Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/23**

Paper 2 Multiple Choice (Extended) **October/November 2020**

45 minutes

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

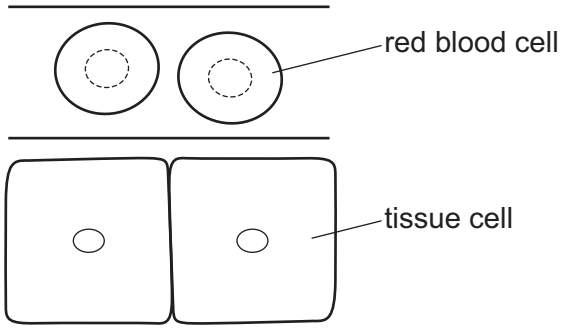
- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the 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.

This document has **16** pages. Blank pages are indicated.

1 The diagram shows two red blood cells inside a capillary and two tissue cells near this capillary.



How does the oxygen in the red blood cells reach the tissue cells?

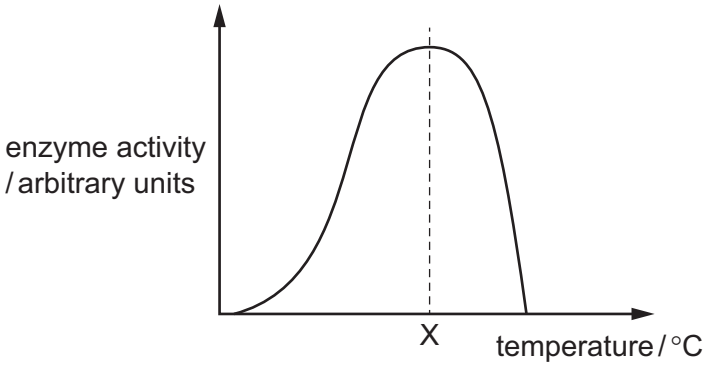
A by absorption

B by diffusion

C by respiration

D by transpiration

2 The diagram shows how the activity of an enzyme changes with temperature.



This enzyme works in the human body.

What is the most likely value of temperature X?

A 10 °C **B** 40 °C **C** 70 °C **D** 100 °C

3 Which row shows the results of mechanical digestion?

	food is broken down into		
	smaller pieces	smaller molecules	soluble molecules
A	✗	✓	✓
B	✗	✗	✓
C	✓	✗	✗
D	✓	✗	✓

4 Protease breaks down protein.

What is the protein broken down into?

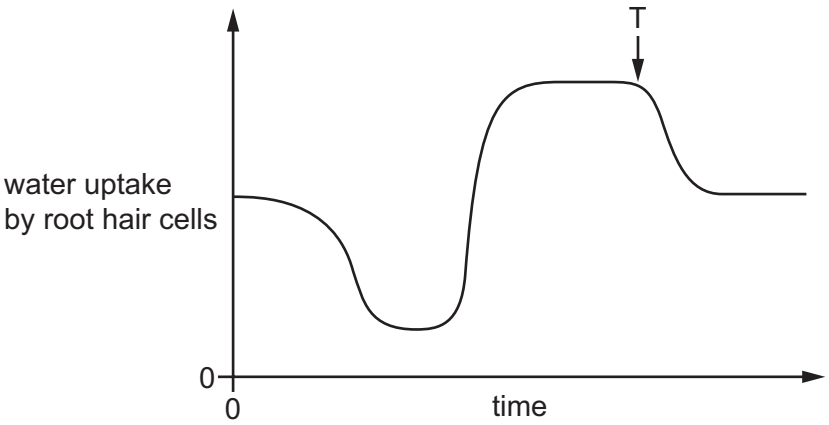
A amino acids

B fatty acids

C glycerol

D starch

5 The graph shows the uptake of water by root hair cells over many hours during a day.



What could have caused the change in the rate of uptake at T?

A decrease in temperature

B decrease in humidity

C increase in light intensity

D increase in temperature

6 How does mucus benefit the gas exchange system?

A It absorbs carbon monoxide before it reaches the alveoli.

B It prevents friction between the air and the trachea.

C It removes the nicotine in cigarette smoke.

D It traps pathogens.

