Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

COMBINED SCIENCE 4003/2

PAPER 2 Theory

NOVEMBER 2023 SESSION 2 hours

Additional materials:
Calculator (Optional)
Answer sheets
String

The Periodic Table is provided on page 13.

Time 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top.

Section A

Answer all questions.

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

Section B

Answer any **two** questions.

Write your answers on the separate answer sheets provided.

Section C

Answer any **two** questions.

Write your answers on the separate answer sheets provided.

Section D

Answer any **two** questions.

Write your answers on the separate answer sheets provided.

INFORMATION FOR CANDIDATES

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

FOR EXAMINER'S USE	
Section A	
Section B	
Section C	
Section D	
TOTAL	

This question paper consists of 13 printed pages and 3 blank pages.

[Turn over

Section A

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

1 **(a)** **Fig.1.1** shows a specialised cell.

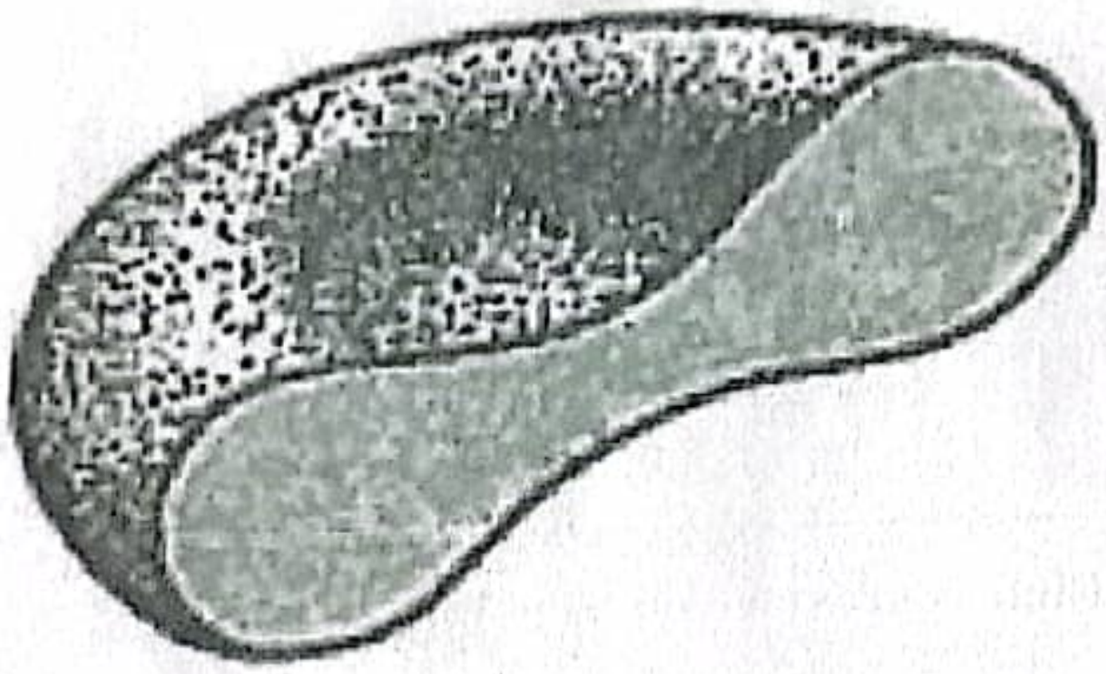

Fig.1.1

(i) Identify the specialised cell.

_____ [1]

(ii) State **two** adaptations of the cell in **Fig. 1.1** to its function.

_____

_____ [2]

(b) **(i)** Define the term *discontinuous variation*.

_____

_____ [1]

(ii) State any **one** characteristic which shows discontinuous variation.

For Examiner Use

_____

_____ [1]

(c) Explain why trophic levels are limited in a food chain.

_____

_____

_____

_____ [2]

2 (a) State the causative agent of

(i) chancroid,

_____ [1]

(ii) genital herpes.

_____ [1]

(b) Describe **one** way of reducing the spread of chancroid.

