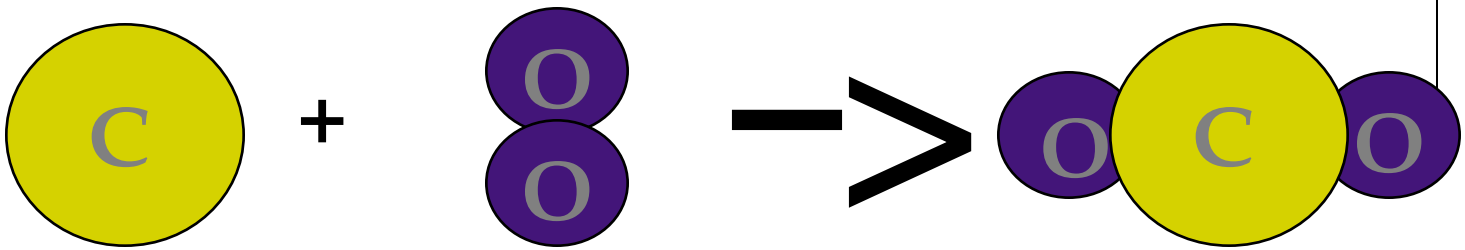
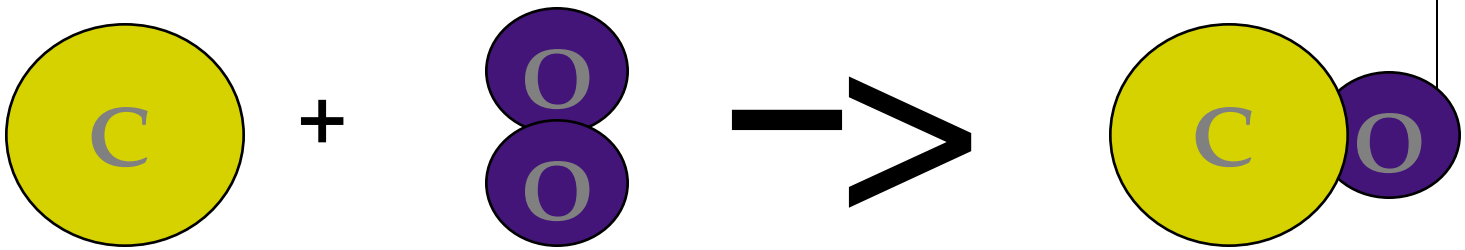
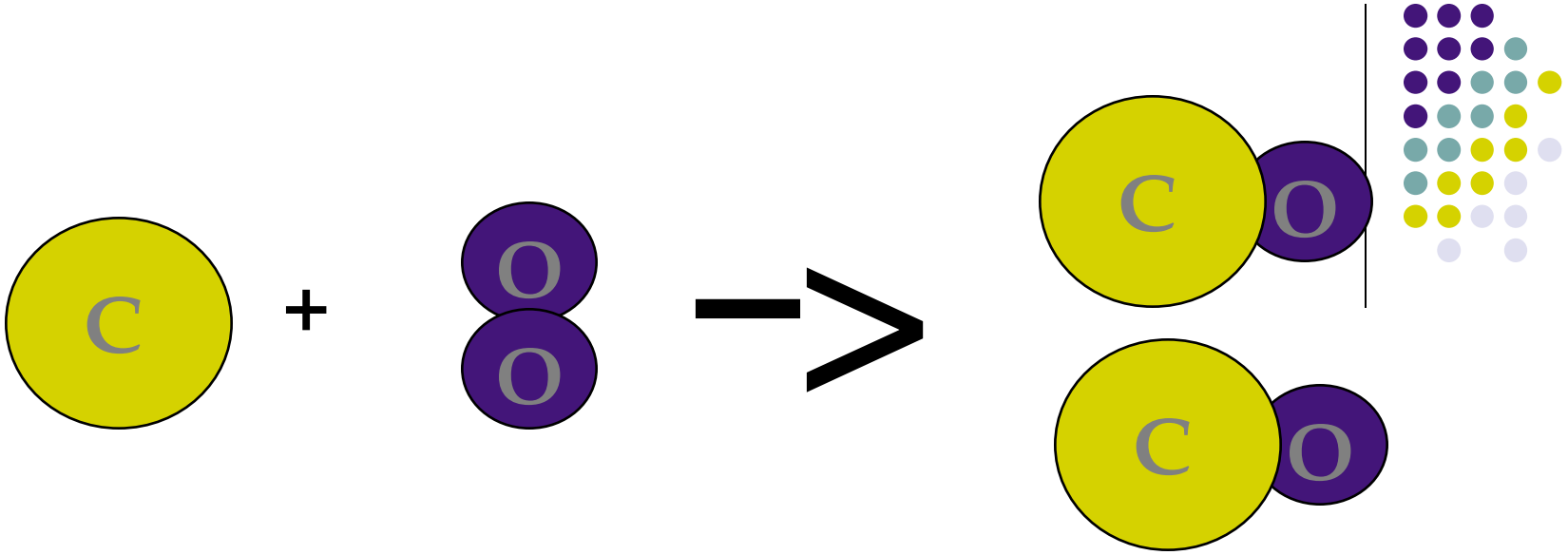


