

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
CHEMISTRY B**

B642/02

Unit 2 Modules C4 C5 C6 (Higher Tier)

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)

**Wednesday 16 June 2010
Morning**

Duration: 1 hour



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly write your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The Periodic Table is printed on the back page.
- This document consists of **24** pages. Any blank pages are indicated.

Answer **all** the questions.

Section A – Module C4

- 1 Sea-water contains many different ions.

Look at the table. It shows the composition of sea-water.

ion	formula	percentage by mass in sea-water
chloride	Cl^-	55.0
magnesium	Mg^{2+}	3.7
potassium	K^+	1.1
sodium	Na^+	30.6
sulfate	SO_4^{2-}	7.7

- (a) Evaporation of sea-water gives a mixture of salts.

One of these salts is potassium sulfate.

Write the formula for potassium sulfate.

..... [1]

- (b) Katharine wants to test for sulfate ions in sea-water.

She uses barium chloride solution.

Barium chloride solution reacts with sulfate ions.

Give the name of the type of reaction.

Choose from:

neutralisation

oxidation

precipitation

reduction

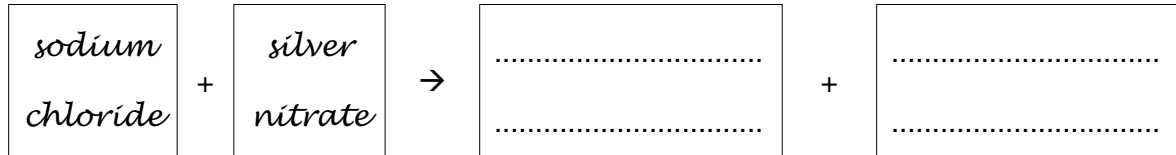
reversible

answer [1]

(c) Sea-water contains sodium chloride.

Silver nitrate solution reacts with sodium chloride.

Complete the **word** equation for this reaction.



[1]

(d) Ryan wants to show that sea-water has a pH of 8.

He does some research on the internet. Ryan finds out he can use a pH meter.

Describe one **other** way Ryan can find out the pH of sea-water.

.....

.....

.....

..... [2]

[Total: 5]

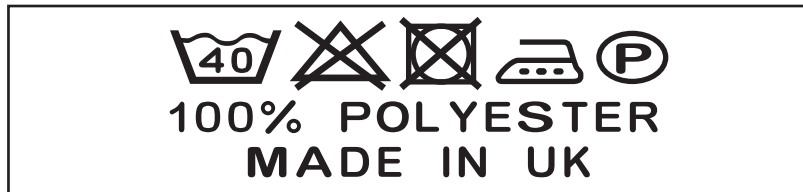
2 This question is about washing clothes.

Kieran wants to wash his dirty shirt.

Kieran's shirt has several food stains on it.

He decides to use a biological washing powder that contains enzymes.

He looks at the wash label on his shirt.



(a) Write down two advantages of using a **low** temperature rather than a high temperature wash.

1

.....

2

..... [2]

(b) The washing powder contains a detergent.

Molecules of the detergent have a hydrophobic tail and a hydrophilic head.

(i) Write down the meaning of the word **hydrophilic**.

..... [1]

(ii) Write down the meaning of the word **hydrophobic**.

..... [1]

[Total: 4]

3 Medicines and pharmaceutical drugs are speciality chemicals.

(a) Digitalis is a medicine used to treat heart disease.

Digitalis can be extracted from the foxglove plant.



Describe how chemicals such as digitalis can be extracted from plants.

.....

.....

.....

..... [2]

(b) Statins are speciality chemicals.

They are medicines used to reduce cholesterol levels.

It has taken over 15 years for some statins to be fully tested.

This is one of the reasons why it is expensive to make and develop a new medicine.

Write down **one** other reason why it is expensive to make and develop a new medicine.

