Inhaltsverzeichnis

Modul:Convert/wikidata

Die Dokumentation für dieses Modul kann unter Modul:Convert/wikidata/Doku erstellt werden

```
-- Functions to access Wikidata for Module:Convert.

local Collection = {}
Collection.__index = Collection
do
	function Collection:add(item)
		if item ~= nil then
			self.n = self.n + 1
			self[self.n] = item
		end
	end
	function Collection:join(sep)
		return table.concat(self, sep)
	end
	function Collection:remove(pos)
		if self.n > 0 and (pos == nil or (0 < pos and pos <= self.n)) the
			self.n = self.n - 1
			return table.remove(self, pos)
		end
	end
	function Collection:sort(comp)
		table.sort(self, comp)
	end
	function Collection.new()
		return setmetatable({n = 0}, Collection)
	end
end

local function strip_to_nil(text)
	-- If text is a non-empty string, return its trimmed content,
	-- otherwise return nothing (empty string or not a string).
	if type(text) == 'string' then
		return text:match('(%S.-)%s*$')
	end
end

local function frequency_unit(value, unit_table)
	-- For use when converting m to Hz.
	-- Return true, s where s = name of unit's default output unit,
	-- or return false, t where t is an error message table.
	-- However, for simplicity a valid result is always returned.
	local unit
	if unit_table._symbol == 'm' then
		-- c = speed of light in a vacuum = 299792458 m/s
		-- frequency = c / wavelength
		local w = value * (unit_table.scale or 1)
		local f = 299792458 / w  -- if w == 0, f = math.huge which works
		if f >= 1e12 then
			unit = 'THz'
		elseif f >= 1e9 then
			unit = 'GHz'
		elseif f >= 1e6 then
			unit = 'MHz'
		elseif f >= 1e3 then
			unit = 'kHz'
		else
```

```
                        unit = 'Hz'
                end
        end
        return true, unit or 'Hz'
end

local function wavelength_unit(value, unit_table)
        -- Like frequency_unit but for use when converting Hz to m.
        local unit
        if unit_table._symbol == 'Hz' then
                -- Using 0.9993 rather than 1 avoids rounding which would give re
                -- like converting 300 MHz to 100 cm instead of 1 m.
                local w = 1 / (value * (unit_table.scale or 1))  -- Hz scale is i
                if w >= 0.9993e6 then
                        unit = 'Mm'
                elseif w >= 0.9993e3 then
                        unit = 'km'
                elseif w >= 0.9993 then
                        unit = 'm'
                elseif w >= 0.9993e-2 then
                        unit = 'cm'
                elseif w >= 0.9993e-3 then
                        unit = 'mm'
                else
                        unit = 'um'
                end
        end
        return true, unit or 'm'
end

local specials = {
        frequency = { frequency_unit },
        wavelength = { wavelength_unit },
        ------------------------------------------------------------------------
        -- Following is a removed experiment to show two values as a range
        -- using '-' as the separator.
        -- frequencyrange = { frequency_unit, '-' },
        -- wavelengthrange = { wavelength_unit, '-' },
}

local function make_unit(units, parms, uid)
        -- Return a unit code for convert or nil if unit unknown.
        -- If necessary, add a dummy unit to parms so convert will use it
        -- for the input without attempting a conversion since nothing
        -- useful is available (for example, with unit volt).
        local unit = units[uid]
        if type(unit) ~= 'table' then
                return nil
        end
        local ucode = unit.ucode
        if ucode and not unit.si then
                return ucode                -- a unit known to convert
        end
        parms.opt_ignore_error = true
        ucode = ucode or unit._ucode    -- must be a non-empty string
        local ukey, utable
        if unit.si then
                local base = units[unit.si]
                ukey = base.symbol          -- must be a non-empty string
                local n1 = base.name1
                local n2 = base.name2
                if not n1 then
                        n1 = ukey
                        n2 = n2 or n1           -- do not append 's'
```

```
                end
                utable = {
                        _symbol = ukey,
                        _name1 = n1,
                        _name2 = n2,
                        link = unit.link or base.link,
                        utype = n1,
                        prefixes = 1,
                }
        else
                ukey = ucode
                utable = {
                        symbol = ucode,         -- must be a non-empty string
                        name1 = unit.name1,     -- if nil, uses symbol
                        name2 = unit.name2,     -- if nil, uses name1..'s'
                        link = unit.link,       -- if nil, uses name1
                        utype = unit.name1 or ucode,
                }
        end
        utable.scale = 1
        utable.default = ''
        utable.defkey = ''
        utable.linkey = ''
        utable.bad_mcode = ''
        parms.unittable = { [ukey] = utable }
        return ucode
end

local function matches_qualifier(statement, qual)
        -- Return:
        --   false, nil : if statement does not match specification
        --   true, nil  : if matches, and statement has no qualifier
        --   true, sq   : if matches, where sq is the statement's qualifier
        -- A match means that no qualifier was specified (qual == nil), or that
        -- the statement has a qualifier matching the specification.
        -- If a match occurs, the caller needs the statement's qualifier (if any)
        -- so statements that duplicate the qualifier are not used, after the fi
        -- Then, if convert is showing all values for a property such as the diam
        -- of a telescope's mirror (diameters of primary and secondary mirrors),
        -- will not show alternative values that could in principle be present fo
        -- same item (telescope) and property (diameter) and qualifier (primary/s
        local target = (statement.qualifiers or {}).P518  -- P518 is "applies to
        if type(target) == 'table' then
                for _, q in ipairs(target) do
                        if type(q) == 'table' then
                                local value = (q.datavalue or {}).value
                                if value then
                                        if qual == nil or qual == value.id then
                                                return true, value.id
                                        end
                                end
                        end
                end
        end
        if qual == nil then
                return true, nil  -- only occurs if statement has no qualifier
        end
        return false, nil  -- statement's qualifier is not relevant because state
end

local function get_statements(parms, pid)
        -- Get specified item and return a list of tables with each statement for
        -- Each table is of form {statqual=sq, stmt=statement} where sq = stateme
        -- Statements are in Wikidata's order except that those with preferred ra
```

```
	-- are first, then normal rank. Any other rank is ignored.
	local stored = {}  -- qualifiers of statements that are first for the qua
	local qid = strip_to_nil(parms.qid)  -- nil for current page's item, or a
	local qual = strip_to_nil(parms.qual)  -- nil or id of wanted P518 (appli
	local result = Collection.new()
	local entity = mw.wikibase.getEntity(qid)
	if type(entity) == 'table' then
		local statements = (entity.claims or {})[pid]
		if type(statements) == 'table' then
			for _, rank in ipairs({ 'preferred', 'normal' }) do
				for _, statement in ipairs(statements) do
					if type(statement) == 'table' and rank ==
						local is_match, statqual = matche
						if is_match then
							result:add({ statqual = s
						end
					end
				end
			end
		end
	end
	return result
end

local function input_from_property(tdata, parms, pid)
	-- Given that pid is a Wikidata property identifier like 'P123',
	-- return a collection of {amount, ucode} pairs (two strings)
	-- for each matching item/property, or return nothing.
	-----------------------------------------------------------------------
	-- There appear to be few restrictions on how Wikidata is organized so it
	-- very likely that any decision a module makes about how to handle data
	-- will be wrong for some cases at some time. This meets current requirem
	-- For each qualifier (or if no qualifier), if there are any preferred
	-- statements, use them and ignore any normal statements.
	-- For each qualifier, for the preferred statements if any, or for
	-- the normal statements (but not both):
	-- * Accept each statement if it has no qualifier (this will not occur
	--   if qual=x is specified because other code already ensures that in th
	--   case, only statements with a qualifier matching x are considered).
	-- * Ignore any statements after the first if it has a qualifier.
	-- The rationale is that for the diameter at [[South Pole Telescope]], wa
	-- convert to show the diameters for both the primary and secondary mirro
	-- if the convert does not specify which diameter is wanted.
	-- However, if convert is given the wanted qualifier, only one value
	-- (_the_ diameter) is wanted. For simplicity/consistency, that is also d
	-- even if no qual=x is specified. Unclear what should happen.
	-- For the wavelength at [[Nançay Radio Telescope]], want to show all thr
	-- values, and the values have no qualifiers.
	-----------------------------------------------------------------------
	local result = Collection.new()
	local done = {}
	local skip_normal
	for _, t in ipairs(get_statements(parms, pid)) do
		local statement = t.stmt
		if statement.mainsnak and statement.mainsnak.datatype == 'quantit
			local value = (statement.mainsnak.datavalue or {}).value
			if value then
				local amount = value.amount
				if amount then
					amount = tostring(amount)  -- in case amo
					if amount:sub(1, 1) == '+' then
						amount = amount:sub(2)
					end
					local unit = value.unit
```

```
                                        if type(unit) == 'string' then
                                                unit = unit:match('Q%d+$')  -- ur
                                                local ucode = make_unit(tdata.wik
                                                if ucode then
                                                        local skip
                                                        if t.statqual then
                                                                if done[t.statqua
                                                                        skip = tr
                                                                else
                                                                        done[t.st
                                                                end
                                                        else
                                                                if statement.rank
                                                                        skip_norm
                                                                elseif skip_norma
                                                                        skip = tr
                                                                end
                                                        end
                                                        if not skip then
                                                                result:add({ amou
                                                        end
                                                end
                                        end
                                end
                        end
                end
        end
        return result
end

local function input_from_text(tdata, parms, text, insert2)
        -- Given string should be of form "<value><space><unit>" or
        -- "<value1><space>ft<space><value2><space>in" for a special case (feet a
        -- Return true if values/units were extracted and inserted, or return not
        text = text:gsub(' ', ' '):gsub('%s+', ' ')
        local pos = text:find(' ', 1, true)
        if pos then
                -- Leave checking of value to convert which can handle fractions.
                local value = text:sub(1, pos - 1)
                local uid = text:sub(pos + 1)
                if uid:sub(1, 3) == 'ft ' and uid:sub(-3) == ' in' then
                        -- Special case for enwiki to allow {{convert|input=5 ft
                        insert2(uid:sub(4, -4), 'in')
                        insert2(value, 'ft')
                else
                        insert2(value, make_unit(tdata.wikidata_units, parms, uid
                end
                return true
        end
end

local function adjustparameters(tdata, parms, index)
        -- For Module:Convert, adjust parms (a table of {{convert}} parameters).
