#### NAME

PeriodicTable

#### **SYNOPSIS**

```
use PeriodicTable;
use PeriodicTable gw(:all);
```

### **DESCRIPTION**

PeriodicTable module provides the following functions:

GetElementMostAbundantNaturalIsotopeData, GetElementMostAbundantNaturalIsotopeMass,
GetElementMostAbundantNaturalIsotopeMassNumber, GetElementNaturalIsotopeAbundance, GetElementNaturalIsotopeCount,
GetElementNaturalIsotopeMass, GetElementNaturalIsotopesData, GetElementPropertiesData, GetElementPropertiesNames,
GetElementPropertiesNamesAndUnits, GetElementPropertyUnits, GetElementsByAmericanStyleGroupLabel,
GetElementsByEuropeanStyleGroupLabel, GetElementsByGroupName, GetElementsByGroupNumber, GetElementsByPeriodNumber,
GetIUPACGroupNumberFromAmericanStyleGroupLabel, GetIUPACGroupNumberFromEuropeanStyleGroupLabel, IsElement,
IsElementNaturalIsotopeMassNumber, IsElementProperty

### **METHODS**

#### GetElements

```
@ElementSymbols = GetElements();
$ElementSymbolsRef = GetElements();
```

Returns an array or a reference to an array of known element symbols

# GetElementsByGroupName

```
@ElementSymbols = GetElementsByGroupName($GroupName);
$ElementSymbolsRef = GetElementsByGroupName($GroupName);
```

Returns an array or a reference to an array of element symbols for a specified *GroupName*. Supported *GroupName* values are: *Alkali metals, Alkaline earth metals, Coinage metals, Pnictogens, Chalcogens, Halogens, Noble gases*; Additionally, usage of *Lanthanides* (Lanthanoids) and *Actinides* (Actinoids) is also supported.

### GetElementsByGroupNumber

```
@ElementSymbols = GetElementsByGroupNumber($GroupNumber);
$ElementSymbolsRef = GetElementsByGroupNumber($GroupNumber);
```

Returns an array or a reference to an array of element symbols for a specified GroupNumber

# GetElementsByAmericanStyleGroupLabel

```
@ElementSymbols = GetElementsByAmericanStyleGroupLabel($GroupLabel);
$ElementSymbolsRef = GetElementsByAmericanStyleGroupLabel($GroupLabel);
```

Returns an array or a reference to an array of element symbols for a specified American style *GroupLabel*. Valid values for Amercian style group labels: *IA to VIIIA, IB to VIIIB, VIII*.

# ${\tt GetElementsByEuropeanStyleGroupLabel}$

```
@ElementSymbols = GetElementsByEuropeanStyleGroupLabel($GroupLabel);
$ElementSymbolsRef = GetElementsByEuropeanStyleGroupLabel($GroupLabel);
```

Returns an array or a reference to an array of element symbols for a specified European style *GroupLabel*. Valid values for European style group labels: *IA to VIIIA, IB to VIIIB, VIII*.

# ${\sf GetElementsByPeriodNumber}$

```
@ElementSymbols = GetElementsByPeriodNumber($PeriodNumber);
$ElementSymbolsRef = GetElementsByPeriodNumber($PeriodNumber);
```

Returns an array or a reference to an array of element symbols for a specified PeriodNumber.

### GetElementMostAbundantNaturalIsotopeData

Returns an array or reference to an array containing data for most abundant isotope of an element specfied by element symbol or atomic number. Isotope data arrays contain these values: *AtomicNumber, IsotopeSymbol, MassNumber, RelativeAtomicMass, and NaturalAbundance*.

www.MayaChemTools.org Page 1

#### GetElementMostAbundantNaturalIsotopeMassNumber

```
$MassNumber = GetElementMostAbundantNaturalIsotopeMassNumber($ElementID);
```

Returns mass number of most abundant natural isotope of an element specfied by element symbol or atomic number

#### GetElementNaturalIsotopeCount

```
$IsotopeCount = GetElementNaturalIsotopeCount($ElementID);
```

Returns natural isotope count for an element specfied by element symbol or atomic number

#### GetElementNaturalIsotopesData

Reurns a reference to a hash containingall available isotope data for an element specified using element symbol or aromic number; an optional mass number indicates retrieve data for a specific isotope

#### GetElementNaturalI sotopeAbundance

Returns percent abundance of natural isotope for an element with specfic mass number.

