ISSUE 2

Contents

SWF - Searching for Words in Files Or, DIY Concordancing

This is a piece of software which may interest colleagues produced by communications graduate Martin Belyanov. With this software you can scan text files for occurrences of certain phrases, prefixes, grammar points, items of lexis etc.

1. First of all you click on the SWF icon to open this window.

2. Then, you select which text files you want to scan for the given phrase.

3. At this point, you click on the binoculars icon and type in the phrase you are looking for, eg. ‘political’ (you could type ‘have been’ or ‘ing’ as a suffix).

4. The result is a file of context sentences with the selected phrase which can be saved as normal and used for language work.

My personal thanks go to Martin for this creation.

Magdalena Tsavkova
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A "concept map" is one of the activities used in today's classroom for expressing the logic and relationships between studied terms in a way that allows students to be creative. On one hand, the key word is concept, i.e. students have to understand the meaning and application of covered material. On the other hand, it is called a map because the main purpose is to find the way different things are related. It is very hard and boring sometimes for teachers to define specific for the subject terms, and to expect students to memorize them. Still our students need to have a clear picture of this "set of definitions" because they will need this particular knowledge for further understanding of the subject matter. "Concept mapping" activity will break the traditional lecture and instead of repeating and dictating definitions you will see your students trying to find their own way of learning the concept discussed in the classroom. There are different versions of this activity:

1. Students are constructing their own maps as part of their work in the classroom under the assistance of the teacher – this is good approach for summary or exercise lessons;
2. The teacher gives the activity as a homework and than evaluates it;
3. The teacher constructs the concept map, leaves empty space (blanks) to be filled in the classroom – this is more appropriate for new lessons and serves as a worksheet, but the teacher have to have a copy for every student or at least an overhead transparency.

Here are some suggestions for doing this activity in the classroom:

(Please note that you could be flexible and decide what is best for your students)

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Here are some suggestions for doing this activity in the classroom:

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I hope you will find this activity useful in your classroom no matter what subject you are teaching. I welcome all suggestions and recommendations that you can send to: magy@mail.acs.bg

1. Divide students into groups;
2. Provide them with a blank peace of paper – the format doesn't matter;
3. Give them instructions – oral, written on the board, or a handout for each group;
4. Before the activity, review the terms you want to be included – explain every word with examples and possible applications. The time is approximate but spend at least 10 minutes, may be more if the terms are new and require lots of explanations.

   !!! It is very important that students see the terms they are supposed to relate either on the board or in their notebooks;

5. Tell your students that it is important to make connections between terms and to think about what relationships they are using;
6. You may want to extend this activity by asking each group to write a paragraph describing their point;
7. Estimate the time, may be 15 – 20 minutes are enough, and then ask each group to present for about 2 minutes;
8. Make conclusions, summarize and encourage student's work.

And here are some instructions you can give to your students:

Building a Concept Map for Atomic Structure and Bonding

1. Working within your group construct a concept map that relates the following studied terms: *atom, subatomic particles, metals, nonmetals, ionic bond, covalent bond, molecules, crystals, ions;*
2. Place circles or rectangles around the terms and connect them with lines;
3. The final "map" may look like a scheme or table, but it is better if you find your own way of placing terms and examples on the piece of paper.

Be creative! There is not just one correct way of doing this…

An example of a concept map, used as a handout to be filled in the classroom, is attached for **"Solutions and their characteristics"**.

JIGSAW READING EXERCISES IN SCIENCE CLASSES

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Jigsaw reading is a popular exercise in language-practice books and tests. In short, the task is to put the jumbled pieces of a text in the right order. My purpose here is to give some ideas of how this type of exercise could be successfully used in science classes, depending on the content of the chosen text.

Choice of text

When choosing a text, it is convenient to use the current book as a source. In my opinion, this exercise also gives science teachers an excellent opportunity to introduce some extra materials to their classes and later focus students' attention on specific language, style, format, etc.

Breaking the text

The text should be cut into meaningful pieces, their length varying from a single phrase to a whole paragraph, depending on the length of the whole piece and the desired level of difficulty. This makes the exercise perfectly applicable in mixed-ability groups where one and the same target text may be divided in different ways so that the pieces are easier or more difficult to rearrange. For advanced students some words in each piece may be wiped out (like in a Cloze test) so that their task becomes even harder. Thus all students benefit from the same text completing graded tasks suitable for their abilities. In any case, however, the teacher should make sure that there are both logical and linguistic clues in each piece showing its unique place in the whole text, so that students need to use both their understanding of the matter and knowledge of the language.

Procedure

One way of doing the exercise is to give everybody in the group access to the whole set if pieces, no matter whether students work individually or/and in pairs or/and in groups according to their abilities (weaker students might feel more comfortable working in a team). Thus the exercise practises mainly reading comprehension and takes less time.

To make the exercise more communicative, although it may be more time-consuming, the teacher could divide the class into pairs or/and groups. Then each student gets a piece or some pieces of the text and their partner/s take the rest of them. Students share the content of their pieces retelling them and then, through a discussion, decide on the order of the pieces.

Finally, there comes the checking stage followed by a discussion of the scientific and linguistic details.

