

Candidate Name _____

Centre Number			Candidate Number								

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

Science

5124/2

Paper 2

Thursday

9 NOVEMBER 2017

Additional Material(s):

Electronic calculator (non programmable) and / or Mathematical tables

Graph paper

Soft clean eraser

Soft pencil (type B or HB is recommended)

Time 2 hours

Instructions to Candidates

Do not open this booklet until you are told to do so.

Write your **name**, **centre number** and **candidate number** in the spaces provided at the top of the page and any separate answer booklet/paper used.

There are **three (3)** sections in this paper.

Section A

There are **twenty (20)** questions in this section. 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 by making it with a cross (X) on the **answer grid provided** on the question paper.

Section B

Answer all questions. Write your answers in the **spaces provided** on the question paper.

Read very carefully the instructions on the answer sheet.

Section C

Answer any two questions. Write your answer on a separate **answer booklet provided**.

Information for candidates

Any rough working should be done in this question paper.

At the end of the examination:

- 1 Fasten the separate answer booklet/papers used securely to the question paper.
- 2 Circle the numbers of the section C questions you have answered in the grid below.

The Periodic Table is printed on page 15.

Cell phones are not allowed in the examination room.

Candidate's Use	Examiner's Use
Section A	
Section B	
Section C	1.
	2.
	3.
Total	

ANSWER GRID FOR SECTION A

Put a cross (X) on the letter indicating your choice of answer.

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D

11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D

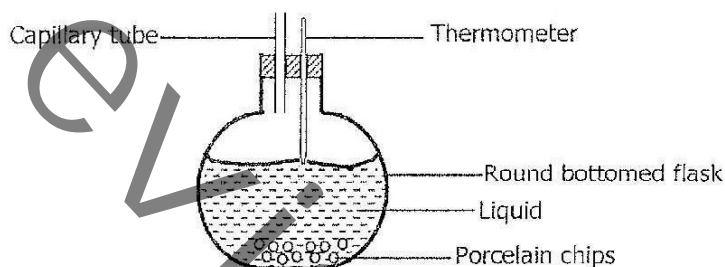
SECTION A [20 marks]

Answer **all** the questions on the answer grid provided.

A1 A teacher asked Mutinta to explain what happens to the particles in a stone when it is heated. The correct explanation given by Mutinta was particles in a stone ...

- A** will not move.
- B** move randomly.
- C** vibrate more in their fixed positions.
- D** vibrate and begin to move randomly.

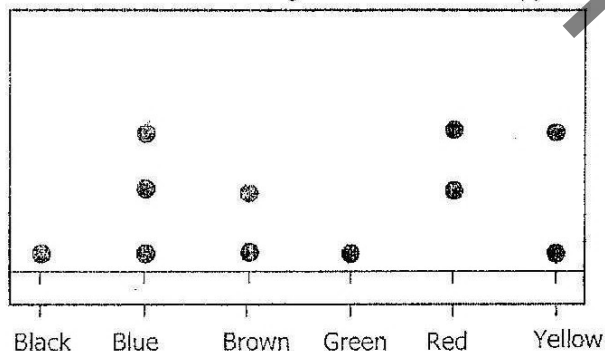
A2 The diagram below shows the experimental set up for the determination of the boiling point of a liquid.



Which statement explains the purpose of adding porcelain chips?

- A** To ensure smooth boiling of the liquid.
- B** To colour the liquid as it starts to boil.
- C** To make the liquid boil faster.
- D** To enable the thermometer record the temperature of the boiling liquid easily.

A3 The diagram below is a chromatogram for various types of ink.



Which statement is correct about the chromatogram?

- A** Red ink contains black ink.
- B** Green ink contains red ink.
- C** Black ink and green ink are pure inks.
- D** Blue ink can be made by mixing brown and green inks.

A4 A phosphorus ion contains ...

	Protons	Neutrons	Electrons
A	15	15	13
B	15	16	18
C	16	15	16
D	16	16	18

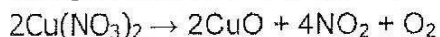
A5 Hydrogen can form both ionic and covalent compounds. With which element will hydrogen form an ionic compound?

