Pearson Edexcel International Advanced Level

Thursday 21 May 2026

Morning (Time: 1 hour 20 minutes)

Paper reference **WCH13/01A**

Chemistry

International Advanced Subsidiary/Advanced Level

UNIT 3: Practical Skills in Chemistry I

Question Paper

You must have:
Answer Book (sent separately)
Scientific calculator, ruler

Turn over ▶

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P 8 1 8 0 6 A

Pearson

Answer ALL the questions.

Write your answers in the spaces provided in your Answer Book.

1 A solid mixture of two Group 2 metal compounds was analysed.
The mixture was added to deionised water and stirred.
After filtration, a white residue and a colourless solution were obtained.

Tests on both the white residue and the colourless solution were carried out.
The tests and the observations are shown.

	White residue	
Step	Test	Observation
1	Add dilute hydrochloric acid	Bubbles of gas **A** and a colourless solution formed
2	Gas **A** bubbled through limewater	White precipitate **B** formed
3	Flame test carried out on the solution formed in Step **1**	Green flame produced
4	Add aqueous sodium sulfate to the solution formed in Step **1**	White precipitate **C** formed

	Colourless solution	
Step	Test	Observation
5	Add dilute hydrochloric acid	No visible change
6	Add an excess of sodium hydroxide solution to a portion of the solution formed in Step **5**	White precipitate **D** formed
7	Flame test carried out on the solution formed in Step **5**	No flame colour
8	Add barium chloride solution to a separate portion of the solution formed in Step **5**	White precipitate **E** formed

1 (a) Identify, by name or formula, gas **A**.

(1)

1 (b) Give the **formula** of precipitate **B**.

(1)

1 (c) Precipitates **C** and **E** are the same.
Name the precipitate.

(1)

1 (d) Deduce the identity of the white residue.

(1)

1 (e) Identify, by name or formula, precipitate **D**.

(1)

1 (f) Deduce the identity of the compound dissolved in the colourless solution.

(1)

(Total for Question 1 = 6 marks)

2 The equilibrium between iron(III) ions and thiocyanate (SCN^-) ions involves the formation of the ion $[FeSCN]^{2+}$, according to the equation shown.

$$Fe^{3+}(aq) + SCN^-(aq) \rightleftharpoons [FeSCN]^{2+}(aq) \qquad \Delta H \text{ negative}$$

yellow colourless blood-red

An orange equilibrium mixture was formed.

2 (a) Silver ions react more readily with thiocyanate ions than with iron(III) ions, forming a precipitate.

State the colour change observed when silver nitrate solution is added to the equilibrium mixture.
Justify your answer.

(2)

2 (b) State the colour change observed when the equilibrium mixture is heated.
Justify your answer.

(2)

2 (c) State the colour change observed when more iron(III) ions are added to the equilibrium mixture.

(1)

2 (d) State the colour change observed if 50 cm^3 of the equilibrium mixture is added to 50 cm^3 deionised water.
Justify your answer.

(2)

(Total for Question 2 = 7 marks)

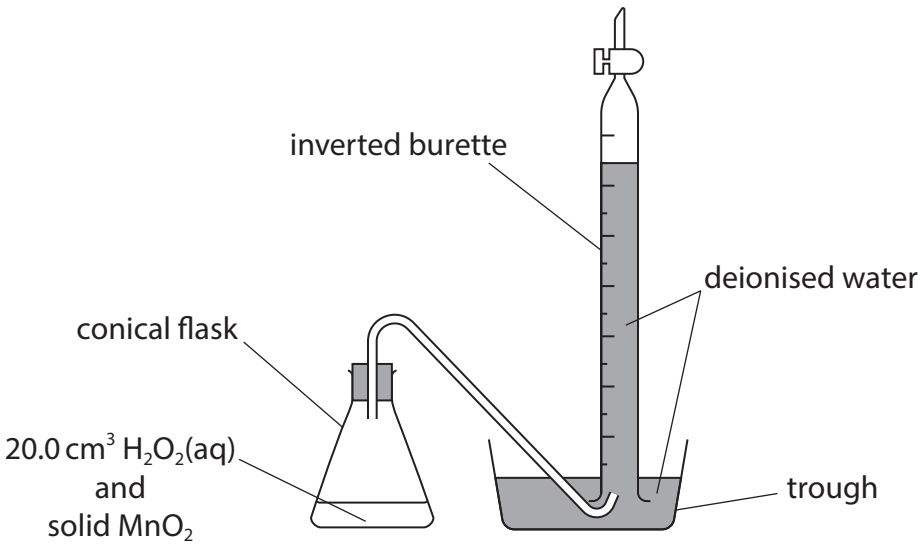
3 Hydrogen peroxide, H_2O_2, decomposes into water and oxygen.