        -- Return true if successful or return false, t where t is an error messa
        -- This is intended mainly for use in infoboxes where the input might be
        --    <value><space><unit>    or
        --    <wikidata-property-id>
        -- If successful, insert values and units in parms, before given index.
        local text = parms.input  -- should be a trimmed, non-empty string
        local pid = text:match('^P%d+$')
        local sep = ','
        local special = specials[parms[index]]
        if special then
                parms.out_unit = special[1]
```

```
                sep = special[2] or sep
                table.remove(parms, index)
        end
        local function quit()
                return false, pid and { 'cvt_no_output' } or { 'cvt_bad_input', t
        end
        local function insert2(first, second)
                table.insert(parms, index, second)
                table.insert(parms, index, first)
        end
        if pid then
                parms.input_text = ''  -- output an empty string if an error occu
                local result = input_from_property(tdata, parms, pid)
                if result.n == 0 then
                        return quit()
                end
                local ucode
                for i, t in ipairs(result) do
                        -- Convert requires each input unit to be identical.
                        if i == 1 then
                                ucode = t[2]
                        elseif ucode ~= t[2] then
                                return quit()
                        end
                end
                local item = ucode
                if item == parms[index] then
                        -- Remove specified output unit if it is the same as the
                        -- For example, {{convert|input=P2044|km}} with property
                        table.remove(parms, index)
                end
                for i = result.n, 1, -1 do
                        insert2(result[i][1], item)
                        item = sep
                end
                return true
        else
                if input_from_text(tdata, parms, text, insert2) then
                        return true
                end
        end
        return quit()
end

-------------------------------------------------------------------------------
--- List units and check syntax of definitions --------------------------------
-------------------------------------------------------------------------------
local specifications = {
        -- seq = sequence in which fields are displayed
        base = {
                title = 'SI base units',
                fields = {
                        symbol = { seq = 2, mandatory = true },
                        name1  = { seq = 3, mandatory = true },
                        name2  = { seq = 4 },
                        link   = { seq = 5 },
                },
                noteseq = 6,
                header = '{| class="wikitable"\n!si !!symbol !!name1 !!name2 !!li
                item = '|-\n|%s ||%s ||%s ||%s ||%s ||%s',
                footer = '|}',
        },
        alias = {
                title = 'Aliases for convert',
```

```
                fields = {
                        ucode  = { seq = 2, mandatory = true },
                        si     = { seq = 3 },
                },
                noteseq = 4,
                header = '{| class="wikitable"\n!alias !!ucode !!base !!note',
                item = '|-\n|%s ||%s ||%s ||%s',
                footer = '|}',
        },
        known = {
                title = 'Units known to convert',
                fields = {
                        ucode  = { seq = 2, mandatory = true },
                        label  = { seq = 3, mandatory = true },
                },
                noteseq = 4,
                header = '{| class="wikitable"\n!qid !!ucode !!label !!note',
                item = '|-\n|%s ||%s ||%s ||%s',
                footer = '|}',
        },
        unknown = {
                title = 'Units not known to convert',
                fields = {
                        _ucode = { seq = 2, mandatory = true },
                        si     = { seq = 3 },
                        name1  = { seq = 4 },
                        name2  = { seq = 5 },
                        link   = { seq = 6 },
                        label  = { seq = 7, mandatory = true },
                },
                noteseq = 8,
                header = '{| class="wikitable"\n!qid !!_ucode !!base !!name1 !!na
                item = '|-\n|%s ||%s ||%s ||%s ||%s ||%s ||%s',
                footer = '|}',
        },
}

local function listunits(tdata, ulookup)
        -- For Module:Convert, make wikitext to list the built-in Wikidata units
        -- Return true, wikitext if successful or return false, t where t is an
        -- error message table. Currently, an error return never occurs.
        -- The syntax of each unit definition is checked and a note is added if
        -- a problem is detected.
        local function safe_cells(t)
                -- This is not currently needed, but in case definitions ever use
                -- like '[[kilogram|kg]]', escape the text so it works in a table
                local result = {}
                for i, v in ipairs(t) do
                        if v:find('|', 1, true) then
                                v = v:gsub('(%[%[[^%[%]]-)|(.-%]%])', '%1\0%2')
                                v = v:gsub('|', '&#124;')
                                v = v:gsub('%z', '|')
                        end
                        result[i] = v:gsub('{', '&#123;')                    -- e
                end
                return unpack(result)
        end
        local wdunits = tdata.wikidata_units
        local speckeys = { 'base', 'alias', 'unknown', 'known' }
        for _, sid in ipairs(speckeys) do
                specifications[sid].units = Collection.new()
        end
        local keys = Collection.new()
        for k, v in pairs(wdunits) do
```

```
                keys:add(k)
        end
        table.sort(keys)
        local note_count = 0
        for _, key in ipairs(keys) do
                local unit = wdunits[key]
                local ktext, sid
                if key:match('^Q%d+$') then
                        ktext = '[[d:' .. key .. '|' .. key .. ']]'
                        if unit.ucode then
                                sid = 'known'
                        else
                                sid = 'unknown'
                        end
                elseif unit.ucode then
                        ktext = key
                        sid = 'alias'
                else
                        ktext = key
                        sid = 'base'
                end
                local result = { ktext }
                local spec = specifications[sid]
                local fields = spec.fields
                local note = Collection.new()
                for k, v in pairs(unit) do
                        if fields[k] then
                                local seq = fields[k].seq
                                if result[seq] then
                                        note:add('duplicate ' .. k)  -- cannot ha
                                else
                                        result[seq] = v
                                end
                        else
                                note:add('invalid ' .. k)
                        end
                end
                for k, v in pairs(fields) do
                        local value = result[v.seq]
                        if value then
                                if k == 'si' and not wdunits[value] then
                                        note:add('need si ' .. value)
                                end
                                if k == 'label' then
                                        local wdl = mw.wikibase.getLabel(key)
                                        if wdl ~= value then
                                                note:add('label changed to ' .. t
                                        end
                                end
                        else
                                result[v.seq] = ''
                                if v.mandatory then
                                        note:add('missing ' .. k)
                                end
                        end
                end
                local text
                if note.n > 0 then
                        note_count = note_count + 1
                        text = '*' .. note:join('<br />')
                end
                result[spec.noteseq] = text or ''
                spec.units:add(result)
        end
```

```
        local results = Collection.new()
        if note_count > 0 then
                local text = note_count .. (note_count == 1 and ' note' or ' note
                results:add("'''Search for * to see " .. text .. "'''\n")
        end
        for _, sid in ipairs(speckeys) do
                local spec = specifications[sid]
                results:add("''''" .. spec.title .. "''''")
                results:add(spec.header)
                local fmt = spec.item
                for _, unit in ipairs(spec.units) do
                        results:add(string.format(fmt, safe_cells(unit)))
                end
                results:add(spec.footer)
        end
        return true, results:join('\n')
end

return { _adjustparameters = adjustparameters, _listunits = listunits }
```

Modul:Convert/wikidata/data

Die Dokumentation für dieses Modul kann unter Modul:Convert/wikidata/data/Doku erstellt werden

```
--[[ Cache of Wikidata information with units for Module:Convert.
The codes should rarely change, and using a cache means that changing a
unit at Wikidata will not cause lots of converts in articles to break.

For a unit known to convert, the unit here must have:
        label = Wikidata label for unit (used only when listing units)
        ucode = unit code for input to convert
        (there are no optional fields because convert handles everything)

For a unit not known to convert, the unit here must have:
        label = Wikidata label for unit (used only when listing units)
        (no ucode field)
        _ucode = unit code for input to convert, and the
                 symbol used to display the unit when abbr=on
        (convert will use the specified fields to display the unit,
        and will not attempt to do a conversion)

For a unit not known to convert, the unit here may have:
        name1 = singular name used to display the unit when abbr=off
        name2 = plural name used to display the unit when abbr=off
        link = name of article that unit will be linked to when lk=on
        si = key for the SI base unit, if any

The base unit for each SI unit here must have:
        symbol = symbol used to display the base unit when abbr=on
        name1 = singular name of base unit used to display the unit when abbr=off
        (if name1 is not given, symbol will be used, but an SI unit should have a

The base unit for each SI unit here may have:
        name2 = plural name of base unit used to display the unit when abbr=off
        link = name of article that unit will be linked to when lk=on
               (applies for all SI units using this base, where the
                   SI unit does not define its own link field)

If name1 is not specified, the symbol is used for the name.
If name2 is not specified, a plural name is formed by appending 's' to name1.
If link is not specified, name1 is used for the link.

