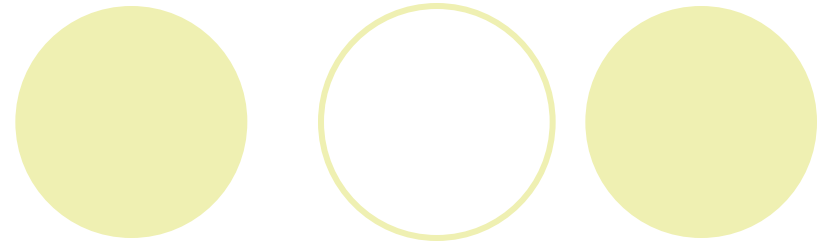


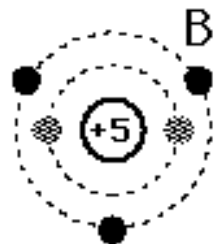
Lewis Diagrams (aka Electron Dot Diagrams)

- Lewis diagrams show **ONLY** the valence electrons for an element.
- Draw one dot each: on the top, right, bottom, and left of the element symbol, then start doubling up. (12, 3, 6, 9 on a clock)
- Draw the Lewis Diagrams for the first 20 Elements on your handout.

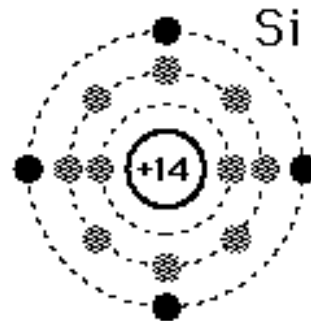
Valence Electrons



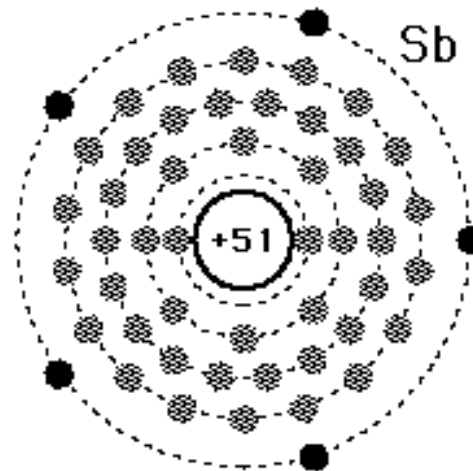
- Valence Electrons are the outermost electrons found in an atom.
- These electrons determine the type of ion an atom will form, and how an atom can bond to other atoms.



Boron
3 Valence
Electrons



Silicon
4 Valence
Electrons



Antimony (5 Valence)

Valence Electrons for each Group

- Group 1
- Group 2
- Group 13
- Group 14
- Group 15
- Group 16
- Group 17
- Group 18

The periodic table shows elements color-coded by group. The colors are: Group 1 (yellow), Group 2 (orange), Group 13 (light green), Group 14 (medium green), Group 15 (darker green), Group 16 (cyan), Group 17 (blue), and Group 18 (dark blue). The lanthanide and actinide series are shown in grey at the bottom.

Do you notice a pattern?

Why do Elements in the same group have similar chemical properties?

- Same number of valence electrons!

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period 1	1																	2
1	H																	He
2	3	4											5	6	7	8	9	10
2	Li	Be											B	C	N	O	F	Ne
3	11	12											13	14	15	16	17	18
3	Na	Mg											Al	Si	P	S	Cl	Ar
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	55	56	57*	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	87	88	89**	104	105	106	107	108	109	110	111	112		114		116		118
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq		Uuh		Uuo

○ Non Metals	● Noble Gases
● Alkali Metals	● Metalloids
● Alkaline Metals	● Halogens
● Transition Metals	● Other Metals
● Rare Earth Elements	

*Lanthanides	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
**Actinides	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

And now for something completely different.....

A decorative header consisting of five circles in a row. From left to right: a solid light green circle, an outlined light green circle, a solid light green circle, an outlined light green circle, and a solid light green circle.

- On your electron diagrams, write the symbol for the ion formed by each of the first 20 elements
- The charge on each ion is called the valence number
- Let's compare.....