The rate of decomposition of the hydrogen peroxide solution can be determined experimentally.

The rate of this decomposition can be increased by adding manganese(IV) oxide, MnO_2.

The progress of the reaction can be followed by measuring the volume of oxygen produced over time.

Procedure



Step **1** Set up the apparatus as shown in the diagram except for the conical flask.

Step **2** Use a measuring cylinder to add 20.0 cm^3 of '2 volume' $H_2O_2(aq)$ to a conical flask.

Step **3** Weigh out approximately 0.05 g of MnO_2.
Record the exact mass used.

Step **4** Record the initial burette reading.

Step **5** Add the MnO_2 to the conical flask and quickly insert the bung.
Shake the conical flask gently to mix the contents.

Step **6** As soon as the first bubble of gas reaches the top of the water in the burette, start the timer.

Step **7** Record the burette readings every 20 seconds for a total of 240 seconds.

3 (a) State, with a reason, how the manganese(IV) oxide can be shown to be a catalyst.

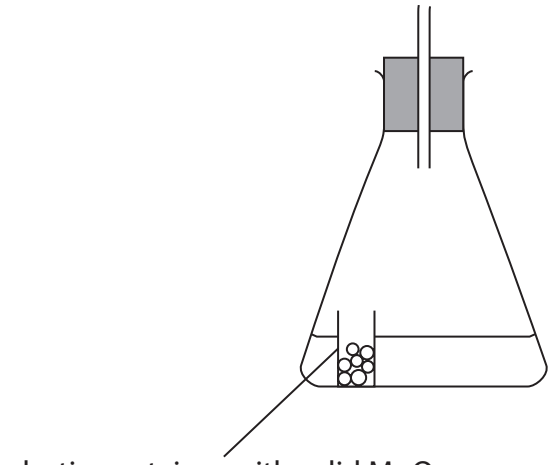
(2)

3 (b) Write an equation for the decomposition of hydrogen peroxide.
State symbols are not required.

(1)

3 (c) Step **5** of the procedure was changed.

A plastic container with solid MnO_2 was placed in the conical flask as shown and tipped over to start the reaction.



Give a reason why this apparatus will give more accurate results for the volume of oxygen collected.

(1)

3 (d) '2 volume' hydrogen peroxide solution means that every 10.0 cm^3 of the solution produces 20.0 cm^3 of oxygen gas when it decomposes completely.

Calculate the concentration, in mol dm^{-3}, of this hydrogen peroxide solution.

[Data: Molar volume of a gas at room temperature and pressure = 24 dm^3 mol^{-1}]

(2)

3 (e) Some selected results for this experiment are shown.

Time / s	Volume of oxygen / cm^3
0	0.00
20	7.50
40	12.50
60	17.50
80	20.50
120	25.00
140	26.50
160	26.80
180	27.00
240	27.00

3 (e) (i) Plot a graph of the volume of oxygen against time on the grid in the Answer Book.

(3)

3 (e) (ii) Calculate the rate of reaction when the volume of oxygen is half its final volume. Include units in your answer.

Show your working on your graph.

(3)

3 (e) (iii) Explain why the rate of reaction decreases as the reaction proceeds.

(2)

3 (f) State why repeating the experiment will not necessarily produce more accurate results.