SI units are assumed to be simple items like V (volt) where 'mV' would
cause convert to insert:
        'm' before the base symbol 'V' to make 'mV', if abbr=on
        'milli' before the base name 'volt' to make 'millivolt', if abbr=off
A unit like "square meter" would not work because it needs an SI prefix
inserted before "meter" rather than at the beginning of the name.

Items that should not be used with convert as no precise unit is implied:
Q11247037  ton          generic (cannot use)
Q178413    gallon       generic
Q130964    calorie      dubious (ambiguous, should not use)
Q216658    bushel       dubious
Q420266    fluid ounce  dubious
]]

local wikidata_units = {
```

```
	-- Following are SI base units.
	A = {
		symbol = 'A',
		name1 = 'ampere',
	},
	F = {
		symbol = 'F',
		name1 = 'faraday',
	},
	H = {
		symbol = 'H',
		name1 = 'henry',
	},
	V = {
		symbol = 'V',
		name1 = 'volt',
	},
	-- Following are aliases to convert unit codes, used with "input=<value><
	kilograms = {
		ucode = 'kg',
	},
	-- Following are SI units not known to convert, used with "input=<value><
	kV = {
		ucode = 'kV',
		si = 'V',
	},
	mV = {
		ucode = 'mV',
		si = 'V',
	},
	-- Following are Wikidata units.
	Q131255 = {
		label = 'farad',
		_ucode = 'F',
		si = 'F',
	},
	Q163354 = {
		label = 'henry',
		_ucode = 'H',
		si = 'H',
	},
	Q1916026 = {
		label = 'microvolt',
		_ucode = 'uV',
		si = 'V',
	},
	Q193933 = {
		label = 'dioptre',
		name1 = 'dioptre',
		_ucode = 'dpt',
	},
	Q212120 = {
		label = 'ampere hour',
		name1 = 'ampere hour',
		_ucode = 'A·h',
	},
	Q2448803 = {
		label = 'millivolt',
		_ucode = 'mV',
		si = 'V',
	},
	Q2451296 = {
		label = 'microfarad',
		_ucode = 'uF',
```

```
		si = 'F',
	},
	Q2490574 = {
		label = 'milliampere',
		_ucode = 'mA',
		si = 'A',
	},
	Q25250 = {
		label = 'volt',
		_ucode = 'V',
		si = 'V',
	},
	Q25272 = {
		label = 'ampere',
		_ucode = 'A',
		si = 'A',
	},
	Q2553708 = {
		label = 'megavolt',
		_ucode = 'MV',
		si = 'V',
	},
	Q2554092 = {
		label = 'kilovolt',
		_ucode = 'kV',
		si = 'V',
	},
	Q2636421 = {
		label = 'nanohenry',
		_ucode = 'nH',
		si = 'H',
	},
	Q2679083 = {
		label = 'microhenry',
		_ucode = 'uH',
		si = 'H',
	},
	Q2682463 = {
		label = 'nanofarad',
		_ucode = 'nF',
		si = 'F',
	},
	Q2756030 = {
		label = 'picofarad',
		_ucode = 'pF',
		si = 'F',
	},
	Q2793566 = {
		label = 'gigavolt',
		_ucode = 'GV',
		si = 'V',
	},
	Q2924137 = {
		label = 'millihenry',
		_ucode = 'mH',
		si = 'H',
	},
	Q3117809 = {
		label = 'microampere',
		_ucode = 'uA',
		si = 'A',
	},
	Q33680 = {
		label = 'radian',
```

```
                name1 = 'radian',
                _ucode = 'rad',
        },
        Q4456994 = {
                label = 'millifarad',
                _ucode = 'mF',
                si = 'F',
        },
        Q47083 = {
                label = 'ohm',
                name1 = 'ohm',
                _ucode = 'Ω',
        },
        Q483261 = {
                label = 'dalton',
                name1 = 'dalton',
                _ucode = 'u',
        },
        Q550341 = {
                label = 'volt-ampere',
                name1 = 'volt-ampere',
                _ucode = 'VA',
        },
        Q100995 = {
                label = 'pound',
                ucode = 'lb',
        },
        Q1022113 = {
                label = 'cubic centimetre',
                ucode = 'cc',
        },
        Q102573 = {
                label = 'becquerel',
                ucode = 'Bq',
        },
        Q103246 = {
                label = 'sievert',
                ucode = 'Sv',
        },
        Q1050958 = {
                label = 'inch of mercury',
                ucode = 'inHg',
        },
        Q1051665 = {
                label = 'metre per second squared',
                ucode = 'm/s2',
        },
        Q1052397 = {
                label = 'rad',
                ucode = 'rad',
        },
        Q1054140 = {
                label = 'megametre',
                ucode = 'Mm',
        },
        Q1057069 = {
                label = 'hectogram',
                ucode = 'hg',
        },
        Q1063786 = {
                label = 'square inch',
                ucode = 'sqin',
        },
        Q1092296 = {
```

```
                label = 'annum',
                ucode = 'year',
        },
        Q11570 = {
                label = 'kilogram',
                ucode = 'kg',
        },
        Q11573 = {
                label = 'metre',
                ucode = 'm',
        },
        Q11574 = {
                label = 'second',
                ucode = 's',
        },
        Q11579 = {
                label = 'kelvin',
                ucode = 'K',
        },
        Q11582 = {
                label = 'litre',
                ucode = 'litre',
        },
        Q1165588 = {
                label = 'rod',
                ucode = 'rod',
        },
        Q1165799 = {
                label = 'thou',
                ucode = 'thou',
        },
        Q11776930 = {
                label = 'megagram',
                ucode = 'Mg',
        },
        Q11929860 = {
                label = 'kiloparsec',
                ucode = 'kpc',
        },
        Q1194225 = {
                label = 'pound-force',
                ucode = 'lbf',
        },
        Q12129 = {
                label = 'parsec',
                ucode = 'pc',
        },
        Q12438 = {
                label = 'newton',
                ucode = 'N',
        },
        Q1255620 = {
                label = 'dram',
                ucode = 'drachm',
        },
        Q12874593 = {
                label = 'watt-hour',
                ucode = 'W.h',
        },
        Q128822 = {
                label = 'knot',
                ucode = 'kn',
        },
        Q1374438 = {
```

```
                label = 'kilosecond',
                ucode = 'ks',
        },
        Q1377051 = {
                label = 'gigasecond',
                ucode = 'Gs',
        },
        Q14754979 = {
                label = 'zettagram',
                ucode = 'Zg',
        },
        Q14786969 = {
                label = 'megajoule',
                ucode = 'MJ',
        },
        Q14787261 = {
                label = 'megawatt hour',
                ucode = 'MW.h',
        },
        Q1550511 = {
                label = 'square yard',
                ucode = 'sqyd',
        },
        Q160857 = {
                label = 'metric horsepower',
                ucode = 'hp',
        },
        Q1628990 = {
                label = 'horsepower-hour',
                ucode = 'hph',
        },
        Q163343 = {
                label = 'tesla',
                ucode = 'T',
        },
        Q1645498 = {
                label = 'microgram',
                ucode = 'ug',
        },
        Q17087835 = {
                label = 'cuerda',
                ucode = 'cda',
        },
        Q174728 = {
                label = 'centimetre',
                ucode = 'cm',
        },
        Q174789 = {
                label = 'millimetre',
                ucode = 'mm',
        },
        Q175821 = {
                label = 'micrometre',
                ucode = 'um',
        },
        Q1770733 = {
                label = 'teragram',
                ucode = 'Tg',
        },
        Q1772386 = {
                label = 'decigram',
                ucode = 'dg',
        },
        Q177493 = {
```

```
                label = 'gauss',
                ucode = 'G',
        },
        Q1777507 = {
                label = 'femtosecond',
                ucode = 'fs',
        },
        Q177974 = {
                label = 'standard atmosphere',
                ucode = 'atm',
        },
        Q178674 = {
                label = 'nanometre',
                ucode = 'nm',
        },
        Q180154 = {
                label = 'kilometre per hour',
                ucode = 'km/h',
        },
        Q180892 = {
                label = 'solar mass',
                ucode = 'solar mass',
        },
        Q1811 = {
                label = 'astronomical unit',
                ucode = 'au',
        },
        Q1815100 = {
                label = 'centilitre',
                ucode = 'cl',
        },
        Q182098 = {
                label = 'kilowatt hour',
                ucode = 'kW.h',
        },
        Q1823150 = {
                label = 'microwatt',
                ucode = 'uW',
        },
        Q182429 = {
                label = 'metre per second',
                ucode = 'm/s',
        },
        Q1826195 = {
                label = 'decilitre',
                ucode = 'dl',
        },
        Q185078 = {
                label = 'are',
                ucode = 'a',
        },
        Q185153 = {
                label = 'erg',
                ucode = 'erg',
        },
        Q185648 = {
                label = 'torr',
                ucode = 'Torr',
        },
        Q190095 = {
                label = 'gray',
                ucode = 'Gy',
        },
        Q191118 = {
```

```
                label = 'tonne',
                ucode = 'tonne',
        },
        Q1913097 = {
                label = 'femtogram',
                ucode = 'fg',
        },
        Q192274 = {
                label = 'picometre',
                ucode = 'pm',
        },
        Q1972579 = {
                label = 'poundal',
                ucode = 'pdl',
        },
        Q200323 = {
                label = 'decimetre',
                ucode = 'dm',
        },
        Q201933 = {
                label = 'dyne',
                ucode = 'dyn',
        },
        Q2029519 = {
                label = 'hectolitre',
                ucode = 'hl',
        },
        Q2051195 = {
                label = 'gigawatt hour',
                ucode = 'GW.h',
        },
        Q207488 = {
                label = 'Rankine scale',
                ucode = 'R',
        },
        Q208788 = {
                label = 'femtometre',
                ucode = 'fm',
        },
        Q2101 = {
                label = 'elementary charge',
                ucode = 'e',
        },
        Q21014455 = {
                label = 'metre per minute',
