

Con un semplice gioco a tessere si può capire che ragionamenti ha fatto Mendeleev durante lo sviluppo della tavola periodica, e come mai la sua scoperta è stata così significativa.

Il gioco contiene alcune semplificazioni, per esempio i valori della massa riportati sono quelli odierni, e vengono considerati solo gli elementi dei gruppi principali. In quest'ottica, è ancora più sorprendente che Mendeleev sia giunto a risultati così buoni senza questi aiuti.

All'epoca di Dmitri Mendeleev, nel 1869, si conoscevano già un po' più di 60 elementi. Le loro proprietà chimiche e la loro massa erano già note con una precisione piuttosto accurata.

Qui sotto sono elencati il simbolo, il nome, la massa e la formula dei primi 20 elementi.

P
Fosforo
31
PH₃

H
Idrogeno
1

B
Boro
11
BH₃

C
Carbonio
12
CH₄

As
Arsenico
75
AsH₃

Ca
Calcio
40
CaH₂

Na
Sodio
23
NaH

Al
Alluminio
27.4
AlH₃

S
Zolfo
32
H₂S

Si
Silicio
28
SiH₄

Be
Berillio
9.4
BeH₂

N
Azoto
14
NH₃

Cl
Cloro
35.5
HCl

O
Ossigeno
16
H₂O

F
Fluoro
19
HF

K
Potassio
39
KH

Br
Bromo
80
HBr

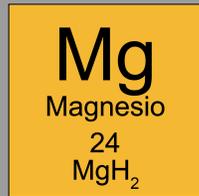
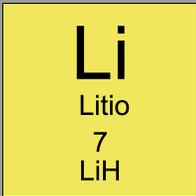
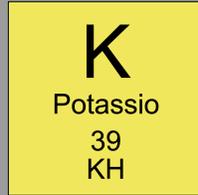
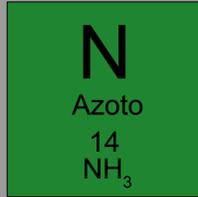
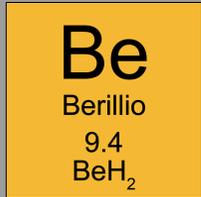
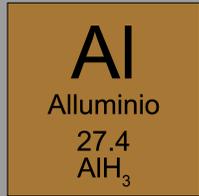
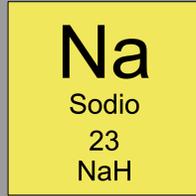
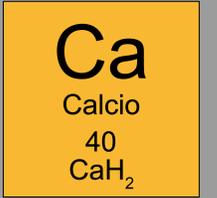
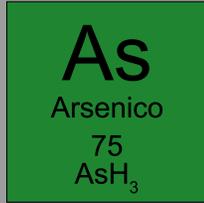
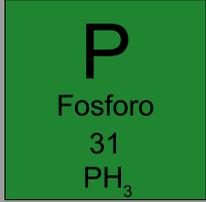
Li
Litio
7
LiH

Mg
Magnesio
24
MgH₂

Se
Selenio
79.4
SeH₂

Già prima di Mendeleev si sapeva che esistono elementi con proprietà simili.

Elementi con proprietà chimiche simili verranno marcati qui con lo stesso colore.

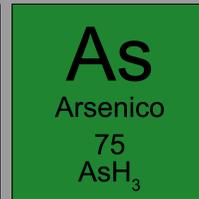
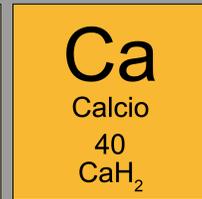
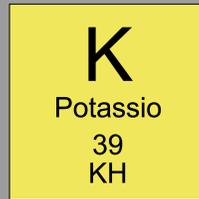
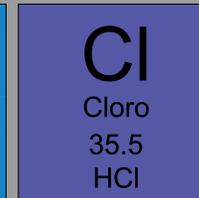
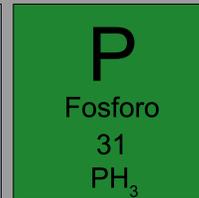
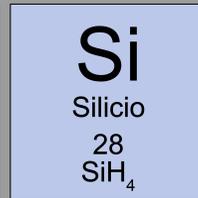
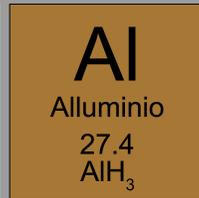
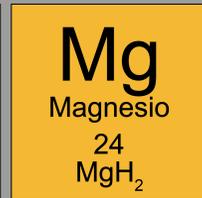
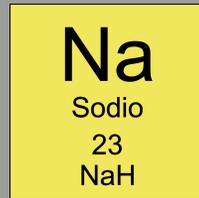
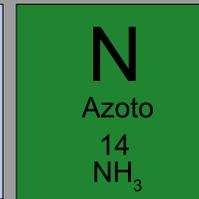
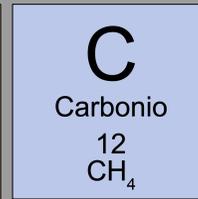
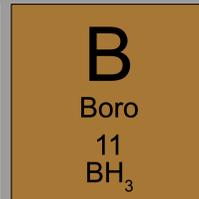
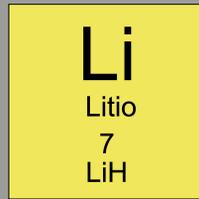