(1)

3 (g) Name a piece of apparatus that would more accurately measure the volume of the hydrogen peroxide solution.

(1)

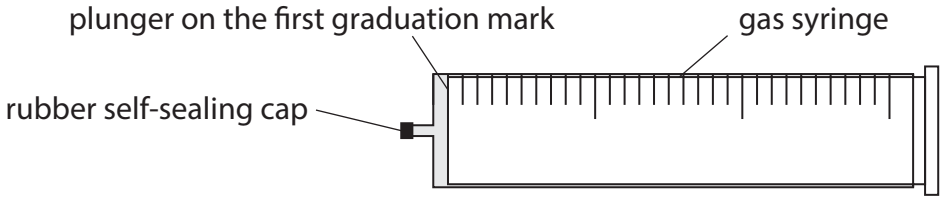
(Total for Question 3 = 16 marks)

4 This question is about an experiment to determine the relative molecular mass of a volatile liquid alkane.

Procedure

Step **1** Air is drawn into a gas syringe so that the volume is on the first graduation mark.

Step **2** Put a rubber self-sealing cap over the syringe nozzle as shown.



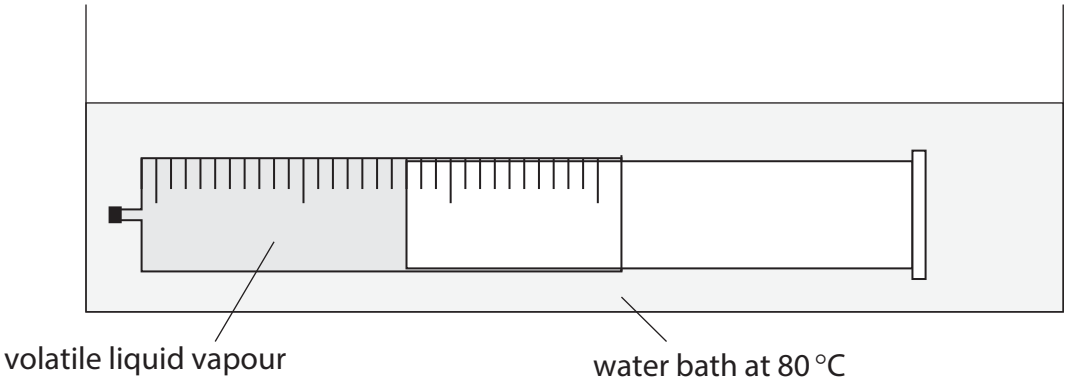
Step **3** Immerse the sealed gas syringe in a hot water bath at 80 °C. Record the volume of the air.

Step **4** Weigh a hypodermic syringe containing a small volume of the volatile alkane.

Step **5** Lift the gas syringe out of the water bath and carefully inject approximately 0.4 cm^3 of the volatile liquid through the rubber self-sealing cap.

Step **6** Reweigh the hypodermic syringe.

Step **7** Return the gas syringe to the water bath at 80 °C and record the new volume, as shown.



Step **8** Subtract the volume of air recorded in Step **3** from this new volume to obtain the volume of vapour formed.

4 (a) Experimental results gave a molar mass of 86 g mol^{-1} for the alkane.

Deduce a possible name **and** skeletal formula for this alkane.

(2)

4 (b) (i) State why it is necessary to start on a graduation mark of the gas syringe in Step **1**.

(1)

4 (b) (ii) State why the cap on the gas syringe must be self-sealing.

(1)

4 (b) (iii) Explain why it is necessary to place the sealed syringe into the water bath in Steps **3** and **7**.

(2)

4 (c) The apparatus used in this experiment will have uncertainty in the readings.

The mass of volatile liquid was 0.252 g and the volume of gas was 85.0 cm^3.

4 (c) (i) Calculate the percentage uncertainty in the mass value for the balance with a measurement uncertainty of ±0.001 g per reading.

(1)

4 (c) (ii) Calculate the percentage uncertainty in the volume value for the gas syringe with a measurement uncertainty of ±0.5 cm^3 per reading.