Atoms and Ions

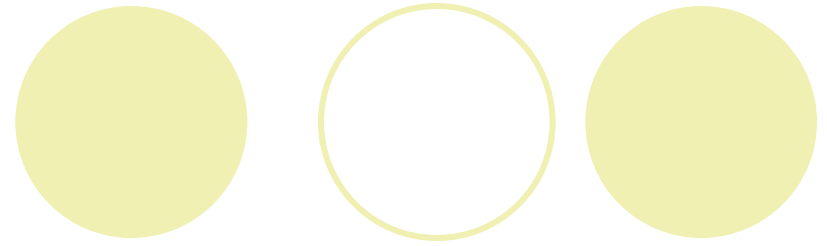
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Atoms & Ions

A decorative graphic at the top of the slide consists of six circles. The first circle is solid light green. The second circle is hollow with a light green outline. The third circle is solid light green. The fourth circle is hollow with a light green outline. The fifth circle is solid light green. The sixth circle is hollow with a light green outline.

- Atoms have equal numbers of protons and electrons and are therefore electrically neutral
- Atoms are not stable unless their outer electron orbits are full
- This is achieved by either gaining, losing, or sharing electrons.

Atoms and Ions



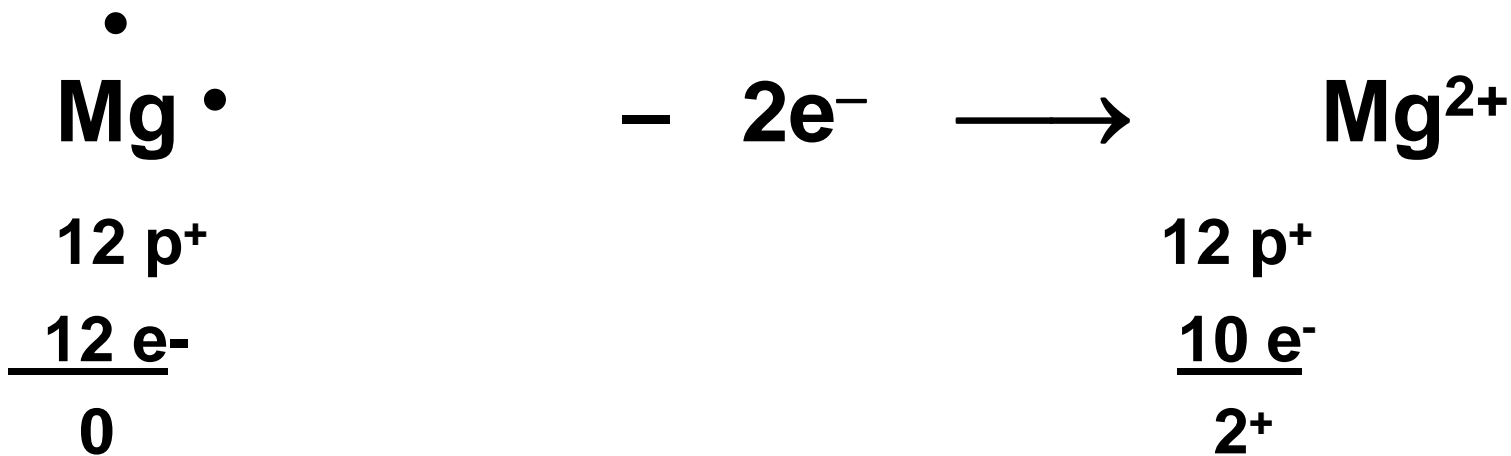
- When an atom gains or loses one or more electrons, it becomes an **ion**. It is now electrically **charged**, but stable.
- The **ionic charge** is the sum of the ion's positive and negative charges.

Cations

- Cations (Positive Ions) form when an atom has more protons than electrons
- Formed by metals (elements with fewer than 4 valence electrons) **losing** electrons

Magnesium atom

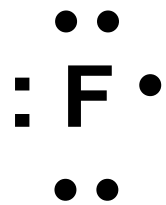
Magnesium ion



Anions

- Anions (negative ions) form when an atom has more electrons than protons
- Formed by non-metals (more than 4 valence electrons) **gaining** electrons

