



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/22

Paper 2 Multiple Choice (Extended)

May/June 2019

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.

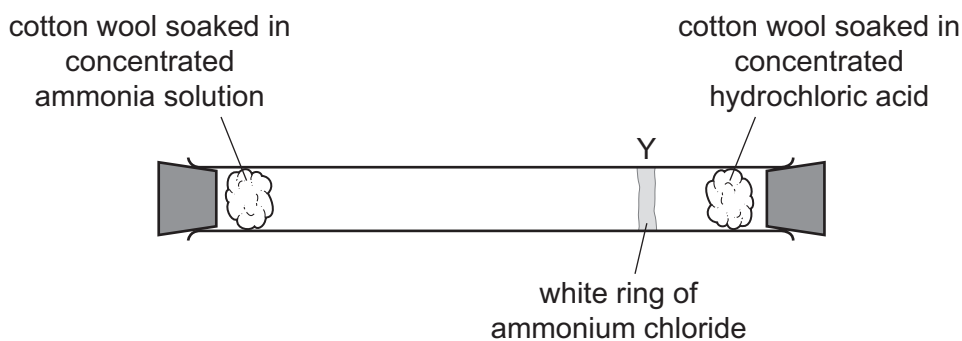
A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **17** printed pages and **3** blank pages.

- 1 The apparatus shown is set up. After 20 minutes a white ring of ammonium chloride is seen at position Y.



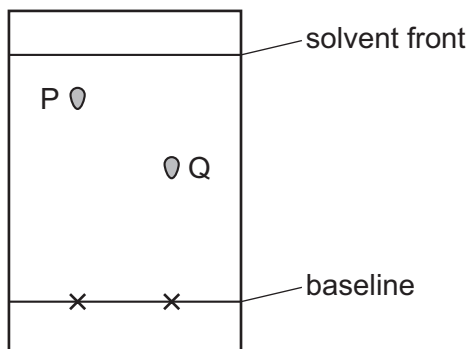
Which statement about the molecules of ammonia and hydrogen chloride is correct?

- A** Molecules in ammonia have a larger M_r than molecules of hydrogen chloride and so they move more slowly.
- B** Molecules in ammonia have a larger M_r than molecules of hydrogen chloride and so they move more quickly.
- C** Molecules in ammonia have a smaller M_r than molecules of hydrogen chloride and so they move more slowly.
- D** Molecules in ammonia have a smaller M_r than molecules of hydrogen chloride and so they move more quickly.
- 2 A student measures 25.00 cm^3 of dilute hydrochloric acid accurately.

Which apparatus is most suitable?

- A** beaker
- B** measuring cylinder
- C** burette
- D** dropping pipette

3 The chromatogram of solutions of two metal ions, P and Q, is shown.



P is coloured. A locating agent is used to find the position of Q.

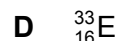
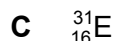
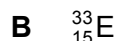
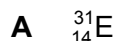
The R_f value of each solution is calculated.

P is a1..... element and has an R_f value2..... than that of Q.

Which words complete gaps 1 and 2?

	1	2
A	non-transition	greater
B	non-transition	smaller
C	transition	greater
D	transition	smaller

4 What is an isotope of $^{31}_{15}\text{E}$?



5 Which row describes the formation of single covalent bonds in methane?

A	atoms share a pair of electrons	both atoms gain a noble gas electronic structure
B	atoms share a pair of electrons	both atoms have the same number of electrons in their outer shell
C	electrons are transferred from one atom to another	both atoms gain a noble gas electronic structure
D	electrons are transferred from one atom to another	both atoms have the same number of electrons in their outer shell

6 Which statement describes the structure of an ionic compound?

- A It is a giant lattice of oppositely charged ions.
- B It is a giant lattice of positive ions in a 'sea' of electrons.
- C It is a giant molecule of oppositely charged ions.
- D It is a simple molecule of oppositely charged ions.

7 Calcium metal reacts with water to form a solution of calcium hydroxide and hydrogen gas.

Which equation is correct?