_____

_____ [1]

(c) Describe how HIV/AIDS differs from genital herpes.

_____

_____

_____

_____ [2]

(d) State any two effects of syphilis on an unborn child.

_____

_____

_____

_____

_____ [2]

3 (a) Table 3.1 shows the effects of substances A and B on litmus paper.

Table 3.1

substance	blue litmus paper	red litmus paper
A	remains blue	turns blue
B	turns red	remains red

(i) State the purpose of the litmus paper.

_____

_____ [1]

(ii) Identify the acid-base nature of

1. substance A,

_____

2. substance B.

_____

_____ [2]

(iii) State any one property of substance B.

_____

_____ [1]

(b) Write an equation for the reaction between calcium carbonate and hydrochloric acid.

[3]

For Examiner Use

4 (a) **Fig.4.1** shows the displayed structural formula of a hydrocarbon.

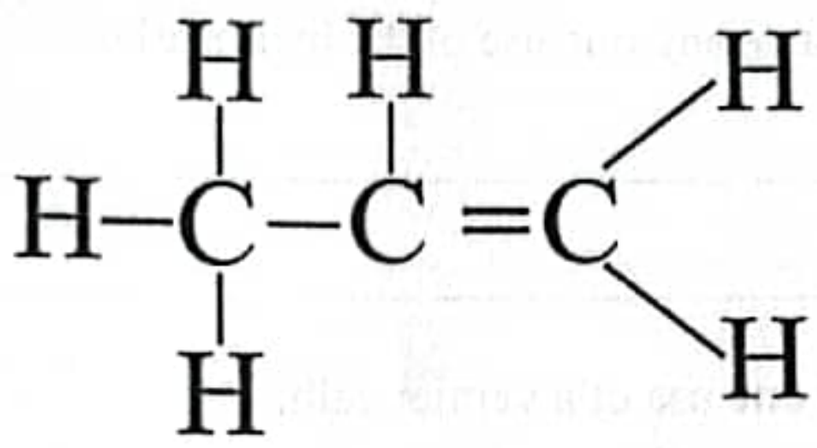

Fig.4.1

(i) Define the term *hydrocarbon*.

_____

_____ [1]

(ii) Name the hydrocarbon in **Fig. 4.1**.

_____ [1]

(iii) Identify the homologous series to which the hydrocarbon belongs.

_____ [1]

(iv) Explain why the hydrocarbon is said to be unsaturated.

_____

_____ [1]

(b) (i) Deduce the empirical formula of the hydrocarbon in **Fig. 4.1**.

_____

_____

_____

_____ [2]

(ii) State any **one** use of the hydrocarbon.

_____

_____ [1]

5 (a) State any **one** use of a vernier callipers.

_____

_____ [1]

(b) **Fig.5.1** shows the scale of a vernier callipers.