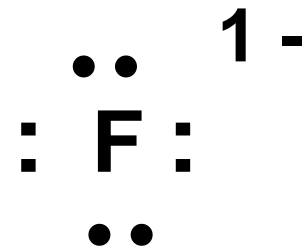
Fluorine atom



$$\begin{array}{r} 9 \text{ p}^+ \\ \underline{9 \text{ e}^-} \\ 0 \end{array}$$



Fluoride ion



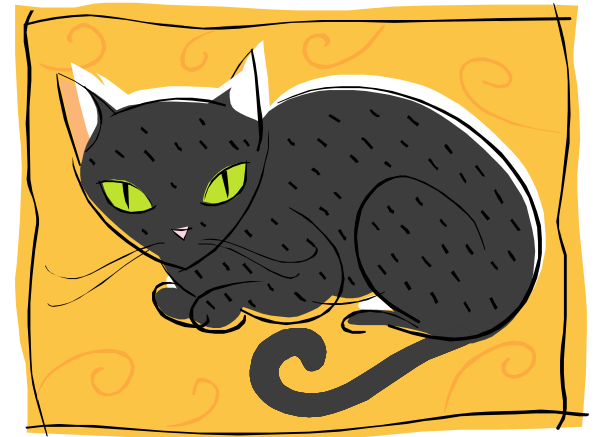
$$\begin{array}{r} 9 \text{ p}^+ \\ \underline{10 \text{ e}^-} \\ 1^- \end{array}$$

“Cats have Paws”

- Here’s another little trick to help you remember what anions and cations are:

○ Cations are Positive

○ Cats have Paws



Ion Joke

Two hydrogen atoms bumped into each other recently.

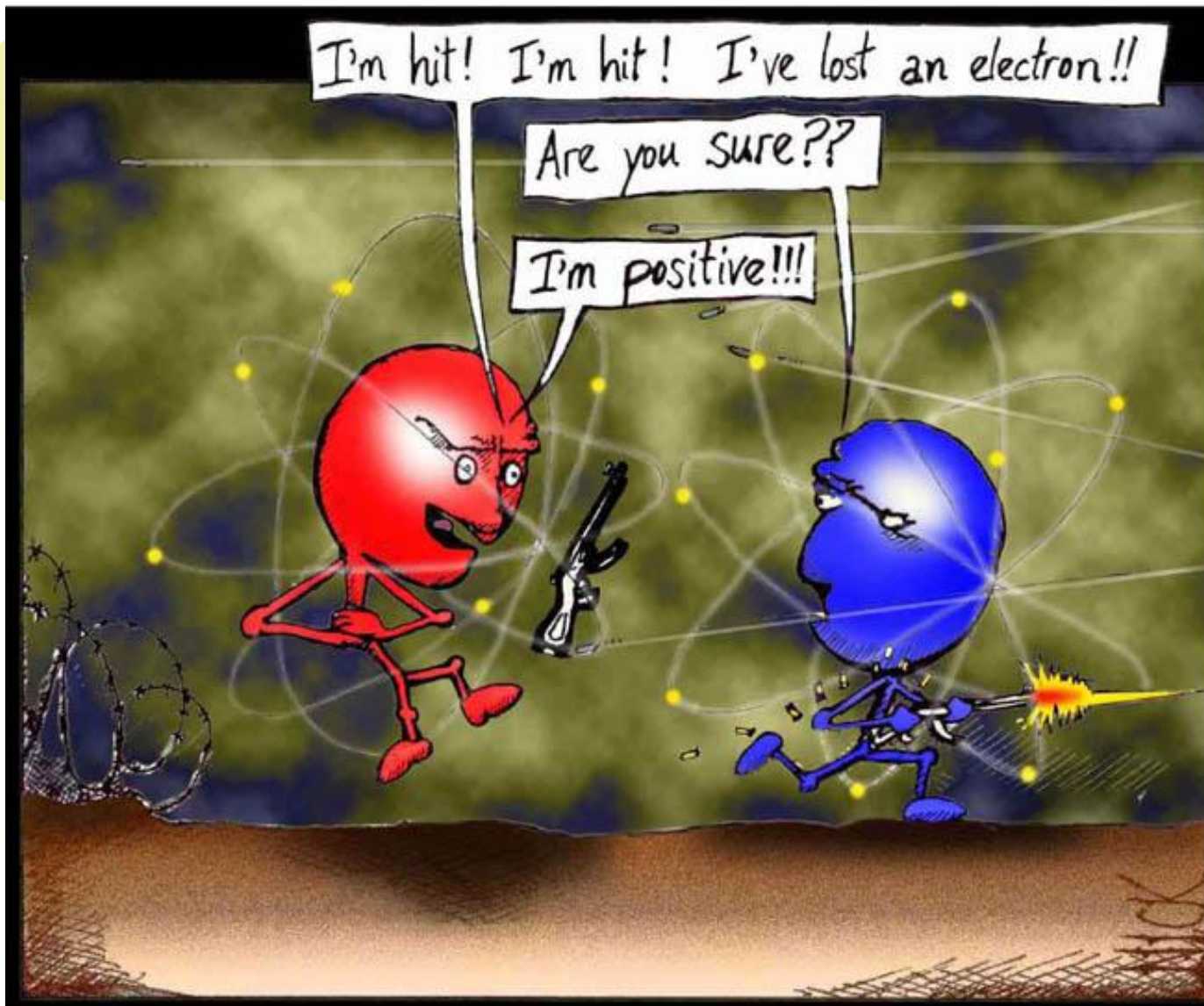
One said: "Why do you look so sad?"

