

# Atoms and Elements

An **element** is any substance made of only one type of atom.

- For example:



Carbon is an element made of only carbon atoms.



Copper is an element made of only copper atoms.



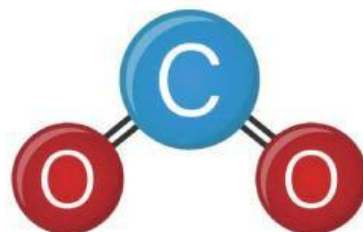
Helium is an element made of only helium atoms.



# Compounds

**A compound is a substance formed when two or more chemical elements are chemically bonded together.**

- The elements in compounds are always present in fixed ratios.
- Compounds can be broken down into the elements that make them, but only using chemical reactions.



CO<sub>2</sub> is always  
1 carbon:2 oxygen

Examples: H<sub>2</sub>O (water), CH<sub>4</sub> (methane),  
NaCl (salt), C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> (glucose/sugar).

  
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# The Periodic Table

The periodic table is organised by horizontal rows, and vertical columns.

- The horizontal rows are called

- The vertical columns are called

Legend:

- Alkali metals
- Alkaline-earth metals
- Transition metals
- Other metals
- Other nonmetals
- Halogens
- Noble gases
- Rare earth elements (21, 39, 57-71) and lanthanoid elements (57-71 only)
- Actinoid elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H	He																
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og

lanthanoid series 6

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu

actinoid series 7

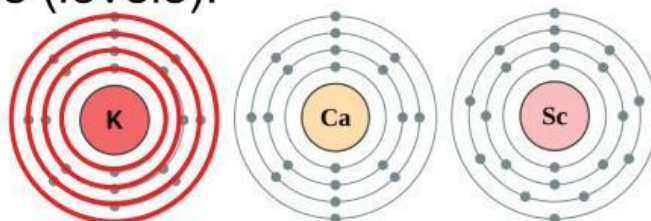
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr



# Periods

The horizontal rows are called .

- There are 7 periods in the periodic table.
- All the elements in a period share the same number of electron shells (energy levels).
- For example, all of the elements in period 4 have 4 electron shells (levels).



A portion of the periodic table showing periods 1 through 7. A red bracket on the left side groups the elements into their respective periods. Period 4 elements (K, Ca, Sc) are highlighted in yellow.

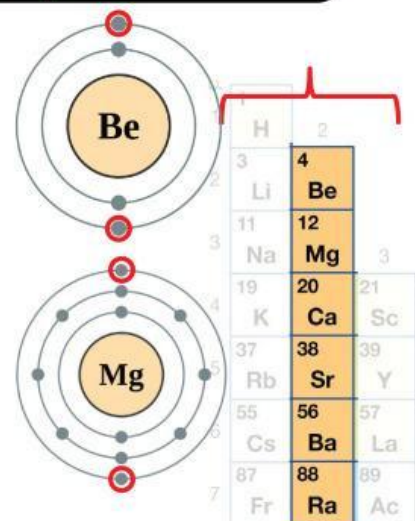
1	H	2	
2	Li	Be	
3	Na	Mg	
4	K	Ca	Sc
5	Rb	Sr	Y
6	Cs	Ba	La
7	Fr	Ra	Ac



# Groups

The vertical columns are called “ ”  
(sometimes called families).

- There are 18 groups in the periodic table.
- All elements in a group have the same number of valence electrons (outer electrons).
- For example, all of the elements in group 2 have 2 valence electrons (outer electrons).
- This means the elements in each group share similar chemical and physical properties.



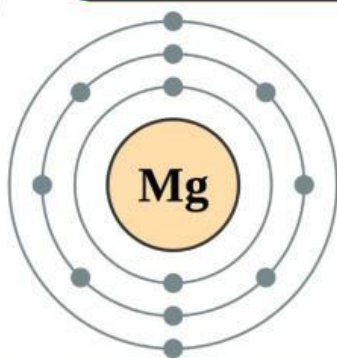
The diagram shows the atomic structure of Beryllium (Be) and Magnesium (Mg). Be has 4 protons and 4 electrons, with 2 in the inner shell and 2 in the outer shell. Mg has 12 protons and 12 electrons, with 2 in the inner shell, 8 in the middle shell, and 2 in the outer shell. To the right, a portion of the periodic table is shown, with Group 2 elements (Be, Mg, Ca, Sr, Ba, Ra) highlighted in orange. A red bracket groups these elements together, and a red line points to the group number '2' at the top.

