- 11 A food chain is shown below. The numbers show the amount of energy, measured in kJ, that passes from one organism to another.



Calculate how much energy is lost from this food chain at X.

- A 25 kJ B 75 kJ C 425 kJ D 575 kJ
- 12 The diagram shows a food web.



How many types of consumer and how many types of producer are shown in this food web?

	types of consumer	types of producer
A	3	3
B	3	14
C	11	3
D	11	14

- 13 Which of these measures helps to reduce the effects of acid rain?
- A avoiding the use of non-recyclable plastics
 B reducing methane emissions in industry and agriculture
 C removing sulfur dioxide from power station waste gases
 D using alkaline fertilisers on fields
- 14 Which method of separation can be used to obtain pure water from aqueous potassium chloride?
- A chromatography
 B crystallisation
 C distillation
 D filtration
- 15 Which row in the table correctly describes the four substances?

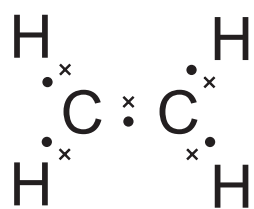
	air	brass	iron	sodium chloride
A	compound	compound	element	mixture
B	compound	element	mixture	mixture
C	mixture	mixture	element	compound
D	element	mixture	compound	element

- 16 Magnesium fluoride, MgF_2 , is an ionic compound.

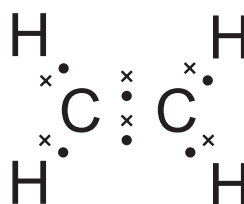
What are the electronic structures of the magnesium ion and the fluoride ion?

	magnesium ion	fluoride ion
A	2,8	2,6
B	2,8	2,8
C	2,8,1	2,6
D	2,8,1	2,8

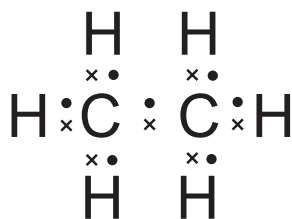
17 What is the dot-and-cross diagram for ethene?



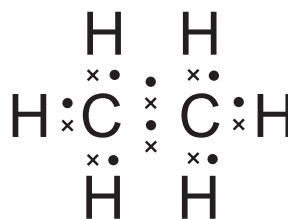
A



B



C



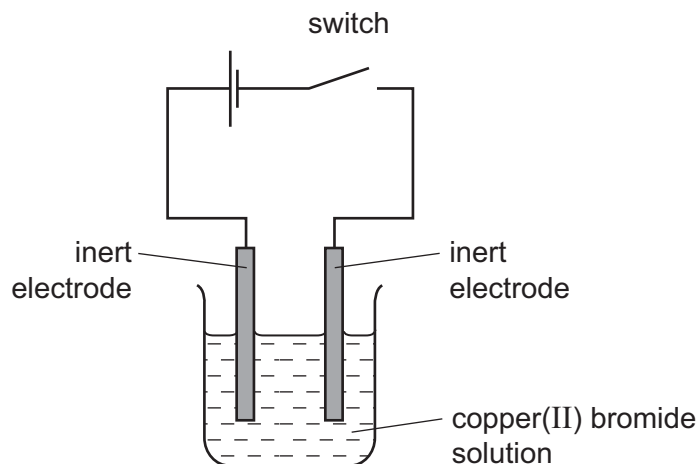
D

18 Hexane, C_6H_{14} , burns in an excess of oxygen, forming carbon dioxide and water.

What is the equation for this reaction?

- A $C_6H_{14} + 9O_2 \rightarrow 6CO_2 + 7H_2O$
 B $C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$
 C $2C_6H_{14} + 19O_2 \rightarrow 6CO_2 + 7H_2O$
 D $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

19 Copper(II) bromide solution can be electrolysed in the same way as copper(II) chloride solution.



Which row in the table correctly describes the products at the electrodes?

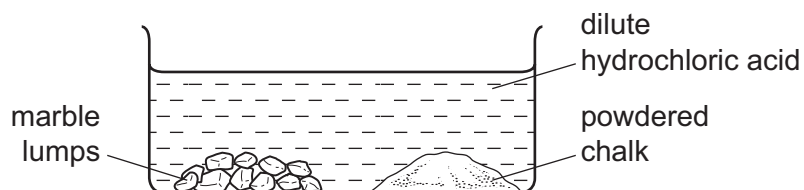
	product at anode	product at cathode
A	brown liquid	brown-red solid
B	brown-red solid	brown liquid
C	colourless gas	brown-red solid
D	silvery solid	colourless gas

20 Which statement describes an endothermic reaction?

- A** Chemical energy is transformed to heat energy and the temperature decreases.
- B** Chemical energy is transformed to heat energy and the temperature increases.
- C** Heat energy is transformed to chemical energy and the temperature decreases.
- D** Heat energy is transformed to chemical energy and the temperature increases.