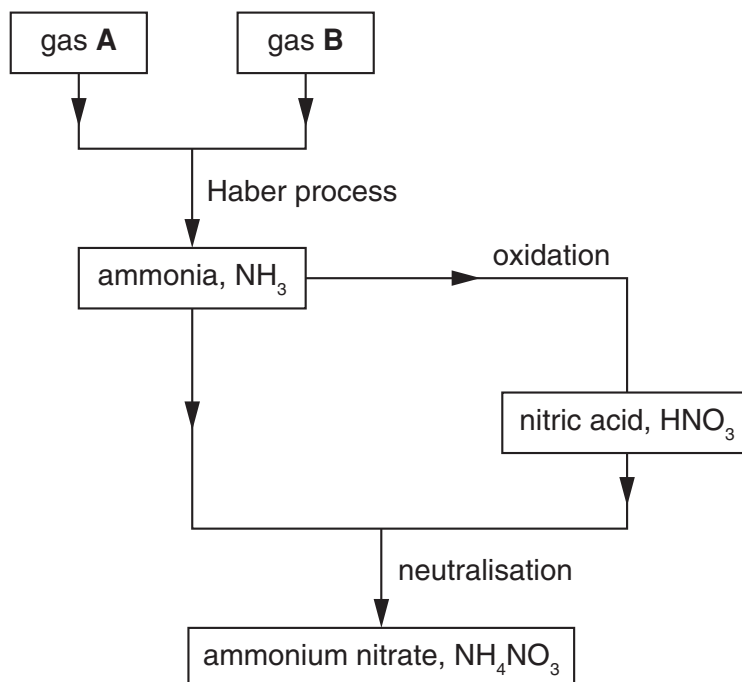
.....

..... [1]

[Total: 3]

4 Ammonium nitrate is a fertiliser used by farmers.

Look at the flow chart. It shows how ammonium nitrate can be made.



(a) Write down the **balanced symbol** equation for the reaction that takes place in the Haber Process.

..... [2]

(b) It is important that the Haber process has a

- high rate of reaction
- good percentage yield.

(i) Explain why a high pressure is used in the Haber process.

.....

..... [1]

(ii) Explain why a compromise temperature of 450°C is used in the Haber process.

.....

.....

..... [1]

- (c) A factory makes ammonium nitrate.

Jordan predicts the factory should make 50 tonnes of ammonium nitrate.

The factory actually makes 37.5 tonnes of ammonium nitrate.

Calculate the percentage yield.

.....
.....
.....

percentage yield =% [2]

- (d) Work out the relative formula mass, M_r , of ammonium nitrate, NH_4NO_3 .

Use this M_r to work out the percentage by mass of nitrogen in ammonium nitrate.

The relative atomic mass, A_r , of H is 1, of N is 14 and of O is 16.

.....
.....
.....
.....

percentage by mass =% [2]

[Total: 8]

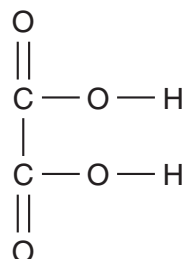
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Section B – Module C5

- 5 Research chemists have identified a weak acid in the leaves of rhubarb.

Look at the displayed formula of the weak acid.



- (a) Write the molecular formula of the weak acid.

..... [1]

- (b) Chris dissolves some of the weak acid in water.

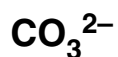
He tests the pH of the solution.

The pH value is 3.5.

The weak acid ionises in water.

Which one of the following ions is present in the solution?

Choose from



answer

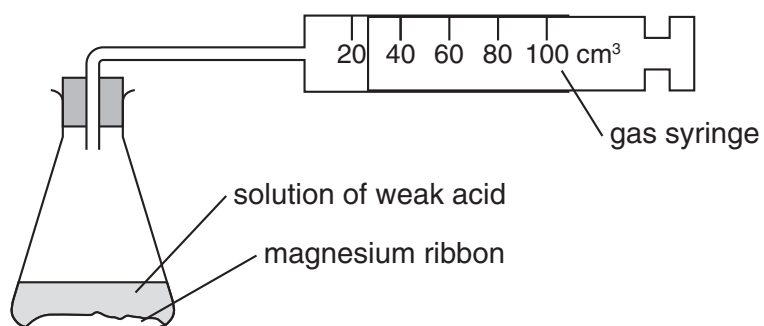
[1]

(c) Chris investigates the reaction of the weak acid with magnesium ribbon.

