FE Other Disciplines Practice Exam and Technical Study Guide Errata

This product has been updated to incorporate all changes shown in the comments on the webpage and email comments as of January 1, 2021.

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$$\Delta E = (1.1) - 0.014 = 1.086\,V$$

The lowered concentration of reactants causes the voltage potential to drop. The opposite would be true if the concentration of reactants was greater than the concentration of products.

3.0 Acids & Bases

An acid is a compound that donates a proton. A base is a compound that accepts a proton. The most common examples of acids and bases are shown below.

$$Acid \rightarrow H^+ \ (gives + proton\ to\ become\ neutral)$$

$$Base \rightarrow \ OH^- \ (accepts + proton\ to\ become\ neutral)$$

3.1 Measuring pH

A typical pH sensor that will measure the acidity or basicity level of a liquid solution. The pH scale is a logarithmic scale that inversely indicates the amount of hydrogen ions in the liquid solution. The more hydrogen ions in a solution will result in a lower pH. A high pH is indicative of a basic solution. The less hydrogen ions in a solution will result in a higher pH. A low pH is indicative of an acidic solution.

$$Acidic \rightarrow ph < 7 \rightarrow More\ H^+ \ \&\ Less\ OH^-$$

$$Basic \rightarrow ph > 7 \rightarrow Less\ H^+ \ \&\ More\ OH^-$$

The FE handbook has the pH equation shown in its Chemistry section, which is also shown below.

$$pH = \log_{10}\left(\frac{1}{[H^+]}\right) = -\log_{10}([H^+])$$

As you can see, pH is a function of the concentration hydrogen ions as opposed to the hydroxide ions.

4.0 Chemical Reactions

A chemical reaction changes a substance(s) chemical identity. A substance's chemical identity consists of the type, number and configuration of the substance's atoms. As an example, consider the following chemical reaction which converts methane and oxygen into carbon dioxide and water.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

The methane and oxygen's chemical identity have been changed. This type of chemical reaction is called combustion.

(a) -4

(b) -3

(c) -2

(d) +1

6.5 Solution 5 – Chemical Reactions

Given the following chemical reaction and 2 L of a 1.0 M HCL solution and 1.5 L of a 0.5 M NaOH solution, what will be the number of NaCl moles produced?

$$HCl + NaOH \rightarrow NaCl + H_2O$$

First, you need to determine the number of moles of each reactant.

$$Moles\ of\ HCl = 1.0\frac{mol}{L} * 2\ L = 2\ mols$$

$$Moles\ of\ NaOH = 0.5\frac{mol}{L} * 1.5\ L = 0.75\ mols$$

The NaOH is the limiting reactant. The moles of NaCl produced will equal the number of NaOH moles, so the moles of water produced will be 0.75 moles.

The correct answer is most nearly, (a) 0.75 mols.

(a) 0.75

(b) 1.0

(c) 1.5

(d) 2.0

6.6 Solution 6 – Chemical Reactions

Given the following chemical reaction and 10 mg of HCl, what will be the number of Mg moles to create a balanced chemical reaction?

$$\_\_\_Mg + \_\_\_HCl \rightarrow \_\_\_\_MgCl_2 + \_\_\_\_H_2$$

First, you need to balance the chemical reaction. Start with the most complex reactant, which is HCl.

$$\_\_\_Mg + 2HCl \rightarrow \_\_\_\_MgCl_2 + 1H_2$$