Environmental Systems

Assignment for May 4 – May 8, 2020

1. Read the paragraph
2. Answer all questions using information provided in reading.
3. Please take a picture of your work and send to your teacher.

Please contact your assigned teacher with questions regarding your assignment(s):

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Name______________________________ Class ________________ Date ________________

Skills Worksheet

Active Reading

Environmental Systems page 1

Section 2: Water Use and Management

Read the passage below and answer the questions that follow.

Industry accounts for more than 19 percent of water used in the world. Water is used to manufacture goods, to dispose of waste, and to generate power. The amount of water needed to manufacture everyday items can be astounding. For instance, nearly 1,000 L of water are needed to produce 1 kg of aluminum, and almost 500,000 L of water are needed to manufacture an automobile. Vast amounts of water are required to produce computer chips and semiconductors.

Most of the water that is used in industry is used to cool power plants. Power-plant cooling systems usually pump water from a surface water source such as a river or lake, carry the water through pipes in a cooling tower, and then pump the water back into the source. The water that is returned is usually warmer than the source, but it is generally clean and can be used again.

IDENTIFYING MAIN IDEAS

One reading skill is the ability to identify the main idea of a passage. The main idea is the main focus or key idea. Frequently, a main idea is accompanied by supporting information that offers detailed facts about main ideas.

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

______ 1. How much water is needed to manufacture a car?
- a. 50,000 L
- b. 500,000 L
- c. 1,000 L
- d. 100,000 L

______ 2. The amount of water used in the world for industry is
- a. 500,000 L.
- b. vast amounts.
- c. 19 percent.
- d. 1,000 L.

______ 3. Water is used in industry mainly to
- a. cool power plants.
- b. keep machinery running.
- c. clean huge cooling towers.
- d. create steam, which is then used for energy.

______ 4. Water that is returned to a river from a power plant cooling tower is
- a. cooler than the river and contaminated.
- b. warmer than the river and contaminated.
- c. cooler than the river but clean.
- d. warmer than the river but clean.

Read each question and write the answer in the space provided.

5. For what three purposes is water used in industry?

____

____

6. Name four items that the author uses as examples of the goods produced by industry.

____

____

SEQUENCING INFORMATION

One reading skill is the ability to sequence information, or to logically place items or events in the order in which they occur.

Write the three steps that show how a power plant's cooling system works.

7. First,

____

____

8. Next,

____

____

9. Finally,

____

____

RECOGNIZING CAUSE AND EFFECT

One reading skill is the ability to recognize cause and effect.

In the space provided, write the letter of the term or phrase that best completes each statement.

______ 10. Because water is used to cool power plants, it is returned to its source

a. cleaner. c. hotter.
b. faster. d. cooler.

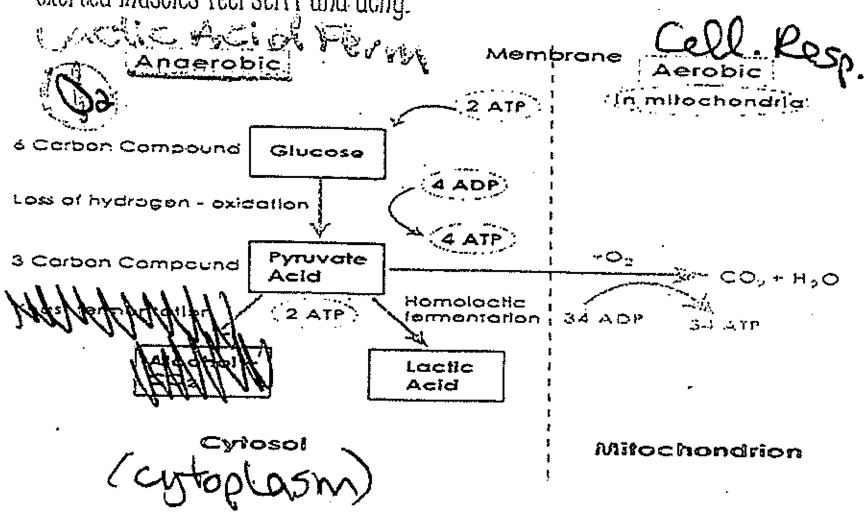
______ 11. Industry uses water to

a. manufacture goods. c. generate power.
b. dispose of waste. d. All of the above

Biology : Read the information and answer questions on the following page.