He adds a small amount of magnesium ribbon to 50 cm³ of the weak acid solution.

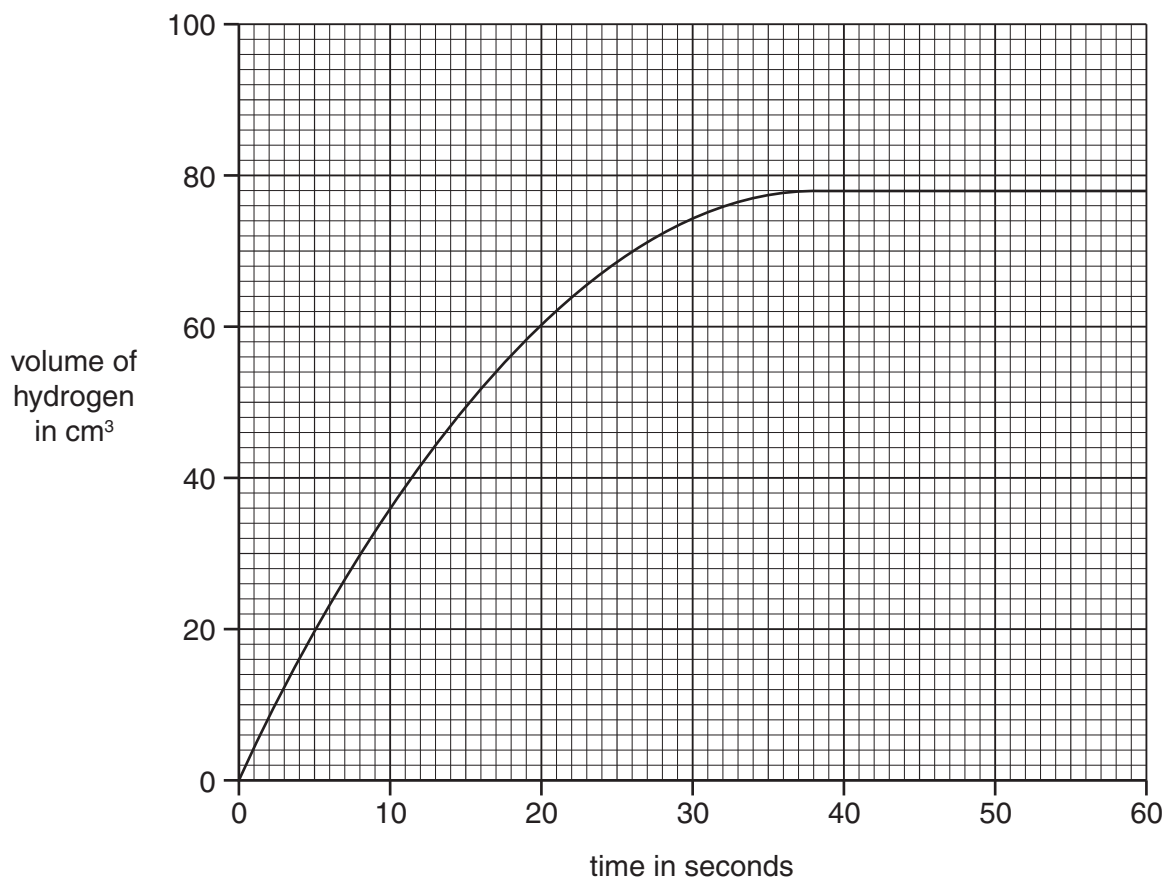
He measures the volume of hydrogen made every 10 seconds.

Look at the apparatus he uses.



At the end of the reaction there was still some magnesium ribbon in the flask.

Look at the graph of Chris' results.



(i) Give the volume of hydrogen made after 18 seconds.

..... cm³ [1]

(ii) At what time did the reaction stop?

..... seconds [1]

(iii) Explain why the reaction stops.

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

(d) Chris does another experiment.