As a follow-up, students could be asked to give each part of the text a title: either a phrase or a key-word. What they will have as a result will be a plan of the whole piece. This is a useful activity because getting students' attention focused on the structure of a scientific text is a step to teaching academic writing. If the text is accompanied by illustrative material, students may be asked to match each figure with the part it illustrates.

Example

For the sample material I have used two books. The text is taken from "Biology for the 9 class" by M. Shishinova et. al., Gera Art, Sofia 1999, page 10. The illustrations are from "Biology for the 8 class" by N. Nachev et. al., Prosveta, Sofia 1992, page 14, fig. 2.5. I have chosen the topic of cell division because there is a clear logic in it. The text is divided in such a way that each stage of the process is a separate part. I have also wiped out the words "first", "second", etc. because they make the exercise fairly easy. Students' first task is to arrange the pieces in the right order. Then they get the illustrations and match them with the corresponding paragraph. As a follow-up, students are asked to pick out the key words for each stage and later the linking words. If students work individually, the whole exercise would take 15 to 20 minutes at the most. In the sample sheets the broken line means "cut here".

In conclusion, I would like to summarise some of the advantages of jigsaw reading exercises. In terms of cognitive value, they develop logical thinking and ability for understanding scientific texts. Linguistically, they increase students' awareness of text structure and scientific jargon. Technically, this is a heterogeneous type of exercise, i.e. it could be successfully used in mixed-ability groups. It may serve as an introductory material, a recycling exercise or an assessment task. Depending on how exactly the classwork is organised, this exercise can take from a few minutes to an hour. The only disadvantage might be the cost of photocopying but once being prepared, the same set of copies can be used for years.

Acknowledgements

None of the exercises mentioned above is virtually new, but as I have no information about their origin, I would like to thank all teachers, textbook and practicebook writers who use them in their work.

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Introduction

Photosynthesis and cellular respiration can be thought of as opposite, yet interdependent, processes.

A. Photosynthesis involves the conversion of light energy, carbon dioxide, and water into glucose, other sugars, and organic compounds; it is the most important mechanism by which oxygen is produced. Oxygen is required for the final stage of cellular respiration.

B. Cellular respiration involves the conversion of glucose and other sugars into high-energy phosphate compounds, carbon dioxide, and water. Photosynthesis prevents toxic carbon dioxide levels from accumulating in the atmosphere.

Cellular Metabolism

A. Metabolic Pathways

1. The term **metabolism** refers to the entire set of simultaneous chemical reactions in a living cell or organism. Metabolism is an essential characteristic of all living organisms.

a. Metabolic reactions occur in "chains" or pathways. In a metabolic pathway, the product of reaction 1 would be a reactant in reaction 2, and so forth. Many pathways are branched because particular molecules enter more than one alternative reaction.

b. Enzyme regulation. Each reaction is catalyzed by a different enzyme. Enzyme regulation controls which pathways are involved in a reaction and to what extent

1. There are two general types of metabolic pathways in living cells.

a. Catabolic pathways result in the decomposition of organic molecules into their simpler components. Catabolism releases the chemical energy stored in the chemical bonds of organic molecules

b. Anabolic pathways result in the synthesis of organic molecules from their simpler components. Anabolism requires an input of chemical energy, storing the energy in organic molecules.

3. Coupled processes. In cells, catabolic pathways provide the chemical energy needed to drive anabolic pathways.

B. Chemical Energy and ATP

1. Obtaining organic molecules. Only plants and other photosynthetic organisms can synthesize their own organic molecules using energy absorbed from sunlight. All other organisms obtain organic molecules from their surroundings.

2. Decomposition of organic molecules releases energy. In all living cells, the chemical energy that is stored in organic molecules is released when these molecules are broken down in catabolic pathways. Some of this energy is lost as heat. The rest of the energy released by catabolism is used to synthesize ATP. ATP is the immediate energy source for cellular work (i.e., energy-requiring processes such as synthesis, movement, transport).

a. **ATP is synthesized** from ADP and inorganic phosphate (Pi) with an input of cellular energy. This phosphorylation reaction stores chemical energy in the unstable ("high-energy") phosphate bond of ATP.

ADP + Pi + energy -> ATP

a. **ATP is hydrolyzed** when the phosphate bond breaks, releasing the stored energy. The energy released by ATP hydrolysis is captured by the transfer of the phosphate to another molecule. This activates the other molecule to do work.

ATP -> ADP + Pi + energy

3. ATP synthesis is driven by catabolism of the six-carbon sugar glucose. The energy in glucose is released by either of two catabolic pathways.

a. Cellular respiration is the most prevalent and efficient catabolic pathway. Respiration requires the presence of oxygen (i.e., aerobic conditions).

b. Fermentation is a less efficient pathway and does not require oxygen. Fermentation occurs in many microorganisms, and it occurs under anaerobic conditions in some cells of higher organisms.

1. **Glucose catabolism** involves electron transfer reactions. The stepwise transfer of high-energy electrons from glucose releases energy to drive ATP synthesis.

a. Coupled oxidation-reduction reactions ("redox" reactions) involve the transfer of electrons from one compound to another.

1. **Oxidation** occurs when an organic compound loses (donates) electrons.

   Reduction occurs when a compound gains (accepts) electrons.