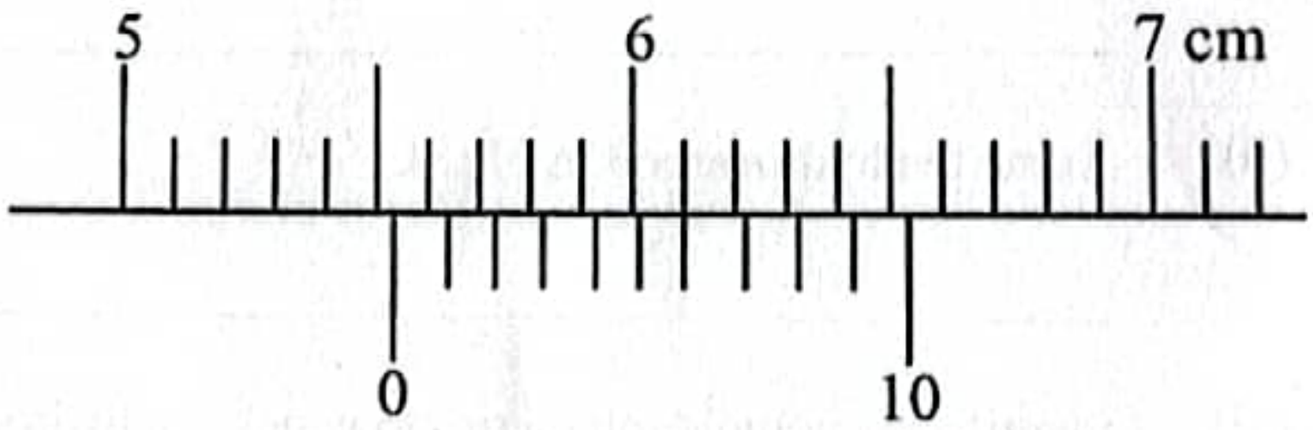

Fig.5.1

State the reading shown on the vernier callipers in **Fig. 5.1**.

_____

_____

_____ [1]

(c) (i) 1 cm^3 of water has a mass of 1 g.

Calculate the density of 50 cm^3 of water.

For Examiner Use

[3]

(ii) Convert 50 cm^3 to litres.

_____

_____ [1]

6 (a) (i) State the law of magnetism.

_____

_____ [1]

(ii) Give any **one** example of a magnetic material and a non-magnetic material.

magnetic _____

non-magnetic _____ [2]

(b) **Table 6.1** shows the differences between a motor and a generator.

(i) Complete **Table 6.1**.

Table 6.1

	motor	generator
power source	present	absent
form of energy produced		

[2]

(ii) State any **one** appliance which has an electric motor.

_____

_____ [1]

Section B

Answer any **two** questions on the separate answer sheets provided.

7 **(a)** State any **three** differences between inhaled and exhaled air. [3]

(b) **(i)** State the word equation for aerobic respiration. [2]

(ii) Explain why little energy is produced during anaerobic respiration. [2]

(iii) Give any **three** differences between respiration and photosynthesis. [3]

8 **(a)** State any **two** functions of transpiration. [2]

(b) Explain any **two** ways in which plants are adapted to reduce water loss by transpiration. [4]

(c) Explain why high concentration of salts in the soil reduces transpiration. [4]

9 **(a)** **Fig.9.1** shows a blood vessel.

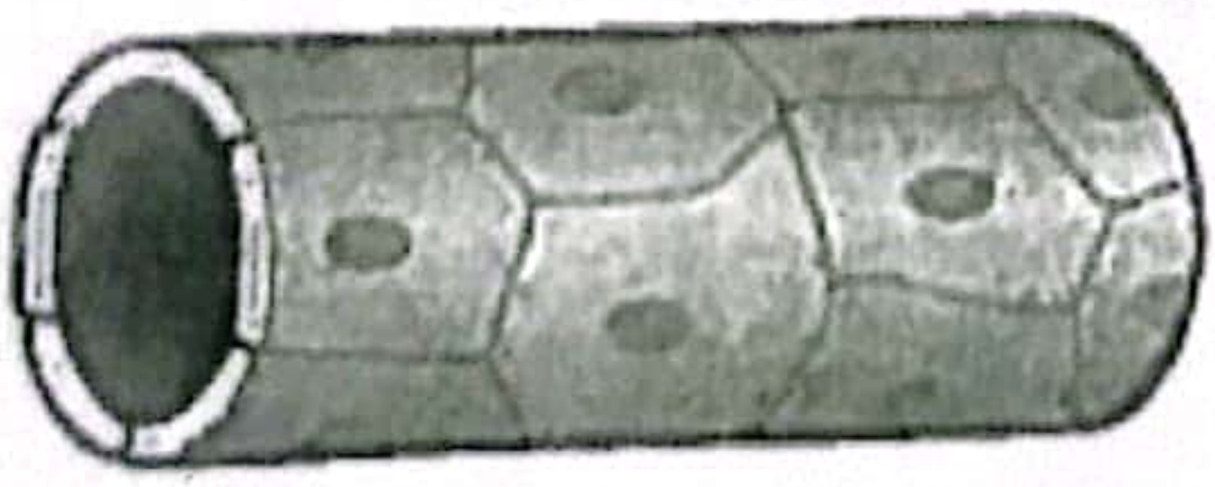

Fig.9.1

(i) Explain the structure of the blood vessel. [4]

(ii) State **two** differences in blood composition between the blood in the aorta and the blood in the vena cava. [2]

(b) Outline the path taken by blood from the right atrium until it reaches the left atrium. [4]

Section C

Answer any **two** questions on the separate answer sheets provided.

