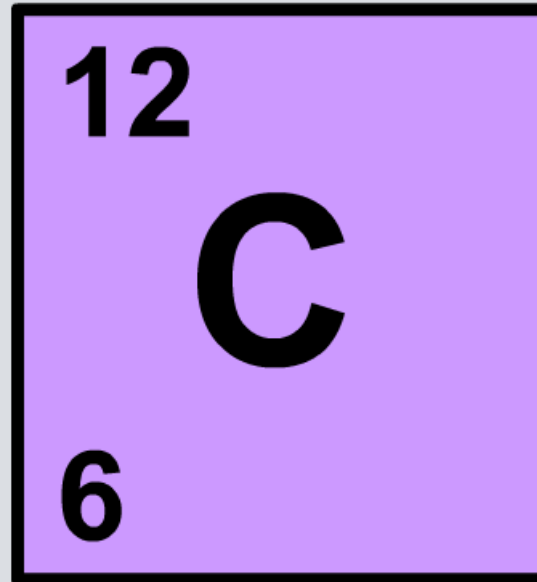


## Atomic Number and Mass Number



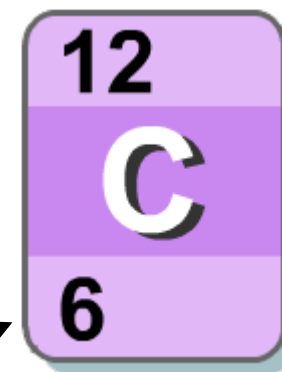
# How many protons?

The atoms of any particular element always contain the same number of protons. For example:

- hydrogen atoms always contain 1 proton
- carbon atoms always contain 6 protons
- magnesium atoms always contain 12 protons.





The number of protons in an atom is known as the **atomic number** or **proton number**.

It is the smaller of the two numbers shown in most periodic tables.



# What is the atomic number?

What are the atomic numbers of these elements?

sodium		11
iron		26
tin		50
fluorine		9



Each element has a definite and fixed number of protons.

If the number of protons changes, then the atom becomes a different element.

Changes in the number of particles in the nucleus (protons or neutrons) are **very rare**. They only take place in nuclear processes such as:

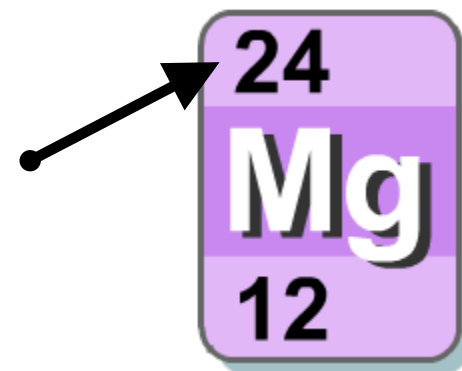
- radioactive decay
- nuclear bombs
- nuclear reactors.



# What is mass number?

Electrons have a mass of almost zero, which means that the mass of each atom results almost entirely from the number of protons and neutrons in the nucleus.

The **sum of the protons and neutrons** in an atom's nucleus is the **mass number**. It is the larger of the two numbers shown in most periodic tables.



Atoms	Protons	Neutrons	Mass number
hydrogen	1	0	1
lithium	3	4	7
aluminum	13	14	27

# What's the mass number?

**mass number = number of protons + number of neutrons**

What is the mass number of these atoms?

Atoms	Protons	Neutrons	Mass number
helium	2	2	4
copper	29	35	64
cobalt	27	32	59
iodine	53	74	127
germanium	32	41	73

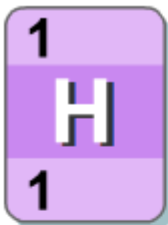
# How many neutrons?

**number of neutrons = mass number - number of protons  
= mass number - atomic number**

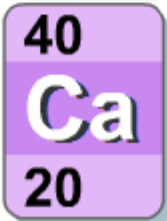
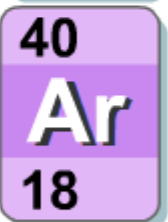
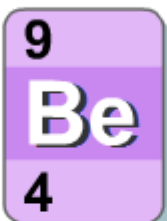
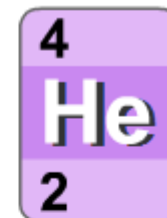
How many neutrons are there in these atoms?

Atoms	Mass number	Atomic number	Neutrons
helium	4	2	2
fluorine	19	9	10
strontium	88	38	50
zirconium	91	40	51
uranium	238	92	146





How many protons and neutrons are there in an element's nucleus?



Select an element to investigate its nucleus.





# How many electrons?

Atoms have no overall electrical charge and are **neutral**.

This means atoms must have an equal number of positive protons and negative electrons.

The number of electrons is therefore the same as the atomic number.

Atoms	Protons	Neutrons	Electrons
helium	2	2	2
copper	29	35	29
iodine	53	74	53

Atomic number is the number of protons rather than the number of electrons, because atoms can lose or gain electrons but do not normally lose or gain protons.



# What are the missing numbers?



## What are the missing numbers?

Atom	Protons	Neutrons	Electrons	Atomic number	Mass number
boron	5	6	<input type="text" value="?"/> ▼	5	<input type="text" value="?"/> ▼
potassium	<input type="text" value="?"/> ▼	<input type="text" value="?"/> ▼	19	19	39
chromium	24	28	24	<input type="text" value="?"/> ▼	<input type="text" value="?"/> ▼
mercury	<input type="text" value="?"/> ▼	121	80	<input type="text" value="?"/> ▼	201
argon	<input type="text" value="?"/> ▼	<input type="text" value="?"/> ▼	<input type="text" value="?"/> ▼	18	40



solve



# Atoms: true or false?