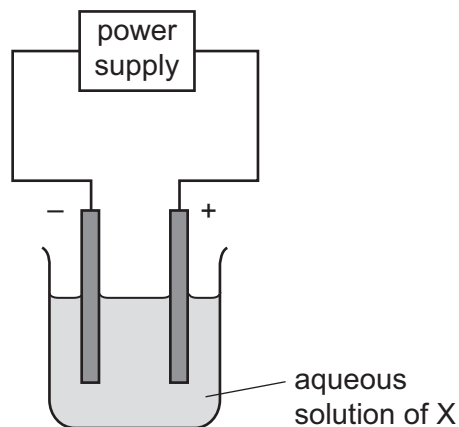
- A $\text{Ca(s)} + \text{H}_2\text{O(aq)} \rightarrow \text{CaOH(aq)} + \text{H(g)}$
- B $\text{Ca(s)} + 2\text{H}_2\text{O(aq)} \rightarrow \text{Ca(OH)}_2\text{(s)} + 2\text{H}_2\text{(g)}$
- C $\text{Ca(s)} + 2\text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2\text{(aq)} + \text{H}_2\text{(g)}$
- D $\text{Ca(s)} + \text{H}_2\text{O(l)} \rightarrow \text{CaOH(l)} + \text{H(g)}$

8 25.0 cm^3 of 0.100 mol/dm^3 aqueous sodium hydroxide is neutralised by 24.6 cm^3 of dilute sulfuric acid.

What is the concentration of the dilute sulfuric acid?

- A 0.0508 mol/dm^3
- B 0.0984 mol/dm^3
- C 0.102 mol/dm^3
- D 0.203 mol/dm^3

9 The diagram shows the electrolysis of an aqueous solution of X using inert electrodes.

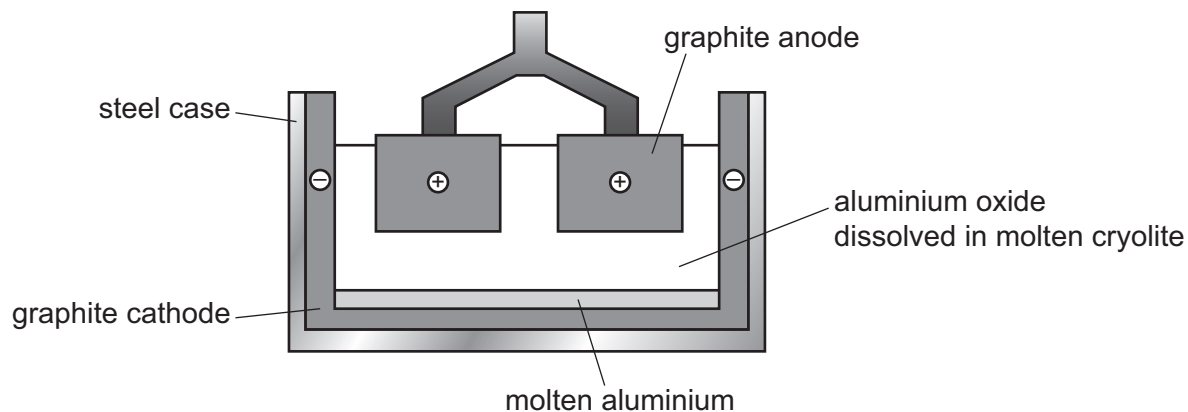


Hydrogen is produced at the cathode and chlorine is produced at the anode.

What is X?

- A concentrated copper(II) chloride solution
- B concentrated hydrochloric acid
- C dilute hydrochloric acid
- D dilute sodium chloride solution

10 Aluminium is extracted by electrolysis as shown.



Which row shows the ionic half-equations at the cathode and the anode?

	cathode	anode
A	$Al^{3+} \rightarrow Al + 3e^{-}$	$2O^{2-} \rightarrow O_2 + 4e^{-}$
B	$Al^{3+} \rightarrow Al + 3e^{-}$	$2O^{2-} + 4e^{-} \rightarrow O_2$
C	$Al^{3+} + 3e^{-} \rightarrow Al$	$2O^{2-} \rightarrow O_2 + 4e^{-}$
D	$Al^{3+} + 3e^{-} \rightarrow Al$	$2O^{2-} + 4e^{-} \rightarrow O_2$

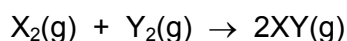
11 Fuel cells are used as energy sources in cars.