7 Which shows the balanced chemical equation for aerobic respiration?

A $6CO_2 + C_6H_{12}O_6 \rightarrow 6O_2 + 6H_2O$

B $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

C $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

D $6O_2 + 6H_2O \rightarrow 6CO_2 + C_6H_{12}O_6$

8 A person's body secretes adrenaline in response to a frightening experience.

Which statement is correct?

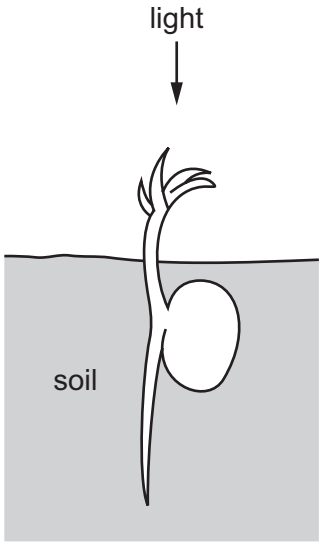
A The person's blood glucose concentration decreases.

B The person's breathing rate does not change.

C The person's pulse rate increases.

D The person's pupils become narrower.

9 The diagram shows a germinating seed.



What does the germinating seed show?

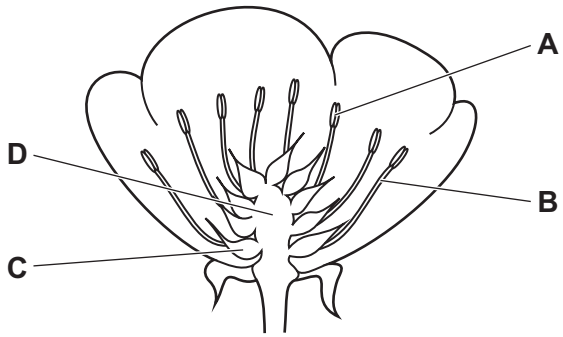
	shoot	root
A	negative phototropism	negative gravitropism
B	negative phototropism	positive gravitropism
C	positive phototropism	negative gravitropism
D	positive phototropism	positive gravitropism

10 Which row describes asexual reproduction?

	number of parents	a zygote is produced	offspring identical to the parent
A	1	no	yes
B	1	yes	no
C	2	no	yes
D	2	yes	no

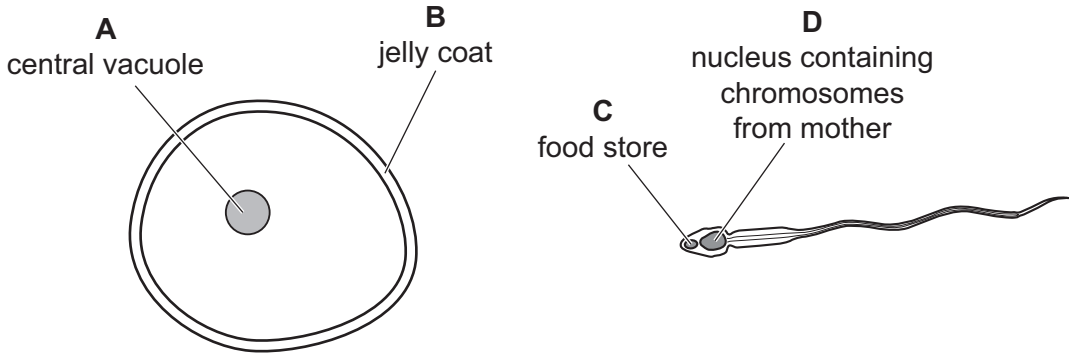
11 The diagram shows a section through a buttercup flower.

Which structure produces pollen grains?



12 The diagram shows a male gamete and a female gamete.

Which label is correct?



13 Some stages in the process of eutrophication are listed.

1 reduction in dissolved oxygen

2 increased aerobic respiration by decomposers

3 increased availability of nitrates

4 death of organisms requiring dissolved oxygen

5 increased growth of producers and increased decomposition after death of producers

In which sequence do these stages take place?