                ucode = 'm/min',
        },
        Q21062777 = {
                label = 'megapascal',
                ucode = 'MPa',
        },
        Q21064807 = {
                label = 'kilopascal',
                ucode = 'kPa',
        },
        Q211256 = {
                label = 'mile per hour',
                ucode = 'mph',
        },
        Q21178489 = {
                label = 'barrels per day',
                ucode = 'oilbbl/d',
        },
        Q2143992 = {
```

```
		label = 'kilohertz',
		ucode = 'kHz',
	},
	Q21467992 = {
		label = 'cubic foot per second',
		ucode = 'cuft/s',
	},
	Q215571 = {
		label = 'newton metre',
		ucode = 'Nm',
	},
	Q216795 = {
		label = 'dunam',
		ucode = 'dunam',
	},
	Q216880 = {
		label = 'kilogram-force',
		ucode = 'kgf',
	},
	Q18413919 = {
		label = 'centimetre per second',
		ucode = 'cm/s',
	},
	Q218593 = {
		label = 'inch',
		ucode = 'in',
	},
	Q2282891 = {
		label = 'microlitre',
		ucode = 'ul',
	},
	Q2282906 = {
		label = 'nanogram',
		ucode = 'ng',
	},
	Q229354 = {
		label = 'curie',
		ucode = 'Ci',
	},
	Q232291 = {
		label = 'square mile',
		ucode = 'sqmi',
	},
	Q2332346 = {
		label = 'millilitre',
		ucode = 'ml',
	},
	Q23387 = {
		label = 'week',
		ucode = 'week',
	},
	Q23823681 = {
		label = 'terawatt',
		ucode = 'TW',
	},
	Q23925410 = {
		label = 'gallon (UK)',
		ucode = 'impgal',
	},
	Q23925413 = {
		label = 'gallon (US)',
		ucode = 'USgal',
	},
	Q2438073 = {
```

```
                label = 'attogram',
                ucode = 'ag',
        },
        Q2474258 = {
                label = 'millisievert',
                ucode = 'mSv',
        },
        Q2483628 = {
                label = 'attosecond',
                ucode = 'as',
        },
        Q2489298 = {
                label = 'square centimetre',
                ucode = 'cm2',
        },
        Q2518569 = {
                label = 'nanosievert',
                ucode = 'nSv',
        },
        Q25235 = {
                label = 'hour',
                ucode = 'h',
        },
        Q25236 = {
                label = 'watt',
                ucode = 'W',
        },
        Q25267 = {
                label = 'degree Celsius',
                ucode = 'C',
        },
        Q25269 = {
                label = 'joule',
                ucode = 'J',
        },
        Q253276 = {
                label = 'mile',
                ucode = 'mi',
        },
        Q25343 = {
                label = 'square metre',
                ucode = 'm2',
        },
        Q25406 = {
                label = 'coulomb',
                ucode = 'coulomb',
        },
        Q25517 = {
                label = 'cubic metre',
                ucode = 'm3',
        },
        Q260126 = {
                label = 'Roentgen equivalent man',
                ucode = 'rem',
        },
        Q2612219 = {
                label = 'petagram',
                ucode = 'Pg',
        },
        Q2619500 = {
                label = 'foe',
                ucode = 'foe',
        },
        Q2637946 = {
```

```
                label = 'decalitre',
                ucode = 'dal',
        },
        Q2655272 = {
                label = 'exagram',
                ucode = 'Eg',
        },
        Q2691798 = {
                label = 'centigram',
                ucode = 'cg',
        },
        Q2739114 = {
                label = 'microsievert',
                ucode = 'uSv',
        },
        Q2799294 = {
                label = 'gigagram',
                ucode = 'Gg',
        },
        Q3013059 = {
                label = 'kiloannum',
                ucode = 'millennium',
        },
        Q305896 = {
                label = 'dots per inch',
                ucode = 'dpi',
        },
        Q3207456 = {
                label = 'milliwatt',
                ucode = 'mW',
        },
        Q3221356 = {
                label = 'yoctometre',
                ucode = 'ym',
        },
        Q3239557 = {
                label = 'picogram',
                ucode = 'pg',
        },
        Q3241121 = {
                label = 'milligram',
                ucode = 'mg',
        },
        Q3267417 = {
                label = 'terametre',
                ucode = 'Tm',
        },
        Q3270676 = {
                label = 'zeptometre',
                ucode = 'zm',
        },
        Q3276763 = {
                label = 'gigahertz',
                ucode = 'GHz',
        },
        Q3277907 = {
                label = 'exametre',
                ucode = 'Em',
        },
        Q3277915 = {
                label = 'zettametre',
                ucode = 'Zm',
        },
        Q3277919 = {
```

```
                label = 'petametre',
                ucode = 'Pm',
        },
        Q3312063 = {
                label = 'femtolitre',
                ucode = 'fl',
        },
        Q3320608 = {
                label = 'kilowatt',
                ucode = 'kW',
        },
        Q3332822 = {
                label = 'megaton of TNT',
                ucode = 'Mt(TNT)',
        },
        Q35852 = {
                label = 'hectare',
                ucode = 'ha',
        },
        Q3675550 = {
                label = 'cubic millimetre',
                ucode = 'mm3',
        },
        Q3710 = {
                label = 'foot',
                ucode = 'ft',
        },
        Q3773454 = {
                label = 'megaparsec',
                ucode = 'Mpc',
        },
        Q3902688 = {
                label = 'picolitre',
                ucode = 'pl',
        },
        Q3902709 = {
                label = 'picosecond',
                ucode = 'ps',
        },
        Q39369 = {
                label = 'hertz',
                ucode = 'Hz',
        },
        Q3972226 = {
                label = 'kilolitre',
                ucode = 'kl',
        },
        Q4068266 = {
                label = "apothecaries' drachm",
                ucode = 'drachm',
        },
        Q41803 = {
                label = 'gram',
                ucode = 'g',
        },
        Q4220561 = {
                label = 'kilometre per second',
                ucode = 'km/s',
        },
        Q42289 = {
                label = 'degree Fahrenheit',
                ucode = 'F',
        },
        Q4243638 = {
```

```
		label = 'cubic kilometre',
		ucode = 'km3',
	},
	Q44395 = {
		label = 'pascal',
		ucode = 'Pa',
	},
	Q48013 = {
		label = 'ounce',
		ucode = 'oz',
	},
	Q482798 = {
		label = 'yard',
		ucode = 'yd',
	},
	Q4989854 = {
		label = 'kilojoule',
		ucode = 'kJ',
	},
	Q4992853 = {
		label = 'kiloton of TNT',
		ucode = 'kt(TNT)',
	},
	Q5139563 = {
		label = 'hectopascal',
		ucode = 'hPa',
	},
	Q5151 = {
		label = 'month',
		ucode = 'month',
	},
	Q531 = {
		label = 'light-year',
		ucode = 'ly',
	},
	Q5465723 = {
		label = 'foot-poundal',
		ucode = 'ftpdl',
	},
	Q573 = {
		label = 'day',
		ucode = 'd',
	},
	Q577 = {
		label = 'year',
		ucode = 'year',
	},
	Q5879479 = {
		label = 'gigawatt',
		ucode = 'GW',
	},
	Q6003257 = {
		label = 'attometre',
		ucode = 'am',
	},
	Q613726 = {
		label = 'yottagram',
		ucode = 'Yg',
	},
	Q6170164 = {
		label = 'yoctogram',
		ucode = 'yg',
	},
	Q667419 = {
```

```
                label = 'long ton',
                ucode = 'LT',
        },
        Q673166 = {
                label = 'gravity of Earth',
                ucode = 'g0',
        },
        Q693944 = {
                label = 'grain',
                ucode = 'gr',
        },
        Q6982035 = {
                label = 'megawatt',
                ucode = 'MW',
        },
        Q712226 = {
                label = 'square kilometre',
                ucode = 'km2',
        },
        Q723733 = {
                label = 'millisecond',
                ucode = 'ms',
        },
        Q732454 = {
                label = 'megaannum',
                ucode = 'Myr',
        },
        Q732707 = {
                label = 'megahertz',
                ucode = 'MHz',
        },
        Q752079 = {
                label = 'gross register ton',
                ucode = 'grt',
        },
        Q752197 = {
                label = 'kilojoule per mole',
                ucode = 'kJ/mol',
        },
        Q7727 = {
                label = 'minute',
                ucode = 'min',
        },
        Q794261 = {
                label = 'cubic metre per second',
                ucode = 'm3/s',
        },
        Q809678 = {
                label = 'barye',
                ucode = 'Ba',
        },
        Q81292 = {
                label = 'acre',
                ucode = 'acre',
        },
        Q81454 = {
                label = 'ångström',
                ucode = 'angstrom',
        },
        Q828224 = {
                label = 'kilometre',
                ucode = 'km',
        },
        Q83327 = {
```

```
                label = 'electronvolt',
                ucode = 'eV',
        },
        Q838801 = {
                label = 'nanosecond',
                ucode = 'ns',
        },
        Q842015 = {
                label = 'microsecond',
                ucode = 'us',
        },
        Q844211 = {
                label = 'kilogram per cubic metre',
                ucode = 'kg/m3',
        },
        Q844338 = {
                label = 'hectometre',
                ucode = 'hm',
        },
        Q844976 = {
                label = 'oersted',
                ucode = 'Oe',
        },
        Q848856 = {
                label = 'decametre',
                ucode = 'dam',
        },
        Q854546 = {
                label = 'gigametre',
                ucode = 'Gm',
        },
        Q857027 = {
                label = 'square foot',
                ucode = 'sqft',
        },
        Q9048643 = {
                label = 'nanolitre',
                ucode = 'nl',
        },
        Q93318 = {
                label = 'nautical mile',
                ucode = 'nmi',
        },
}

return { wikidata_units = wikidata_units }
```

Modul:Convert/wikidata/data/sandbox

Die Dokumentation für dieses Modul kann unter Modul:Convert/wikidata/data/sandbox/Doku erstellt werden

```
--[[ Cache of Wikidata information with units for Module:Convert.