1	H	2	
3	Li	4 Be	
11	Na	12 Mg	13 Al
19	K	20 Ca	21 Sc
37	Rb	38 Sr	39 Y
55	Cs	56 Ba	57 La
87	Fr	88 Ra	89 Ac



# Shell Models

If we know the number of shells and how many valence electrons, we can find which group and period the element is in.



**Example:** Magnesium

- It has 3 electron shells
- It has 2 valence electrons

**Remember:** Valence electrons are the electrons in the outermost shell.

period	group 1*	2
1	1 H	
2	3 Li	4 Be
3	11 Na	12 Mg
4	19 K	20 Ca
5	37 Rb	38 Sr

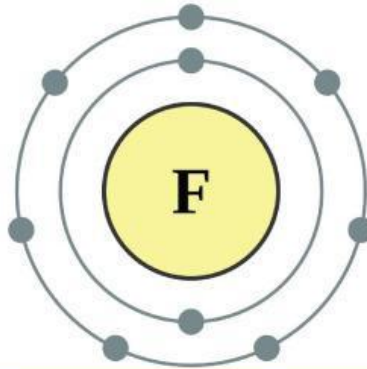


# Shell Models

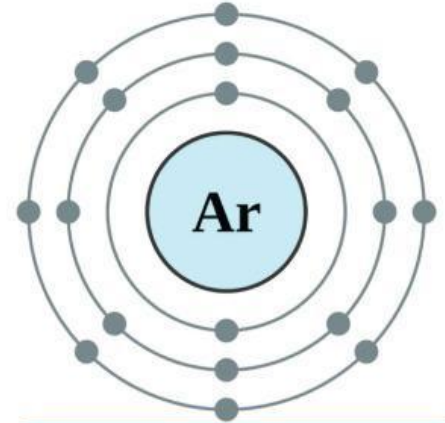
**You try:** What is the period and group for these elements?



1 electron shell  
1 valence electrons



2 electron shell  
7 valence electrons



3 electron shell  
8 valence electrons

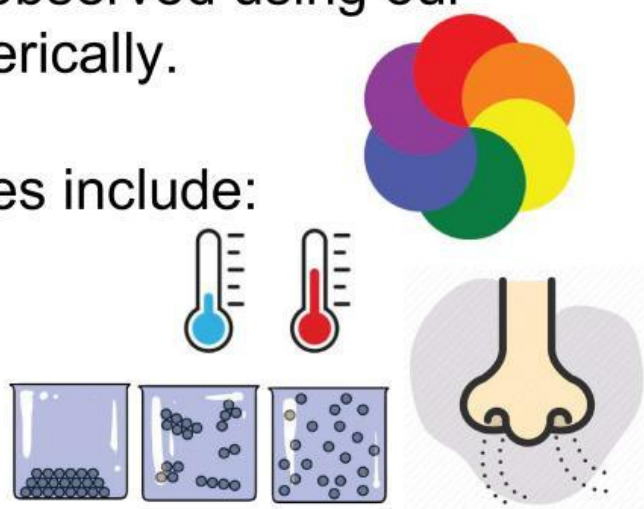


**The \_\_\_\_\_ of an element don't involve changing the chemistry of the element.**

- \_\_\_\_\_ can be observed using our senses and measured numerically.

Examples of physical properties include:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_





are when there is a change in the structure of the element.

- are only observable during a chemical reaction.
- Elements in the same group have similar





# Respiratory System

The \_\_\_\_\_ is the group of organs we use for respiration and breathing.

\_\_\_\_\_ is the process of moving air in and out of the lungs - like when you take a breath. \_\_\_\_\_ is the reaction, carried out in cells, which produces energy.