Which row gives a fuel used in a fuel cell and the products formed?

	fuel in a fuel cell	products formed
A	hydrogen	carbon dioxide and water
B	hydrogen	water only
C	petrol	carbon dioxide and water
D	petrol	water only

12 Two elements, X and Y, react together to form a covalent molecule as shown.

The reaction is exothermic.



The bond energies are shown in the table.

bond	bond energy in kJ/mol
X-X	436
Y-Y	242
X-Y	431

What is the energy change for the reaction?

A +184 kJ/mol **B** -184 kJ/mol **C** +247 kJ/mol **D** -247 kJ/mol

13 Which change in reaction conditions increases both the collision rate and the proportion of molecules with sufficient energy to react?

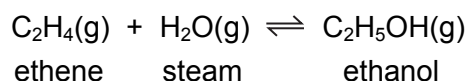
- A** addition of a catalyst
- B** increasing the concentration of a reactant
- C** increasing the surface area of a reactant
- D** increasing the temperature of the reaction

- 14 When blue-green crystals of nickel(II) sulfate are heated, water is produced and a yellow solid remains. When water is added to the yellow solid, the blue-green colour returns.

Which process describes these changes?

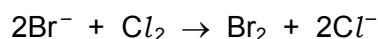
- A combustion
- B corrosion
- C neutralisation
- D reversible reaction

- 15 The equation for the manufacture of ethanol is shown.



What is the effect of doubling the pressure on this reaction?

- A decreases the rate of formation of ethanol
 - B increases the yield of ethene
 - C decreases the rate of formation of ethene
 - D increases the yield of ethanol
- 16 The ionic equation for the reaction of aqueous potassium bromide with chlorine gas is shown.



Which statement is correct?

- A Bromide ions are oxidised by gaining electrons.
 - B Bromide ions are oxidised by losing electrons.
 - C Chlorine is oxidised by gaining electrons.
 - D Chlorine is oxidised by losing electrons.
- 17 Which type of oxide are carbon monoxide and aluminium oxide?

	carbon monoxide	aluminium oxide
A	acidic	amphoteric
B	acidic	basic
C	neutral	amphoteric
D	neutral	basic

18 The positions of elements W, X, Y and Z in the Periodic Table are shown.

Which elements form basic oxides?

- A** W, X and Y **B** W and X only **C** Y only **D** Z only

19 Which row shows the difference between a weak acid and a strong acid?

	weak acid	strong acid
A	fully ionised	partially ionised
B	concentrated	dilute
C	dilute	concentrated
D	partially ionised	fully ionised

20 Part of the Periodic Table is shown.

Which row describes the properties of X, Y and Z?

	good conductor of electricity	high melting point
A	X	Z
B	Y	Z and X
C	Y and Z	Z
D	Z and X	X

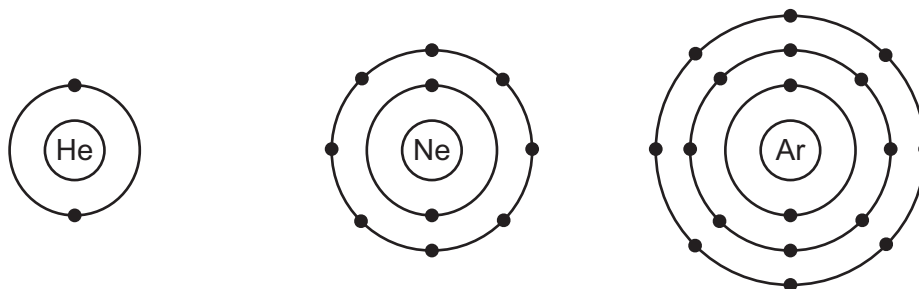
21 The melting points and boiling points of the elements of Group I of the Periodic Table are shown.

element	melting point /°C	boiling point /°C
lithium	181	1330
sodium	98	883
potassium	63	759
rubidium	39	688
caesium	28	671

Which pair of elements are liquid at 800 °C?