(1)

(Total for Question 4 = 8 marks)

5 When propan-1-ol is heated with acidified potassium dichromate(VI), it can be partially oxidised to propanal, CH_3CH_2CHO. The equation is shown.

$$CH_3CH_2CH_2OH + [O] \rightarrow CH_3CH_2CHO + H_2O$$

Procedure

Step **1** Add 2.70 g potassium dichromate(VI) (an excess), and some anti-bumping granules, to a round-bottomed flask using a funnel.

Step **2** Slowly add 12.0 cm^3 of 3.00 mol dm^{-3} sulfuric(VI) acid to the potassium dichromate(VI) in the round-bottomed flask using the funnel.

Step **3** Swirl the flask to help dissolve the solid.

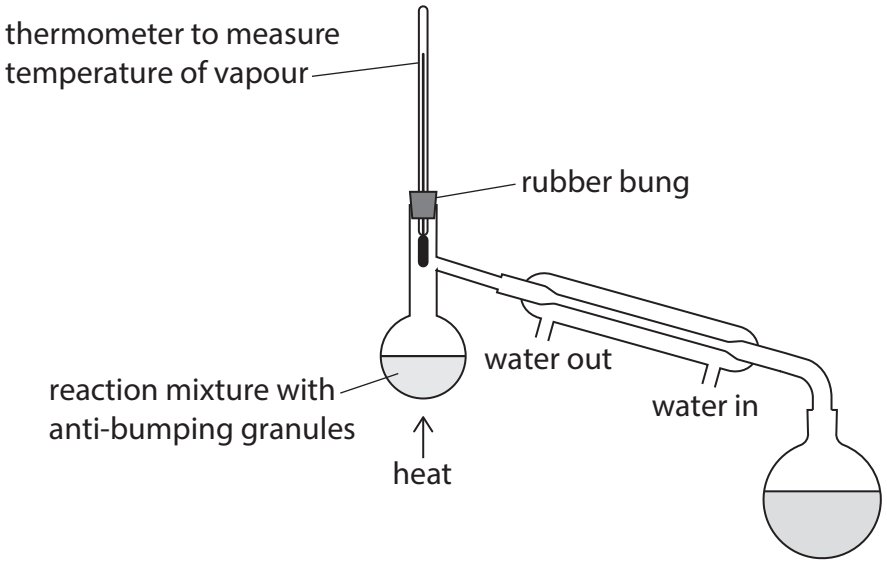
Step **4** Cool the solution by swirling the flask in an ice-water bath for 2–3 minutes, until the solution is $<10\,°C$.

Step **5** Carefully add 2.00 cm^3 propan-1-ol to the flask dropwise, while swirling the round-bottomed flask in the ice-water bath.

Step **6** Remove the flask from the ice-water bath, connect to a condenser and turn on the condenser water flow.

Step **7** Heat the reaction mixture for about 30 minutes.

Step **8** The product is collected by distillation as it forms.
An incorrect distillation apparatus is shown.



5 (a) Suggest why the flask is placed in an ice-water bath while the propan-1-ol is added.

(1)

5 (b) The distillation apparatus was incorrectly set up, as shown in the diagram.

Identify the mistake in the diagram, describing the problem that would occur due to this mistake.

Assume the apparatus is clamped correctly.

(1)

5 (c) The table shows the boiling temperature of some of the materials used in this experiment.

Compound	Boiling temperature / °C
propan-1-ol	97
water	100
propanal	49

Suggest why the temperature, on heating, does not go much higher than 100 °C.

(1)

5 (d) Explain, with reference to intermolecular forces, why distillation can be used to separate propanal from the reaction mixture.

(3)

5 (e) Identify, by name or formula, an appropriate reagent to remove water from the propanal distillate.

(1)

5 (f) After purification the mass of propanal obtained was 1.12 g.
Calculate the % yield of propanal.
Give your answer to an appropriate number of significant figures.

[Data: Density of propan-1-ol = 0.804 g cm^{-3}]

(4)

5 (g) Propanal can be further oxidised to produce propanoic acid.