1. In a redox reaction, one molecule donates electrons, and the other accepts electrons. The electron donor is oxidized and the electron acceptor is reduced.
2. Hydrogen ions (protons) are transferred along with electrons in many redox reactions.

b. High-energy electrons are released from glucose and transferred to special molecules called **electron carriers,** which include the coenzymes nicotinamide adenine dinucleotide (NAD^+) and flavin adenine dinucleotide (FAD^+).

Cellular Respiration and Fermentation

A. Overview

1. The **overall reaction** for cellular respiration is:

$$C_6H_{12}O_6 + 6O_2 \text{ -> } 6CO_2 + 6H_2O + \text{Energy}$$

2. Respiration

a. During respiration, **glucose is completely oxidized to carbon dioxide.** Step-wise redox reactions release a substantial amount of energy for ATP synthesis. Overall, approximately 40% of the energy released from glucose is captured as ATP, and the rest is lost as heat.

b. In respiration, oxygen is the final electron acceptor. **Oxygen is reduced to water.**

a. **The respiration pathway includes three stages:** glycolysis, Krebs cycle, and the electron transport chain (ETC).

d. Most of the ATP production occurs in the final stage of respiration.

e. Glycolysis occurs in the cytoplasm of the cell, whereas the last two stages occur in the mitochondria.

3. Fermentation. During fermentation, glucose is only partially oxidized, and an organic molecule is reduced. Only a small amount of ATP is produced because the Krebs cycle and the ETC do not take place.

B. Glycolysis

1. Glycolysis can be summarized in the following equation:

$$\text{Glucose} + 2NAD^+ + 2ADP + 2Pi \text{ -> } 2 \text{ pyruvic acid} + 2NADH + 2H^+ + 2ATP$$

2. The reactions of the glycolysis pathway are catalyzed by enzymes in the cytoplasm.

In the first part of glycolysis, the **preparatory phase,** two molecules of ATP are consumed. Each molecule of glucose is split to form two molecules of a three-carbon compound, glyceraldehyde-3-phosphate (G3P).

In the second part of glycolysis, the **oxidative phase,** four molecules of ATP are synthesized by the direct transfer of a phosphate group from an intermediate molecule to ADP. This method of ATP synthesis is referred to as **substrate-level phosphorylation:**

X - P + ADP -> X + ATP

where X is an organic molecule.

(1) G3P is oxidized and two molecules of NAD^+ are reduced to NADH.

(2) Two molecules of the three-carbon compound pyruvic acid are produced.

3. The main outcomes of glycolysis are as follows:

a. **A net gain of two molecules of ATP per one molecule of glucose**

b. Transfer of high-energy electrons from glucose to NADH

c. Partial oxidation of glucose to form pyruvic acid (most of the chemical energy from glucose is in this organic compound)

(1) Pyruvic acid is converted to acetyl coenzyme A (acetyl CoA).

(a) In the presence of oxygen, pyruvic acid is transported from the cytoplasm into the mitochondria and converted to a two-carbon compound, **acetyl CoA.**

(b) One carbon is cleaved from pyruvic acid and released as carbon dioxide, pyruvic acid is oxidized, and NAD^+ is reduced. The resulting two-carbon compound is then attached to coenzyme A to form acetyl CoA.

(2) For each molecule of glucose that enters glycolysis, two molecules of acetyl CoA enter the next stage of respiration, the Krebs cycle.

C. The Krebs cycle is also known as the citric acid cycle or the tricarboxylic acid (TCA) cycle.

1. The Krebs cycle occurs in the **inner compartment or matrix of the mitochondria.**

2. This **series of reactions** can be summarized as follows:

a. Each molecule of acetyl CoA (a two-carbon compound) enters the Krebs cycle by combining with a four-carbon compound (i.e., oxaloacetate). This results in a six-carbon compound (i.e., citrate).
b. .In subsequent steps, two carbon dioxide molecules are removed from citrate, leaving a four-carbon compound. Stepwise redox reactions oxidize the organic intermediates and reduce three molecules of NAD^+ and one of FAD^+ to NADH and $FADH_2$ respectively.

c. One molecule of ATP is synthesized by substrate-level phosphorylation.

d. The four-carbon oxaloacetate is regenerated and is ready to combine with another incoming molecule of acetyl CoA.

3. The **main outcomes** of the Krebs cycle are as follows:

a. **Production of two molecules of ATP per glucose molecule**

b. Transfer of high-energy electrons to NADH and FADH+

D. Electron transport chain

1. The ETC is composed of a series of electron carriers located in the inner mitochondrial membrane (i.e., cristae). These carriers are mainly proteins with prosthetic groups (e.g., cytochrome with attached iron).

2. The reduced coenzymes produced by glycolysis and the Krebs cycle (10 NADH and 2 $FADH_2$ per glucose molecule) donate high-energy electrons to the ETC. The electrons are transferred from one carrier to the next in a series of redox reactions.

a. **The final acceptor is oxygen.** Oxygen has such a high affinity for electrons that it essentially pulls them down the chain.
b. **Oxygen is reduced to water** when, at the end of the chain, oxygen accepts the electrons combined with hydrogen ions (protons).