- A Zinc
- B Sodium
- C Nitrogen
- D Sulphur

A6 One mole of a sample of hydrated sodium sulphide contains 162g of water of crystallization. What is the correct chemical formula of this compound?

- A $\text{Na}_2\text{S} \cdot 7\text{H}_2\text{O}$
- B $\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$
- C $\text{Na}_2\text{S} \cdot 3\text{H}_2\text{O}$
- D $\text{Na}_2\text{S} \cdot 5\text{H}_2\text{O}$

A7 On strong heating copper (II) nitrate decomposed to produce copper (II) oxide, nitrogen dioxide and oxygen according to the balanced chemical equation below



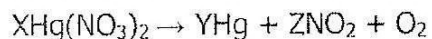
Calculate the mass of copper (II) oxide obtained when 56.4g of copper (II) nitrate decomposes.

- A 24.0g
- B 40.0g
- C 80.0g
- D 160.0g

A8 An endothermic reaction is one that ...

- A evolves heat.
- B produces light.
- C absorbs energy.
- D produces sound.

A9 Consider the following chemical reaction.



The letters X, Y and Z represent ...

	X	Y	Z
A	2	2	2
B	1	1	2
C	3	3	2
D	3	3	3

A10 Which statement best describes the rate of a chemical reaction?

- A The time taken for reactants to be used up.
- B The time taken for products to be formed.
- C The time taken for one of the reactants to finish.
- D The increase in the concentration of a product per unit time.

A11 Study the diagram below.



During the experiment a gas and a white precipitate were formed. What is the identity of liquid X and the white precipitate?

	Liquid X	White precipitate
A	Water	Calcium carbonate
B	Dilute nitric acid	Calcium oxide
C	Lime water	Calcium hydrogen carbonate
D	Lime water	Calcium carbonate

A12 Which of the following salts can be crystallized?

- A Sodium sulphate
- B Barium sulphate
- C Lead (II) sulphate
- D Silver chloride

- A13** Halogens play an important role in industry. The halogen which is used in photography is ...
- A** Bromine.
 - B** Chlorine.
 - C** Fluorine.
 - D** Iodine.
- A14** An element is in period **3** and group **VII** of the Periodic table. Which statement about this element is correct?
- A** It forms a cation with a 2+ charge.
 - B** It is a gas at room temperature and pressure.
 - C** It is a liquid at room temperature and pressure.
 - D** It forms an anion with a 2- charge.
- A15** Solution **P** forms a white precipitate with a little amount of aqueous ammonia solution. The precipitate dissolves in excess ammonia solution to form a colourless solution. The cation present in solution **P** is ...
- A** Al^{3+}
 - B** Ca^{2+}
 - C** NH_4^+
 - D** Zn^{2+}
- A16** A compound **X** leaves behind a black solid when heated. What is the identity of compound **X**?
- A** Copper (II) hydrogen carbonate
 - B** Magnesium carbonate
 - C** Sodium hydrogen carbonate
 - D** Calcium carbonate
- A17** The identity test for the element which is immediately above copper in the reactivity series is that it ...
- A** puts off a burning splint with a pop sound.
 - B** puts off a glowing splint with a pop sound.
 - C** re-lights a glowing splint.
 - D** re-lights a burning splint.
- A18** Graphite powder is used as a lubricant for machinery. What property makes graphite suitable for this use?
- A** It contains many ions.
 - B** Its atoms are spherical.
 - C** It consists of layers of atoms which slide over each other.
 - D** It has a structure of small molecules.