This time he collects 0.060 dm³ of hydrogen at room temperature and pressure (rtp).

Give the number of moles of hydrogen collected.

One mole of hydrogen at rtp occupies a volume of 24 dm³.

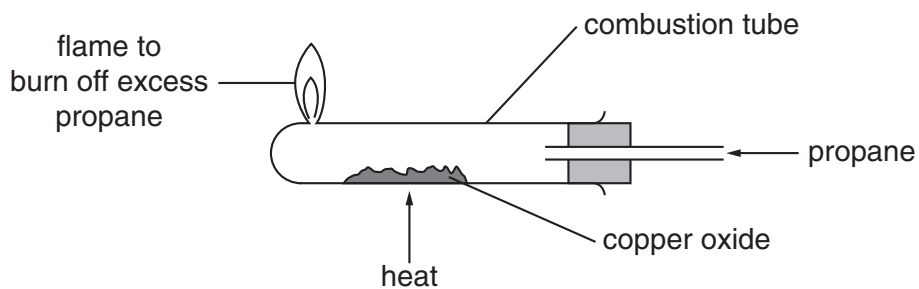
.....
.....

number of moles = [1]

[Total: 6]

6 Alyce wants to find the empirical formula of a sample of copper oxide.

Look at the apparatus she uses.



Alyce puts 2.88 g of copper oxide into the combustion tube.

Propane gas is moved over the heated copper oxide.

After 20 minutes all the copper oxide has been changed into copper.

She makes 2.56 g of copper.

(a) (i) Work out the amount, in moles, of copper made.

The relative atomic mass, A_r , of Cu is 64.

.....

amount of copper = moles [1]

(ii) During the reaction all the oxygen in the 2.88 g of copper oxide is removed.

Write down the amount, in moles, of oxygen removed.

The relative atomic mass, A_r , of O is 16.

.....

amount of oxygen = moles [1]

(iii) Use your answers to parts (i) and (ii) to work out the empirical formula for copper oxide.

.....

empirical formula is [1]

(b) Alyce repeats the experiment.

This time she uses **5.76 g** of copper oxide instead of **2.88 g**.

Work out the mass of copper Alyce should make.

.....
.....

mass of copper =g

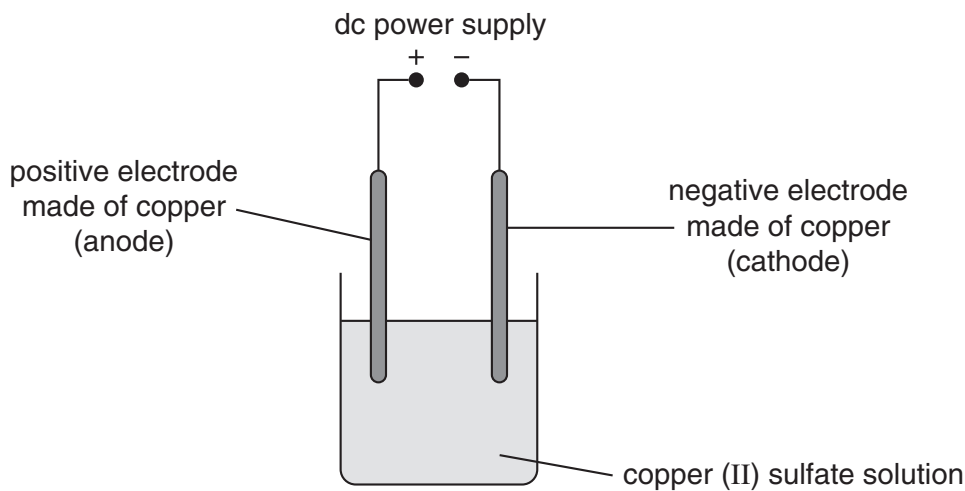
[1]

[Total: 4]

7 This question is about the electrolysis of copper(II) sulfate solution.

Look at the diagram.

It shows the apparatus Jess uses to electrolyse copper(II) sulfate solution.



(a) Jess finds the mass of the copper electrodes before and after doing the electrolysis.