3. Proton pumps and the proton gradient. As electrons flow down the chain, NADH and $FADH_2$ release protons into the mitochondrial matrix. Some of the inner membrane proteins can pump protons into the intermembrane space (i.e., space between the inner and outer mitochondrial membranes). These **pumps generate an electrochemical concentration gradient** across the inner membrane, which is impermeable to protons. The proton gradient is a source of potential energy.

4. Energy is released as protons flow down their concentration gradient across the inner membrane. Protons can cross the membrane only by passing through a membrane-spanning protein complex called ATP synthase. This enzyme uses the released energy to phosphorylate ADP.

a. Chemiosmosis is the term for the coupling of proton flow to ATP synthesis.

b. During chemiosmosis, three molecules of ATP are generated for each molecule of NADH. Also, two molecules of ATP are generated for each molecule of $FADH_2$, which donates electrons at a later point in the ETC

1. **Oxidative phosphorylation** is the term used to describe the production of ATP using energy from the redox reactions of the ETC. Most of the ATP output of respiration is produced by oxidative phosphorylation.

TABLE 1. **Cellular Respiration Summary**

Process	Location	Input	Output (per glucose)
Glycolysis	Cytoplasm	Glucose	2 Pyruvic acid, 2 NADH. 2 ATP
Krebs cycle	Mitochondria— inner space, (matrix)	2 Pyruvic acid converted to 2 acetyl CoA	2 $NADH^+$ (pyruvic acid conversion step), 6 $NADH^+$, 2 $FADH_2$, 2 ATP
Electron transport chain and oxidative	Mitochondria— inner membrane	10 NADH, 2 $FADH_2$	32 ATP (12 H_2O)
phosphorylation	(cristae)		
Total: 36 ATP/glucose			

E. Anaerobic Pathways

1. Anaerobic pathways allow glucose catabolism to occur in the absence of oxygen. Table 2 compares cellular respiration and fermentation

2. Certain microorganisms are capable **of anaerobic respiration,** in which an inorganic compound is the final electron acceptor instead of oxygen. (For example, some bacteria reduce sulfates or nitrates in soil.)

3. Fermentation is an anaerobic pathway that occurs in many different microorganisms as well as in certain cell types in higher organisms (e.g., human muscle cells). The entire pathway occurs in the cytoplasm, and there is no ETC.

a. Fermentation pathways start with glycolysis, followed by production of fermentation waste products .This process partially oxidizes glucose to an organic molecule, which is then reduced by NADH. Most of the energy in glucose remains in an organic molecule.

b. A total of two molecules of ATP per one molecule of glucose are produced by **substrate-level phosphorylation** during glycolysis.

4. The various **types of fermentation pathways** differ in the waste products produced.

a. In **alcohol fermentation,** pyruvic acid releases carbon dioxide and forms a two-carbon compound, **acetaldehyde.** Acetaldehyde is reduced to form **ethanol,** and NADH is oxidized to regenerate NAD^+.

b. In **lactic acid fermentation,** pyruvic acid is reduced to lactic acid, and NADH is oxidized. Some cells, such as human muscle cells, can switch from cellular respiration to lactic acid fermentation when oxygen is depleted.

TABLE 2. Comparison of Respiration and Fermentation

	Cellular Respiration	**Fermentation**
Growth conditions	Aerobic	Aerobic or anaerobic
Electron transport chain	Yes	No
Final electron and hydrogen acceptor	Oxygen	Organic (e.g. acetaldehyde or pyruvic acid)
Method of making ATP	Mostly oxidative phosphorylation; some substrate-level phosphorylation	Substrate-level phosphorylation

Photosynthesis

A. Photosynthesis provides **nutrition** to almost all living things, either directly or indirectly.

1. **Photoautotrophs** use photosynthesis directly to synthesize organic molecules. Photoautotrophs include:

a. Plants

b. Multicellular algae (e.g., pond-living algae)

c. Some unicellular protists (e.g., *Euglena)*

d. **Some prokaryotes** (e.g., cyanobacteria)

2. Heterotrophs cannot produce their own organic food molecules; they obtain nutrition by eating other organisms or their byproducts. Heterotrophs include:

a. Multicellular eukaryotes (e.g., sponges, insects, fish, amphibians, mammals)

a. **Fungi,** which feed on decomposing organic matter

c. Some prokaryotes (e.g., unicellular bacteria that act as decomposers)

B. Organelles of Photosynthesis

1. Chloroplasts are the organelles of photosynthesis **of plants, multicellular algae,** and **protists.**

a. Chloroplasts contain an **inner membrane,** an **outer membrane, a fluid-filled stroma,** and **grana,** stacks of flattened sacs called **thylakoids** that form an extensive membrane system.

b. All green parts of the plant (i.e., the stem and leaves) contain intracellular chloroplasts. In multicellular algae and protists, the chloroplasts are also intracellular.

2. Plasma membranes or **vesicle membranes** are the site of photosynthesis in **photosynthetic prokaryotes;** these organisms lack chloroplasts.