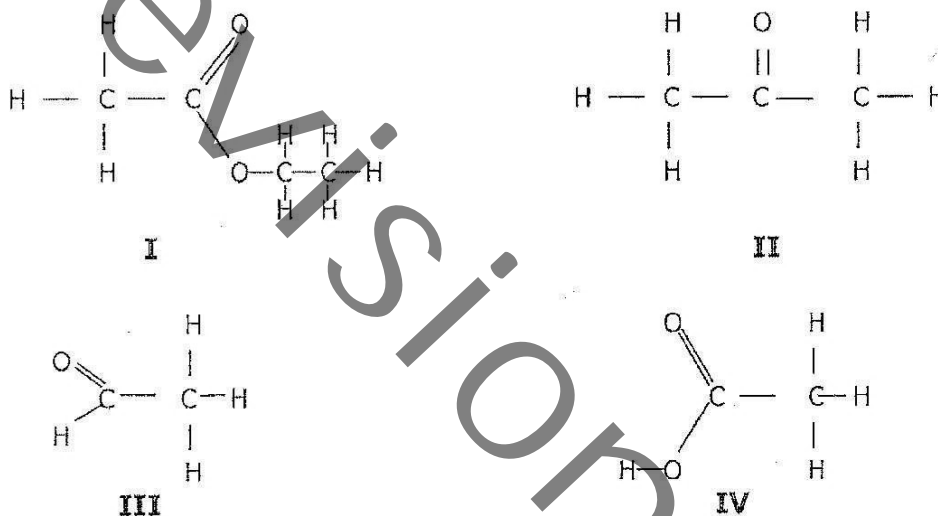
A19 A pupil reacted the monomers shown below.



What name is given to the product of the reaction between the two monomers above?

- A** Nylon
- B** Protein
- C** Starch
- D** Terylene

A20 Below are some structures of organic compounds. Which organic compound will react with rubidium?



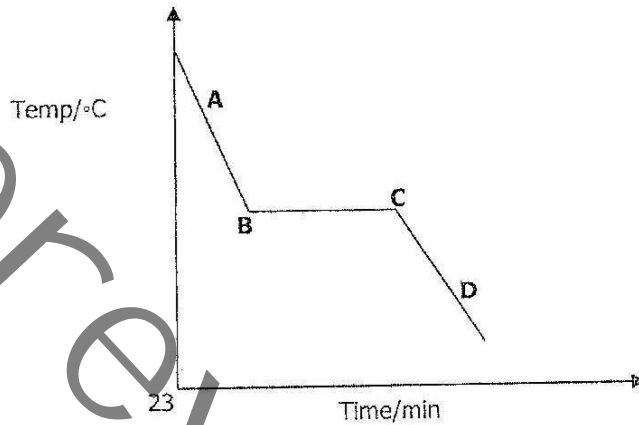
- A** IV
- B** III
- C** II
- D** I

Section B [45 marks]

Answer **all** questions in this section.

Write your answers in the spaces provided on the question paper.

B1 The diagram below shows the cooling curve for a liquid.



(a) In what state of matter is the substance in area **A**?

..... [1]

(b) What name is given to the point labelled **B**?

..... [1]

(c) In what states of matter is the substance between points **B** and **C**?

..... [2]

(d) Explain the reason why the thermometer reading remained constant between points **B** and **C**.

..... [1]

(e) Explain what happens during cooling in relation to the heat content of the substance.

..... [1]

[Total: 6 marks]

B2 When caesium metal is reacted with water, there is a rise in temperature.

(a) (i) How would you detect the rise in temperature?

.....

(ii) What type of a reaction takes place?

.....

(iii) Give a reason for your answer in (a) (ii) above.

..... [3]

(b) Potassium is found in the same group of the Periodic table as caesium.

(i) Compare the reaction of the two metals with water.

.....

.....

.....

(ii) Give a reason for your answer in (b) (i) above.

..... [2]

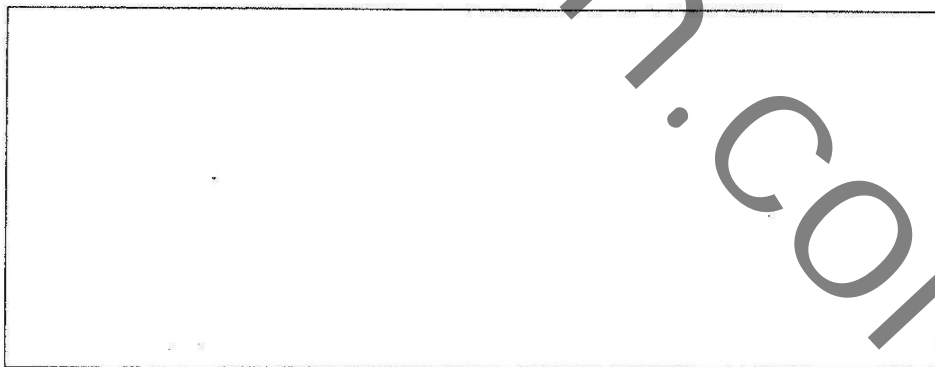
[Total: 5 marks]

