



# 150 YEARS OF THE PERIODIC TABLE

The modern periodic table was first created 150 years ago, enabling the classification of chemical elements for the first time, including the Platinum Group Metals

Created by Russian chemist Dmitri Ivanovich Mendeleev in 1869, the periodic table is one of the most important developments in the history of chemistry. It describes the atomic properties of every known chemical element in a concise format, including its atomic number, atomic mass and relationship with other elements.

By the time of Mendeleev's breakthrough discovery, the Platinum Group Metals (PGMs) – platinum, palladium, rhodium, ruthenium, iridium and osmium – had already been identified as separate elements, albeit derived from the same ore. All six PGMs were included in Mendeleev's original version of the periodic table.

Within the periodic table, elements with similar chemical properties are arranged in 18 columns called groups. The seven rows of the table, called periods, generally have metals on the left and non-metals on the right.

Prior to Mendeleev's discovery, chemists had already recognised patterns in the properties of elements and were looking for ways of arranging the elements to reflect these similarities.

However, Mendeleev was the first to establish a method of classification which arranged the chemical elements by increasing relative atomic mass 'periodically', that is in a way that shows a

pattern in chemical or physical properties. The modern periodic table lists the elements in order of increasing atomic number (the number of protons in the nucleus of an atom).

The creation of the periodic table has enabled not only the identification of matter already discovered by humankind, but also the classification of new matter. The atomic structure of new matter can be compared to the existing elements in the table in order to work out which family it is closest to and how it is likely to behave.

In 1869, the periodic table contained 63 elements compared to 118 today, with the most recent additions having been made in 2016 with the inclusion of four new elements.

## Platinum and the periodic table

Chemical elements are the atomic building blocks of the universe, playing a vital role in our daily lives. By using the periodic table, elements can be grouped into particular families that have similar characteristics.

**Platinum and its sister metals** are one such family of elements within the periodic table. Clustered together, these elements are all 'transition' metals in groups eight, nine and ten, and periods five and six, adjacent to the other precious metals, gold and silver.

Transition metals are generally hard and dense, and less reactive than the alkali metals. They also have catalytic properties and are good conductors of heat and electricity.

As the data on the periodic table shows, the PGMs

share many properties and are used, either individually or in combination as alloys, in a multitude of applications from autocatalysts to fertiliser production, glass making, cloud computing and even cancer treatments.

# PERIODIC TABLE OF THE ELEMENTS

1

H

HYDROGEN

1.0079

3

Li

LITHIUM

6.941

4

Be

BERYLLIUM

9.0122

11

Na

SODIUM

22.989

12

Mg

MAGNESIUM

24.305

19

K

POTASSIUM

39.098

37

Rb

RUBIDIUM

85.467

55

Cs

CAESIUM

132.905

87

Fr

FRANCIUM

(223)

Non-metal

Alkali metal

Alkaline earth metal

Transition metal

Metal

Metalloid

Halogen

Noble gas

Lanthanide

Actinide

2

He

HELIUM

4.0026

10

Ne

NEON

20.1797

18

Ar

ARGON

39.948

36

Kr

KRYPTON

83.798

54

Xe

XENON

131.293

86

Rn

RADON

(222)

118

Uuo

UNUNOCTIUM

(294)

5

B

BORON

10.811

6

C

CARBON

12.011

7

N

NITROGEN

14.007

8

O

OXYGEN

15.999

9

F

FLUORINE

18.998

13

Al

ALUMINIUM

26.981

14

Si

SILICON

28.085

15

P

PHOSPHORUS

30.974

16

S

SULFUR

32.066

17

Cl

CHLORINE

35.453

31

Ga

GALLIUM

69.723

32

Ge

GERMANIUM

72.63

33

As

ARSENIC

74.921

34

Se

SELENIUM

78.971

35

Br

BROMINE

79.904

49

In

INDIUM

114.818

50

Sn

TIN

118.710

51

Sb

ANTIMONY

121.760

52

Te

TELLURIUM

127.60

81

Tl

THALLIUM

204.38

82

Pb

LEAD

207.2

83

Bi

BISMUTH

208.98

113

Uut

UNUNTRIUM

(284)

114

Fl

FLEROVIUM

(289)

115

Uup

UNUNPENTIUM

(288)

116

Lv

LIVERMORIUM

(293)

117

Uus

UNUNSEPTIUM

(294)

24

Cr

CHROMIUM

51.9961

25

Mn

MANGANESE

54.938

26

Fe

IRON

55.845

27

Co

COBALT

58.933

28

Ni

NICKEL

58.6934

44

Ru

RUTHENIUM

101.07

45

Rh

RHODIUM

102.90

46

Pd

PALLADIUM

106.42

76

Os

OSMIUM

190.23

77

Ir

IRIDIUM

192.217

78

Pt

PLATINUM

195.084

108

Hs

HASSIUM

(270)

109

Mt

MEITNERIUM

(276)

110

Ds

DARMSTADIUM

(281)

111

Rg

ROENTGENIUM

(280)

57

La

LANTHANUM

138.90

58

Ce

CERIUM

140.116

59

Pr

PRASEODYMIUM

140.90

60

Nd

NEODYMIUM

144.242

61

Pm

PROMETHIUM

(145)

62

Sm

SAMARIUM

150.36

63

Eu

EUROPIUM

151.964

64

Gd

GADOLINIUM

157.25

65

Tb

TERBIUM

158.92

66

Dy

DYSPROSIUM

162.500

67

Ho

HOLMIUM

164.93

68

Er

ERBIUM

167.259

69

Tm

THULIUM

168.93

70

Yb

YTTERIUM

173.054

71

Lu

LUTETIUM

174.9668

89

Ac

ACTINIUM

(227)

90

Th

THORIUM

232.0377

91

Pa

PROTACTINIUM

231.03688

92

U

URANIUM

238.02891

93

Np

NEPTUNIUM

(237)

94

Pu

PLUTONIUM

(244)

95

Am

AMERICIUM

(243)

96

Cm

CURIUM

(247)

97

Bk

BERKELIUM

(247)

98

Cf

CALIFORNIUM

(251)

99

Es

EINSTEINIUM

(252)

100

Fm

FERMIDIUM

(257)

101

Md

MENDELEVIUM

(288)

102

No

NOBELIUM

(289)

103

Lr

LAWRENCIUM

(260)

### Contacts:

David Badham, Chief Administrative Officer, [dbadham@platinuminvestment.com](mailto:dbadham@platinuminvestment.com)

Brendan Clifford, Investor Development, [bclifford@platinuminvestment.com](mailto:bclifford@platinuminvestment.com)

Trevor Raymond, Research, [traymond@platinuminvestment.com](mailto:traymond@platinuminvestment.com)

Vicki Barker, Investor Communications, [vbarker@platinuminvestment.com](mailto:vbarker@platinuminvestment.com)



DISCLAIMER: The World Platinum Investment Council is not authorised by any regulatory authority to give investment advice. Nothing within this document is intended or should be construed as investment advice or offering to sell or advising to buy any securities or financial instruments and appropriate professional advice should always be sought before making any investment. More detailed information is available on the WPIC website: <http://www.platinuminvestment.com>