(a) **Table 10.1** shows characteristics of three elements **A**, **B** and **C**. The letters are **not** the real symbols of the elements.

Table 10.1

element	proton number	mass number	electronic configuration
A		23	2, 8, 1
B	18	40	
C	8	16	2, 6

(i) Complete **Table 10.1** by writing the proton number of element **A** and the electronic configuration of element **B**. [2]

(ii) State the Group to which element **A** belongs. [1]

(iii) Identify, using **A**, **B** or **C**, the element that is a noble gas. [1]

(b) **(i)** Draw a dot and cross diagram to show the bonding between elements **A** and **C**. [2]

(ii) State any **one** physical property of the compound formed between elements **A** and **C**. [2]

(c) Calculate the number of moles in 69 g of element **A**. [2]

Sulphuric acid is manufactured by the contact process.

(a) Name the **two** raw materials that are used in the production of sulphur trioxide. [2]

(b) Give any **two** conditions needed for the production of sulphur trioxide. [2]

(c) Describe how each condition stated in **(b)** affects the production of sulphur trioxide. [2]

(d) Describe the dilution stage in the contact process. [2]

(e) Calculate the relative molecular mass of sulphuric acid (H_2SO_4). [2]

For Examiner Use

12 **Fig.12.1** shows an experiment between iron (III) oxide (Fe_2O_3) and coke (C).

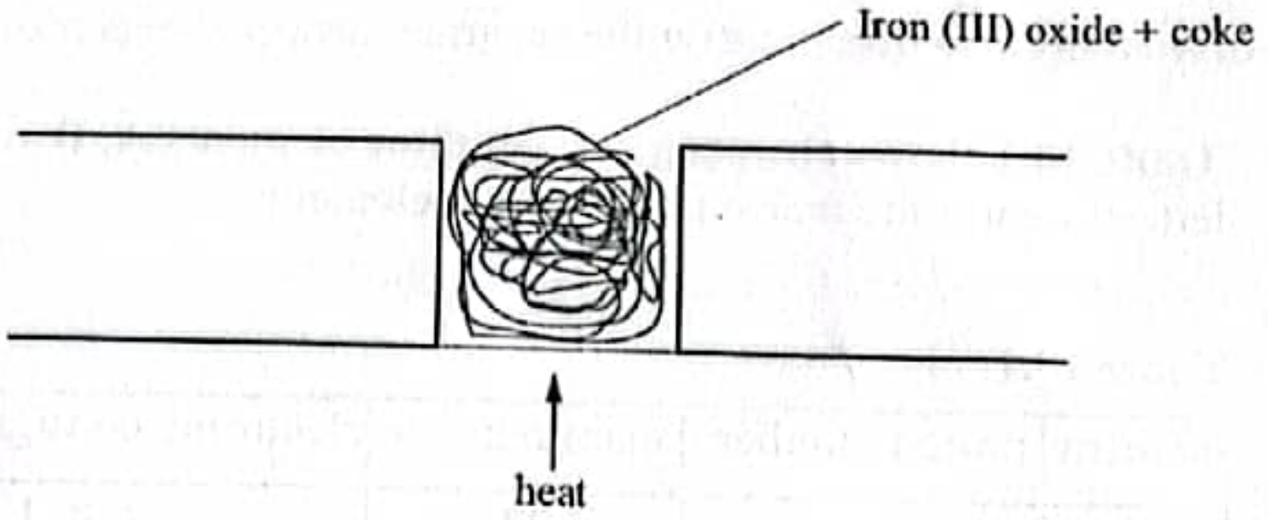

Fig.12.1

(a) Explain the term *oxidation*. [1]

(b) Write a balanced chemical equation for the reaction. [2]

(c) Identify the oxidising agent in the reaction. [1]

(d) **(i)** Name **two** elements which are added to the solid product to make stainless steel. [2]

(ii) State any **two** properties of stainless steel. [2]

(iii) Give any **two** uses of stainless steel. [2]

Section D

Answer any **two** questions on the separate answer sheets provided.