B3 Beryllium burns in fluorine to form a white solid, beryllium fluoride.

(a) Name the type of bonding in beryllium fluoride.

..... [1]

(b) In the space below, draw a "dot" and "cross" diagram to show the bonding in beryllium fluoride. Show all electrons.



[2]

(c) Suggest any **two** physical properties of compounds that have similar bonding as beryllium fluoride.

.....

..... [2]

[Total: 5 marks]

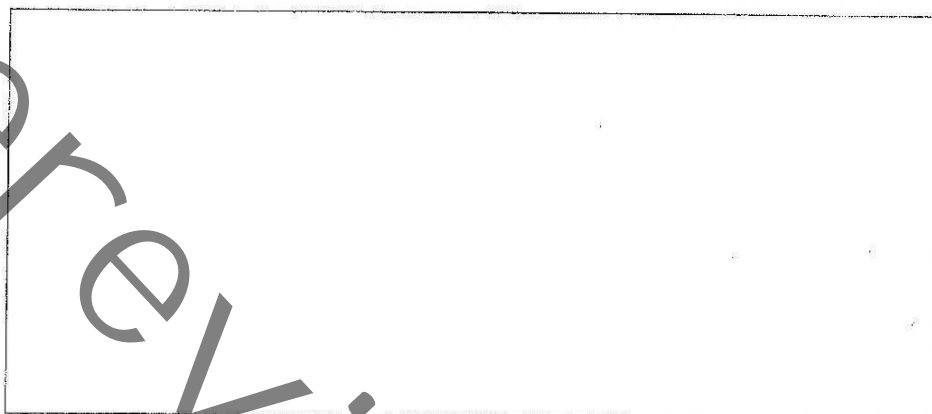
[Turn over

B4 A learner wanted to obtain clear water from muddy water.

(a) Name the process that the learner would use to obtain the clear water.

..... [1]

(b) Draw a large labelled diagram to show the arrangement of the apparatus the learner would use.



[3]

(c) Give an industrial application of the process named in (a) above.

..... [1]

[Total: 5 marks]

B5 Chlorine, Bromine and Iodine are elements in Group VII of the Periodic Table.

(a) (i) Describe the change in the states of the elements at room temperature and pressure as the atomic numbers increase.

.....

(ii) Why is chlorine used in water treatment?

..... [2]

(b) Write an ionic equation for the reaction between chlorine and aqueous potassium bromide solution. Include state symbols.

..... [2]

[Total: 4 marks]

B6 Below are chemical formulae of organic compounds.



(a) Name the compound which reacts with steam.

..... [1]

(b) Draw the structural formula of a compound which turns blue litmus paper red.

[1]

(c) Choose **two** compounds which are isomers.

..... [2]

(d) Which **two** compounds can undergo esterification?

..... [1]

[Total: 5 marks]

B7 A solution of aqueous sodium hydroxide was added from a burette to 25.0cm^3 of dilute sulphuric acid solution in a conical flask. The pH of the mixture was measured during the addition of sodium hydroxide.

(a) Describe how the pH value changed.

..... [1]

(b) (i) Name the type of reaction that took place between sodium hydroxide and sulphuric acid.

.....

(ii) Write a balanced chemical equation for the reaction above (include state symbols)

..... [3]

(c) Sulphuric acid is a strong acid. What does this mean?