State a simple chemical test which proves the production of propanoic acid from propan-1-ol. Include an observation for **each** substance.

(2)

(Total for Question 5 = 13 marks)

TOTAL FOR PAPER = 50 MARKS

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Thursday 21 May 2026

Morning (Time: 1 hour 20 minutes)

Paper reference **WCH13/01A**

Chemistry

International Advanced Subsidiary/Advanced Level
UNIT 3: Practical Skills in Chemistry I
Answer Book

You must have:
Question paper (sent separately)
Scientific calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- A Periodic Table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Show all your working in calculations and include units where appropriate.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

Answer ALL the questions. Write your answers in the spaces provided in the answer book.

1 (a)

(1)

1 (b)

(1)

1 (c)

(1)

1 (d)

(1)

1 (e)

(1)

1 (f)

(1)

(Total for Question 1 = 6 marks)

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(1)

2 (d)

(2)

(Total for Question 2 = 7 marks)

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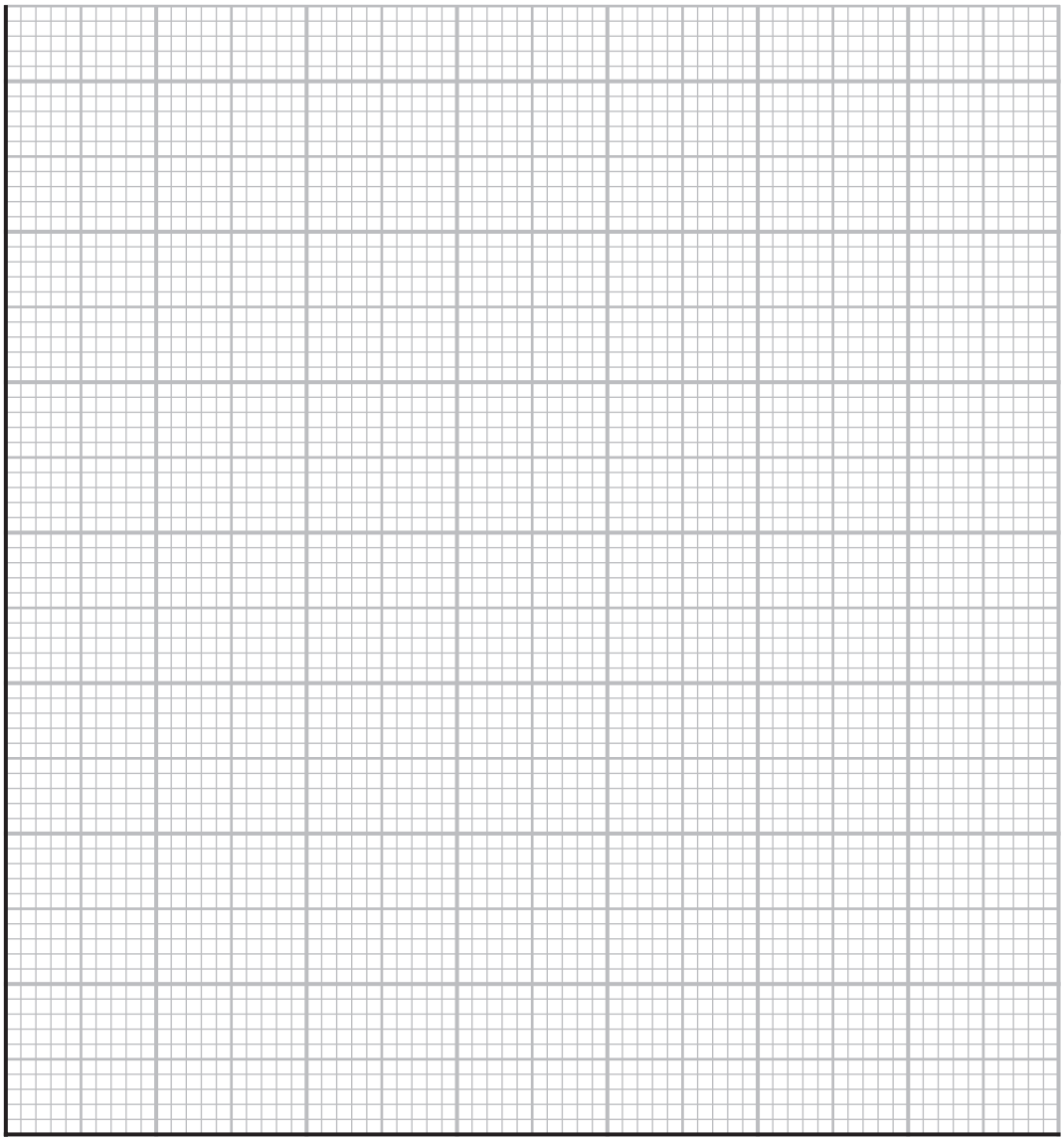
3 (e) (i)

