

CANDIDATE  
NAME

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--

\* 2 7 1 1 5 1 7 7 5 4 \*

**CHEMISTRY**

**0620/41**

Paper 4 Theory (Extended)

**May/June 2018**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

A copy of the Periodic Table is printed on page 12.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

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

This document consists of **12** printed pages.

1 Substances can be classified as elements, compounds or mixtures.

(a) What is meant by the term *compound*?

.....

.....

..... [2]

(b) Mixtures can be separated by physical processes.

A sequence of physical processes can be used to separate common salt (sodium chloride) from a mixture containing sand and common salt only.

Give the order and the correct scientific term for the physical processes used to separate the common salt from the mixture.

1 .....

2 .....

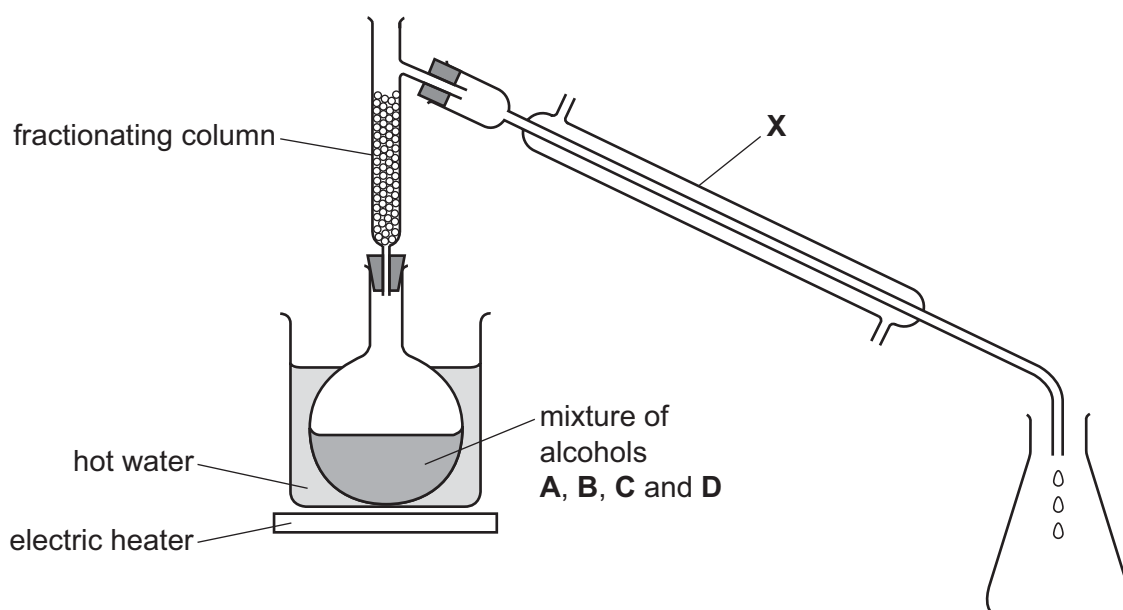
3 .....

[4]

The boiling points of four different alcohols, **A**, **B**, **C** and **D**, are shown.

alcohol	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
boiling point/°C	56	78	122	160

(c) A student suggested that the apparatus shown could be used to separate the mixture of alcohols.



(i) Apparatus **X** needs to have cold water flowing through it.

- Draw an arrow on the diagram to show where the cold water enters apparatus **X**.
- Name apparatus **X**.

..... [2]

(ii) Part of the fractionating column is missing. This means that the experiment will not work.

- Draw on the diagram the part of the fractionating column which is missing.
- Explain why the experiment will **not** work with this part of the fractionating column missing.

..... [2]

(iii) Suggest why a Bunsen burner is **not** used to heat the flask.

..... [1]

(iv) A hot water bath cannot be used to separate alcohols **C** and **D**.

Explain why.

..... [2]

[Total: 13]

2 Flerovium, Fl, atomic number 114, was first made in research laboratories in 1998.

(a) Flerovium was made by bombarding atoms of plutonium, Pu, atomic number 94, with atoms of element Z.