The codes should rarely change, and using a cache means that changing a
unit at Wikidata will not cause lots of converts in articles to break.

For a unit known to convert, the unit here must have:
        label = Wikidata label for unit (used only when listing units)
        ucode = unit code for input to convert
        (there are no optional fields because convert handles everything)

For a unit not known to convert, the unit here must have:
        label = Wikidata label for unit (used only when listing units)
        (no ucode field)
        _ucode = unit code for input to convert, and the
                 symbol used to display the unit when abbr=on
        (convert will use the specified fields to display the unit,
        and will not attempt to do a conversion)

For a unit not known to convert, the unit here may have:
        name1 = singular name used to display the unit when abbr=off
        name2 = plural name used to display the unit when abbr=off
        link = name of article that unit will be linked to when lk=on
        si = key for the SI base unit, if any

The base unit for each SI unit here must have:
        symbol = symbol used to display the base unit when abbr=on
        name1 = singular name of base unit used to display the unit when abbr=off
        (if name1 is not given, symbol will be used, but an SI unit should have a

The base unit for each SI unit here may have:
        name2 = plural name of base unit used to display the unit when abbr=off
        link = name of article that unit will be linked to when lk=on
               (applies for all SI units using this base, where the
                   SI unit does not define its own link field)

If name1 is not specified, the symbol is used for the name.
If name2 is not specified, a plural name is formed by appending 's' to name1.
If link is not specified, name1 is used for the link.

SI units are assumed to be simple items like V (volt) where 'mV' would
cause convert to insert:
        'm' before the base symbol 'V' to make 'mV', if abbr=on
        'milli' before the base name 'volt' to make 'millivolt', if abbr=off
A unit like "square meter" would not work because it needs an SI prefix
inserted before "meter" rather than at the beginning of the name.

Items that should not be used with convert as no precise unit is implied:
Q11247037  ton          generic (cannot use)
Q178413    gallon       generic
Q130964    calorie      dubious (ambiguous, should not use)
Q216658    bushel       dubious
Q420266    fluid ounce  dubious
]]

local wikidata_units = {
```

```
	-- Following are SI base units.
	A = {
		symbol = 'A',
		name1 = 'ampere',
	},
	F = {
		symbol = 'F',
		name1 = 'faraday',
	},
	H = {
		symbol = 'H',
		name1 = 'henry',
	},
	V = {
		symbol = 'V',
		name1 = 'volt',
	},
	-- Following are aliases to convert unit codes, used with "input=<value><
	kilograms = {
		ucode = 'kg',
	},
	-- Following are SI units not known to convert, used with "input=<value><
	kV = {
		ucode = 'kV',
		si = 'V',
	},
	mV = {
		ucode = 'mV',
		si = 'V',
	},
	-- Following are Wikidata units.
	Q131255 = {
		label = 'farad',
		_ucode = 'F',
		si = 'F',
	},
	Q163354 = {
		label = 'henry',
		_ucode = 'H',
		si = 'H',
	},
	Q1916026 = {
		label = 'microvolt',
		_ucode = 'uV',
		si = 'V',
	},
	Q193933 = {
		label = 'dioptre',
		name1 = 'dioptre',
		_ucode = 'dpt',
	},
	Q212120 = {
		label = 'ampere hour',
		name1 = 'ampere hour',
		_ucode = 'A·h',
	},
	Q2448803 = {
		label = 'millivolt',
		_ucode = 'mV',
		si = 'V',
	},
	Q2451296 = {
		label = 'microfarad',
		_ucode = 'uF',
```

```
		si = 'F',
	},
	Q2490574 = {
		label = 'milliampere',
		_ucode = 'mA',
		si = 'A',
	},
	Q25250 = {
		label = 'volt',
		_ucode = 'V',
		si = 'V',
	},
	Q25272 = {
		label = 'ampere',
		_ucode = 'A',
		si = 'A',
	},
	Q2553708 = {
		label = 'megavolt',
		_ucode = 'MV',
		si = 'V',
	},
	Q2554092 = {
		label = 'kilovolt',
		_ucode = 'kV',
		si = 'V',
	},
	Q2636421 = {
		label = 'nanohenry',
		_ucode = 'nH',
		si = 'H',
	},
	Q2679083 = {
		label = 'microhenry',
		_ucode = 'uH',
		si = 'H',
	},
	Q2682463 = {
		label = 'nanofarad',
		_ucode = 'nF',
		si = 'F',
	},
	Q2756030 = {
		label = 'picofarad',
		_ucode = 'pF',
		si = 'F',
	},
	Q2793566 = {
		label = 'gigavolt',
		_ucode = 'GV',
		si = 'V',
	},
	Q2924137 = {
		label = 'millihenry',
		_ucode = 'mH',
		si = 'H',
	},
	Q3117809 = {
		label = 'microampere',
		_ucode = 'uA',
		si = 'A',
	},
	Q33680 = {
		label = 'radian',
```

```
                name1 = 'radian',
                _ucode = 'rad',
        },
        Q4456994 = {
                label = 'millifarad',
                _ucode = 'mF',
                si = 'F',
        },
        Q47083 = {
                label = 'ohm',
                name1 = 'ohm',
                _ucode = 'Ω',
        },
        Q483261 = {
                label = 'dalton',
                name1 = 'dalton',
                _ucode = 'u',
        },
        Q550341 = {
                label = 'volt-ampere',
                name1 = 'volt-ampere',
                _ucode = 'VA',
        },
        Q100995 = {
                label = 'pound',
                ucode = 'lb',
        },
        Q1022113 = {
                label = 'cubic centimetre',
                ucode = 'cc',
        },
        Q102573 = {
                label = 'becquerel',
                ucode = 'Bq',
        },
        Q103246 = {
                label = 'sievert',
                ucode = 'Sv',
        },
        Q1050958 = {
                label = 'inch of mercury',
                ucode = 'inHg',
        },
        Q1051665 = {
                label = 'metre per second squared',
                ucode = 'm/s2',
        },
        Q1052397 = {
                label = 'rad',
                ucode = 'rad',
        },
        Q1054140 = {
                label = 'megametre',
                ucode = 'Mm',
        },
        Q1057069 = {
                label = 'hectogram',
                ucode = 'hg',
        },
        Q1063786 = {
                label = 'square inch',
                ucode = 'sqin',
        },
        Q1092296 = {
```

```
                label = 'annum',
                ucode = 'year',
        },
        Q11570 = {
                label = 'kilogram',
                ucode = 'kg',
        },
        Q11573 = {
                label = 'metre',
                ucode = 'm',
        },
        Q11574 = {
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                ucode = 's',
        },
        Q11579 = {
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                ucode = 'K',
        },
        Q11582 = {
                label = 'litre',
                ucode = 'litre',
        },
        Q1165588 = {
                label = 'rod',
                ucode = 'rod',
        },
        Q1165799 = {
                label = 'thou',
                ucode = 'thou',
        },
        Q11776930 = {
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                ucode = 'Mg',
        },
        Q11929860 = {
                label = 'kiloparsec',
                ucode = 'kpc',
        },
        Q1194225 = {
                label = 'pound-force',
                ucode = 'lbf',
        },
        Q12129 = {
                label = 'parsec',
                ucode = 'pc',
        },
        Q12438 = {
                label = 'newton',
                ucode = 'N',
        },
        Q1255620 = {
                label = 'dram',
                ucode = 'drachm',
        },
        Q12874593 = {
                label = 'watt-hour',
                ucode = 'W.h',
        },
        Q128822 = {
                label = 'knot',
                ucode = 'kn',
        },
        Q1374438 = {
```

```
                label = 'kilosecond',
                ucode = 'ks',
        },
        Q1377051 = {
                label = 'gigasecond',
                ucode = 'Gs',
        },
        Q14754979 = {
                label = 'zettagram',
                ucode = 'Zg',
        },
        Q14786969 = {
                label = 'megajoule',
                ucode = 'MJ',
        },
        Q14787261 = {
                label = 'megawatt hour',
                ucode = 'MW.h',
        },
        Q1550511 = {
                label = 'square yard',
                ucode = 'sqyd',
        },
        Q160857 = {
                label = 'metric horsepower',
                ucode = 'hp',
        },
        Q1628990 = {
                label = 'horsepower-hour',
                ucode = 'hph',
        },
        Q163343 = {
                label = 'tesla',
                ucode = 'T',
        },
        Q1645498 = {
                label = 'microgram',
                ucode = 'ug',
        },
        Q17087835 = {
                label = 'cuerda',
                ucode = 'cda',
        },
        Q174728 = {
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                ucode = 'cm',
        },
        Q174789 = {
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                ucode = 'mm',
        },
        Q175821 = {
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                ucode = 'um',
        },
        Q1770733 = {
                label = 'teragram',
                ucode = 'Tg',
        },
        Q1772386 = {
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                ucode = 'dg',
        },
        Q177493 = {
```

```
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                ucode = 'G',
        },
        Q1777507 = {
                label = 'femtosecond',
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        },
        Q177974 = {
                label = 'standard atmosphere',
                ucode = 'atm',
        },
        Q178674 = {
                label = 'nanometre',
                ucode = 'nm',
        },
        Q180154 = {
                label = 'kilometre per hour',
                ucode = 'km/h',
        },
        Q180892 = {
                label = 'solar mass',
                ucode = 'solar mass',
        },
        Q1811 = {
                label = 'astronomical unit',
                ucode = 'au',
        },
        Q1815100 = {
                label = 'centilitre',
                ucode = 'cl',
        },
        Q182098 = {
                label = 'kilowatt hour',
                ucode = 'kW.h',
        },
        Q1823150 = {
                label = 'microwatt',
                ucode = 'uW',
        },
        Q182429 = {
                label = 'metre per second',
                ucode = 'm/s',
        },
        Q1826195 = {
                label = 'decilitre',
                ucode = 'dl',
        },
        Q185078 = {
                label = 'are',
                ucode = 'a',
        },
        Q185153 = {
                label = 'erg',
                ucode = 'erg',
        },
        Q185648 = {
                label = 'torr',
                ucode = 'Torr',
        },
        Q190095 = {
                label = 'gray',
                ucode = 'Gy',
        },
        Q191118 = {
```

```
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                ucode = 'tonne',
        },
        Q1913097 = {
                label = 'femtogram',
                ucode = 'fg',
        },
        Q192274 = {
                label = 'picometre',
                ucode = 'pm',
        },
        Q1972579 = {
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                ucode = 'pdl',
        },