21 Marble and chalk are two forms of calcium carbonate.

The diagram shows equal masses of lumps of marble and powdered chalk placed in dilute hydrochloric acid.



The marble takes longer than the chalk to dissolve in the acid.

Why is this?

- A Marble is more reactive than chalk.
- B Marble is more soluble than chalk.
- C The marble has the smaller surface area.
- D The marble is more basic.

22 Metal X reacts rapidly with cold water.

Metal Y does not react with dilute hydrochloric acid.

Metal Y is obtained from its oxide by heating the oxide with carbon.

Which row in the table shows the more reactive metal and the type of reaction that metal Y oxide undergoes when it is heated with carbon?

	more reactive metal	type of reaction of metal oxide
A	X	oxidation
B	X	reduction
C	Y	oxidation
D	Y	reduction

23 The table shows the properties of four substances.

Which substance is an alkali?

	solubility in water	reaction with an acid
A	insoluble	reacts
B	insoluble	does not react
C	soluble	reacts
D	soluble	does not react

24 Which row in the table describes the physical state of some of the Group VII elements at room temperature?

	chlorine	bromine	iodine
A	gas	gas	liquid
B	gas	liquid	solid
C	liquid	liquid	gas
D	liquid	solid	solid

25 P, Q, R and S are four metals.

P reacts rapidly with dilute acid, but it slowly forms bubbles of gas in cold water.

S reacts slowly with dilute acid, but it displaces Q from an aqueous solution of its salt.

R reacts rapidly with cold water.

What is the order of reactivity of the metals?

	least reactive \longrightarrow most reactive			
A	Q	S	P	R
B	R	P	S	Q
C	R	S	P	Q
D	S	Q	P	R

- 26 Which row in the table describes the method of extraction of aluminium, and the reason for using this method?

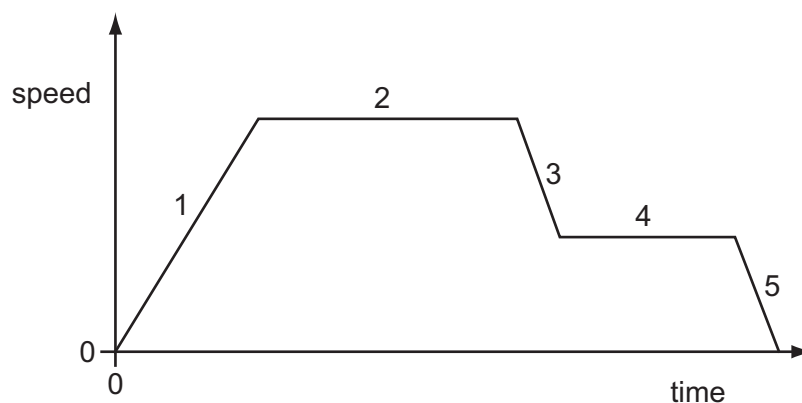
	method of extraction	reason
A	heat with carbon	aluminium is less reactive than carbon
B	heat with carbon	aluminium is more reactive than carbon
C	electrolysis	aluminium is more reactive than carbon
D	electrolysis	aluminium is resistant to corrosion

- 27 Petroleum is separated by fractional distillation.

Which row in the table describes the properties of the compounds collected at the top of the fractionating column?

	boiling point	molecular size	intermolecular forces
A	high	large	strong
B	high	small	weak
C	low	large	strong
D	low	small	weak

- 28 The speed/time graph for a car journey is shown.



During which two parts of the journey is the car moving at constant speed?

- A** 1 and 3 **B** 1 and 5 **C** 2 and 4 **D** 3 and 5

- 29 The strength of the gravitational field on the Moon is less than the strength of the gravitational field on Earth.

An object has mass M and weight W on the Moon.

What is the mass and the weight of the object on Earth?

	mass	weight
A	more than M	W
B	more than M	more than W
C	M	W
D	M	more than W

- 30 The equation for Hooke's Law relates the extension of a spring to the load applied to it.

In an experiment, loads are applied to a spring and the spring extends. The table shows the results.

load/N	0	12	24	36	48	60	72
length of spring/cm	15	18	21	24	27	31	36

What is the value of the constant k for this spring, and has the spring been loaded past its limit of proportionality?

	spring constant k N/cm	loaded past limit of proportionality?
A	0.67	no
B	0.67	yes
C	4.0	no
D	4.0	yes

- 31 A ball rolls along a frictionless, horizontal track at a speed of 4.0 m/s. It reaches a sloping section of the track and continues to roll up the slope.



What is the maximum vertical height that the ball reaches up the slope?

The acceleration of free fall g is 10 m/s^2 .

- A** 0.20 m **B** 0.40 m **C** 0.80 m **D** 2.5 m

- 32 A gas is trapped in a sealed container of constant volume. The gas is heated.

What effect does this have on the gas molecules?