Describe what happens to the mass of each electrode during the electrolysis.

mass of negative electrode

.....

mass of positive electrode

..... [2]

(b) Jess replaces copper(II) sulfate solution with **solid** copper(II) sulfate.

This time no electrolysis takes place.

Explain why.

Use ideas about the particles found in copper(II) sulfate.

.....

.....

..... [2]

(c) The electrolysis of molten (liquid) potassium chloride makes potassium and chlorine.

At the negative electrode, potassium ions, K^+ , gain electrons to make potassium atoms.

Write down the **symbol** equation for the process that happens at the negative electrode.

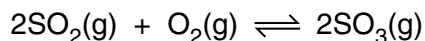
Use e^- for an electron.

..... [1]

[Total: 5]

- 8 The Contact Process manufactures sulfuric acid, H_2SO_4 .

One of the reactions in the Contact Process changes sulfur dioxide into sulfur trioxide.



This is a reversible reaction.

- (a) Some reversible reactions reach a position of equilibrium.

Explain why.

Use ideas about rate of reaction.

.....

.....

.....

..... [2]

- (b) The position of equilibrium for this reaction lies on the right.

What does this tell you about the concentrations of sulfur dioxide and sulfur trioxide at equilibrium?

.....

..... [1]

- (c) Describe the effect of a catalyst on the position of equilibrium.

.....

..... [1]

- (d) Sulfur trioxide reacts with water to make sulfuric acid.

Write the **balanced symbol** equation for this reaction.

..... [1]

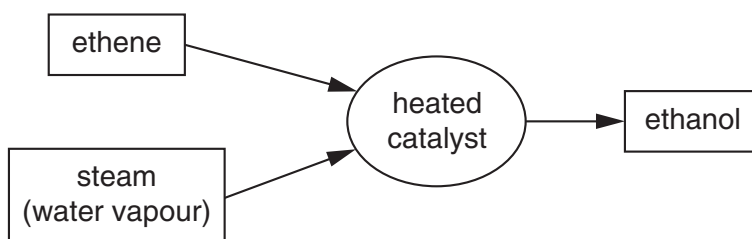
[Total: 5]

Section C – Module C6

9 This question is about ethanol.

Look at the flow chart.

It shows how ethanol is made from ethene.



(a) (i) Write down the **word** equation for making **ethanol** from ethene.

..... [1]

(ii) **Ethene** can be made from ethanol.

Write down **one** condition for this reaction.

.....
 [1]

(b) Ethanol can also be made from glucose solution and yeast.

This reaction is called fermentation.

Fermentation makes a solution of ethanol.

Name the process used to obtain ethanol from this solution.

..... [1]

(c) The formula of ethanol is C_2H_5OH .

Ethanol is one of a series of alcohols with the general formula $C_nH_{2n+1}OH$.

Butanol has **4** carbon atoms. Write down the formula of butanol.

..... [1]

[Total: 4]

10 This question is about rusting.

(a) Colin is fixing the roof of his shed using galvanised iron nails.



Galvanised iron nails have been coated in zinc.

The zinc coating prevents the iron nail from rusting.

Explain **two** ways the zinc coating does this.

1

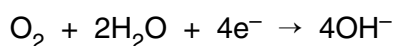
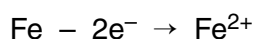
.....

2

..... [2]

(b) Look at the equations.

These are two processes that happen during rusting.



Rusting is a redox reaction.

Explain why it is a redox reaction using information from **both** equations.

.....

..... [1]

[Total: 3]