C. Photosynthetic Process

1. The photosynthetic reaction is:

$$6\ CO_2 + 6\ H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6\ O_2$$

2. Pigments. **The thylakoid membrane contains pigments that are sensitive to, and absorb, different wavelengths of light energy. All absorbed light energy is ultimately conveyed to chlorophyll a.**

a. Chlorophyll *a* and **chlorophyll *b*** are composed of a magnesium-containing porphyrin ring and a hydrocarbon tail; the functional group bound to the porphyrin is what differentiates the two. Chlorophyll is **blue-** or **yellow-green.**

b. Carotenoids, which are hydrocarbons, are **yellow** and **orange** pigments.

3. Photosystems. The light-absorbing pigments and some other molecules are arranged into photosystems in the thylakoid membrane. Each photosystem is optimally stimulated by a different spectrum of light.

a. Photosystem I contains chlorophyll *a* molecules that are most sensitive to light at wavelengths of 700 nm (P_{700}).

b. Photosystem II contains chlorophyll *a* molecules that are most sensitive to light at wavelengths of 680 nm (P_{680}).

4. Stages of photosynthesis. There are two stages of photosynthesis, the light reaction stage and the Calvin cycle .

a. **Light reaction.** The light reaction has two routes for electron flow: cyclic and noncyclic. Both occur in the thylakoid membrane.

(1) Cyclic electron flow. Electrons are returned to the chlorophyll in the photosystem.

(a) Absorption of light energy (photons) by **photosystem I** causes chlorophyll *a* to move from its ground state to an excited state.

(b) Chlorophyll *a* loses its excited electron to a neighboring molecule, the **primary electron acceptor.**

(c) The primary electron acceptor supplies electrons to the **electron transport chain.** The chain includes **ferredoxin** (an iron-containing protein), **plastoquinone** (an electron carrier), **cytochrome complexes, and plastocyanin** (a copper-containing protein).

(d) As electrons are being transported from one member of the chain to the next, hydrogen ions are being pumped across the thylakoid membrane into the thylakoid compartment. The **linking of electron transport with hydrogen ion pumping** generates a proton-motive force that powers an enzyme, which in turn phosphorylates adenosine diphosphate (ADP) to adenosine triphosphate (ATP).

(e) Plastocyanin, the last protein in the electron transport chain, returns the electrons to photosystem I.

(2) Noncyclic electron flow. Electrons pass from water to oxidized nicotinamide adenine dinucleotide phosphate ($NADP^+$); they do not return to the chlorophyll in the photosystem. Either photosystem I or photosystem II pigments can be stimulated.

a. **Photosystem I stimulation**

i. Chlorophyll a moves from its ground state to an excited state.
ii. Electrons are transferred to the primary electron acceptor.
iii. From the primary electron acceptor, electrons are transferred to ferredoxin, where $NADP^+$ is reduced to nicotinamide adenine dinucleotide phosphate (NADPH).

a. **Photosystem II stimulation**

i. Light stimulates chlorophyll *a* in the photosystem II complex.
ii. The primary electron acceptor of photosystem II pulls electrons from the chlorophyll and transfers them to the same electron transport chain as the one involved in the cyclic reaction.
iii. Electrons move down the electron transport chain, losing potential energy. Electron transport is coupled to hydrogen ion pumping across the thylakoid membrane. The proton-motive force generated then drives ATP synthesis.
i. Electrons are eventually transferred to photosystem I, where they replace the electrons lost during the reduction of $NADP^+$

(v) The electrons lost by photosystem II are replaced by the hydrolysis of water into oxygen gas and hydrogen ions:

$$H_2O \rightarrow 1/2\ O_2 + 2H+ + 2e^-$$

b. Calvin cycle. The Calvin cycle, the critical pathway by which sugar molecules are formed from carbon dioxide, occurs in the stroma of the chloroplast.

1. To synthesize one molecule of glyceraldehyde phosphate, the cycle must take place three times. $NADP^+$ is used for reducing power, and ATP is used as an energy source. For every three molecules of carbon dioxide that enter the cycle, one molecule of glyceraldehyde phosphate (a three-carbon sugar) is produced, nine ATP molecules are hydrolyzed, and six molecules of NADPH are oxidized.

   (a.) Each carbon dioxide molecule attaches to ribulose bisphosphate (RuBP), a five-carbon sugar, to form an unstable six-carbon molecule that splits to form two molecules of 3-phosphoglycerate.

a. Each 3-phosphoglycerate molecule is supplied with an additional phosphate group by ATP, forming 1,3-diphosphoglycerate.
b. NADPH reduces 1,3-diphosphoglycerate to glyceraldehyde phosphate.

(2.) Some glyceraldehyde phosphate molecules leave the Calvin cycle to supply the plant cell with energy and the building blocks for other organic compounds. Other glyceraldehyde phosphate molecules stay within the cycle to regenerate RuBP, a process that requires ATP.

The text was generaly written by Stephen Bresnick, M.D., taken from Columbia Review High-Yield Biology, 1996, Williams & Wilkins, and adapted for 9th grade students.

The tests were taken from Columbia Review High-Yield Biology, 1996, Williams & Wilkins, and from Study Guide to Essentials of Biology, 1990, McGraw-Hill

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An Introduction to the Gentle Art of Making Parodies

This material could be used in a language classroom or a literature one, I hope, with equal success. I have used it in both and I found it educating but also entertaining. I am offering to your attention its realization in a literature lesson. Here it is:

I have eaten the plums

That were in the icebox

And which you were probably

Saving for breakfast.