- The nucleus of **one** atom of plutonium combined with the nucleus of **one** atom of element Z.
- This formed the nucleus of **one** atom of flerovium.

Suggest the identity of element Z.

..... [1]

(b) In which period of the Periodic Table is flerovium?

..... [1]

(c) Predict the number of outer shell electrons in an atom of flerovium.

..... [1]

(d) Two isotopes of flerovium are  $^{286}\text{Fl}$  and  $^{289}\text{Fl}$ . The nuclei of both of these isotopes are unstable and emit energy when they split up.

(i) State the term used to describe isotopes with unstable nuclei.

..... [1]

(ii) Complete the table to show the number of protons, neutrons and electrons in the atoms of the isotopes shown.

isotope	number of protons	number of neutrons	number of electrons
$^{286}\text{Fl}$			
$^{289}\text{Fl}$			

[2]

(e) Only a relatively small number of atoms of flerovium have been made in the laboratory and the properties of flerovium have not yet been investigated.

It has been suggested that flerovium is a typical metal.

(i) Suggest **two** physical properties of flerovium.

1 .....

2 .....

[2]

(ii) Suggest **one** chemical property of flerovium oxide.

..... [1]

[Total: 9]

3 This question is about iron.

(a) Three of the raw materials added to a blast furnace used to extract iron from hematite are coke, hematite and limestone.

Name **one** other raw material added to the blast furnace.

..... [1]

(b) A series of reactions occurs in a blast furnace during the extraction of iron from hematite.

Describe these reactions.

Include:

- **one** chemical equation for the reduction of hematite
- **one** chemical equation for the formation of slag.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [5]

(c) The iron extracted from hematite using a blast furnace is impure.

Identify the main impurity in this iron and explain how it is removed in the steel-making process.

main impurity .....

how it is removed .....

.....  
..... [3]

[Total: 9]

4 This question is about masses, volumes and moles.

(a) Which term is defined by the following statement?

*The average mass of naturally occurring atoms of an element on a scale where the  $^{12}\text{C}$  atom has a mass of exactly 12 units.*

..... [1]

(b) Butane,  $\text{C}_4\text{H}_{10}$ , has a relative **molecular** mass of 58.  
Potassium fluoride, KF, has a relative **formula** mass of 58.

Explain why the term relative molecular mass can be used for butane but **cannot** be used for potassium fluoride.

.....  
..... [2]

(c) A 0.095 g sample of gaseous element **Y** occupies  $60.0\text{ cm}^3$  at room temperature and pressure.

- Determine the number of moles of element **Y** in  $60.0\text{ cm}^3$ .

moles of element **Y** = ..... mol

- Calculate the relative molecular mass of element **Y** and hence suggest the identity of element **Y**.

relative molecular mass = .....

identity of element **Y** = .....

[3]

(d) A 1.68g sample of phosphorus was burned and formed 3.87g of an oxide of phosphorus.

Calculate the empirical formula of this oxide of phosphorus.

empirical formula = ..... [4]

(e) Another oxide of phosphorus has the empirical formula  $P_2O_3$ .  
One molecule of this oxide of phosphorus contains four atoms of phosphorus.

Calculate the mass of **one** mole of this oxide of phosphorus.

mass = ..... g [2]

[Total: 12]

- 5 (a) The table gives some chemical properties of transition elements and their compounds, and of Group I elements and their compounds.

chemical property	transition elements	Group I elements
ability to act as catalysts	yes	no
exist as coloured compounds	yes	no

- (i) What is meant by the term *catalyst*?

.....  
 .....  
 ..... [2]

- (ii) Give **one** other chemical property shown by transition elements which is **not** shown by Group I elements.