        Q200323 = {
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                ucode = 'dm',
        },
        Q201933 = {
                label = 'dyne',
                ucode = 'dyn',
        },
        Q2029519 = {
                label = 'hectolitre',
                ucode = 'hl',
        },
        Q2051195 = {
                label = 'gigawatt hour',
                ucode = 'GW.h',
        },
        Q207488 = {
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                ucode = 'R',
        },
        Q208788 = {
                label = 'femtometre',
                ucode = 'fm',
        },
        Q2101 = {
                label = 'elementary charge',
                ucode = 'e',
        },
        Q21014455 = {
                label = 'metre per minute',
                ucode = 'm/min',
        },
        Q21062777 = {
                label = 'megapascal',
                ucode = 'MPa',
        },
        Q21064807 = {
                label = 'kilopascal',
                ucode = 'kPa',
        },
        Q211256 = {
                label = 'mile per hour',
                ucode = 'mph',
        },
        Q21178489 = {
                label = 'barrels per day',
                ucode = 'oilbbl/d',
        },
        Q2143992 = {
```

```
		label = 'kilohertz',
		ucode = 'kHz',
	},
	Q21467992 = {
		label = 'cubic foot per second',
		ucode = 'cuft/s',
	},
	Q215571 = {
		label = 'newton metre',
		ucode = 'Nm',
	},
	Q216795 = {
		label = 'dunam',
		ucode = 'dunam',
	},
	Q216880 = {
		label = 'kilogram-force',
		ucode = 'kgf',
	},
	Q18413919 = {
		label = 'centimetre per second',
		ucode = 'cm/s',
	},
	Q218593 = {
		label = 'inch',
		ucode = 'in',
	},
	Q2282891 = {
		label = 'microlitre',
		ucode = 'ul',
	},
	Q2282906 = {
		label = 'nanogram',
		ucode = 'ng',
	},
	Q229354 = {
		label = 'curie',
		ucode = 'Ci',
	},
	Q232291 = {
		label = 'square mile',
		ucode = 'sqmi',
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	Q2332346 = {
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		ucode = 'ml',
	},
	Q23387 = {
		label = 'week',
		ucode = 'week',
	},
	Q23823681 = {
		label = 'terawatt',
		ucode = 'TW',
	},
	Q23925410 = {
		label = 'gallon (UK)',
		ucode = 'impgal',
	},
	Q23925413 = {
		label = 'gallon (US)',
		ucode = 'USgal',
	},
	Q2438073 = {
```

```
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                ucode = 'ag',
        },
        Q2474258 = {
                label = 'millisievert',
                ucode = 'mSv',
        },
        Q2483628 = {
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                ucode = 'as',
        },
        Q2489298 = {
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                ucode = 'cm2',
        },
        Q2518569 = {
                label = 'nanosievert',
                ucode = 'nSv',
        },
        Q25235 = {
                label = 'hour',
                ucode = 'h',
        },
        Q25236 = {
                label = 'watt',
                ucode = 'W',
        },
        Q25267 = {
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                ucode = 'C',
        },
        Q25269 = {
                label = 'joule',
                ucode = 'J',
        },
        Q253276 = {
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                ucode = 'mi',
        },
        Q25343 = {
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                ucode = 'm2',
        },
        Q25406 = {
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                ucode = 'coulomb',
        },
        Q25517 = {
                label = 'cubic metre',
                ucode = 'm3',
        },
        Q260126 = {
                label = 'Roentgen equivalent man',
                ucode = 'rem',
        },
        Q2612219 = {
                label = 'petagram',
                ucode = 'Pg',
        },
        Q2619500 = {
                label = 'foe',
                ucode = 'foe',
        },
        Q2637946 = {
```

```
		label = 'decalitre',
		ucode = 'dal',
	},
	Q2655272 = {
		label = 'exagram',
		ucode = 'Eg',
	},
	Q2691798 = {
		label = 'centigram',
		ucode = 'cg',
	},
	Q2739114 = {
		label = 'microsievert',
		ucode = 'uSv',
	},
	Q2799294 = {
		label = 'gigagram',
		ucode = 'Gg',
	},
	Q3013059 = {
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		ucode = 'millennium',
	},
	Q305896 = {
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		ucode = 'dpi',
	},
	Q3207456 = {
		label = 'milliwatt',
		ucode = 'mW',
	},
	Q3221356 = {
		label = 'yoctometre',
		ucode = 'ym',
	},
	Q3239557 = {
		label = 'picogram',
		ucode = 'pg',
	},
	Q3241121 = {
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		ucode = 'mg',
	},
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		ucode = 'Tm',
	},
	Q3270676 = {
		label = 'zeptometre',
		ucode = 'zm',
	},
	Q3276763 = {
		label = 'gigahertz',
		ucode = 'GHz',
	},
	Q3277907 = {
		label = 'exametre',
		ucode = 'Em',
	},
	Q3277915 = {
		label = 'zettametre',
		ucode = 'Zm',
	},
	Q3277919 = {
```

```
                label = 'petametre',
                ucode = 'Pm',
        },
        Q3312063 = {
                label = 'femtolitre',
                ucode = 'fl',
        },
        Q3320608 = {
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                ucode = 'kW',
        },
        Q3332822 = {
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                ucode = 'Mt(TNT)',
        },
        Q35852 = {
                label = 'hectare',
                ucode = 'ha',
        },
        Q3675550 = {
                label = 'cubic millimetre',
                ucode = 'mm3',
        },
        Q3710 = {
                label = 'foot',
                ucode = 'ft',
        },
        Q3773454 = {
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                ucode = 'Mpc',
        },
        Q3902688 = {
                label = 'picolitre',
                ucode = 'pl',
        },
        Q3902709 = {
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                ucode = 'ps',
        },
        Q39369 = {
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                ucode = 'Hz',
        },
        Q3972226 = {
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                ucode = 'kl',
        },
        Q4068266 = {
                label = "apothecaries' drachm",
                ucode = 'drachm',
        },
        Q41803 = {
                label = 'gram',
                ucode = 'g',
        },
        Q4220561 = {
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                ucode = 'km/s',
        },
        Q42289 = {
                label = 'degree Fahrenheit',
                ucode = 'F',
        },
        Q4243638 = {
```

```
                label = 'cubic kilometre',
                ucode = 'km3',
        },
        Q44395 = {
                label = 'pascal',
                ucode = 'Pa',
        },
        Q48013 = {
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                ucode = 'oz',
        },
        Q482798 = {
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                ucode = 'yd',
        },
        Q4989854 = {
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                ucode = 'kJ',
        },
        Q4992853 = {
                label = 'kiloton of TNT',
                ucode = 'kt(TNT)',
        },
        Q5139563 = {
                label = 'hectopascal',
                ucode = 'hPa',
        },
        Q5151 = {
                label = 'month',
                ucode = 'month',
        },
        Q531 = {
                label = 'light-year',
                ucode = 'ly',
        },
        Q5465723 = {
                label = 'foot-poundal',
                ucode = 'ftpdl',
        },
        Q573 = {
                label = 'day',
                ucode = 'd',
        },
        Q577 = {
                label = 'year',
                ucode = 'year',
        },
        Q5879479 = {
                label = 'gigawatt',
                ucode = 'GW',
        },
        Q6003257 = {
                label = 'attometre',
                ucode = 'am',
        },
        Q613726 = {
                label = 'yottagram',
                ucode = 'Yg',
        },
        Q6170164 = {
                label = 'yoctogram',
                ucode = 'yg',
        },
        Q667419 = {
```

```
                label = 'long ton',
                ucode = 'LT',
        },
        Q673166 = {
                label = 'gravity of Earth',
                ucode = 'g0',
        },
        Q693944 = {
                label = 'grain',
                ucode = 'gr',
        },
        Q6982035 = {
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                ucode = 'MW',
        },
        Q712226 = {
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                ucode = 'km2',
        },
        Q723733 = {
                label = 'millisecond',
                ucode = 'ms',
        },
        Q732454 = {
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                ucode = 'Myr',
        },
        Q732707 = {
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                ucode = 'MHz',
        },
        Q752079 = {
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                ucode = 'grt',
        },
        Q752197 = {
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                ucode = 'kJ/mol',
        },
        Q7727 = {
                label = 'minute',
                ucode = 'min',
        },
        Q794261 = {
                label = 'cubic metre per second',
                ucode = 'm3/s',
        },
        Q809678 = {
                label = 'barye',
                ucode = 'Ba',
        },
        Q81292 = {
                label = 'acre',
                ucode = 'acre',
        },
        Q81454 = {
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                ucode = 'angstrom',
        },
        Q828224 = {
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                ucode = 'km',
        },
        Q83327 = {
```

```
                label = 'electronvolt',
                ucode = 'eV',
        },
        Q838801 = {
                label = 'nanosecond',
                ucode = 'ns',
        },
        Q842015 = {
                label = 'microsecond',
                ucode = 'us',
        },
        Q844211 = {
                label = 'kilogram per cubic metre',
                ucode = 'kg/m3',
        },
        Q844338 = {
                label = 'hectometre',
                ucode = 'hm',
        },
        Q844976 = {
                label = 'oersted',
                ucode = 'Oe',
        },
        Q848856 = {
                label = 'decametre',
                ucode = 'dam',
        },
        Q854546 = {
                label = 'gigametre',
                ucode = 'Gm',
        },
        Q857027 = {
                label = 'square foot',
                ucode = 'sqft',
        },
        Q9048643 = {
                label = 'nanolitre',
                ucode = 'nl',
        },
        Q93318 = {
                label = 'nautical mile',
                ucode = 'nmi',
        },
}

return { wikidata_units = wikidata_units }
```

Modul:Convert/wikidata/sandbox

Die Dokumentation für dieses Modul kann unter Modul:Convert/wikidata/sandbox/Doku erstellt werden

```
-- Functions to access Wikidata for Module:Convert.