Forgive me.

They were delicious

So sweet

And so cold.

By William Carlos Williams

The parodies are called **Variations on a Theme** and were written by Kenneth Koch.

Here they are:

We both laughed at the hollyhocks

And I sprayed them with lye.

Forgive me.

I do not know what I am doing

And the wind on the porch

Was so juicy and cold.

I chopped down the house

That you had been saving

To live in for the next 10 years

Forgive me.

It was early in the morning

And I had nothing to do

And its wooden beams were so inviting.

Last night we went dancing

And I broke your leg.

Forgive me.

I was clumsy.

And I wanted you here

In the wards

Where I am the doctor.

A literature classroom.

1. **Exercise 1. Warm-up: A discussion on what parody is based on casting about for the students' experience with it. The teacher tries to sum up and deducts the definition that best fits from their answers.**

   Useful Questions: ***What is a parody? Can you point out some examples from literature or your experience in life? What is likely to be parodied? Do we have to think low of the parodied literary work? Why? / Why not? How does a parody work? What does it bring out in the parodied work? Why is it always funny? Give some examples of film parodies. (e.g. The Silence of the Hams), here the parody operates on many semantic levels: lexical, phonological, syntagmatical. How?***

2. **Exercise 2. Delving into the mater: Identify the key phrases that make up a productive pattern for parodies.**

   Useful Questions: ***What makes up the frame of all the works? What is this particular one based on? What traits of character are made fun of in the original work and its parodies? Could the original work be a sincere apology? If not, why not? How do the parodies highlight the ridiculing of these traits? A parody can be a direct attack on the author of the original work. Are these such cases? If yes, which one?***

3. **Exercise 3. Putting the finishing touches: Make up parodies going for each single line of the original work.**

   Useful suggestions: ***The teacher asks a student to parody the first line by keeping its overall meaning that is the key phrase or meaning in it. His/her partner will have to parody the***

second line having in mind what the first has already said. They do so until a complete poem is made up. The students make several rounds until they come up with different poem parodies. The best, that is the funniest and most original ones, are written down.

The exercise can be performed on another basis – the competitive one: each column in class makes a team and each team makes rounds within itself. The best one is agreed on by the majority of the whole class. The aim of this exercise is to encourage the students to admit defeat and acknowledge the better production of the others, also to aim at victory, of course, trying to be really the best.

4. **Exercise 4. Follow-up: Give homework assignments:**

   Useful suggestions: ***1. Ask the students to make parodies on their own at home having in mind the work done in class. 2. Ask them to think of the line in the original poem: and so cold. Why is it "redundant"? How is it parodied in one of the variations? 3. Can you make a parody on a parody? What will come out in the end if you go on parodying a parody?***

Please write to me about any possibilities of this material being used in a content classroom. I'll appreciate highly any collaboration. I have some vague ideas about its usage in a content classroom. I don't see anything wrong, for example, in parodying any piece of pompous scientific text with all its terms being replaced by other, nonscientific words in the context of this very productive pattern for making half-hearted apologies that can make you laugh with all your heart.

Contact me at hristo_boev@yahoo.com (*there is a lower dash between the first and second word*)

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BULGARIAN UPRISING 1185-1188

In the fall of 1185, two brothers named Thodore(soon to take the name of Peter) and Assen, from the region of Turnovo in Bulgaria, arrived at Kypsela to seek audience with the emperor. They hoped to obtain a mountain district in the Balkan Mountains - as a pronoia for service to the emperor. Not needing more troops, the emperor refused. The two brothers withdrew in a huff, and, returning to their region of Turnovo, immediately began to raise a rebellion.

Bulgaria at that time was not calm. The Bulgarians were dissatisfied with taxes, which at that time also included a special wedding tax to finance the elaborate ceremonies for his wedding with the Hungarian princess.

The two brothers called for a full rebellion. Still, many hesitated. The brothers then made use of a major catalyst. When Thessaloniki had been under siege from the Normans, some Bulgarians had saved, by bringing back to Bulgaria, several miracle-working icons of Saint Demetrius, the patron Saint and long-time savior of Thessaloniki. They had set up a chapel to Saint Demetrius to house these icons in Turnovo. The brothers now procured some shamans who went into a trance and prophesied the success of the forthcoming Bulgarian rebellion. Saint Demetrius had deserted Thessaloniki, as was clearly shown by the city's fall to the Normans. But the saint had come to Turnovo, and the success of their uprising was assured. Thus Assen and Peter persuaded the doubtful and in the weeks that followed they mobilized new support.

They were able to mobilize many Cumans. These nomads had a loose state in what is now southern Romania. By the late 12th century many of these Cumans had settled in Bulgaria and had become Christians. Now large numbers of these Cumans, both from within Bulgaria and from beyond the Danube provided a key element in the Bulgarian rebel army. That the rebellion was to succeed probably owed in great part to Cuman participation. The close relations with the Cumans also meant that Bulgarian fugitives could flee across the Danube for asylum and there regroup for subsequent offensives. That would often be more effective than the preceding one owing to increased manpower from further recruitment among the Cumans. Having mobilized this support, the brothers began to attack and take various fortresses in the vicinity of Turnovo. The uprising broke out at a considerable distance from imperial centres, at a time when many troops had presumably been withdrawn to repel the Normans; thus there seems to have been few loyal imperial troops north of the Balkan Mountains.