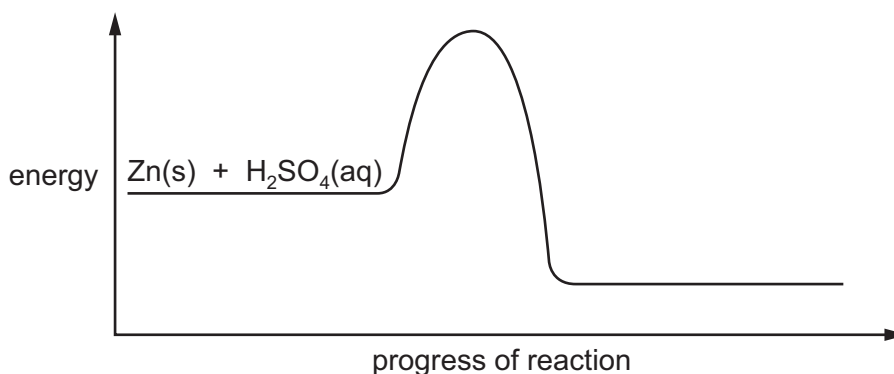
..... [1]

- (b) Give **two** physical properties shown by transition elements which are **not** shown by Group I elements.

1 .....

2 ..... [2]

- (c) The energy level diagram shows the energy profile for the reaction between zinc and dilute sulfuric acid.



- (i) Complete the diagram by adding the formulae of the products. Include state symbols. [3]

- (ii) Draw an arrow on the diagram to represent the activation energy. [1]

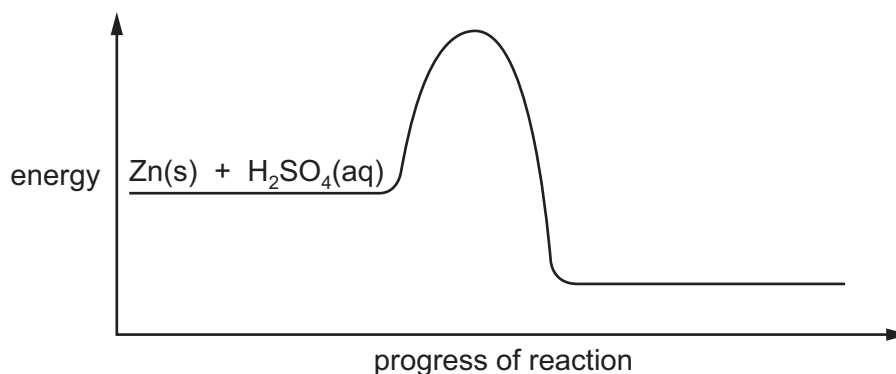
- (iii) Is the reaction endothermic or exothermic? Explain your answer.

.....  
 ..... [1]



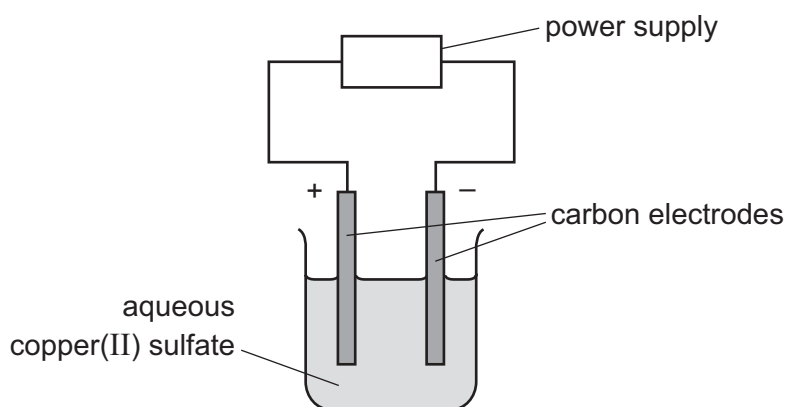
- (d) The reaction between zinc and dilute sulfuric acid can be catalysed by the addition of aqueous copper(II) sulfate.

On the diagram, add the energy profile for the catalysed reaction.



[1]

- (e) A student electrolyses aqueous copper(II) sulfate using the apparatus shown.



Oxygen gas forms at the positive electrode (anode).

- (i) Write an ionic half-equation for the reaction at the negative electrode (cathode). Include state symbols.

..... [3]

- (ii) Describe what the student observes at the negative electrode.

..... [1]

- (iii) Give **two other** observations which the student makes during the electrolysis.

1 .....

2 ..... [2]

- (iv) What difference would the student observe at the positive electrode if the aqueous copper(II) sulfate were replaced by concentrated aqueous copper(II) chloride?