- A caesium and rubidium
- B potassium and sodium
- C lithium and sodium
- D potassium and caesium

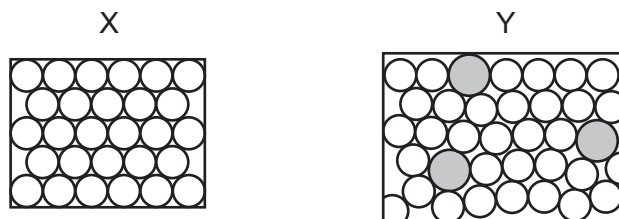
22 The electronic structures of helium, neon and argon are shown.



Which row describes these gases?

	reactivity	form of the gas	electronic structure
A	reactive	monoatomic	incomplete outer shell of electrons
B	unreactive	diatomic	complete outer shell of electrons
C	unreactive	diatomic	incomplete outer shell of electrons
D	unreactive	monoatomic	complete outer shell of electrons

23 The diagrams show the structure of two substances used to make electrical conductors.



Which statement correctly describes X and Y?

- A X is a pure metal and Y is a compound.
- B X is a pure metal and Y is an alloy.
- C X is a solid and Y is a liquid.
- D X is harder and stronger than Y.

24 A student heated the carbonates and nitrates of sodium and copper.

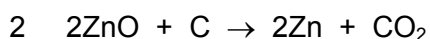
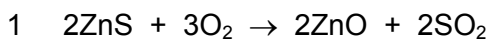
The results are shown.

	compound heated	gases released	solid formed
1	sodium carbonate	carbon monoxide	sodium oxide
2	copper(II) carbonate	carbon dioxide	copper
3	sodium nitrate	oxygen only	sodium nitrite
4	copper(II) nitrate	nitrogen dioxide and oxygen	copper(II) oxide

Which rows describe the correct results?

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

25 Zinc is extracted from its ore, zinc blende, using two chemical reactions.



Which substance is reduced in reactions 1 and 2?

	reaction 1	reaction 2
A	O ₂	C
B	O ₂	ZnO
C	ZnS	C
D	ZnS	ZnO

- 26** Four metals, zinc, M, copper and magnesium, are reacted with aqueous solutions of their nitrates.

The results are shown.

metal	magnesium nitrate	M nitrate	copper nitrate	zinc nitrate	
magnesium		✓	✓	✓	key ✓ = reacts X = no reaction
zinc	X	✓	✓		
M	X		✓	X	
copper	X	X		X	

What is the order of reactivity of these four metals starting with the most reactive?

- A** copper → zinc → M → magnesium
B copper → M → zinc → magnesium
C magnesium → M → zinc → copper
D magnesium → zinc → M → copper
- 27** Which property of aluminium makes it useful in the manufacture of aircraft?
- A** conducts electricity
B high boiling point
C low density
D silver colour
- 28** The exhaust gases from cars contain oxides of nitrogen.

How are these oxides of nitrogen formed?

- A** Nitrogen and oxygen from the air react together at the high temperatures in the engine.
B Nitrogen and oxygen from the petrol react together in the car exhaust.
C Nitrogen from the petrol reacts with oxygen at the high temperatures in the engine.
D Nitrogen reacts with oxygen from the air in the catalytic converter.

29 Water can be treated by filtration then chlorination.

Which uses do **not** need water of this quality?

- 1 water for cooling in industry
- 2 water for washing clothes
- 3 water for drinking

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

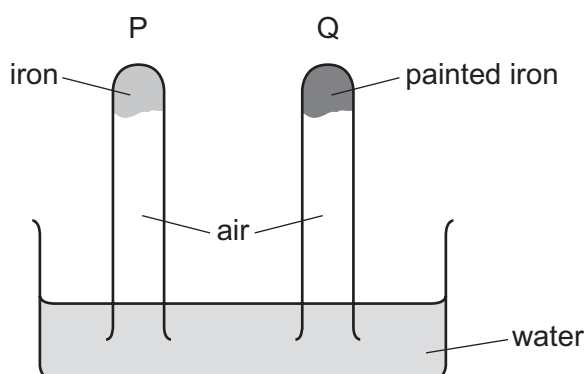
30 Some of the processes involved in the carbon cycle are shown.

- 1 glucose + oxygen → carbon dioxide + water
- 2 carbon dioxide + water → glucose + oxygen
- 3 methane + oxygen → carbon dioxide + water

What are the names of these processes?