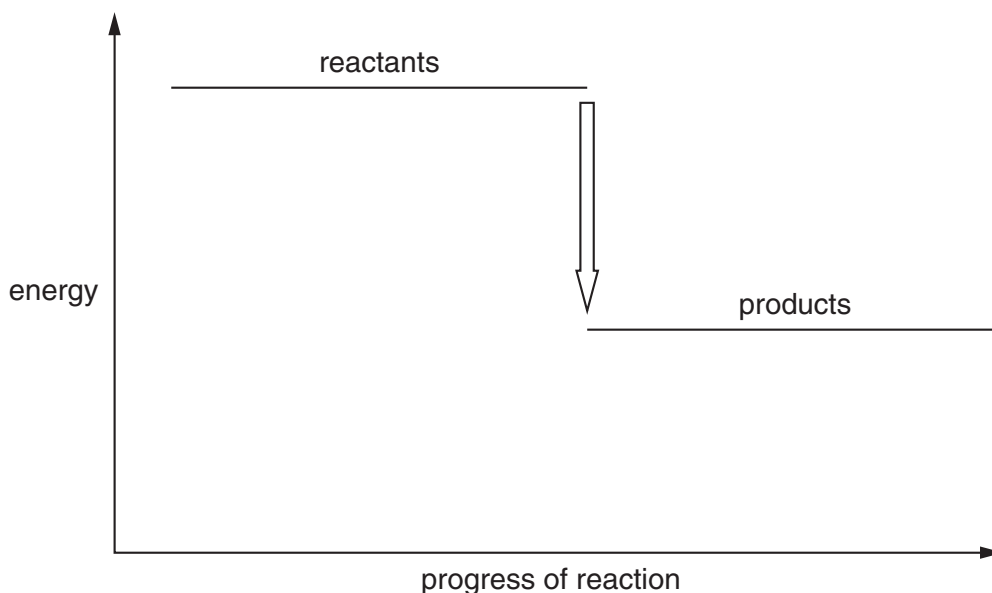
12 Fuel cells use hydrogen, H₂, and oxygen, O₂.

Fuel cells make water.

(a) Write a **balanced symbol** equation for the reaction between hydrogen and oxygen.

..... [2]

(b) Look at the energy level diagram for the reaction between hydrogen and oxygen.



Energy is given out in this reaction.

(i) Explain how the diagram shows that energy is given out.

.....
 [1]

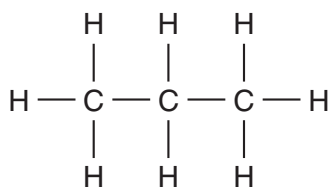
(ii) Give the name for a reaction that gives out energy.

..... [1]

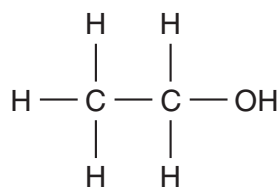
[Total: 4]

13 This question is about unsaturated compounds.

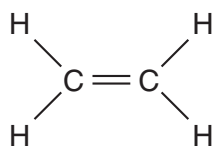
Look at the displayed formulas of some compounds of carbon.



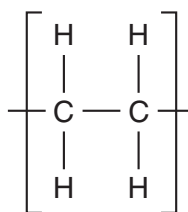
compound **A**



compound **B**



compound **C**



compound **D**

(a) One of the compounds is unsaturated.

Choose from **A**, **B**, **C**, or **D**.

answer

[1]

(b) Look at the list of chemicals.

bromine water

phosphoric acid

sodium carbonate

sodium hydroxide

One of these chemicals can be used to test for unsaturation.

Choose from the list.

answer [1]

(c) Unsaturated vegetable oils are often too liquid to spread onto bread.

Unsaturated vegetable oils are hardened by changing them into saturated vegetable oils.



(i) Write down the name of gas X.

..... [1]

(ii) Write down a condition used in this reaction.