..... [1]

[Total: 18]

6 The table shows the structures of four hydrocarbons.

P	Q	R	S
$\text{CH}_3\text{-CH}_3$	$\text{CH}_2=\text{CH}_2$	$\text{CH}_2=\text{CH-CH}_3$	$\text{CH}_2=\text{CH-CH}_2\text{-CH}_3$

(a) Why are compounds **P**, **Q**, **R** and **S** known as hydrocarbons?

.....  
 ..... [2]

(b) Compound **P** is saturated.

What is meant by the term *saturated*?

.....  
 ..... [1]

(c) Compound **P** undergoes a substitution reaction with chlorine.

(i) What is meant by the term *substitution reaction*?

.....  
 ..... [1]

(ii) State a condition required for this reaction to occur.

..... [1]

(iii) Write a chemical equation for this reaction.

..... [2]

(d) Compound **R** undergoes an addition reaction with bromine.

(i) Why is this reaction an addition reaction?

..... [1]

(ii) A compound containing bromine is formed in this reaction.

Draw the structure of this compound. Show all of the atoms and all of the bonds.

[1]

- (e) Draw the structure of an unbranched isomer of compound **S**. Show all of the atoms and all of the bonds. Name this unbranched isomer of compound **S**.

structure

name ..... [2]

- (f) Compound **Q** undergoes polymerisation.

- (i) Name the polymer formed.

..... [1]

- (ii) Complete the chemical equation to show the polymerisation of compound **Q**.



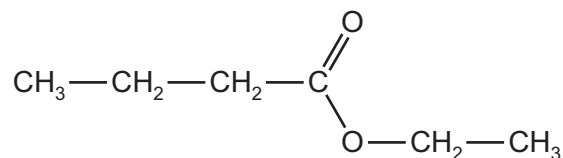
- (g) Amino acids undergo polymerisation to form proteins. Part of a protein molecule with the linkages missing is shown.

Draw the linkages on the diagram. Show all of the atoms and all of the bonds.



[2]

- (h) The structure shows an ester.



Write the word equation for a reaction which could be used to make this ester.

..... [3]

[Total: 19]