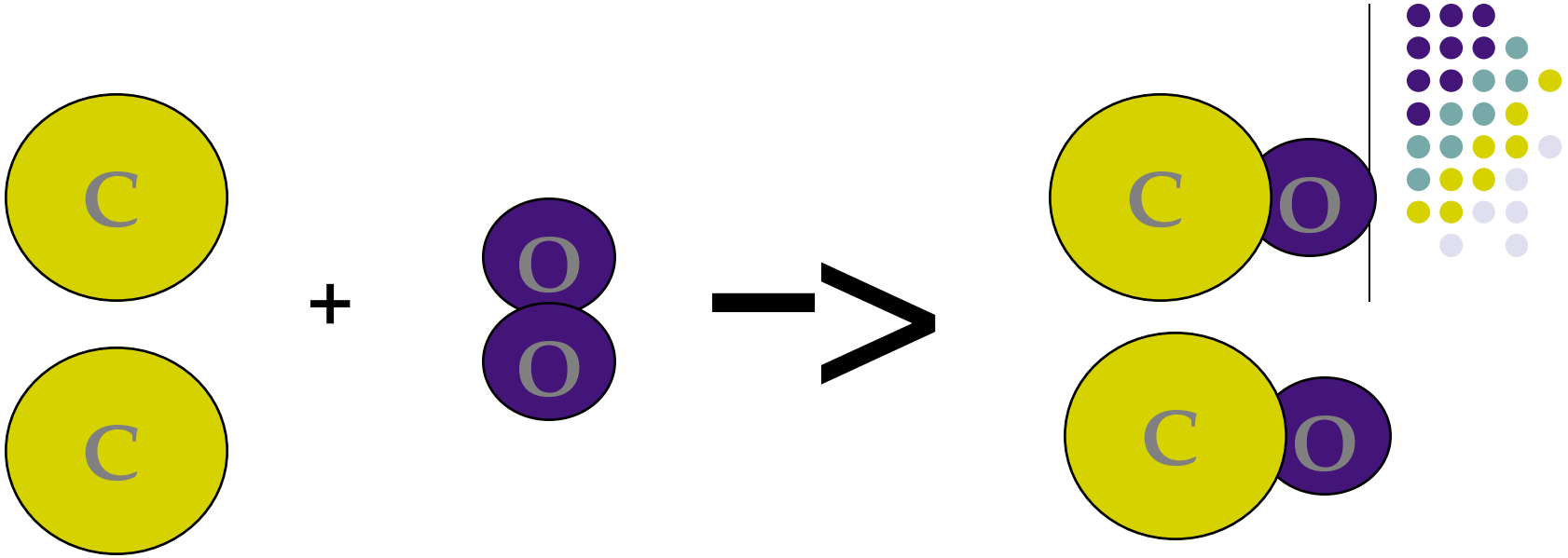

- $C + O_2 \rightarrow CO_2$
- This equation is already balanced
- What if it isn't?




- $C + O_2 \rightarrow CO$
- We need one more oxygen in the products.
- Can't change the formula, because it describes what it is (carbon monoxide in this example)

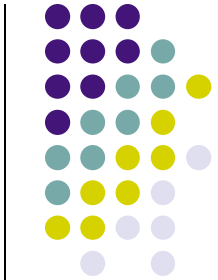



- Must be used to make another CO
- But where did the other C come from?




- Must have started with two C
- 2 C + $O_2$ –> 2 CO

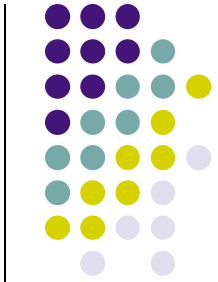
# Rules for balancing:



1. Assemble, write the correct formulas for all the reactants and products
2. Count the number of atoms of each type appearing on both sides
3. Balance the elements one at a time by adding coefficients (the numbers in front) - save H and O until LAST!
4. Check to make sure it is balanced.


- Never change a subscript to balance an equation.
  - If you change the formula you are describing a different reaction.
  - $H_2O$ is a different compound than $H_2O_2$
- Never put a coefficient in the middle of a formula
  - 2 NaCl is okay, Na2Cl is not.

# Example



$$H_2 + O_2 \rightarrow H_2O$$

# Example

$$H_2 + O_2 \rightarrow H_2O$$

| R | | P |
|---|---|---|
| 2 | H | 2 |
| 2 | O | 1 |

Need twice as much O in the product

# Example

$$H_2 + O_2 \rightarrow 2\,H_2O$$

| | R | | P |
|---|---|---|---|
| 2 | H | 2 | |
| 2 | O | 1 | |

Changes the O

# Example

$$H_2 + O_2 \rightarrow 2\,H_2O$$

| R | | P | |
|---|---|---|---|
| 2 | H | 2 | |
| 2 | O | ~~1~~ | 2 |

Also changes the H

# Example

$$H_2 + O_2 \rightarrow 2\,H_2O$$

| | R | | P |
|---|---|---|---|
| 2 | H | ~~2~~ | 4 |
| 2 | O | ~~1~~ | 2 |

Need twice as much H in the reactant

# Example

$$2\,H_2 + O_2 \rightarrow 2\,H_2O$$

| R | | P | |
|---|---|---|---|
| 2 | H | ~~2~~ | 4 |
| 2 | O | ~~1~~ | 2 |

Recount

# Example

$$2\,H_2 + O_2 \rightarrow 2\,H_2O$$

| | R | | P | |
|---|---|---|---|---|
| 4 | ~~2~~ | H | ~~2~~ | 4 |
| 2 | | O | ~~1~~ | 2 |

The equation is balanced, has the same number of each kind of atom on both sides

# Balancing Examples

- _$AgNO_3$ + _Cu −> _$Cu(NO_3)_2$ + _Ag
- _Mg + _$N_2$ −> _$Mg_3N_2$
- _P + _$O_2$ −> _$P_4O_{10}$
- _Na + _$H_2O$ −> _$H_2$ + _NaOH
- _$CH_4$ + _$O_2$ −> _$CO_2$ + _$H_2O$