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

[Total: 4]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0	
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 O oxygen 8	16 F fluorine 9	17 Ne neon 10
19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27
37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium 43	44 Ru ruthenium 44	45 Rh rhodium 45
55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	58 Hf hafnium 58	59 Ta tantalum 59	60 W tungsten 60	61 Re rhenium 61	62 Os osmium 62	63 Ir iridium 63
87 Fr francium 87	88 Ra radium 88	89 Ac* actinium 89	90 Rf rutherfordium 90	91 Db dubnium 91	92 Sg seaborgium 92	93 Bh bohrium 93	94 Hs hassium 94	95 Mt meitnerium 95
133 Cs caesium 133	137 Ba barium 137	138 La* lanthanum 138	139 Hf hafnium 139	140 Ta tantalum 140	141 W tungsten 141	142 Re rhenium 142	143 Os osmium 143	144 Ir iridium 144
187 Rb rubidium 187	188 Sr strontium 188	189 Y yttrium 189	190 Zr zirconium 190	191 Nb niobium 191	192 Mo molybdenum 192	193 Tc technetium 193	194 Ru ruthenium 194	195 Rh rhodium 195
223 Fr francium 223	226 Ra radium 226	227 Ac* actinium 227	228 Rf rutherfordium 228	229 Db dubnium 229	230 Sg seaborgium 230	231 Bh bohrium 231	232 Hs hassium 232	233 Mt meitnerium 233
285 Ac actinium 285	286 Th thorium 286	287 Pa protactinium 287	288 U uranium 288	289 Np neptunium 289	290 Pu plutonium 290	291 A americium 291	292 Cm curium 292	293 Bk berkelium 293
337 Fr francium 337	338 Ra radium 338	339 Ac actinium 339	340 Rf rutherfordium 340	341 Db dubnium 341	342 Sg seaborgium 342	343 Bh bohrium 343	344 Hs hassium 344	345 Mt meitnerium 345
401 Fr francium 401	402 Ra radium 402	403 Ac actinium 403	404 Rf rutherfordium 404	405 Db dubnium 405	406 Sg seaborgium 406	407 Bh bohrium 407	408 Hs hassium 408	409 Mt meitnerium 409
509 Fr francium 509	510 Ra radium 510	511 Ac actinium 511	512 Rf rutherfordium 512	513 Db dubnium 513	514 Sg seaborgium 514	515 Bh bohrium 515	516 Hs hassium 516	517 Mt meitnerium 517
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811 Fr francium 811	812 Ra radium 812	813 Ac actinium 813	814 Rf rutherfordium 814	815 Db dubnium 815	816 Sg seaborgium 816	817 Bh bohrium 817	818 Hs hassium 818	819 Mt meitnerium 819
911 Fr francium 911	912 Ra radium 912	913 Ac actinium 913	914 Rf rutherfordium 914	915 Db dubnium 915	916 Sg seaborgium 916	917 Bh bohrium 917	918 Hs hassium 918	919 Mt meitnerium 919
1011 Fr francium 1011	1012 Ra radium 1012	1013 Ac actinium 1013	1014 Rf rutherfordium 1014	1015 Db dubnium 1015	1016 Sg seaborgium 1016	1017 Bh bohrium 1017	1018 Hs hassium 1018	1019 Mt meitnerium 1019
1111 Fr francium 1111	1112 Ra radium 1112	1113 Ac actinium 1113	1114 Rf rutherfordium 1114	1115 Db dubnium 1115	1116 Sg seaborgium 1116	1117 Bh bohrium 1117	1118 Hs hassium 1118	1119 Mt meitnerium 1119
1211 Fr francium 1211	1212 Ra radium 1212	1213 Ac actinium 1213	1214 Rf rutherfordium 1214	1215 Db dubnium 1215	1216 Sg seaborgium 1216	1217 Bh bohrium 1217	1218 Hs hassium 1218	1219 Mt meitnerium 1219
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1911 Fr francium 1911	1912 Ra radium 1912	1913 Ac actinium 1913	1914 Rf rutherfordium 1914	1915 Db dubnium 1915	1916 Sg seaborgium 1916	1917 Bh bohrium 1917	1918 Hs hassium 1918	1919 Mt meitnerium 1919