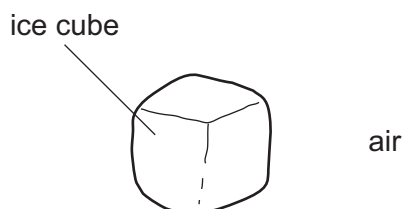
- A The average distance between the molecules increases.
 B The average mass of the molecules increases.
 C The molecules expand.
 D The molecules move more quickly.
- 33 Benzene and glycerine are two substances.

The table shows the melting point and the boiling point of benzene and of glycerine.

	melting point/°C	boiling point/°C
benzene	5.4	80
glycerine	18	290

At which temperature will both benzene and glycerine be liquid?

- A 10°C B 50°C C 100°C D 150°C
- 34 The diagram shows an ice cube surrounded by air. The ice cube cools the air around it. This cooling changes the density of the air and causes the air to move.



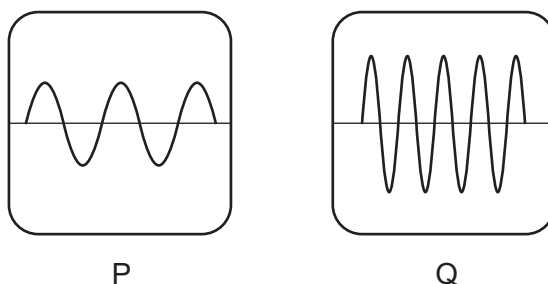
Which row in the table shows the change in density of the air and the direction in which the air moves?

	density change	direction of movement
A	decreases	downwards
B	decreases	upwards
C	increases	downwards
D	increases	upwards

- 35 A water wave with a wavelength of 2.0 cm moves a distance of 900 cm in 1.0 minute.

What is its frequency?

- A 7.5 Hz B 30 Hz C 450 Hz D 1800 Hz
- 36 Which electromagnetic waves are found immediately either side of the visible region of the electromagnetic spectrum?
- A infra-red and ultra-violet
 B microwaves and infra-red
 C microwaves and X-rays
 D ultra-violet and X-rays
- 37 Two sound waves, P and Q, are displayed on an oscilloscope. The settings on the oscilloscope are the same for P and Q.



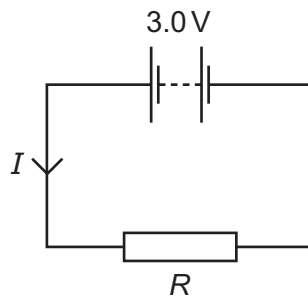
Which statement correctly compares the pitch and the loudness of the two sounds?

- A P has a higher pitch and is louder than Q.
 B P has a higher pitch and is quieter than Q.
 C P has a lower pitch and is louder than Q.
 D P has a lower pitch and is quieter than Q.
- 38 Sound travels in liquids and solids.

Which row in the table shows the approximate speed of sound in a liquid, and the approximate speed of sound in a solid?

	speed in liquid m/s	speed in solid m/s
A	340	340
B	340	1500
C	1500	5000
D	5000	1500

- 39 The circuit shows a current I in a resistor of resistance R .



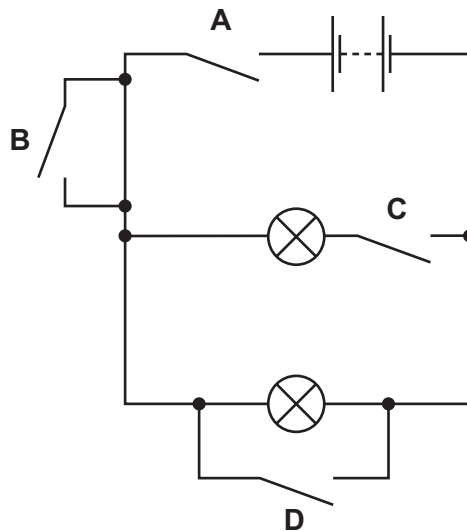
Which row in the table shows possible pairs of values of I and R ?

	I/A	R/Ω
A	1.5	1.5
B	1.5	2.0
C	6.0	2.0
D	4.0	12.0

- 40 The circuit shown contains four labelled switches.

When all the switches are closed, one switch can be opened without affecting the brightness of either lamp.

Which switch is this?



I		Group										VIII																																								
II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII																																				
3 Li lithium 7	4 Be beryllium 9	11 Na sodium 23	12 Mg magnesium 24	19 K potassium 39	20 Ca calcium 40	37 Rb rubidium 85	38 Sr strontium 88	55 Cs caesium 133	87 Fr francium	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	57-71 Ba lanthanoids barium 137	88-103 Ra actinoids radium	5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulphur 32	17 Cl chlorine 35.5	18 Ar argon 40	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium	85 At astatine	86 Rn radon	1 H hydrogen 1	2 He helium 4
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px;"> Key atomic number atomic symbol name relative atomic mass </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> 1 H hydrogen 1 </div> </div>																																																				

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
	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 dm³ at room temperature and pressure (r.t.p.)

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