## The Periodic Table of Elements

		Group																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
I	II	III	IV	V	VI	VII	VIII																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Li lithium 7	Be beryllium 9	B boron 11	C carbon 12	Al aluminium 13	Si silicon 14	P phosphorus 15	S sulfur 16	Cl chlorine 17	Ar argon 18	K potassium 19	Ca calcium 20	Sc scandium 21	Ti titanium 22	V vanadium 23	Cr chromium 24	Mn manganese 25	Fe iron 26	Co cobalt 27	Ni nickel 28	Cu copper 29	Zn zinc 30	Ga gallium 31	Ge germanium 32	As arsenic 33	Se selenium 34	Br bromine 35	Kr krypton 36																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57-71 lanthanoids	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Rb rubidium 85	Sr strontium 88	Y yttrium 89	Zr zirconium 90	Nb niobium 91	Mo molybdenum 92	Tc technetium 93	Ru ruthenium 94	Rh rhodium 95	Pd palladium 96	Ag silver 97	Cd cadmium 98	In indium 99	Sn tin 100	Sb antimony 101	Te tellurium 102	I iodine 103	Xe xenon 104	Ba barium 105	La lanthanum 106	Hf hafnium 107	Ta tantalum 108	W tungsten 109	Re rhenium 110	Os osmium 111	Ir iridium 112	Pt platinum 113	Au gold 114	Hg mercury 115	Tl thallium 116	Pb lead 117	Bi bismuth 118	Po polonium 119	At astatine 120	Rn radon 121																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
87	88	89-103 actinoids	Rf rutherfordium 104	Db dubnium 105	Sg seaborgium 106	Bh bohrium 107	Hs hassium 108	Mt meitnerium 109	Ds darmstadtium 110	Rg roentgenium 111	Cn copernicium 112	Fl flerovium 113	Lv livermorium 114	Uu ununpentium 115	Uub ununseptium 116	Uuq ununoctium 117	Uuq ununoctium 118	Uub ununseptium 119	Uuo ununoctium 120	Uuo ununoctium 121	Uuo ununoctium 122	Uuo ununoctium 123	Uuo ununoctium 124	Uuo ununoctium 125	Uuo ununoctium 126	Uuo ununoctium 127	Uuo ununoctium 128	Uuo ununoctium 129	Uuo ununoctium 130	Uuo ununoctium 131	Uuo ununoctium 132	Uuo ununoctium 133	Uuo ununoctium 134	Uuo ununoctium 135	Uuo ununoctium 136	Uuo ununoctium 137	Uuo ununoctium 138	Uuo ununoctium 139	Uuo ununoctium 140	Uuo ununoctium 141	Uuo ununoctium 142	Uuo ununoctium 143	Uuo ununoctium 144	Uuo ununoctium 145	Uuo ununoctium 146	Uuo ununoctium 147	Uuo ununoctium 148	Uuo ununoctium 149	Uuo ununoctium 150	Uuo ununoctium 151	Uuo ununoctium 152	Uuo ununoctium 153	Uuo ununoctium 154	Uuo ununoctium 155	Uuo ununoctium 156	Uuo ununoctium 157	Uuo ununoctium 158	Uuo ununoctium 159	Uuo ununoctium 160	Uuo ununoctium 161	Uuo ununoctium 162	Uuo ununoctium 163	Uuo ununoctium 164	Uuo ununoctium 165	Uuo ununoctium 166	Uuo ununoctium 167	Uuo ununoctium 168	Uuo ununoctium 169	Uuo ununoctium 170	Uuo ununoctium 171	Uuo ununoctium 172	Uuo ununoctium 173	Uuo ununoctium 174	Uuo ununoctium 175	Uuo ununoctium 176	Uuo ununoctium 177	Uuo ununoctium 178	Uuo ununoctium 179	Uuo ununoctium 180	Uuo ununoctium 181	Uuo ununoctium 182	Uuo ununoctium 183	Uuo ununoctium 184	Uuo ununoctium 185	Uuo ununoctium 186	Uuo ununoctium 187	Uuo ununoctium 188	Uuo ununoctium 189	Uuo ununoctium 190	Uuo ununoctium 191	Uuo