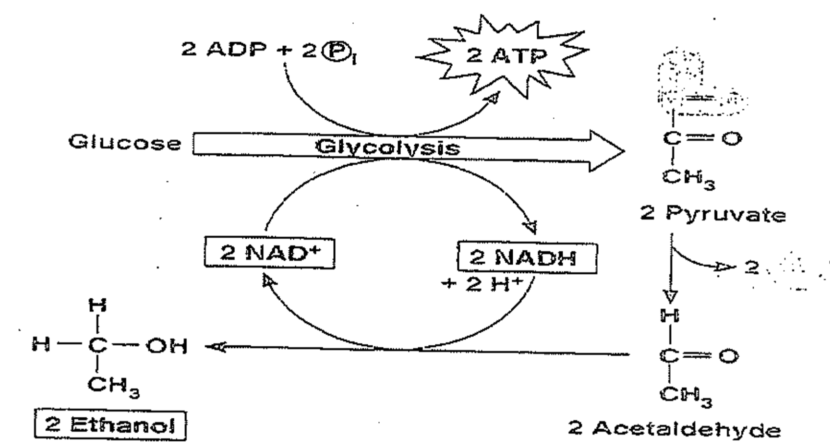
Lactic Acid Fermentation

- Lactic acid fermentation is anaerobic and is done by some fungi, some bacteria, and sometimes by our muscles to get energy. ↳ no oxygen
- Lactic acid in yogurt gives it its sour taste, lactic acid produced by the bacteria and/or fungi in many cheeses gives those cheeses their characteristic flavors, and it is the presence of lactic acid in our muscles that makes them so sore after excessive use.
- Normally our muscles go through cellular respiration, using O_2 supplied via our lungs and blood.
- However, under greater exertion when the oxygen supplied by the lungs and blood system can't get there fast enough or energy can't be made quickly enough, our muscles can switch over and make ATP through lactic acid fermentation.
- In the process of lactic acid fermentation, the pyruvates created during glycolysis are broken into lactic acid and CO_2, which produces only 2 ATP molecules.
- Until the lactic acid trapped in our muscles is gradually washed away by the blood stream and carried to the liver (which is able to deal with it), our over-exerted muscles feel stiff and achy.



Alcoholic Fermentation

- Alcoholic fermentation is anaerobic done by some yeasts and other organisms to get energy ↳ no oxygen
- In alcoholic fermentation, glucose is broken down into 2 pyruvates which releases a net gain of 2 ATP molecules.
- CO_2 and ethanol are released as byproducts
- Yeast is present in dough and as it releases CO2, the dough rises. The alcohol evaporates when baking, which leaves the "holes" in the bread.



(a) Alcohol fermentation

a

Biology

Name ______________________________ Period ________ Date _______________

1. Lactic acid fermentation is ______________________ (no oxygen).

2. What makes our muscles sore after excessive use?

3. Explain the process of lactic acid fermentation.

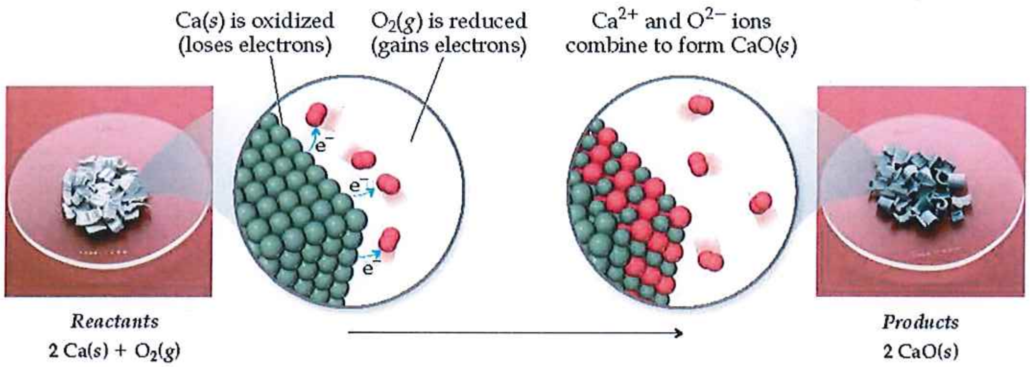
4. What has to happen to make our overexerted muscles stop feeling stiff and achy?