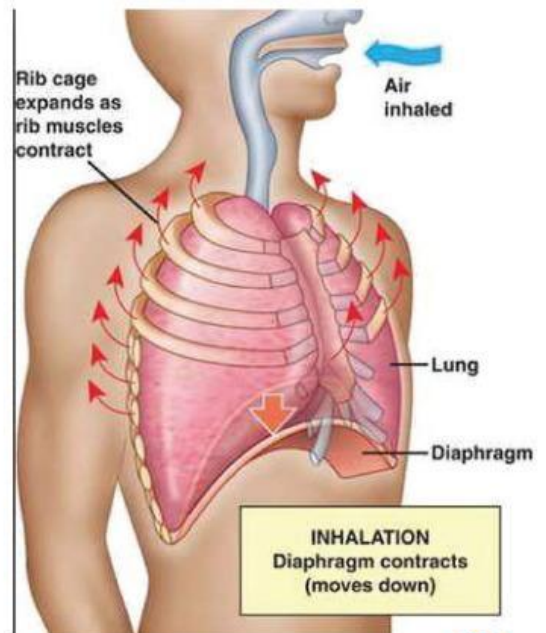


# Breathing in - inhalation

\_\_\_\_\_ contract pulling the chest walls up and out.

The \_\_\_\_\_ contracts and moves down.

The \_\_\_\_\_ increase in size, causing air to rush in from the nose or mouth.



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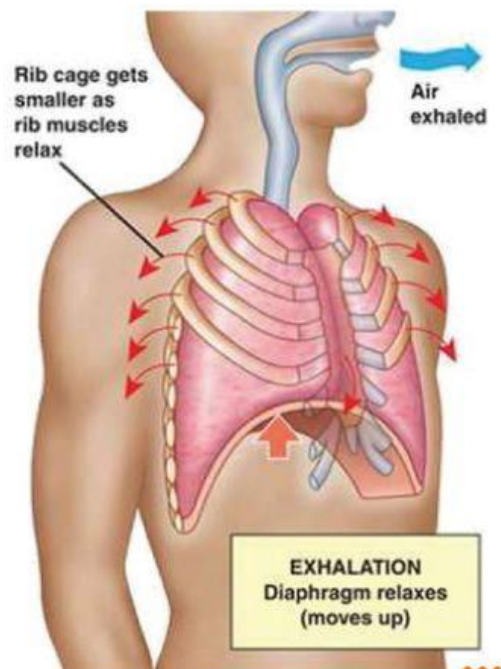


# Breathing out - exhalation

\_\_\_\_\_ relax, pushing  
the chest walls down and in.

The \_\_\_\_\_ muscle relaxes and  
bulges up.

The \_\_\_\_\_ decrease in size, so air is  
pushed out through the nose or  
mouth.



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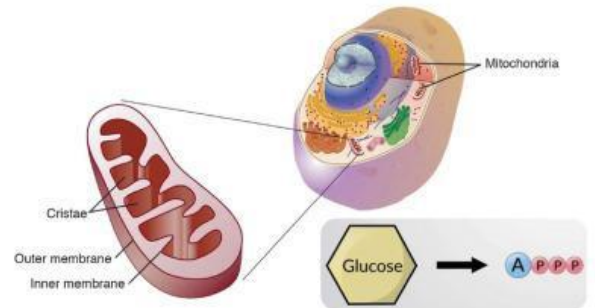
# Aerobic Respiration

happens  
in the mitochondria in plant  
and animal cells.

use glucose  
and oxygen to make an  
energy molecule called ATP.

Water and  $\text{CO}_2$  are waste  
products of cellular respiration.

Don't Copy. Only FYI:  
ATP = adenosine triphosphate



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# Aerobic Respiration Equation

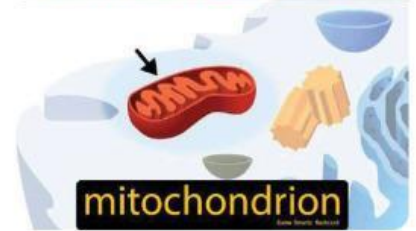
word equation

glucose + oxygen  $\rightarrow$  carbon dioxide + water + Energy!

balanced chemical equation



the cell organelle that releases energy from food molecules



ATP

Energy



21%

0.04%

78%

16%

4%

78%

<b>Gas</b>	<b>Amount in inhaled air</b>	<b>Amount in exhaled air</b>
oxygen		
carbon dioxide		
nitrogen		
water vapour	<b>Variable</b>	