A $1 \rightarrow 4 \rightarrow 3 \rightarrow 5 \rightarrow 2$

B $3 \rightarrow 1 \rightarrow 5 \rightarrow 2 \rightarrow 4$

C $3 \rightarrow 5 \rightarrow 2 \rightarrow 1 \rightarrow 4$

D $4 \rightarrow 3 \rightarrow 1 \rightarrow 2 \rightarrow 5$

14 The temperature and pressure of oxygen in two different containers are shown.

	temperature / °C	pressure / kN/m^2
container 1	20	200
container 2	50	150

Which statement about the oxygen molecules in container 1 compared to container 2 is correct?

A In container 1 they are closer together and moving faster.

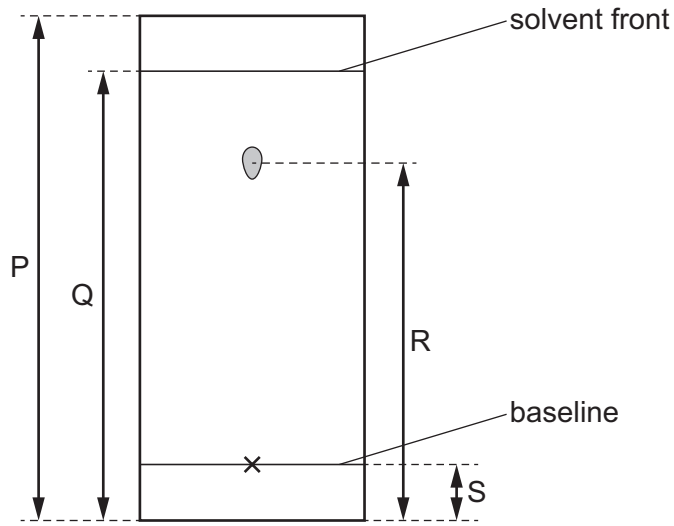
B In container 1 they are closer together and moving slower.

C In container 1 they are further apart and moving faster.

D In container 1 they are further apart and moving slower.

15 A pure sample of a coloured dye is tested using chromatography.

The chromatogram obtained is shown.



How is the R_f value of the dye calculated?

A $\frac{R}{P}$ **B** $\frac{R}{Q}$ **C** $\frac{R-S}{Q-S}$ **D** $\frac{R-S}{P-S}$

16 Which statement describes a mixture?

A It contains molecules made from the same type of atom.

B It contains only one type of atom.

C It contains two different types of atom joined by chemical bonds.

D It contains two different types of atom that can be separated by physical processes.

17 Which equation is **not** correctly balanced?

A $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

B $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

C $CaO + 2HCl \rightarrow CaCl_2 + H_2O$

D $Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + H_2O$

18 What happens to cations during electrolysis?

A They gain electrons.

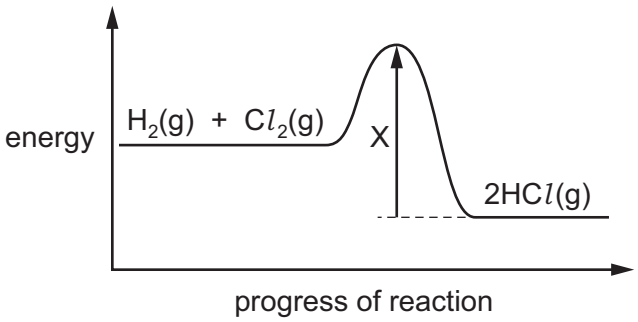
B They gain oxygen.

C They lose electrons.

D They lose oxygen.

19 The equation and the energy level diagram for the reaction between hydrogen and chlorine are shown.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$



Which statement about this reaction is correct?

A The reaction is endothermic.

B The products have less energy than the reactants.

C X is the activation energy.

D More bonds are being broken than are being formed.

20 Dilute hydrochloric acid reacts with solid calcium carbonate.

Decreasing the temperature and diluting the acid both decrease the rate of reaction.

Which statement explains why these changes cause the rate of reaction to decrease?

A Both result in the acid particles having less energy.

B Both result in a lower proportion of collisions between reacting particles being successful.

C Both result in fewer acid particles per cm^3 of solution.

D Both result in a lower frequency of collisions between reacting particles.

21 The equation for the reaction between zinc oxide and copper is shown.

$$ZnO + Cu \rightarrow Zn + CuO$$

Which statement about this reaction is correct?

A Copper is the oxidising agent.

B Copper oxide is being oxidised.

C Zinc is the reducing agent.