	1	2	3
A	combustion	respiration	photosynthesis
B	photosynthesis	combustion	respiration
C	respiration	combustion	photosynthesis
D	respiration	photosynthesis	combustion

31 The diagram shows an experiment to investigate how paint affects the rusting of iron.

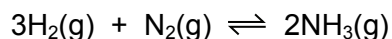


What happens to the water level in tubes P and Q?

	tube P	tube Q
A	falls	rises
B	no change	rises
C	rises	falls
D	rises	no change

32 Ammonia is produced in the Haber process.

The equation for the reaction is shown.



The forward reaction is exothermic.

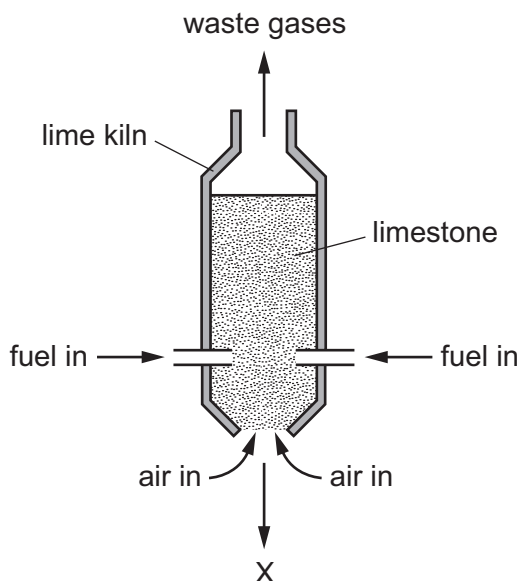
Which conditions of temperature and pressure produce the highest yield of ammonia?

	temperature	pressure
A	high	high
B	high	low
C	low	high
D	low	low

33 Which row shows the conditions used in the Contact process?

	temperature /°C	pressure /atm	catalyst
A	25	2	iron
B	25	200	iron
C	450	2	vanadium(V) oxide
D	450	200	vanadium(V) oxide

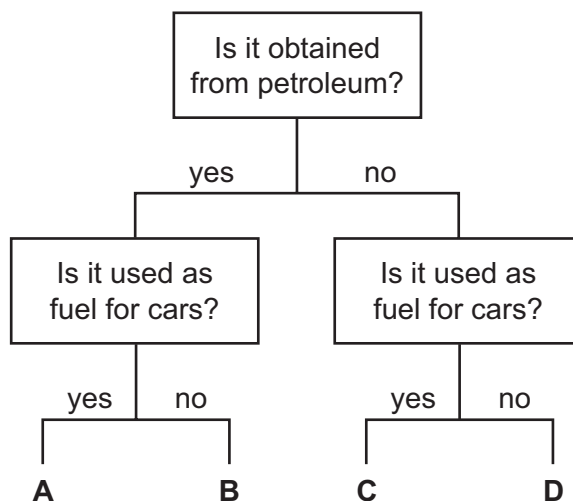
34 The diagram represents a lime kiln used to heat limestone to a very high temperature.



What leaves the kiln at X?

- A calcium carbonate
- B calcium hydroxide
- C calcium oxide
- D calcium sulfate

35 Which fuel could be gasoline?



36 Which statement about homologous series is **not** correct?

- A All homologous series are hydrocarbons.
- B Members of a homologous series have the same functional group.
- C Members of a homologous series have similar chemical properties.
- D The alkanes are an example of a homologous series.

37 In bright sunlight, ethane and chlorine combine in substitution reactions.

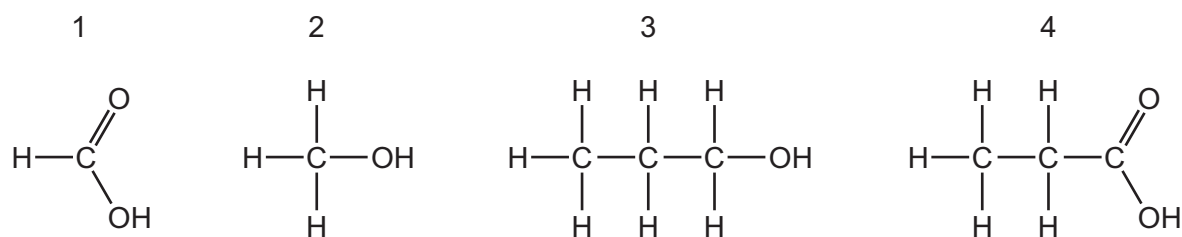
Which compound is **not** formed in these reactions?