5. Alcoholic fermentation is __________________________ (no oxygen).

6. What happens during alcoholic fermentation?

7. What are the byproducts of alcoholic fermentation?

AP Chemistry Assigned May 4, Due May 18



▲ **FIGURE 4.12 Oxidation of calcium metal by molecular oxygen.** The oxidation involves transfer of electrons from the calcium metal to the O_2, leading to formation of CaO.

Oxidation Numbers

Before we can identify an oxidation-reduction reaction, we must have a bookkeeping system—a way of keeping track of electrons gained by the substance being reduced and electrons lost by the substance being oxidized. The concept of oxidation numbers (also called *oxidation states*) was devised as a way of doing this. Each atom in a neutral substance or ion is assigned an **oxidation number**. For monatomic ions the oxidation number is the same as the charge. For neutral molecules and polyatomic ions, the oxidation number of a given atom is a hypothetical charge. This charge is assigned by artificially dividing up the electrons among the atoms in the molecule or ion. We use the following rules for assigning oxidation numbers:

1. *For an atom in its **elemental form**, the oxidation number is always zero.* Thus, each H atom in the H_2 molecule has an oxidation number of 0 and each P atom in the P_4 molecule has an oxidation number of 0.
2. *For any **monatomic ion** the oxidation number equals the ionic charge.* Thus, K^+ has an oxidation number of +1, S^{2-} has an oxidation number of −2, and so forth. In ionic compounds the alkali metal ions (group 1A) always have a 1+ charge and therefore an oxidation number of +1. The alkaline earth metals (group 2A) are always +2, and aluminum (group 3A) is always +3 in ionic compounds. (In writing oxidation numbers we will write the sign before the number to distinguish them from the actual electronic charges, which we write with the number first.)
3. ***Nonmetals*** usually have negative oxidation numbers, although they can sometimes be positive:
   (a) *The oxidation number of **oxygen** is usually −2 in both ionic and molecular compounds.* The major exception is in compounds called peroxides, which contain the $O_2{}^{2-}$ ion, giving each oxygen an oxidation number of −1.
   (b) *The oxidation number of **hydrogen** is usually +1 when bonded to nonmetals and −1 when bonded to metals.*
   (c) *The oxidation number of **fluorine** is −1 in all compounds.* The other ***halogens*** have an oxidation number of −1 in most binary compounds. When combined with oxygen, as in oxyanions, however, they have positive oxidation states.
4. *The **sum of the oxidation numbers** of all atoms in a neutral compound is zero. The sum of the oxidation numbers in a polyatomic ion equals the charge of the ion.* For example, in the hydronium ion H_3O^+ the oxidation number of each hydrogen is +1 and that of oxygen is −2. Thus, the sum of the oxidation numbers is $3(+1) + (-2) = +1$, which equals the net charge of the ion. This rule is useful in obtaining the oxidation number of one atom in a compound or ion if you know the oxidation numbers of the other atoms, as illustrated in Sample Exercise 4.8.

It's important to remember that in every oxidation-reduction reaction, the oxidation numbers of at least two atoms must change. The oxidation number increases for any atom that is oxidized and decreases for any atom that is reduced.

GIVE IT SOME THOUGHT

What is the oxidation number of nitrogen (a) in aluminum nitride, AlN, and (b) in nitric acid, HNO_3?

SAMPLE EXERCISE 4.8 Determining Oxidation Numbers

Determine the oxidation number of sulfur in (a) H_2S, (b) S_8, (c) SCl_2, (d) Na_2SO_3, (e) SO_4^{2-}.