Se si ordinano gli elementi per massa crescente (come fatto da Mendeleev) si nota che gli elementi simili si ripetono con una certa regolarità.

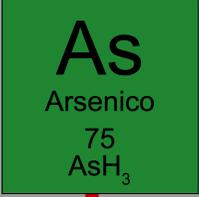
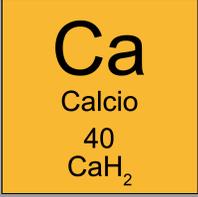
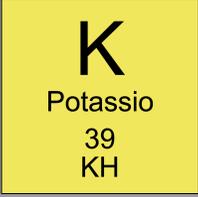
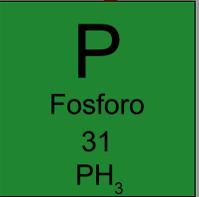
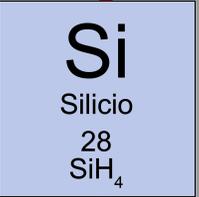
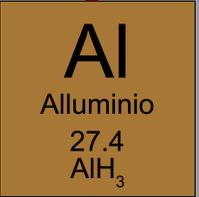
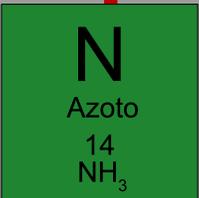
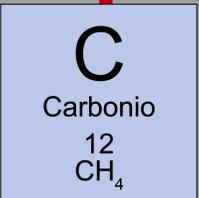
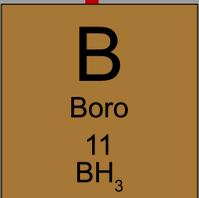
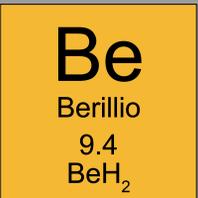
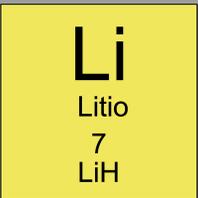
Scopri questa regolarità!

H Idrogeno 1	Li Litio 7 LiH	Be Berillio 9.4 BeH ₂	B Boro 11 BH ₃	C Carbonio 12 CH ₄	N Azoto 14 NH ₃	O Ossigeno 16 H ₂ O	F Fluoro 19 HF	Na Sodio 23 NaH	Mg Magnesio 24 MgH ₂
Al Alluminio 27.4 AlH ₃	Si Silicio 28 SiH ₄	P Fosforo 31 PH ₃	S Zolfo 32 H ₂ S	Cl Cloro 35.5 HCl	K Potassio 39 KH	Ca Calcio 40 CaH ₂	As Arsenico 75 AsH ₃	Se Selenio 79.4 SeH ₂	Br Bromo 80 HBr

Mendeleev ha messo gli elementi con proprietà simili uno sotto l'altro.
In questo modo, la regolarità con la quale le proprietà si ripetono è ancora più ovvia.



L'arsenico, il selenio e il bromo tuttavia non rientrano nelle stesse categorie degli elementi sopra di loro!

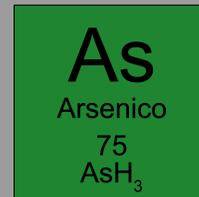
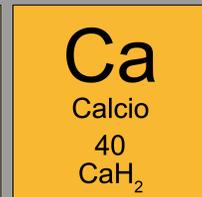
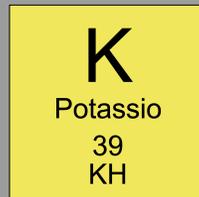
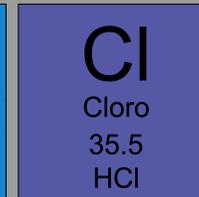
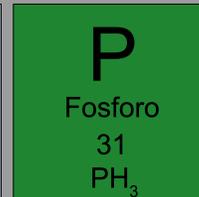
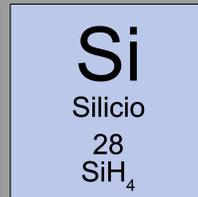
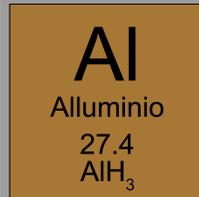
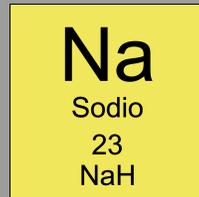
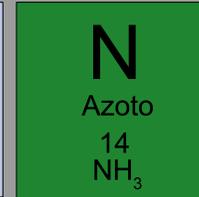
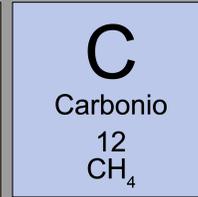
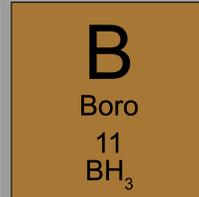
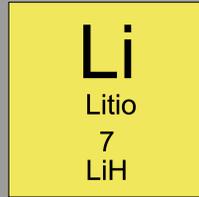