2011 Fr francium 2011	2012 Ra radium 2012	2013 Ac actinium 2013	2014 Rf rutherfordium 2014	2015 Db dubnium 2015	2016 Sg seaborgium 2016	2017 Bh bohrium 2017	2018 Hs hassium 2018	2019 Mt meitnerium 2019
2111 Fr francium 2111	2112 Ra radium 2112	2113 Ac actinium 2113	2114 Rf rutherfordium 2114	2115 Db dubnium 2115	2116 Sg seaborgium 2116	2117 Bh bohrium 2117	2118 Hs hassium 2118	2119 Mt meitnerium 2119
2211 Fr francium 2211	2212 Ra radium 2212	2213 Ac actinium 2213	2214 Rf rutherfordium 2214	2215 Db dubnium 2215	2216 Sg seaborgium 2216	2217 Bh bohrium 2217	2218 Hs hassium 2218	2219 Mt meitnerium 2219
2311 Fr francium 2311	2312 Ra radium 2312	2313 Ac actinium 2313	2314 Rf rutherfordium 2314	2315 Db dubnium 2315	2316 Sg seaborgium 2316	2317 Bh bohrium 2317	2318 Hs hassium 2318	2319 Mt meitnerium 2319
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3011 Fr francium 3011	3012 Ra radium 3012	3013 Ac actinium 3013	3014 Rf rutherfordium 3014	3015 Db dubnium 3015	3016 Sg seaborgium 3016	3017 Bh bohrium 3017	3018 Hs hassium 3018	3019 Mt meitnerium 3019
3111 Fr francium 3111	3112 Ra radium 3112	3113 Ac actinium 3113	3114 Rf rutherfordium 3114	3115 Db dubnium 3115	3116 Sg seaborgium 3116	3117 Bh bohrium 3117	3118 Hs hassium 3118	3119 Mt meitnerium 3119
3211 Fr francium 3211	3212 Ra radium 3212	3213 Ac actinium 3213	3214 Rf rutherfordium 3214	3215 Db dubnium 3215	3216 Sg seaborgium 3216	3217 Bh bohrium 3217	3218 Hs hassium 3218	3219 Mt meitnerium 3219
3311 Fr francium 3311	3312 Ra radium 3312	3313 Ac actinium 3313	3314 Rf rutherfordium 3314	3315 Db dubnium 3315	3316 Sg seaborgium 3316	3317 Bh bohrium 3317	3318 Hs hassium 3318	3319 Mt meitnerium 3319
3411 Fr francium 3411	3412 Ra radium 3412	3413 Ac actinium 3413	3414 Rf rutherfordium 3414	3415 Db dubnium 3415	3416 Sg seaborgium 3416	3417 Bh bohrium 3417	3418 Hs hassium 3418	3419 Mt meitnerium 3419
3511 Fr francium 3511	3512 Ra radium 3512	3513 Ac actinium 3513	3514 Rf rutherfordium 3514	3515 Db dubnium 3515	3516 Sg seaborgium 3516	3517 Bh bohrium 3517	3518 Hs hassium 3518	3519 Mt meitnerium 3519
3611 Fr francium 3611	3612 Ra radium 3612	3613 Ac actinium 3613	3614 Rf rutherfordium 3614	3615 Db dubnium 3615	3616 Sg seaborgium 3616	3617 Bh bohrium 3617	3618 Hs hassium 3618	3619 Mt meitnerium 3619
3711 Fr francium 3711	3712 Ra radium 3712	3713 Ac actinium 3713	3714 Rf rutherfordium 3714	3715 Db dubnium 3715	3716 Sg seaborgium 3716	3717 Bh bohrium 3717	3718 Hs hassium 3718	3719 Mt meitnerium 3719
3811 Fr francium 3811	3812 Ra radium 3812	3813 Ac actinium 3813	3814 Rf rutherfordium 3814	3815 Db dubnium 3815	3816 Sg seaborgium 3816	3817 Bh bohrium 3817	3818 Hs hassium 3818	3819 Mt meitnerium 3819
3911 Fr francium 3911	3912 Ra radium 3912	3913 Ac actinium 3913	3914 Rf rutherfordium 3914	3915 Db dubnium 3915	3916 Sg seaborgium 3916	3917 Bh bohrium 3917	3918 Hs hassium 3918	3919 Mt meitnerium 3919
4011 Fr francium 4011	4012 Ra radium 4012	4013 Ac actinium 4013	4014 Rf rutherfordium 4014	4015 Db dubnium 4015	4016 Sg seaborgium 4016	4017 Bh bohrium 4017	4018 Hs hassium 4018	4019 Mt meitnerium 4019
4111 Fr francium 4111	4112 Ra radium 4112	4						