SOLUTION

Analyze We are asked to determine the oxidation number of sulfur in two molecular species, in the elemental form, and in two substances containing ions.

Plan In each species the sum of oxidation numbers of all the atoms must equal the charge on the species. We will use the rules outlined previously to assign oxidation numbers.

Solve

(a) When bonded to a nonmetal, hydrogen has an oxidation number of +1 (rule 3b). Because the H_2S molecule is neutral, the sum of the oxidation numbers must equal zero (rule 4). Letting x equal the oxidation number of S, we have $2(+1) + x = 0$. Thus, S has an oxidation number of −2.

(b) Because this is an elemental form of sulfur, the oxidation number of S is 0 (rule 1).

(c) Because this is a binary compound, we expect chlorine to have an oxidation number of −1 (rule 3c). The sum of the oxidation numbers must equal zero (rule 4). Letting x equal the oxidation number of S, we have $x + 2(-1) = 0$. Consequently, the oxidation number of S must be +2.

(d) Sodium, an alkali metal, always has an oxidation number of +1 in its compounds (rule 2). Oxygen has a common oxidation state of −2 (rule 3a). Letting x equal the oxidation number of S, we have $2(+1) + x + 3(-2) = 0$. Therefore, the oxidation number of S in this compound is +4.

(e) The oxidation state of O is −2 (rule 3a). The sum of the oxidation numbers equals −2, the net charge of the SO_4^{2-} ion (rule 4). Thus, we have $x + 4(-2) = -2$. From this relation we conclude that the oxidation number of S in this ion is +6.

Comment These examples illustrate that the oxidation number of a given element depends on the compound in which it occurs. The oxidation numbers of sulfur, as seen in these examples, range from −2 to +6.

PRACTICE EXERCISE

What is the oxidation state of the boldfaced element in (a) P_2O_5, (b) NaH, (c) $Cr_2O_7^{2-}$, (d) $SnBr_4$, (e) BaO_2?

Answers: (a) +5, (b) −1, (c) +6, (d) +4, (e) −1

Oxidation of Metals by Acids and Salts

The reaction between a metal and either an acid or a metal salt conforms to the general pattern

$$A + BX \longrightarrow AX + B \qquad [4.24]$$

Examples:

$$Zn(s) + 2\,HBr(aq) \longrightarrow ZnBr_2(aq) + H_2(g)$$

$$Mn(s) + Pb(NO_3)_2(aq) \longrightarrow Mn(NO_3)_2(aq) + Pb(s)$$

These reactions are called **displacement reactions** because the ion in solution is *displaced* (replaced) through oxidation of an element.

4.48 Determine the oxidation number of sulfur in each of the following substances: (a) barium sulfate, $BaSO_4$, (b) sulfurous acid, H_2SO_3, (c) strontium sulfide, SrS, (d) hydrogen sulfide, H_2S. (e) Based on these compounds what is the range of oxidation numbers seen for sulfur? Is there any relationship between the range of accessible oxidation states and sulfur's position on the periodic table?

4.50 Determine the oxidation number for the indicated element in each of the following compounds: (a) Co in $LiCoO_2$, (b) Al in $NaAlH_4$, (c) C in CH_3OH (methanol), (d) N in GaN, (e) Cl in $HClO_2$, (f) Cr in $BaCrO_4$.

4.51 Which element is oxidized and which is reduced in the following reactions?

(a) $N_2(g) + 3\,H_2(g) \longrightarrow 2\,NH_3(g)$

(b) $3\,Fe(NO_3)_2(aq) + 2\,Al(s) \longrightarrow 3\,Fe(s) + 2\,Al(NO_3)_3(aq)$

(c) $Cl_2(aq) + 2\,NaI(aq) \longrightarrow I_2(aq) + 2\,NaCl(aq)$

(d) $PbS(s) + 4\,H_2O_2(aq) \longrightarrow PbSO_4(s) + 4\,H_2O(l)$