D Zinc oxide is being reduced.

22 Which two substances both react with dilute sulfuric acid to make the salt magnesium sulfate?

A magnesium carbonate and magnesium chloride

B magnesium chloride and magnesium nitrate

C magnesium oxide and magnesium carbonate

D magnesium oxide and magnesium nitrate

23 Acid X reacts with metal Y.

A colourless gas is given off and a pale green solution is produced.

Two tests are carried out on the solution.

test	reagent(s) added	result
1	aqueous silver nitrate and nitric acid	white precipitate
2	aqueous sodium hydroxide	green precipitate

What are acid X and metal Y?

	acid	metal
A	hydrochloric	iron
B	hydrochloric	zinc
C	sulfuric	iron
D	sulfuric	zinc

24 X, Y and Z are elements in Group VII.

X reacts with potassium iodide but not with potassium bromide.

Y reacts with potassium bromide but not with sodium chloride.

Z does not react with potassium bromide or with potassium iodide.

What are X, Y and Z?

	X	Y	Z
A	bromine	chlorine	iodine
B	bromine	iodine	chlorine
C	chlorine	bromine	iodine
D	iodine	chlorine	bromine

25 Some physical properties of four elements are shown.

Which element can act as a catalyst?

	melting point / °C	conductivity as a solid	density / g/cm^3
A	98	good	0.97
B	113	poor	2.07
C	1455	good	8.9
D	1683	poor	2.32

26 Which method is used to extract copper from copper(II) oxide?

A dissolving copper(II) oxide in hydrochloric acid and then filtering

B dissolving copper(II) oxide in water and then filtering

C heating the copper(II) oxide

D heating the copper(II) oxide mixed with carbon

27 Which statement describes a hydrocarbon?

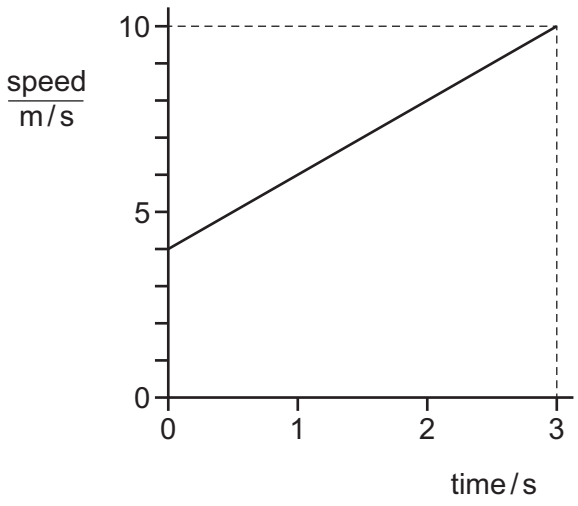
A a compound that burns to form carbon dioxide and hydrogen

B a compound that contains carbon and hydrogen only

C a compound that only contains ionic bonds

D a compound that reacts easily with metals

28 The diagram shows a speed–time graph for an object.



What is the average speed of the object?

A 2.0 m/s **B** 4.0 m/s **C** 7.0 m/s **D** 10 m/s

29 A load is hung from a spring. Measurements are taken to determine the spring constant of the spring.

Which calculation is used to obtain the spring constant?

A $\frac{\text{extension of spring}}{\text{mass of load}}$

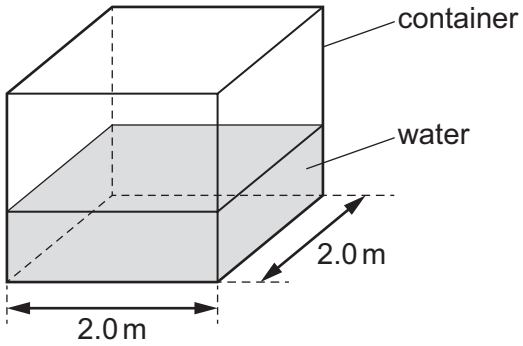
B $\frac{\text{extension of spring}}{\text{weight of load}}$

C $\frac{\text{mass of load}}{\text{extension of spring}}$

D $\frac{\text{weight of load}}{\text{extension of spring}}$

30 A container has a square base of side 2.0 m.

The pressure due to the water on the base of the container is 20 000 N / m^2.