#### GetElementMostAbundantNaturalIsotopeMass

Returns relative atomic mass of most abundant isotope for an element specified using element symbol or aromic number.

## **GetElementNaturalIsotopeMass**

Returns relative atomic mass of an element with specfic mass number.

## GetElementPropertiesData

```
$PropertyDataHashRef = GetElementPropertiesData($ElementID);
```

Returns a reference to a hash containing all available properties data for an element specified using element symbol or atomic number.

### GetElementPropertyName

```
$PropertyValue = GetElement<PropertyName>($ElementID);
```

Returns value of an element for a element specified using element symbol or atomic number.

These functions are not defined in this modules; these are implemented on-the-fly using Perl's AUTOLOAD funcionality.

Here is the list of known element *property names*: AllenElectronegativity, AllredRochowElectronegativity, AtomicNumber, AtomicRadiusCalculated, AtomicRadiusEmpirical, AtomicWeight, Block, BoilingPoint, BondLength, BrinellHardness, BulkModulus, Classification, CoefficientOfLinearExpansion, Color, CommonValences, LowestCommonValence, HighestCommonOxidationNumbers, LowestCommonOxidationNumber, HighestCommonOxidationNumber, CovalentRadiusEmpirical, CriticalTemperature, DensityOfSolid, DiscoveredAt, DiscoveredBy, DiscoveredWhen, ElectricalResistivity, ElectronAffinity, ElementName, ElementSymbol, EnthalpyOfAtmization, EnthalpyOfFusion, EnthalpyOfVaporization, FirstIonizationEnergy, GroundStateConfiguration, GroundStateLevel, GroupName, GroupNumber, NaturalIsotopeData, MeltingPoint, MineralHardness, MolarVolume, MullikenJaffeElectronegativity, OriginOfName, PaulingElectronegativity, PeriodNumber, PoissonsRatio, Reflectivity, RefractiveIndex, RigidityModulus, SandersonElectronegativity, StandardState, SuperconductionTemperature, ThermalConductivity, VanderWaalsRadius, VelocityOfSound, VickersHardness, YoungsModulus.

# GetElementPropertiesNames

```
@PropertyNames = GetElementPropertiesNames([$Mode]);
$PropertyNamesRef = GetElementPropertiesNames([$Mode]);
```

Returns names of all available element properties. Optional mode parameter controls grouping of property names; Possible values: *ByGroup or Alphabetical*. Default: *ByGroup*.

### GetElementPropertiesNamesAndUnits

```
$NameUnitsHashRef = GetElementPropertiesNamesAndUnits();
```

Returns a reference to a hash of property names and units of all available element properties. Names with no units contains empty strings.

### GetElementPropertyUnits

```
$Units = GetElementPropertyUnits($PropertyName);
```

Returns units for a specific element property name. An empty string is returned for a property with no units.

# ${\tt GetIUPACGroupNumberFromAmericanStyleGroupLabel}$

```
$GroupNumber = GetIUPACGroupNumberFromAmericanStyleGroupLabel(
    $GroupLabel);
```

Returns IUPAC group numbers of a specific American style group label. A comma delimited string is returned for group VIII or VIIIB

# ${\tt GetIUPACGroupNumberFromEuropeanStyleGroupLabel}$

Returns IUPAC group numbers of a specific European style group label. A comma delimited string is returned for group VIII or VIIIA.

# IsElement

```
$Status = IsElement($ElementID);
```

Returns 1 or 0 based on whether it's a known element symbol or atomic number.

### IsElementNaturalIsotopeMassNumber

```
$Status = IsElementNaturalIsotopeMassNumber($ElementID, $MassNumber);
```

Returns 1 or 0 based on whether it's a valid mass number for an element symbol or atomic number.

# **IsElementProperty**

```
$Status = IsElementProperty($PropertyName);
```

Returns 1 or 0 based on whether it's a valid property name.

### **AUTHOR**

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## SEE ALSO

AminoAcids.pm, NucleicAcids.pm

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