ununoctium 192	Uuo ununoctium 193	Uuo ununoctium 194	Uuo ununoctium 195	Uuo ununoctium 196	Uuo ununoctium 197	Uuo ununoctium 198	Uuo ununoctium 199	Uuo ununoctium 200	Uuo ununoctium 201	Uuo ununoctium 202	Uuo ununoctium 203	Uuo ununoctium 204	Uuo ununoctium 205	Uuo ununoctium 206	Uuo ununoctium 207	Uuo ununoctium 208	Uuo ununoctium 209	Uuo ununoctium 210	Uuo ununoctium 211	Uuo ununoctium 212	Uuo ununoctium 213	Uuo ununoctium 214	Uuo ununoctium 215	Uuo ununoctium 216	Uuo ununoctium 217	Uuo ununoctium 218	Uuo ununoctium 219	Uuo ununoctium 220	Uuo ununoctium 221	Uuo ununoctium 222	Uuo ununoctium 223	Uuo ununoctium 224	Uuo ununoctium 225	Uuo ununoctium 226	Uuo ununoctium 227	Uuo ununoctium 228	Uuo ununoctium 229	Uuo ununoctium 230	Uuo ununoctium 231	Uuo ununoctium 232	Uuo ununoctium 233	Uuo ununoctium 234	Uuo ununoctium 235	Uuo ununoctium 236	Uuo ununoctium 237	Uuo ununoctium 238	Uuo ununoctium 239	Uuo ununoctium 240	Uuo ununoctium 241	Uuo ununoctium 242	Uuo ununoctium 243	Uuo ununoctium 244	Uuo ununoctium 245	Uuo ununoctium 246	Uuo ununoctium 247	Uuo ununoctium 248	Uuo ununoctium 249	Uuo ununoctium 250	Uuo ununoctium 251	Uuo ununoctium 252	Uuo ununoctium 253	Uuo ununoctium 254	Uuo ununoctium 255	Uuo ununoctium 256	Uuo ununoctium 257	Uuo ununoctium 258	Uuo ununoctium 259	Uuo ununoctium 260	Uuo ununoctium 261	Uuo ununoctium 262	Uuo ununoctium 263	Uuo ununoctium 264	Uuo ununoctium 265	Uuo ununoctium 266	Uuo ununoctium 267	Uuo ununoctium 268	Uuo ununoctium 269	Uuo ununoctium 270	Uuo ununoctium 271	Uuo ununoctium 272	Uuo ununoctium 273	Uuo ununoctium 274	Uuo ununoctium 275	Uuo ununoctium 276	Uuo ununoctium 277	Uuo ununoctium 278	Uuo ununoctium 279	Uuo ununoctium 280	Uuo ununoctium 281	Uuo ununoctium 282	Uuo ununoctium 283	Uuo ununoctium 284	Uuo ununoctium 285	Uuo ununoctium 286	Uuo ununoctium 287	Uuo ununoctium 288	Uuo ununoctium 289	Uuo ununoctium 290	Uuo ununoctium 291	Uuo ununoctium 292	Uuo ununoctium 293	Uuo ununoctium 294	Uuo ununoctium 295	Uuo ununoctium 296	Uuo ununoctium 297	Uuo ununoctium 298	Uuo ununoctium 299	Uuo ununoctium 300	Uuo ununoctium 301	Uuo ununoctium 302	Uuo ununoctium 303	Uuo ununoctium 304	Uuo ununoctium 305	Uuo ununoctium 306	Uuo ununoctium 307	Uuo ununoctium 308	Uuo ununoctium 309	Uuo ununoctium 310	Uuo ununoctium 311	Uuo ununoctium 312	Uuo ununoctium 313	Uuo ununoctium 314	Uuo ununoctium 315	Uuo ununoctium 316	Uuo ununoctium 317	Uuo ununoctium 318	Uuo ununoctium 319	Uuo ununoctium 320	Uuo ununoctium 321	Uuo ununoctium 322	Uuo ununoctium 323	Uuo ununoctium 324	Uuo ununoctium 325	Uuo ununoctium 326	Uuo ununoctium 327	Uuo ununoctium 328	Uuo ununoctium 329	Uuo ununoctium 330	Uuo ununoctium 331	Uuo ununoctium 332	Uuo ununoctium 333	Uuo ununoctium 334	Uuo ununoctium 335	Uuo ununoctium 336	Uuo ununoctium 337	Uuo ununoctium 338	Uuo ununoctium 339	Uuo ununoctium 340	Uuo ununoctium 341	Uuo ununoctium 342	Uuo ununoctium 343	Uuo ununoctium 344	Uuo ununoctium 345	Uuo ununoctium 346	Uuo ununoctium 347	Uuo ununoctium 348	Uuo ununoctium 349	Uuo ununoctium 350	