(3)



3 (e) (ii)

(3)

3 (e) (iii)

(2)

3 (f)

(1)

3 (g)

(1)

(Total for Question 3 = 16 marks)

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4 (a)

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4 (b) (i)

(1)

4 (b) (ii)

(1)

4 (b)(iii)

(2)

4 (c) (i)

(1)

4 (c) (ii)

(1)

(Total for Question 4 = 8 marks)

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5 (a)

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5 (d)

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5 (e)

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5 (f)

(4)

5 (g)

(2)

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(Total for Question 5 = 13 marks)

TOTAL FOR PAPER = 50 MARKS

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The Periodic Table of Elements

1	2											3	4	5	6	7	0 (8) (18)
							1.0 H hydrogen 1										4.0 He helium 2
(1)	(2)											(13)	(14)	(15)	(16)	(17)	
6.9 Li lithium 3	9.0 Be beryllium 4											10.8 B boron 5	12.0 C carbon 6	14.0 N nitrogen 7	16.0 O oxygen 8	19.0 F fluorine 9	20.2 Ne neon 10
23.0 Na sodium 11	24.3 Mg magnesium 12	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18
39.1 K potassium 19	40.1 Ca calcium 20	45.0 Sc scandium 21	47.9 Ti titanium 22	50.9 V vanadium 23	52.0 Cr chromium 24	54.9 Mn manganese 25	55.8 Fe iron 26	58.9 Co cobalt 27	58.7 Ni nickel 28	63.5 Cu copper 29	65.4 Zn zinc 30	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36
85.5 Rb rubidium 37	87.6 Sr strontium 38	88.9 Y yttrium 39	91.2 Zr zirconium 40	92.9 Nb niobium 41	95.9 Mo molybdenum 42	[98] Tc technetium 43	101.1 Ru ruthenium 44	102.9 Rh rhodium 45	106.4 Pd palladium 46	107.9 Ag silver 47	112.4 Cd cadmium 48	114.8 In indium 49	118.7 Sn tin 50	121.8 Sb antimony 51	127.6 Te tellurium 52	126.9 I iodine 53	131.3 Xe xenon 54
132.9 Cs caesium 55	137.3 Ba barium 56	138.9 La* lanthanum 57	178.5 Hf hafnium 72	180.9 Ta tantalum 73	183.8 W tungsten 74	186.2 Re rhenium 75	190.2 Os osmium 76	192.2 Ir iridium 77	195.1 Pt platinum 78	197.0 Au gold 79	200.6 Hg mercury 80	204.4 Tl thallium 81	207.2 Pb lead 82	209.0 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111							

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

Elements with atomic numbers 112-116 have been reported but not fully authenticated

* Lanthanide series	140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	[147] Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	163 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
* Actinide series	232 Th thorium 90	[231] Pa protactinium 91	238 U uranium 92	[237] Np neptunium 93	[242] Pu plutonium 94	[243] Am americium 95	[247] Cm curium 96	[245] Bk berkelium 97	[251] Cf californium 98	[254] Es einsteinium 99	[253] Fm fermium 100	[256] Md mendelevium 101	[254] No nobelium 102	[257] Lr lawrencium 103