The other responded: "I lost an electron."

Concerned, One asked "Are you sure?"

The other replied "I'm positive."





Another casualty in the War of the Atoms.

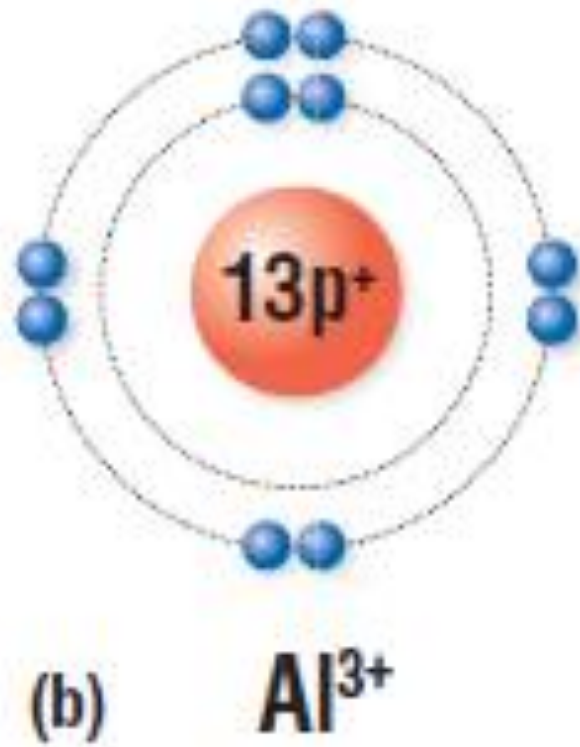
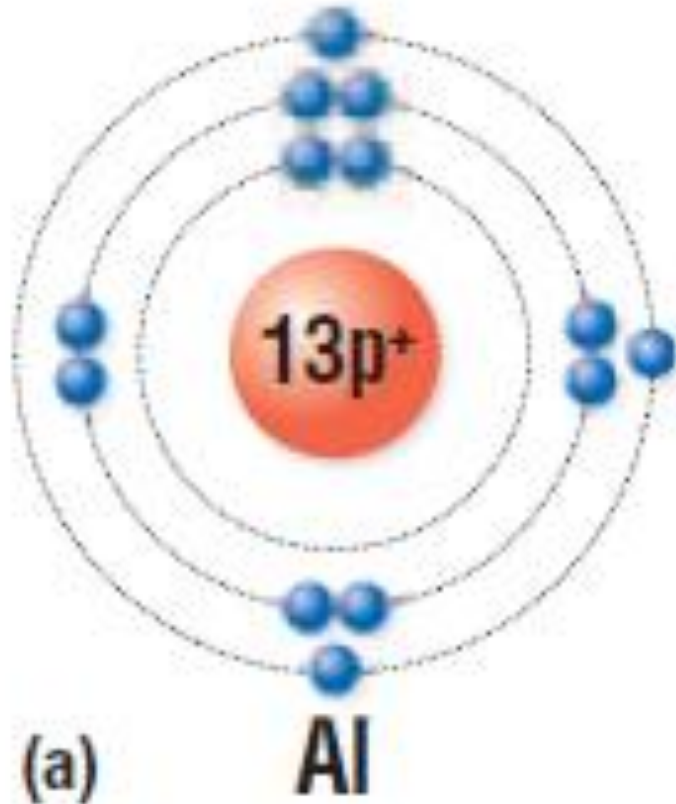
Valence electrons and Valence Number