Uuo ununoctium 351	Uuo ununoctium 352	Uuo ununoctium 353	Uuo ununoctium 354	Uuo ununoctium 355	Uuo ununoctium 356	Uuo ununoctium 357	Uuo ununoctium 358	Uuo ununoctium 359	Uuo ununoctium 360	Uuo ununoctium 361	Uuo ununoctium 362	Uuo ununoctium 363	Uuo ununoctium 364	Uuo ununoctium 365	Uuo ununoctium 366	Uuo ununoctium 367	Uuo ununoctium 368	Uuo ununoctium 369	Uuo ununoctium 370	Uuo ununoctium 371	Uuo ununoctium 372	Uuo ununoctium 373	Uuo ununoctium 374	Uuo ununoctium 375	Uuo ununoctium 376	Uuo ununoctium 377	Uuo ununoctium 378	Uuo ununoctium 379	Uuo ununoctium 380	Uuo ununoctium 381	Uuo ununoctium 382	Uuo ununoctium 383	Uuo ununoctium 384	Uuo ununoctium 385	Uuo ununoctium 386	Uuo ununoctium 387	Uuo ununoctium 388	Uuo ununoctium 389	Uuo ununoctium 390	Uuo ununoctium 391	Uuo ununoctium 392	Uuo ununoctium 393	Uuo ununoctium 394	Uuo ununoctium 395	Uuo ununoctium 396	Uuo ununoctium 397	Uuo ununoctium 398	Uuo ununoctium 399	Uuo ununoctium 400	Uuo ununoctium 401	Uuo ununoctium 402	Uuo ununoctium 403	Uuo ununoctium 404	Uuo ununoctium 405	Uuo ununoctium 406	Uuo ununoctium 407	Uuo ununoctium 408	Uuo ununoctium 409	Uuo ununoctium 410	Uuo ununoctium 411	Uuo ununoctium 412	Uuo ununoctium 413	Uuo ununoctium 414	Uuo ununoctium 415	Uuo ununoctium 416	Uuo ununoctium 417	Uuo ununoctium 418	Uuo ununoctium 419	Uuo ununoctium 420	Uuo ununoctium 421	Uuo ununoctium 422	Uuo ununoctium 423	Uuo ununoctium 424	Uuo ununoctium 425	Uuo ununoctium 426	Uuo ununoctium 427	Uuo ununoctium 428	Uuo ununoctium 429	Uuo ununoctium 430	Uuo ununoctium 431	Uuo ununoctium 432	Uuo ununoctium 433	Uuo ununoctium 434	Uuo ununoctium 435	Uuo ununoctium 436	Uuo ununoctium 437	Uuo ununoctium 438	Uuo ununoctium 439	Uuo ununoctium 440	Uuo ununoctium 441	Uuo ununoctium 442	Uuo ununoctium 443	Uuo ununoctium 444	Uuo ununoctium 445	Uuo ununoctium 446	Uuo ununoctium 447	Uuo ununoctium 448	Uuo ununoctium 449	Uuo ununoctium 450	Uuo ununoctium 451	Uuo ununoctium 452	Uuo ununoctium 453	Uuo ununoctium 454	Uuo ununoctium 455	Uuo ununoctium 456	Uuo ununoctium 457	Uuo ununoctium 458	Uuo ununoctium 459	Uuo ununoctium 460	Uuo ununoctium 461	Uuo ununoctium 462	Uuo ununoctium 463	Uuo ununoctium 464	Uuo ununoctium 465	Uuo ununoctium 466	Uuo ununoctium 467	Uuo ununoctium 468	Uuo ununoctium 469	Uuo ununoctium 470	Uuo ununoctium 471	Uuo ununoctium 472	Uuo ununoctium 473	Uuo ununoctium 474	Uuo ununoctium 475	Uuo ununoctium 476	Uuo ununoctium 477	Uuo ununoctium 478	Uuo ununoctium 479	Uuo ununoctium 480	Uuo ununoctium 481	Uuo ununoctium 482	Uuo ununoctium 483	Uuo ununoctium 484	Uuo ununoctium 485	Uuo ununoctium 486	Uuo ununoctium 487	Uuo ununoctium 488	Uuo ununoctium 489	Uuo ununoctium 490	Uuo ununoctium 491	Uuo ununoctium 492	Uuo ununoctium 493	Uuo ununoctium 494	Uuo ununoctium 495	Uuo ununoctium 496	Uuo ununoctium 497	Uuo ununoctium 498	Uuo ununoctium 499	Uuo ununoctium 500	Uuo ununoctium 501	Uuo ununoctium 502	Uuo ununoctium 503	Uuo ununoctium 504	Uuo ununoctium 505	Uuo ununoctium 506	Uuo ununoctium 507	Uuo ununoctium 508	Uuo