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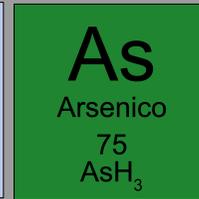
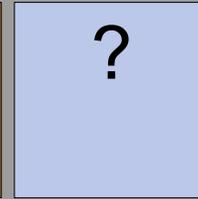
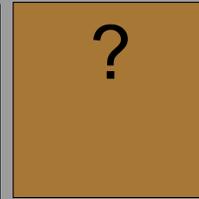
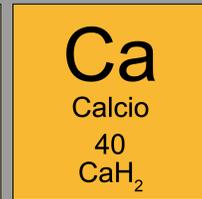
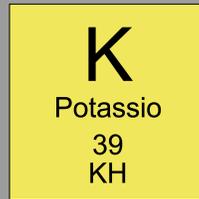
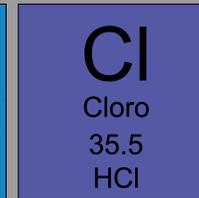
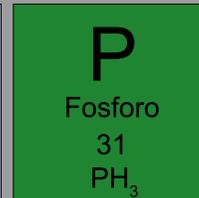
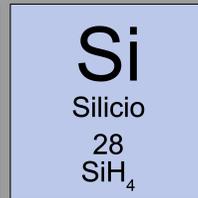
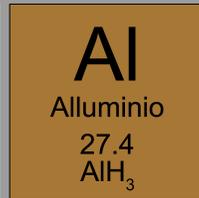
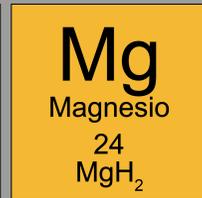
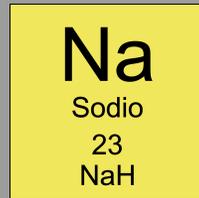
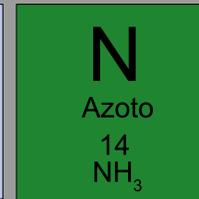
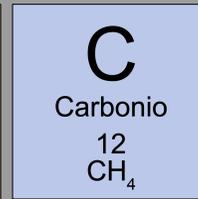
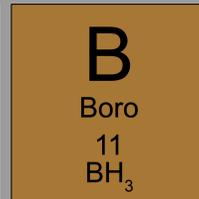
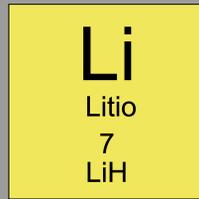
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Ma se si scalano l'arsenico, il selenio e il bromo due posti verso destra, le categorie delle similitudini sono ancora valide.



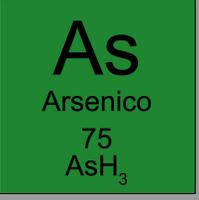
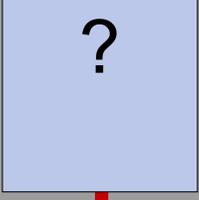
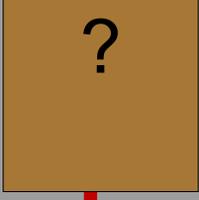
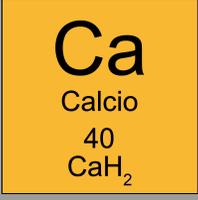
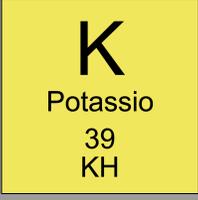
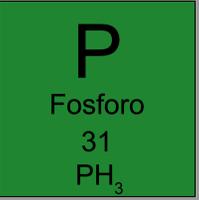
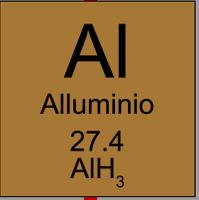
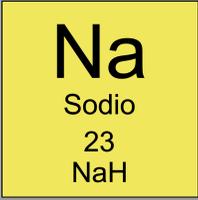
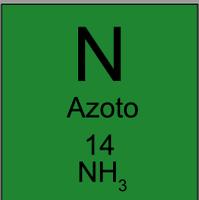
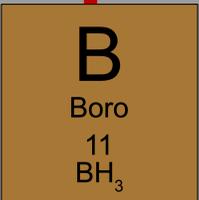
Mendeleev era al corrente che ordinando gli elementi in questo modo si sarebbero creati dei buchi. Ha ipotizzato che questi non fossero realmente spazi vuoti, ma che lì ci sarebbero dovuti essere degli elementi non ancora scoperti.