Fig.13.1 shows a piece of an unidentified material being heated. After five minutes, the heat was felt on the other end.

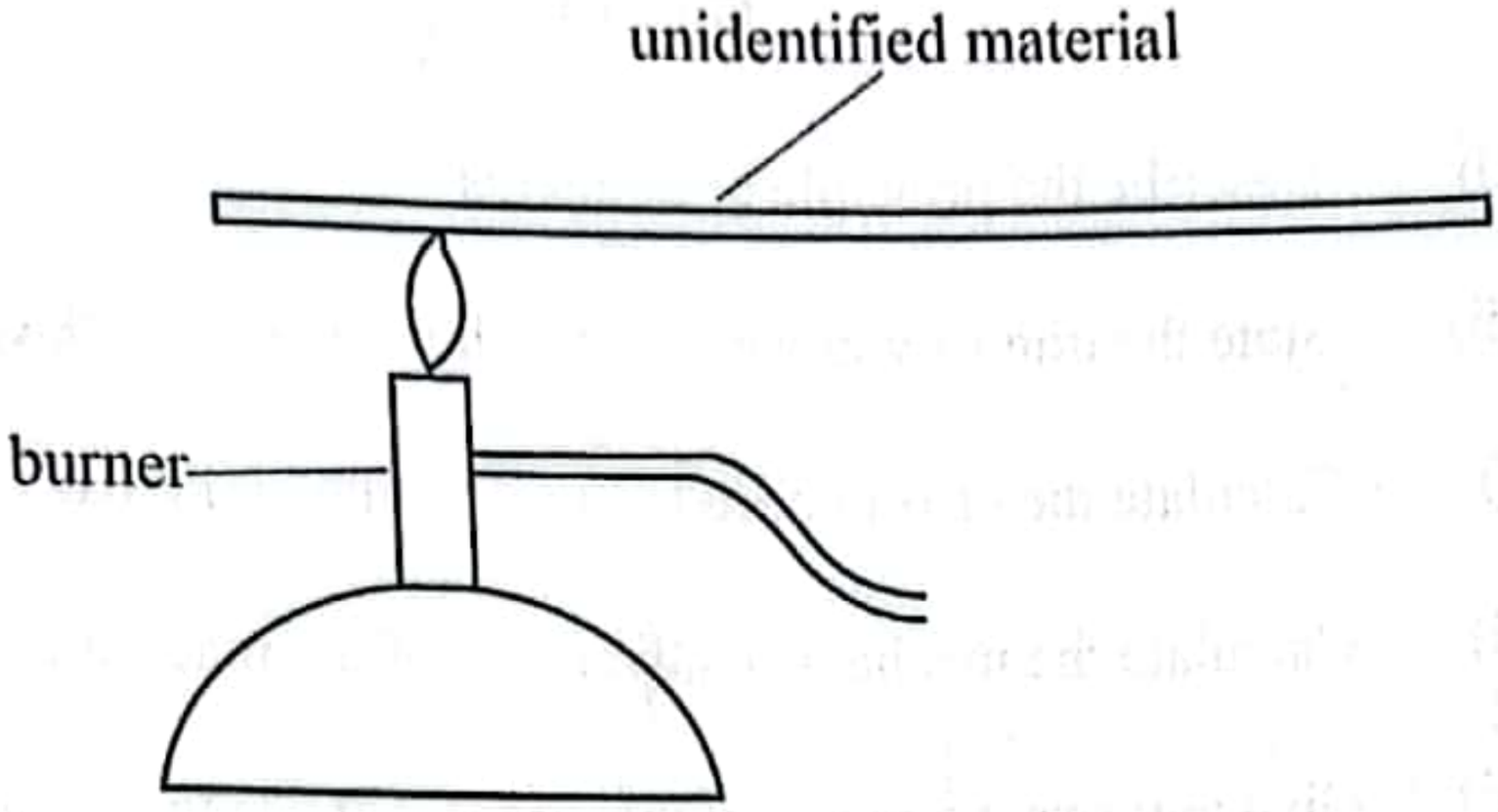

Fig.13.1

(i) Identify, with a reason, the type of material that was used in the investigation. [2]

(ii) Explain why heat conduction is fast in solids. [1]

(iii) State the method by which heat energy is transferred in **Fig. 13.1**. [1]

(b) (i) State any **two** types of potential energy. [2]

(ii) State the law of conservation of energy. [2]

(c) Explain why a tyre gets hot after travelling a long distance. [2]

For Examiner Use

14 **Fig.14.1** shows a machine used to lift a 50 kg bag of maize.

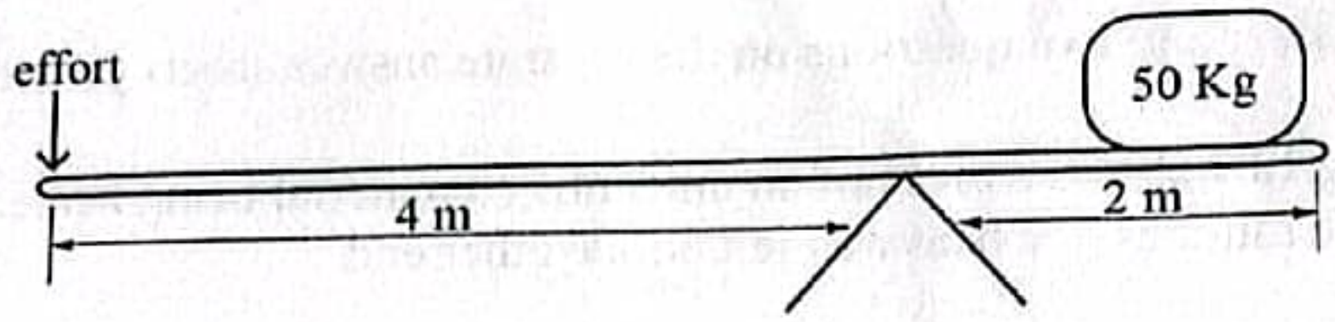

Fig.14.1

(a) (i) Describe the principle of moments. [1]

(ii) State the **one** way in which a machine makes work easier. [1]

(b) (i) Calculate the effort needed to just lift the 50 kg bag. [3]

(ii) Calculate the mechanical advantage of the machine. [2]

(iii) Give any **two** examples of machines that use the same principle as that shown in **Fig.14.1**. [2]

(c) Suggest a reason why the machine in **Fig. 14.1** is not 100% efficient. [1]

15 **(a) (i)** Explain why copper and polythene have different electrical conductivities. [3]

(ii) Name a non-metal which is a good electrical conductor. [1]

(b) A Christmas tree was decorated with light bulbs. It was observed that when one of the lights on the Christmas tree broke, the rest went off as well.

(i) State the type of connection used to connect the light bulbs. [1]

(ii) Describe the effect of breaking one light bulb to the ammeter reading. [1]

(c) State the function of a fuse. [1]

(d) State any **two** safety precautions that one must take before rescuing an electrocuted person. [2]

(e) Give **one** difference between direct current (d.c) and alternating current (a.c). [1]

DATA SHEET
The Periodic Table of the Elements

Group I	Group II										Group III	Group IV	Group V	Group VI	Group VII	Group O
																4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

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

Key: a X — a = relative atomic mass; X = atomic symbol; b = proton (atomic) Number

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