What is the force due to the water on the base of the container?

A 5000 N **B** 10 000 N **C** 40 000 N **D** 80 000 N

31 A crane raises a mass of 200 kg through a vertical distance of 12 m.

The gravitational field strength *g* is 10 N / kg.

How much work is done on the mass?

A 17 J **B** 170 J **C** 2400 J **D** 24 000 J

32 A car of mass 1200 kg travels at a speed of 15 m / s.

The speed of the car now increases to 25 m / s.

What is the increase in the kinetic energy of the car?

A 60 000 J **B** 135 000 J **C** 240 000 J **D** 375 000 J

33 For which energy resource is the Sun the only source?

A geothermal

B natural gas

C nuclear

D tidal

34 The molecules in a substance vibrate about fixed positions.

The substance is now cooled.

Which row gives the state of the substance and the effect of cooling on the distance between its molecules?

	state of substance	effect on distance between molecules
A	solid	decreases
B	solid	increases
C	liquid	decreases
D	liquid	increases

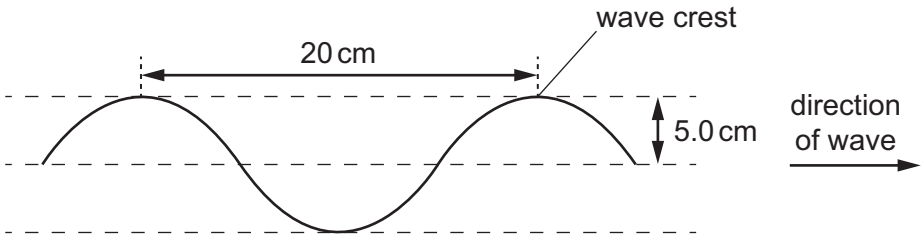
35 In which states of matter can convection occur?

	in a solid	in a liquid	in a gas
A	no	no	yes
B	no	yes	yes
C	yes	no	no
D	yes	yes	no

36 The diagram shows a section of a rope.

Four wave crests pass a point on the rope every second.

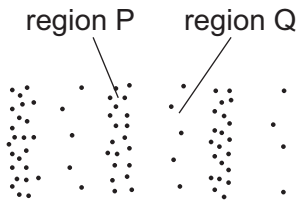
Each wave crest travels 80 cm in one second.



What is the speed of the wave?

A 4.0 cm / s **B** 5.0 cm / s **C** 20 cm / s **D** 80 cm / s

37 The diagram represents a wave in air. Molecules are closer together in region P than they are in region Q.



What are the names of regions P and Q, and which type of wave is represented?

	region P	region Q	type of wave
A	compression	rarefaction	longitudinal
B	compression	rarefaction	transverse
C	rarefaction	compression	longitudinal
D	rarefaction	compression	transverse

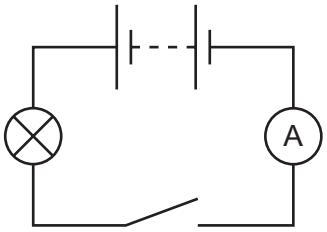
38 A power supply causes a current in a circuit.

The electromotive force (e.m.f.) of the power supply and the resistance of the circuit are both changed.

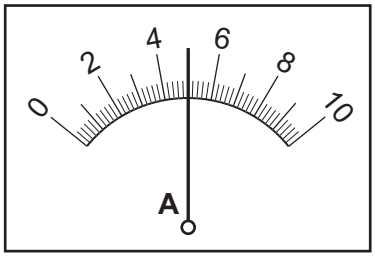
Which pair of changes **must** result in a smaller current in the circuit?

	e.m.f.	resistance
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

39 A circuit includes a lamp, a switch and an ammeter. The switch is open.



The switch is now closed and the ammeter displays the current reading shown.



The switch remains closed for 20 seconds before it is opened again.

What is the charge that flows while the switch is closed?

A 0.25 C **B** 4.0 C **C** 90 C **D** 100 C

40 What is the purpose of a fuse in an electrical appliance?

A to maintain the correct current in the appliance

B to maintain the correct voltage across the appliance

C to prevent the insulation around the cables from becoming too thin

D to protect the wires from overheating when the current is too large

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.).