Mendeleev ha quindi marcato i buchi con dei punti di domanda.



Vista la somiglianza con gli elementi sovrastanti, Mendeleev ha potuto fare delle previsioni sulle proprietà chimiche degli elementi ancora sconosciuti.

Queste previsioni hanno permesso di cercare questi elementi in maniera più mirata. Alcuni anni dopo sono stati scoperti gli elementi germanio e gallio, e guarda un po': ci stavano perfettamente in questi buchi!



Somiglianza

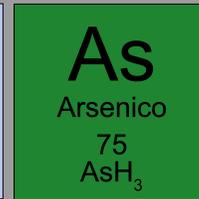
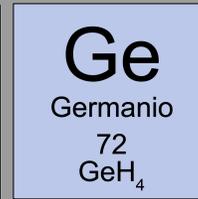
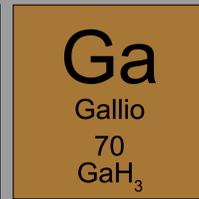
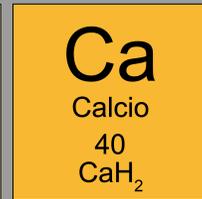
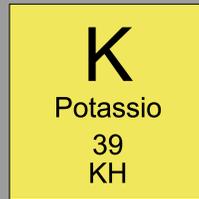
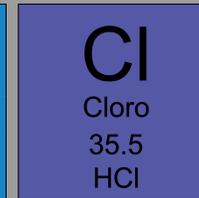
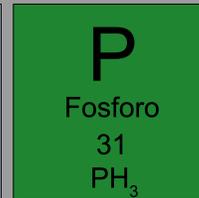
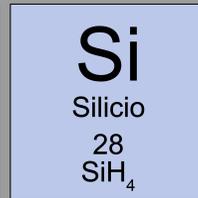
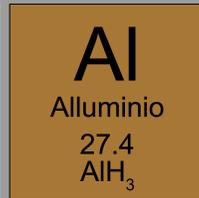
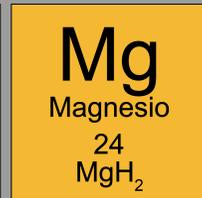
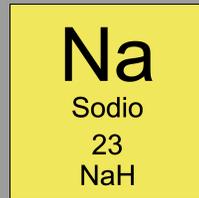
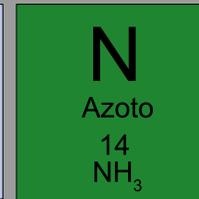
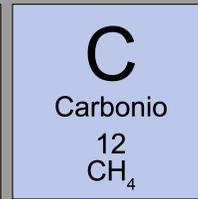
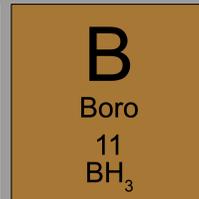
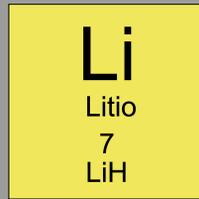
Somiglianza



Possibili
previsioni

Le previsioni di Mendeleev sull'elemento sotto al silicio	Le proprietà osservate del germanio dopo la sua scoperta
Massa atomica ca. 72	Massa atomica 72.6
Metallo grigio scuro con punto di fusione alto, densità ca. 5.5 g/cm ³	Metallo di un grigio biancastro con punto di fusione 958 °C, densità 5.36 g/cm ³
Scaldandolo all'aria si crea XO ₂	Scaldandolo all'aria si crea GeO ₂
Il cloruro di X, XCl ₄ , è un liquido poco volatile con un punto di ebollizione sotto i 100 °C.	GeCl ₄ è liquido e ha un punto di ebollizione di 83 °C.

La tavola periodica ha potuto essere espansa in modo mirato.



La scoperta di Mendeleev consiste principalmente nel fatto che è stato trovato un sistema per ordinare gli elementi col quale è anche possibile fare delle **previsioni** sugli elementi ancora da scoprire, in modo da riempire i buchi nella tavola. Queste previsioni hanno contribuito alla scoperta di nuovi elementi.