The chronology of the revolt is not secure. Many scholars believed that substantial fighting began early in 1186, others argue that significant fighting had broken out by November 1185.

The rebels benefited from the shortage of Byzantine garrison troops in Bulgaria, for until the end of November 1185 the Byzantine armies were completing their action against the Normans and at first Byzantine officials did not realize the seriousness of the uprising. Thus the revolt was given time to grow. With their successes the rebels' ambitions grew, and they soon began to dream of full independence. One of the brothers, Theodore, put on the purple boots, a symbol worn by an emperor and was proclaimed Tsar. He took the name of Peter, after the canonized Tsar Peter I who had ruled Bulgaria in the middle of the 10th century. For their capital the brothers settled on the naturally well-fortified settlement of Turnovo.

At the very end of 1185(or during the first days of 1186) Emperor Isaac dispatched an army under his own uncle, Sebastocrator John Ducas. But before this force had had time to achieve anything Isaac became worried that John might revolt; so he quickly recalled him. Isaac then sent out John Cantacuzenus, his brother-in-law, who being blind was ineligible for the throne and thus not a threat to Isaac. The rebels had established themselves in the Balkan Mountains, the natural fortification that separated the rebellious Bulgarian territory from imperial Thrace. Cantacuzenus did not take proper precautions and fell into an ambush, losing a large number of soldiers. A third army under Alexius Branas was dispatched.

Unknown to Isaac, Branas already had ambitions for the throne. He led the troops to his own hometown of Adrianople, where they proclaimed him emperor. He then marched on Constantinople. While he was laying siege to the city, soldiers loyal to Emperor Isaac emerged from the city and put Brana's troops to flight. In the course of the fighting Brana was killed.

After Brana's revolt was suppressed, Isaac decided to lead the armies against the Bulgarian rebels himself. Isaac's attack on Bulgaria probably began in late May or early June 1186. He successfully drove the rebel armies across the Danube and returned to the capital without even leaving new garrisons in Bulgaria. Meanwhile, across the Danube the two brothers had been recruiting more Cumans and soon, probably in the fall of 1186, returned to Bulgaria and regained control over it, while Cuman armies poured through Bulgaria to raid Byzantine territory both in Thrace and along the Black Sea.

Isaac was thus forced to take action against the Bulgarians again. His second campaign probably began in September 1187. His forces marched first to Adrianople, which was under siege from a Cuman force. The Cumans retreated beyond the Balkan Mountains. Isaac did not think it sensible to pursue them or to make any effort against Bulgaria itself. So, he dispatched part of his army to winter at Sardica, while he returned to Constantinople.

In general, the Bulgarians and Cumans tried to avoid major battles with the Byzantines, preferring to carry out raids against places with weak defenses. But though he failed to engage Assen’s main forces, Isaac did manage to capture Assen's wife. To get her back Assen had to enter into treaty negotiations. The treaty recognized the existence of an independent Bulgarian state that included the territory between the Balkan Mountains and the Danube. Thus the empire recognized that this region was no longer imperial. Assen regained his wife but he was obliged to send a third brother, Kalojan or loanica, to Constantinople as a hostage.

Turnovo was retained as the capital of the newly recognized state. The brothers decided that it should have an archbishop. In 1187 they appointed one of Assen's close supporters, a certain Basil , to that office. Shortly after assuming office, he crowned one of the brothers (probably Peter) tsar in a splendid church coronation. According to a version, shortly thereafter Peter turned the rule over to Assen and departed for Preslav over which he took control. The two brothers continued to rule as colleagues, with Assen in Turnovo and Peter in Preslav.

Literature:

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OXIDATION AND REDUCTION

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Тази работа е оригинална с това, че представя нов, методологичен вариант на приложната тема (unit) "Oxidation Reduction Processes". Есенцията на урока е представена с кратки изречения, примери с практическо приложение и допълнителни задачи.

Представената разработка е на урока " Oxidation and Reduction"

Използвани са богатите възможности на английския език, особено научния, за да се обяснят сложните окислително-редукционни процеси.

Под формата на къси и ясни изречения, без излишна обяснителност, учениците усвояват с лекота урока.

Разработката включва:

1. Key terms
2. Chapter summary
3. Chapter objectives (You should…..)
4. Discussion
5. Example problem
6. Additional problem
7. Self-test (multiple choice)

OXIDATION AND REDUCTION

Key terms

Redox reactions

Oxidation

Reduction

Oxidizing agent

Reducing agent

Electric current

Battery

Antiseptics

Bleaches

SUMMARY

I. <u>Oxygen:</u> Abundant and essential

A. Oxygen is the most abundant element on this planet

1. Air: 20% oxygen (free)
2. Water: 89% oxygen (combined)
3. People: 60% oxygen (combined)

A. Fuels such as natural gas, gasoline, coal, and the food we eat all need oxygen for combustion to release their stored chemical energy.
B. Pure oxygen is obtained by liquefying air, then allowing the nitrogen and argon to boil off.