local Collection = {}
Collection.__index = Collection
do
	function Collection:add(item)
		if item ~= nil then
			self.n = self.n + 1
			self[self.n] = item
		end
	end
	function Collection:join(sep)
		return table.concat(self, sep)
	end
	function Collection:remove(pos)
		if self.n > 0 and (pos == nil or (0 < pos and pos <= self.n)) the
			self.n = self.n - 1
			return table.remove(self, pos)
		end
	end
	function Collection:sort(comp)
		table.sort(self, comp)
	end
	function Collection.new()
		return setmetatable({n = 0}, Collection)
	end
end

local function strip_to_nil(text)
	-- If text is a non-empty string, return its trimmed content,
	-- otherwise return nothing (empty string or not a string).
	if type(text) == 'string' then
		return text:match('(%S.-)%s*$')
	end
end

local function frequency_unit(value, unit_table)
	-- For use when converting m to Hz.
	-- Return true, s where s = name of unit's default output unit,
	-- or return false, t where t is an error message table.
	-- However, for simplicity a valid result is always returned.
	local unit
	if unit_table._symbol == 'm' then
		-- c = speed of light in a vacuum = 299792458 m/s
		-- frequency = c / wavelength
		local w = value * (unit_table.scale or 1)
		local f = 299792458 / w  -- if w == 0, f = math.huge which works
		if f >= 1e12 then
			unit = 'THz'
		elseif f >= 1e9 then
			unit = 'GHz'
		elseif f >= 1e6 then
			unit = 'MHz'
		elseif f >= 1e3 then
```

```
                        unit = 'kHz'
                else
                        unit = 'Hz'
                end
        end
        return true, unit or 'Hz'
end

local function wavelength_unit(value, unit_table)
        -- Like frequency_unit but for use when converting Hz to m.
        local unit
        if unit_table._symbol == 'Hz' then
                -- Using 0.9993 rather than 1 avoids rounding which would give re
                -- like converting 300 MHz to 100 cm instead of 1 m.
                local w = 1 / (value * (unit_table.scale or 1))  -- Hz scale is i
                if w >= 0.9993e6 then
                        unit = 'Mm'
                elseif w >= 0.9993e3 then
                        unit = 'km'
                elseif w >= 0.9993 then
                        unit = 'm'
                elseif w >= 0.9993e-2 then
                        unit = 'cm'
                elseif w >= 0.9993e-3 then
                        unit = 'mm'
                else
                        unit = 'um'
                end
        end
        return true, unit or 'm'
end

local specials = {
        frequency = { frequency_unit },
        wavelength = { wavelength_unit },
        ------------------------------------------------------------------------
        -- Following is a removed experiment to show two values as a range
        -- using '-' as the separator.
        -- frequencyrange = { frequency_unit, '-' },
        -- wavelengthrange = { wavelength_unit, '-' },
}

local function make_unit(units, parms, uid)
        -- Return a unit code for convert or nil if unit unknown.
        -- If necessary, add a dummy unit to parms so convert will use it
        -- for the input without attempting a conversion since nothing
        -- useful is available (for example, with unit volt).
        local unit = units[uid]
        if type(unit) ~= 'table' then
                return nil
        end
        local ucode = unit.ucode
        if ucode and not unit.si then
                return ucode                -- a unit known to convert
        end
        parms.opt_ignore_error = true
        ucode = ucode or unit._ucode    -- must be a non-empty string
        local ukey, utable
        if unit.si then
                local base = units[unit.si]
                ukey = base.symbol          -- must be a non-empty string
                local n1 = base.name1
                local n2 = base.name2
                if not n1 then
```

```
                        n1 = ukey
                        n2 = n2 or n1           -- do not append 's'
                end
                utable = {
                        _symbol = ukey,
                        _name1 = n1,
                        _name2 = n2,
                        link = unit.link or base.link,
                        utype = n1,
                        prefixes = 1,
                }
        else
                ukey = ucode
                utable = {
                        symbol = ucode,         -- must be a non-empty string
                        name1 = unit.name1,     -- if nil, uses symbol
                        name2 = unit.name2,     -- if nil, uses name1..'s'
                        link = unit.link,       -- if nil, uses name1
                        utype = unit.name1 or ucode,
                }
        end
        utable.scale = 1
        utable.default = ''
        utable.defkey = ''
        utable.linkey = ''
        utable.bad_mcode = ''
        parms.unittable = { [ukey] = utable }
        return ucode
end

local function matches_qualifier(statement, qual)
        -- Return:
        --   false, nil : if statement does not match specification
        --   true, nil  : if matches, and statement has no qualifier
        --   true, sq   : if matches, where sq is the statement's qualifier
        -- A match means that no qualifier was specified (qual == nil), or that
        -- the statement has a qualifier matching the specification.
        -- If a match occurs, the caller needs the statement's qualifier (if any)
        -- so statements that duplicate the qualifier are not used, after the fi
        -- Then, if convert is showing all values for a property such as the diam
        -- of a telescope's mirror (diameters of primary and secondary mirrors),
        -- will not show alternative values that could in principle be present fo
        -- same item (telescope) and property (diameter) and qualifier (primary/s
        local target = (statement.qualifiers or {}).P518  -- P518 is "applies to
        if type(target) == 'table' then
                for _, q in ipairs(target) do
                        if type(q) == 'table' then
                                local value = (q.datavalue or {}).value
                                if value then
                                        if qual == nil or qual == value.id then
                                                return true, value.id
                                        end
                                end
                        end
                end
        end
        if qual == nil then
                return true, nil  -- only occurs if statement has no qualifier
        end
        return false, nil  -- statement's qualifier is not relevant because state
end

local function get_statements(parms, pid)
        -- Get specified item and return a list of tables with each statement for
```

```
        -- Each table is of form {statqual=sq, stmt=statement} where sq = stateme
        -- Statements are in Wikidata's order except that those with preferred ra
        -- are first, then normal rank. Any other rank is ignored.
        local stored = {}  -- qualifiers of statements that are first for the qua
        local qid = strip_to_nil(parms.qid)  -- nil for current page's item, or a
        local qual = strip_to_nil(parms.qual)  -- nil or id of wanted P518 (appli
        local result = Collection.new()
        local entity = mw.wikibase.getEntity(qid)
        if type(entity) == 'table' then
                local statements = (entity.claims or {})[pid]
                if type(statements) == 'table' then
                        for _, rank in ipairs({ 'preferred', 'normal' }) do
                                for _, statement in ipairs(statements) do
                                        if type(statement) == 'table' and rank ==
                                                local is_match, statqual = matche
                                                if is_match then
                                                        result:add({ statqual = s
                                                end
                                        end
                                end
                        end
                end
        end
        return result
end

local function input_from_property(tdata, parms, pid)
        -- Given that pid is a Wikidata property identifier like 'P123',
        -- return a collection of {amount, ucode} pairs (two strings)
        -- for each matching item/property, or return nothing.
        ------------------------------------------------------------------------
        -- There appear to be few restrictions on how Wikidata is organized so it
        -- very likely that any decision a module makes about how to handle data
        -- will be wrong for some cases at some time. This meets current requirem
        -- For each qualifier (or if no qualifier), if there are any preferred
        -- statements, use them and ignore any normal statements.
        -- For each qualifier, for the preferred statements if any, or for
        -- the normal statements (but not both):
        -- * Accept each statement if it has no qualifier (this will not occur
        --   if qual=x is specified because other code already ensures that in th
        --   case, only statements with a qualifier matching x are considered).