..... [2]

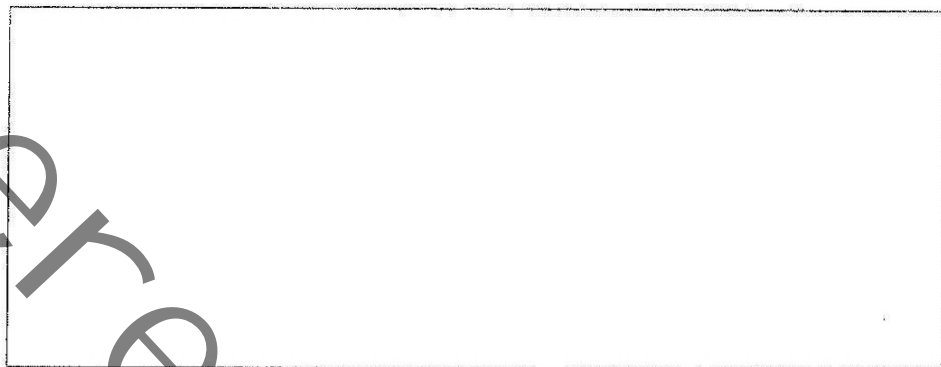
[Total: 6 marks]

[Turn over]

B8 (a) Define the term concentration.

..... [1]

(b) Calculate the concentration of a solution made by dissolving 60g of sodium hydroxide, (NaOH) pellets in 300cm³ of water.



[3]

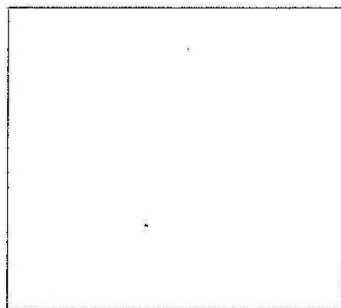
(c) What is the effect of increasing the concentration of the reactants on the rate of a chemical reaction?

..... [1]

[Total: 5 marks]

B9 Draw diagrams to show the arrangement of particles in:

- (a) (i) Aluminium metal
- (ii) Hydrogen chloride



Aluminium metal



Hydrogen chloride

[2]

(b) Which of the **two** substances has a lower melting point? Give a reason for your answer.

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

[Total: 4 marks]

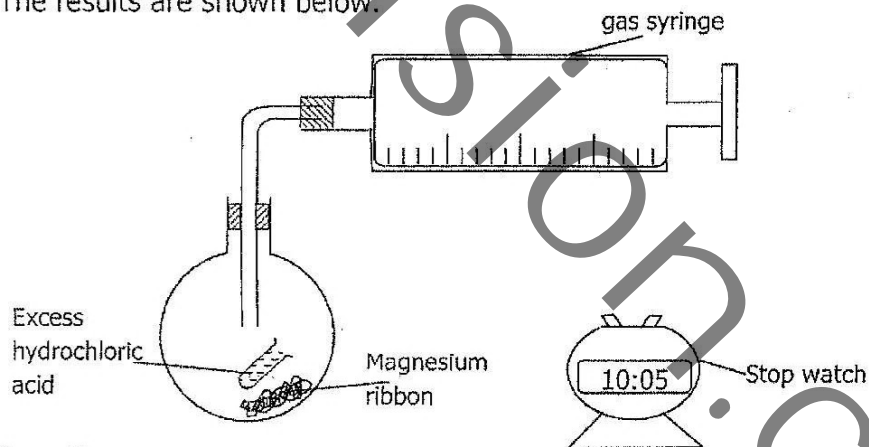
Section C [20 marks]

Answer any **two (2)** questions from this section. Write your answers in the separate answer booklet provided.

- C1** On the packet of a particular opaque beer is written, "contains 5% alcohol per unit volume".
- (a) Name the alcohol found in the opaque beer. [1]
- (i) Describe, in outline, how this alcohol you have named in (a) above is commercially produced from starch. [5]
- (ii) Write down a balanced chemical equation for the formation of the alcohol from glucose. State symbols not required [2]
- (b) Give **one** use and **one** bad effect of the alcohol found in beer. [2]

[Total: 10 marks]

- C2** A piece of Magnesium ribbon was made to react with dilute hydrochloric acid. The volume of the hydrogen gas collected in a syringe was measured at intervals. The results are shown below.