ununoctium 509	Uuo ununoctium 510	Uuo ununoctium 511	Uuo ununoctium 512	Uuo ununoctium 513	Uuo ununoctium 514	Uuo ununoctium 515	Uuo ununoctium 516	Uuo ununoctium 517	Uuo ununoctium 518	Uuo ununoctium 519	Uuo ununoctium 520	Uuo ununoctium 521	Uuo ununoctium 522	Uuo ununoctium 523	Uuo ununoctium 524	Uuo ununoctium 525	Uuo ununoctium 526	Uuo ununoctium 527	Uuo ununoctium 528	Uuo ununoctium 529	Uuo ununoctium 530	Uuo ununoctium 531	Uuo ununoctium 532	Uuo ununoctium 533	Uuo ununoctium 534	Uuo ununoctium 535	Uuo ununoctium 536	Uuo ununoctium 537	Uuo ununoctium 538	Uuo ununoctium 539	Uuo ununoctium 540	Uuo ununoctium 541	Uuo ununoctium 542	Uuo ununoctium 543	Uuo ununoctium 544	Uuo ununoctium 545	Uuo ununoctium 546	Uuo ununoctium 547	Uuo ununoctium 548	Uuo ununoctium 549	Uuo ununoctium 550	Uuo ununoctium 551	Uuo ununoctium 552	Uuo ununoctium 553	Uuo ununoctium 554	Uuo ununoctium 555	Uuo ununoctium 556	Uuo ununoctium 557	Uuo ununoctium 558	Uuo ununoctium 559	Uuo ununoctium 560	Uuo ununoctium 561	Uuo ununoctium 562	Uuo ununoctium 563	Uuo ununoctium 564	Uuo ununoctium 565	Uuo ununoctium 566	Uuo ununoctium 567	Uuo ununoctium 568	Uuo ununoctium 569	Uuo ununoctium 570	Uuo ununoctium 571	Uuo ununoctium 572	Uuo ununoctium 573	Uuo ununoctium 574	Uuo ununoctium 575	Uuo ununoctium 576	Uuo ununoctium 577	Uuo ununoctium 578	Uuo ununoctium 579	Uuo ununoctium 580	Uuo ununoctium 581	Uuo ununoctium 582	Uuo ununoctium 583	Uuo ununoctium 584	Uuo ununoctium 585	Uuo ununoctium 586	Uuo ununoctium 587	Uuo ununoctium 588	Uuo ununoctium 589	Uuo ununoctium 590	Uuo ununoctium 591	Uuo ununoctium 592	Uuo ununoctium 593	Uuo ununoctium 594	Uuo ununoctium 595	Uuo ununoctium 596	Uuo ununoctium 597	Uuo ununoctium 598	Uuo ununoctium 599	Uuo ununoctium 600	Uuo ununoctium 601	Uuo ununoctium 602	Uuo ununoctium 603	Uuo ununoctium 604	Uuo ununoctium 605	Uuo ununoctium 606	Uuo ununoctium 607	Uuo ununoctium 608	Uuo ununoctium 609	Uuo ununoctium 610	Uuo ununoctium 611	Uuo ununoctium 612	Uuo ununoctium 613	Uuo ununoctium 614	Uuo ununoctium 615	Uuo ununoctium 616	Uuo ununoctium 617	Uuo ununoctium 618	Uuo ununoctium 619	Uuo ununoctium 620	Uuo ununoctium 621	Uuo ununoctium 622	Uuo ununoctium 623	Uuo ununoctium 624	Uuo ununoctium 625	Uuo ununoctium 626	Uuo ununoctium 627	Uuo ununoctium 628	Uuo ununoctium 629	Uuo ununoctium 630	Uuo ununoctium 631	Uuo ununoctium 632	Uuo ununoctium 633	Uuo ununoctium 634	Uuo ununoctium 635	Uuo ununoctium 636	Uuo ununoctium 637	Uuo ununoctium 638	Uuo ununoctium 639	Uuo ununoctium 640	Uuo ununoctium 641	Uuo ununoctium 642	Uuo ununoctium 643	Uuo ununoctium 644	Uuo ununoctium 645	Uuo ununoctium 646	Uuo ununoctium 647	Uuo ununoctium 648	Uuo ununoctium 649	Uuo ununoctium 650	Uuo ununoctium 651	Uuo ununoctium 652	Uuo ununoctium 653	Uuo ununoctium 654	Uuo ununoctium 655	Uuo ununoctium 656	Uuo ununoctium 657	Uuo ununoctium 658	Uuo ununoctium 659	Uuo ununoctium 660	Uuo ununoctium 661	Uuo ununoctium 662	Uuo ununoctium 663	Uuo ununoctium 664	Uuo ununoctium 665	Uuo ununoctium 666	Uuo ununoctium 667