        -- * Ignore any statements after the first if it has a qualifier.
        -- The rationale is that for the diameter at [[South Pole Telescope]], wa
        -- convert to show the diameters for both the primary and secondary mirro
        -- if the convert does not specify which diameter is wanted.
        -- However, if convert is given the wanted qualifier, only one value
        -- (_the_ diameter) is wanted. For simplicity/consistency, that is also d
        -- even if no qual=x is specified. Unclear what should happen.
        -- For the wavelength at [[Nançay Radio Telescope]], want to show all thr
        -- values, and the values have no qualifiers.
        ------------------------------------------------------------------------
        local result = Collection.new()
        local done = {}
        local skip_normal
        for _, t in ipairs(get_statements(parms, pid)) do
                local statement = t.stmt
                if statement.mainsnak and statement.mainsnak.datatype == 'quantit
                        local value = (statement.mainsnak.datavalue or {}).value
                        if value then
                                local amount = value.amount
                                if amount then
                                        amount = tostring(amount)  -- in case amo
                                        if amount:sub(1, 1) == '+' then
                                                amount = amount:sub(2)
```

```
                                        end
                                        local unit = value.unit
                                        if type(unit) == 'string' then
                                                unit = unit:match('Q%d+$')  -- ur
                                                local ucode = make_unit(tdata.wik
                                                if ucode then
                                                        local skip
                                                        if t.statqual then
                                                                if done[t.statqua
                                                                        skip = tr
                                                                else
                                                                        done[t.st
                                                                end
                                                        else
                                                                if statement.rank
                                                                        skip_norm
                                                                elseif skip_norma
                                                                        skip = tr
                                                                end
                                                        end
                                                        if not skip then
                                                                result:add({ amou
                                                        end
                                                end
                                        end
                                end
                        end
                end
        end
        return result
end

local function input_from_text(tdata, parms, text, insert2)
        -- Given string should be of form "<value><space><unit>" or
        -- "<value1><space>ft<space><value2><space>in" for a special case (feet a
        -- Return true if values/units were extracted and inserted, or return not
        text = text:gsub(' ', ' '):gsub('%s+', ' ')
        local pos = text:find(' ', 1, true)
        if pos then
                -- Leave checking of value to convert which can handle fractions
                local value = text:sub(1, pos - 1)
                local uid = text:sub(pos + 1)
                if uid:sub(1, 3) == 'ft ' and uid:sub(-3) == ' in' then
                        -- Special case for enwiki to allow {{convert|input=5 ft
                        insert2(uid:sub(4, -4), 'in')
                        insert2(value, 'ft')
                else
                        insert2(value, make_unit(tdata.wikidata_units, parms, uid
                end
                return true
        end
end

local function adjustparameters(tdata, parms, index)
        -- For Module:Convert, adjust parms (a table of {{convert}} parameters).
        -- Return true if successful or return false, t where t is an error messa
        -- This is intended mainly for use in infoboxes where the input might be
        --    <value><space><unit>    or
        --    <wikidata-property-id>
        -- If successful, insert values and units in parms, before given index.
        local text = parms.input  -- should be a trimmed, non-empty string
        local pid = text:match('^P%d+$')
        local sep = ','
        local special = specials[parms[index]]
```

```
	if special then
		parms.out_unit = special[1]
		sep = special[2] or sep
		table.remove(parms, index)
	end
	local function quit()
		return false, pid and { 'cvt_no_output' } or { 'cvt_bad_input', t
	end
	local function insert2(first, second)
		table.insert(parms, index, second)
		table.insert(parms, index, first)
	end
	if pid then
		parms.input_text = ''  -- output an empty string if an error occu
		local result = input_from_property(tdata, parms, pid)
		if result.n == 0 then
			return quit()
		end
		local ucode
		for i, t in ipairs(result) do
			-- Convert requires each input unit to be identical.
			if i == 1 then
				ucode = t[2]
			elseif ucode ~= t[2] then
				return quit()
			end
		end
		local item = ucode
		if item == parms[index] then
			-- Remove specified output unit if it is the same as the
			-- For example, {{convert|input=P2044|km}} with property
			table.remove(parms, index)
		end
		for i = result.n, 1, -1 do
			insert2(result[i][1], item)
			item = sep
		end
		return true
	else
		if input_from_text(tdata, parms, text, insert2) then
			return true
		end
	end
	return quit()
end

-------------------------------------------------------------------------------
--- List units and check syntax of definitions --------------------------------
-------------------------------------------------------------------------------
local specifications = {
	-- seq = sequence in which fields are displayed
	base = {
		title = 'SI base units',
		fields = {
			symbol = { seq = 2, mandatory = true },
			name1  = { seq = 3, mandatory = true },
			name2  = { seq = 4 },
			link   = { seq = 5 },
		},
		noteseq = 6,
		header = '{| class="wikitable"\n!si !!symbol !!name1 !!name2 !!li
		item = '|-\n|%s ||%s ||%s ||%s ||%s ||%s',
		footer = '|}',
	},
```

```
	alias = {
		title = 'Aliases for convert',
		fields = {
			ucode  = { seq = 2, mandatory = true },
			si     = { seq = 3 },
		},
		noteseq = 4,
		header = '{| class="wikitable"\n!alias !!ucode !!base !!note',
		item = '|-\n|%s ||%s ||%s ||%s',
		footer = '|}',
	},
	known = {
		title = 'Units known to convert',
		fields = {
			ucode  = { seq = 2, mandatory = true },
			label  = { seq = 3, mandatory = true },
		},
		noteseq = 4,
		header = '{| class="wikitable"\n!qid !!ucode !!label !!note',
		item = '|-\n|%s ||%s ||%s ||%s',
		footer = '|}',
	},
	unknown = {
		title = 'Units not known to convert',
		fields = {
			_ucode = { seq = 2, mandatory = true },
			si     = { seq = 3 },
			name1  = { seq = 4 },
			name2  = { seq = 5 },
			link   = { seq = 6 },
			label  = { seq = 7, mandatory = true },
		},
		noteseq = 8,
		header = '{| class="wikitable"\n!qid !!_ucode !!base !!name1 !!na
		item = '|-\n|%s ||%s ||%s ||%s ||%s ||%s ||%s',
		footer = '|}',
	},
}

local function listunits(tdata, ulookup)
	-- For Module:Convert, make wikitext to list the built-in Wikidata units
	-- Return true, wikitext if successful or return false, t where t is an
	-- error message table. Currently, an error return never occurs.
	-- The syntax of each unit definition is checked and a note is added if
	-- a problem is detected.
	local function safe_cells(t)
		-- This is not currently needed, but in case definitions ever use
		-- like '[[kilogram|kg]]', escape the text so it works in a table
		local result = {}
		for i, v in ipairs(t) do
			if v:find('|', 1, true) then
				v = v:gsub('(%[%[[^%[%]]-)|(.-%]%])', '%1\0%2')
				v = v:gsub('|', '&#124;')
				v = v:gsub('%z', '|')
			end
			result[i] = v:gsub('{', '&#123;')                    -- e
		end
		return unpack(result)
	end
	local wdunits = tdata.wikidata_units
	local speckeys = { 'base', 'alias', 'unknown', 'known' }
	for _, sid in ipairs(speckeys) do
		specifications[sid].units = Collection.new()
	end
```

```
	local keys = Collection.new()
	for k, v in pairs(wdunits) do
		keys:add(k)
	end
	table.sort(keys)
	local note_count = 0
	for _, key in ipairs(keys) do
		local unit = wdunits[key]
		local ktext, sid
		if key:match('^Q%d+$') then
			ktext = '[[d:' .. key .. '|' .. key .. ']]'
			if unit.ucode then
				sid = 'known'
			else
				sid = 'unknown'
			end
		elseif unit.ucode then
			ktext = key
			sid = 'alias'
		else
			ktext = key
			sid = 'base'
		end
		local result = { ktext }
		local spec = specifications[sid]
		local fields = spec.fields
		local note = Collection.new()
		for k, v in pairs(unit) do
			if fields[k] then
				local seq = fields[k].seq
				if result[seq] then
					note:add('duplicate ' .. k)  -- cannot ha
				else
					result[seq] = v
				end
			else
				note:add('invalid ' .. k)
			end
		end
		for k, v in pairs(fields) do
			local value = result[v.seq]
			if value then
				if k == 'si' and not wdunits[value] then
					note:add('need si ' .. value)
				end
				if k == 'label' then
					local wdl = mw.wikibase.getLabel(key)
					if wdl ~= value then
						note:add('label changed to ' .. t
					end
				end
			else
				result[v.seq] = ''
				if v.mandatory then
					note:add('missing ' .. k)
				end
			end
		end
		local text
		if note.n > 0 then
			note_count = note_count + 1
			text = '*' .. note:join('<br />')
		end
		result[spec.noteseq] = text or ''
```

```
                spec.units:add(result)
        end
        local results = Collection.new()
        if note_count > 0 then
                local text = note_count .. (note_count == 1 and ' note' or ' note
                results:add("'''Search for * to see " .. text .. "'''\n")
        end
        for _, sid in ipairs(speckeys) do
                local spec = specifications[sid]
                results:add("''''" .. spec.title .. "''''")
                results:add(spec.header)
                local fmt = spec.item
                for _, unit in ipairs(spec.units) do
                        results:add(string.format(fmt, safe_cells(unit)))
                end
                results:add(spec.footer)
        end
        return true, results:join('\n')
end

return { _adjustparameters = adjustparameters, _listunits = listunits }
```