Group	Valence e-	Valence #
1 (alkali metals)	1	1
2 (alkaline earth metals)	2	2
13	3	3
14	4	4
15	5	3
16	6	2
17 (halogens)	7	1
18 (noble gases)	8	0

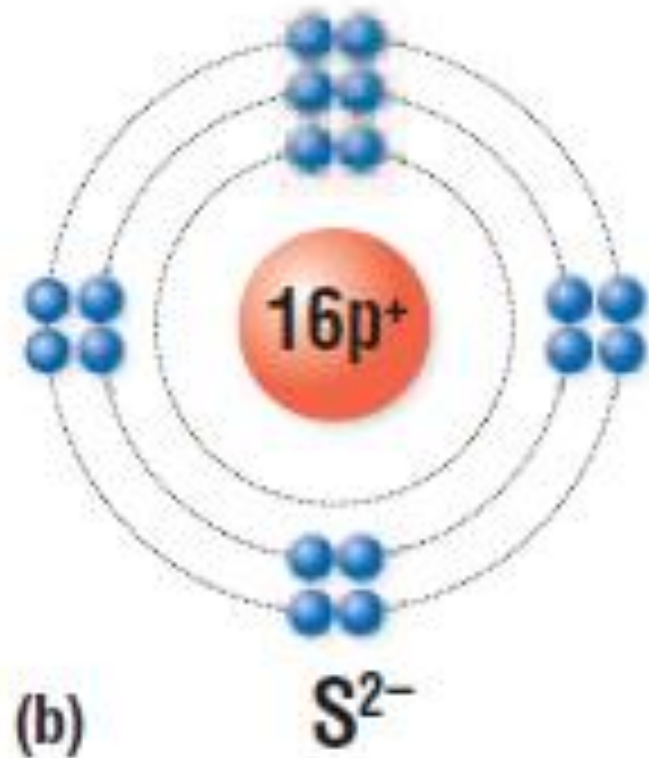
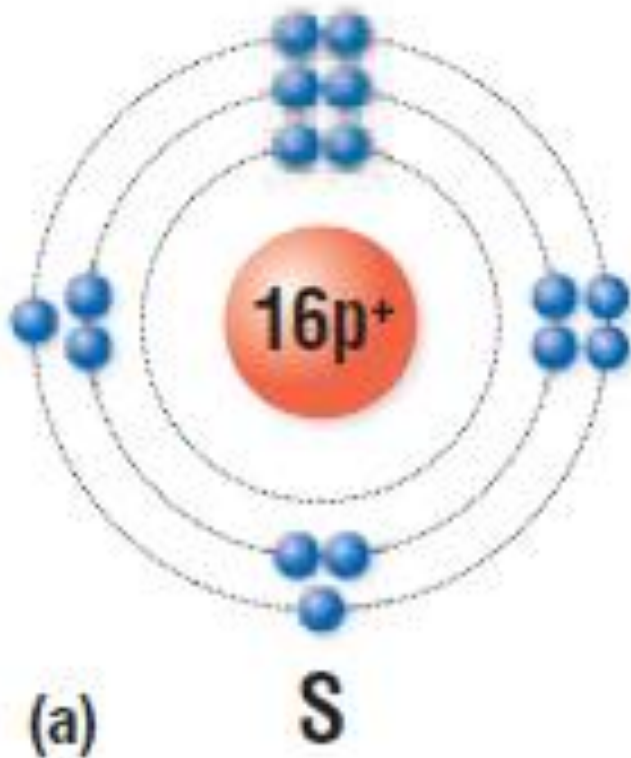
How Cool is That??!!!



Let's look at a comparison between Atoms and Ions



Let's look at a comparison between Atoms and Ions





You'll get a charge out of this....

Atoms and Ions

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Chapter 5 Quiz on Tuesday

5.4 – 5.5

Did you do the

'Mystery Gases' Lab last year?