**Results**

Time/min	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Volume of hydrogen/(cm ³)	0	8	14	20	25	35	33	36	38	39	40	40	40

- (a) Write a balanced chemical equation for the reaction between magnesium and dilute hydrochloric acid (include state symbols). [3]
- (b) Plot a graph of the results (volume against time) on the graph paper provided. [3]
- (c) Which result should be rejected as being an error? [1]
- (d) What was the maximum volume of hydrogen produced in this reaction? [1]
- (e) From the graph, how can you tell when the reaction came to an end? [1]
- (f) What is the average rate of this reaction? [1]

[Total: 10 marks]

[Turn over

C3 Iron (II) sulphate crystals can be prepared from the reaction between iron metal and warm dilute sulphuric acid.

- (a) (i) Construct a balanced chemical equation for the above chemical reaction. [2]
- (ii) What is the importance of warming the acid? [1]
- (iii) How do you ensure that the iron (II) sulphate obtained is free of sulphuric acid? [1]
- (iv) Describe how you can obtain pure crystals of iron (II) sulphate from the above reaction. [3]
- (b) When an iron nail is placed in an aqueous solution of copper (II) sulphate, a reaction takes place.
- (i) Construct an ionic equation for the reaction. [1]
- (ii) State **two** observations you would make during the reaction. [2]
- [Total: 10 marks]

DATA SHEET
The Periodic Table of the Elements

Group		I	II	III	IV	V	VI	VII	0																																																																																																																																																																																																																																																										
7	Li Lithium 3	11	B Boron 5	12	C Carbon 6	13	Al Aluminium 13	14	N Nitrogen 7	15	O Oxygen 8	16	F Fluorine 9	17	Ne Neon 10	18	Ar Argon 18	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	28	Ni Nickel 28	29	Cu Copper 29	30	Zn Zinc 30	31	Ga Gallium 31	32	Ge Germanium 32	33	As Arsenic 33	34	Se Selenium 34	35	Br Bromine 35	36	Kr Krypton 36	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	46	Pd Palladium 46	47	Ag Silver 47	48	Cd Cadmium 48	49	In Indium 49	50	Sn Tin 50	51	Sb Antimony 51	52	Te Tellurium 52	53	I Iodine 53	54	Xe Xenon 54	55	Cs Caesium 55	56	Ba Barium 56	57	La Lanthanum 57	58	Ce Cerium 58	59	Pr Praseodymium 59	60	Nd Neodymium 60	61	Pm Promethium 61	62	Sm Samarium 62	63	Eu Europium 63	64	Gd Gadolinium 64	65	Tb Terbium 65	66	Dy Dysprosium 66	67	Ho Holmium 67	68	Er Erbium 68	69	Tm Thulium 69	70	Yb Ytterbium 70	71	Lu Lutetium 71	72	Hf Hafnium 72	73	Ta Tantalum 73	74	W Tungsten 74	75	Re Rhenium 75	76	Os Osmium 76	77	Ir Iridium 77	78	Pt Platinum 78	79	Au Gold 79	80	Hg Mercury 80	81	Tl Thallium 81	82	Pb Lead 82	83	Bi Bismuth 83	84	Po Polonium 84	85	At Astatine 85	86	Rn Radon 86	87	Fr Francium 87	88	Ra Radium 88	89	Ac Actinium 89	90	Th Thorium 90	91	Pa Protactinium 91	92	U Uranium 92	93	Np Neptunium 93	94	Pu Plutonium 94	95	Am Americium 95	96	Cm Curium 96	97	Bk Berkelium 97	98	Cf Californium 98	99	Es Einsteinium 99	100	Fm Fermium 100	101	Md Mendelevium 101	102	No Nobelium 102	103	Lr Lawrencium 103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175

*58-71 Lanthanoid series
+90-103 Actinoid series

Key

a	X
b	

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

NA = 6.0 × 10²³/mol; 1F = 96500C.

Chemistry/5070/1/2016 a