- A C_2H_3Cl B C_2H_5Cl C $C_2H_4Cl_2$ D HCl

38 What are the properties of aqueous ethanoic acid?

	decolourises bromine water	reacts with calcium carbonate to make carbon dioxide	turns damp red litmus blue
A	✓	✓	x
B	✓	x	✓
C	x	✓	x
D	x	x	✓

39 The structures of four molecules are shown.

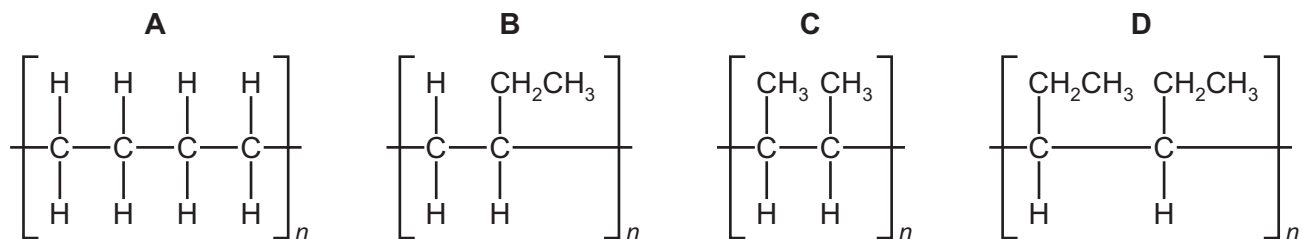


Which molecules react together to form the ester propyl methanoate?

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

40 But-1-ene has the structure $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$.

What is the structure of poly(but-1-ene)?



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The Periodic Table of Elements

