[TP] What does the following chemical equation tell us?

$$Cu(s) + 2\ Ag^{+}(aq) \rightleftharpoons Cu^{2+}(aq) + 2\ Ag(s)$$

14% 1. If 0.731 mol Cu reacts, then 0.731 mol Cu^{2+} will be formed
14% 2. 2 mol of Ag^{+} will form 1 mol Cu^{2+}
14% 3. 10 g Cu will form 10 g Cu^{2+}
14% 4. 1 and 3
14% 5. 2 and 3
14% 6. All of the above
14% 7. None of the above

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Lecture 11 CH101 A1 (MWF 9:05 am)

Friday, September 28, 2018

For today ...

- Postscript on atmospheric warming

Begin ch5: Chemical reaction, chemical equations

- What a chemical equation tells us
- Balancing chemical equations
- Stoichiometry: Amounts in chemical transformations

Next lecture: Complete ch5: Limiting reagent and percent yield

Representative questions: 5.4, 5.7, 5.11, 5.17, 5.37, 5.43, 5.47

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Timeline of Earth's average temperature …

… since the last ice age glaciation

When people say "the climate has changed before,"
these are the kind's of changes they're talking about.

http://xkcd.com/1732/

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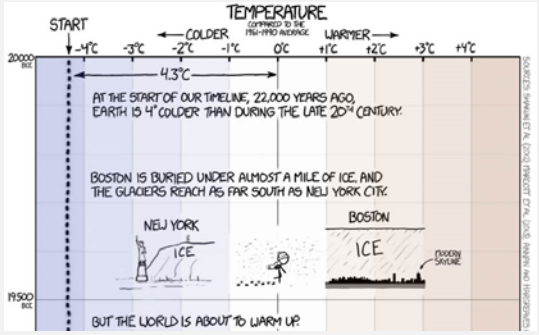
Timeline of Earth's average temperature …



http://xkcd.com/1732/

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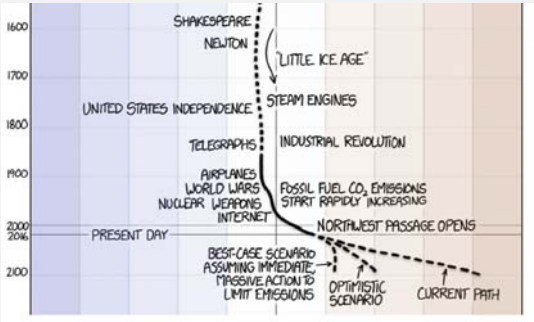
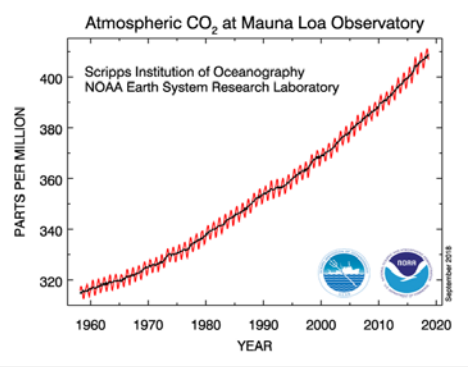
Timeline of Earth's average temperature …



http://xkcd.com/1732/

And so it goes …



Ch5: Chemical reaction, chemical equations

A chemical equation tells us …

$$\mathrm{Cu}(s) + 2\ \mathrm{Ag}^{+}(aq) \rightleftharpoons \mathrm{Cu}^{2+}(aq) + 2\ \mathrm{Ag}(s)$$

- Relative amounts (in mol) of species that are needed to react and that could be formed

A chemical equation cannot tell us …

$$Cu(s) + 2\ Ag^+(aq) \rightleftharpoons Cu^{2+}(aq) + 2\ Ag(s)$$

- How much of each species reacts
- How much reactants are present
- Which direction is spontaneous
- Whether energy is released or absorbed
- How fast a reaction proceeds
- The microscopic mechanism of the reaction

All of these are goals of the remainder of CH101 and CH102

[TP] What does the following chemical equation tell us?

$$Cu(s) + 2\ Ag^+(aq) \rightleftharpoons Cu^{2+}(aq) + 2\ Ag(s)$$

0% 1. If 0.731 mol Cu reacts, then 0.731 mol Cu^{2+} will be formed
0% 2. 2 mol of Ag^+ will form 1 mol Cu^{2+}
0% 3. 10 g Cu will form 10 g Cu^{2+}
0% 4. 1 and 3
0% 5. 2 and 3
0% 6. All of the above
0% 7. None of the above

Balancing chemical equations (by inspection)

$$C_6H_{12}O_6(s) + O_2(g) \rightarrow CO_2(g) + H_2O(l)$$

- Adjust coefficients (but never change subscripts)
- Coefficients are molar amounts, so fractions OK
- Set coefficient of most complicated molecule to 1
- Save elements for last
- Don't forget about states (s, l, g, and aq)
- Check your final result (never partial credit!)

Practice

$$C_6H_{12}O_6(s) + O_2(g) \rightarrow CO_2(g) + H_2O(l)$$

$$\mathbf{C_6}H_{12}O_6(s) + O_2(g) \rightarrow \mathbf{6\ C}O_2(g) + H_2O(l)$$

$$C_6\mathbf{H_{12}}O_6(s) + O_2(g) \rightarrow 6\ CO_2(g) + \mathbf{6\ H_2}O(l)$$

$$C_6H_{12}\mathbf{O_6}(s) + \mathbf{6\ O_2}(g) \rightarrow \mathbf{6}\ CO_2(g) + \mathbf{6}\ H_2O(l)$$

Stoichiometry: Amounts in chemical transformations

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[TP] Intense exercise uses lactic acid,
$CH_3CH(OH)C(O)OH$ and shown at below,
as a combustion fuel. How many moles of carbon dioxide are formed for each mole of lactic acid "burned" completely in the oxygen of air, forming CO_2 and water?

20% 1. 3 mol CO_2
20% 2. 6 mol CO_2
20% 3. 9 mol CO_2
20% 4. 12 mol CO_2
20% 5. None of the above

Lactic Acid

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[Quiz] How many mol of O_2 are needed to completely burn exactly 3 mol of butane, $CH_3CH_2CH_2CH_3$, to form carbon dioxide and water?

0% 1. 4
0% 2. 8
0% 3. 12
0% 4. 18
0% 5. 26
0% 6. 32
0% 7. Something else

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