		Group							
I	II	III	IV	V	VI	VII	VIII		
3 Li lithium 7	4 Be beryllium 9	1 H hydrogen 1	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
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
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
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 —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —
			118 Og oganesson —	119 Uu ununoctium —	120 Uub unbinilium —	121 Uut ununtrium —	122 Uuq unquadium —	123 Uuq unquadium —	124 Uuq unquadium —
			125 Uup unpentium —	126 Uuq unquadium —	127 Uuq unquadium —	128 Uuq unquadium —	129 Uuq unquadium —	130 Uuq unquadium —	131 Uuq unquadium —
			132 Uuq unquadium —	133 Uuq unquadium —	134 Uuq unquadium —	135 Uuq unquadium —	136 Uuq unquadium —	137 Uuq unquadium —	138 Uuq unquadium —
			139 Uuq unquadium —	140 Uuq unquadium —	141 Uuq unquadium —	142 Uuq unquadium —	143 Uuq unquadium —	144 Uuq unquadium —	145 Uuq unquadium —
			146 Uuq unquadium —	147 Uuq unquadium —	148 Uuq unquadium —	149 Uuq unquadium —	150 Uuq unquadium —	151 Uuq unquadium —	152 Uuq unquadium —
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			265 Uuq unquadium —	266 Uuq unquadium —	267 Uuq unquadium —	268 Uuq unquadium —	269 Uuq unquadium —	270 Uuq unquadium —	271 Uuq unquadium —
			272 Uuq unquadium —	273 Uuq unquadium —	274 Uuq unquadium —	275 Uuq unquadium —	276 Uuq unquadium —	277 Uuq unquadium —	278 Uuq unquadium —
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			307 Uuq unquadium —	308 Uuq unquadium —	309 Uuq unquadium —	310 Uuq unquadium —	311 Uuq unquadium —	312 Uuq unquadium —	313 Uuq unquadium —
			314 Uuq unquadium —	315 Uuq unquadium —	316 Uuq unquadium —	317 Uuq unquadium —	318 Uuq unquadium —	319 Uuq unquadium —	320 Uuq unquadium —
			321 Uuq unquadium —	322 Uuq unquadium —	323 Uuq unquadium —	324 Uuq unquadium —	325 Uuq unquadium —	326 Uuq unquadium —	327 Uuq unquadium —
			328 Uuq unquadium —	329 Uuq unquadium —	330 Uuq unquadium —	331 Uuq unquadium —	332 Uuq unquadium —	333 Uuq unquadium —	334 Uuq unquadium —
			335 Uuq unquadium —	336 Uuq unquadium —	337 Uuq unquadium —	338 Uuq unquadium —	339 Uuq unquadium —	340 Uuq unquadium —	341 Uuq unquadium —
			342 Uuq unquadium —	343 Uuq unquadium —	344 Uuq unquadium —	345 Uuq unquadium —	346 Uuq unquadium —	347 Uuq unquadium —	348 Uuq unquadium —
			349 Uuq unquadium —	350 Uuq unquadium —	351 Uuq unquadium —	352 Uuq unquadium —	353 Uuq unquadium —	354 Uuq unquadium —	355 Uuq unquadium —
			356 Uuq unquadium —	357 Uuq unquadium —	358 Uuq unquadium —	359 Uuq unquadium —	360 Uuq unquadium —	361 Uuq unquadium —	362 Uuq unquadium —
			363 Uuq unquadium —	364 Uuq unquadium —	365 Uuq unquadium —	366 Uuq unquadium —	367 Uuq unquadium —	368 Uuq unquadium —	369 Uuq unquadium —
			370 Uuq unquadium —	371 Uuq unquadium —	372 Uuq unquadium —	373 Uuq unquadium —	374 Uuq unquadium —	375 Uuq unquadium —	376 Uuq unquadium —
			377 Uuq unquadium —	378 Uuq unquadium —	379 Uuq unquadium —	380 Uuq unquadium —	381 Uuq unquadium —	382 Uuq unquadium —	383 Uuq unquadium —
			384 Uuq unquadium —	385 Uuq unquadium —	386 Uuq unquadium —	387 Uuq unquadium —	388 Uuq unquadium —	389 Uuq unquadium —	390 Uuq unquadium —
			391 Uuq unquadium —	392 Uuq unquadium —	393 Uuq unquadium —	394 Uuq unquadium —	395 Uuq unquadium —	396 Uuq unquadium —	397 Uuq unquadium —
			398 Uuq unquadium —	399 Uuq unquadium —	400 Uuq unquadium —	401 Uuq unquadium —	402 Uuq unquadium —	403 Uuq unquadium —	404 Uuq unquadium —
			405 Uuq unquadium —	406 Uuq unquadium —	407 Uuq unquadium —	408 Uuq unquadium —	409 Uuq unquadium —	410 Uuq unquadium —	411 Uuq unquadium —
			412 Uuq unquadium —	413 Uuq unquadium —	414 Uuq unquadium —	415 Uuq unquadium —	416 Uuq unquadium —	417 Uuq unquadium —	418 Uuq unquadium —
			419 Uuq unquadium —	420 Uuq unquadium —	421 Uuq unquadium —	422 Uuq unquadium —	423 Uuq unquadium —	424 Uuq unquadium —	425 Uuq unquadium —
			426 Uuq unquadium —	427 Uuq unquadium —	428 Uuq unquadium —	429 Uuq unquadium —	430 Uuq unquadium —	431 Uuq unquadium —	432 Uuq unquadium —
			433 Uuq unquadium —	434 Uuq unquadium —	435 Uuq unquadium —	436 Uuq unquadium —	437 Uuq unquadium —	438 Uuq unquadium —	439 Uuq unquadium —
			440 Uuq unquadium —	441 Uuq unquadium —	442 Uuq unquadium —	443 Uuq unquadium —	444 Uuq unquadium —	445 Uuq unquadium —	446 Uuq unquadium —
			447 Uuq unquadium —	448 Uuq unquadium —	449 Uuq unquadium —	450 Uuq unquadium —	451 Uuq unquadium —	452 Uuq unquadium —	453 Uuq unquadium —
			454 Uuq unquadium —	455 Uuq unquadium —	456 Uuq unquadium —	457 Uuq unquadium —	458 Uuq unquadium —	459 Uuq unquadium —	460 Uuq unquadium —
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