I. <u>Chemical properties of Oxygen:</u> Oxidation

A. Materials react with oxygen to form oxides.

This process is called oxidation.

1. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$

   iron (III) oxide (rust)

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

   (methane) (carbon dioxide)

A. The substances that combine with oxygen are said to be oxidized
B. Oxidation is characterized by one or more of the following:

1. Addition of oxygen
2. Loss of hydrogen
3. Loss of electrons

I. <u>Hydrogen:</u> occurrence, preparation, and physical properties

1. Hydrogen represents only 0,9% of the Earth's crust (by weight), but is the most abundant element in the Universe.

Free or uncombined hydrogen is rarely found on Earth, but combined hydrogen is found water, natural gas, petroleum, and all foodstuffs.

B. Preparation and properties of hydrogen

1. $Zn + HCl \rightarrow ZnCl_2 + H_2$

   active metal + acid

2. Hydrogen is colorless and odorless gas. It is very light but highly flammable.

I. <u>Chemical properties of hydrogen: Reduction</u>

A. Hydrogen combines readily with oxygen to form water. It will react with many metal oxides to remove the oxygen and form the free metal.

   $CuO + H_2 \rightarrow Cu + H_2O$

B. The substance that reacts with hydrogen is said to be reduced, and this process is called reduction.
C. Reduction is characterized by one or more of the following (compare this list with II.C).

1. Loss of oxygen
2. Addition of hydrogen
3. Addition of electrons

A. In a redox reaction, the substance being oxidized is called the reducing agent, and the substance being reduced is the oxidizing agent.

$CuO + H_2 \rightarrow Cu + H_2O$

Hydrogen is being oxidized and is the reducing agent.

I. <u>Batteries</u>

A. Electricity can cause chemical change (electrolysis). Chemical change can produce electricity.
B. When a reactive metal (such as Zn) is placed in contact with the ions of a less reactive metal (such as copper) the metal will give up its electrons (that is, it is oxidized) to the ions (which are reduced).
C. The oxidation and reduction processes can be placed in separate compartments so that the electrons must flow through an external circuit. The electron flow constitutes an electric current. The device is an electrochemical cell.
D. A battery is a series of electrochemical cells.

I. Corrosion

A. The rusting of iron is an electrochemical process that requires water, oxygen, and an electrolyte.
B. Aluminum is more reactive than iron, but it is protected by an impervious aluminum oxide film on its surface.
C. Silver tarnish is largely silver sulfide.

I. Some Common Oxidizing Agents

A. Oxygen is used to "burn" all sorts of fuels and foodstuffs

   $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

   Glucose

B. Hydrogen peroxide is a syrupy, colorless liquid usually used as 3 or 30% aqueous solution. It is converted during oxidation:

$PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$

VIII<u>. Some Reducing Agents of Interest</u>

A. Elemental carbon is used as a reducing agent

$2FeO_3 + 3C \rightarrow 4Fe + 3CO_2$

B. Hydrogen gas is also used as reducing agent

$CuO + H_2 \rightarrow Cu + H_2O$

IX. Oxidation and Antiseptics

A. Many common antiseptics are mild oxidizing agents: 3% H_2O_2, NaOCl, solutions of iodine.
B. Common disinfectants include bleaching powder [$Ca(OCl)_2$] and chlorine (Cl_2).

IX. Oxidation: Bleaching and Stain Removal

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A. Common bleaching agents act by removing mobile or high-energy electrons whose absorption properties account for the unwanted colors.

1. Laundry bleaches: 5,25% NaOCl (sodium hypochlorite)
2. Bleaching powder: $Ca(OCL)_2$
3. Hydrogen peroxide: bleaches hair by oxidizing the melanin pigments to colorless compounds.

A. Stain removal can involve solubilization or conversion to colorless materials by either oxidizing or reducing agents.

1. Hydrogen peroxide removes bloodstains from cotton.
2. Oxalic acid removes rust spots through complex formation
3. Acetone is used as a solvent for inks, etc.

XI. Oxidation , Reduction and Living things

A. Reduced compounds represent a form of stored potential energy. The driving force to produce reduced compounds is ultimately derived from the sun in the process of photosynthesis

$6CO_2 + 6H_2O + \text{energy} \rightarrow 6O_2 + C_6H_{12}O_6$

Plants and animals that feed on plants use the glucose to make other reduced compounds such as the carbohydrates, fats, and proteins that constitute our major food materials.

B. We produce energy to meet our metabolic and body needs by releasing energy stored in these compounds as we "burn" them back to CO_2 and water.

Carbohydrates + $O_2 \rightarrow CO_2 + H_2O$ + energy

Fats + $O_2 \rightarrow CO_2 + H_2O$ + energy

Proteins + $O_2 \rightarrow CO_2 + H_2O$ + urea + energy

Discussion

It is impossible to over-emphasize the importance of oxidation-reduction processes. Think of it this way. You are powered by the energy of sunlight, only you can't simply unfold solar panels, as artificial satellites do, and convert sunlight to stored electrical energy, to be tapped as necessary. You are a chemical factory and not an artificial satellite, solar-powdered or otherwise.

So somehow you have to tap that solar energy into a chemical way. This is precisely the role of oxidation-reduction reactions in life processes - they plug you into the sun.

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Sample problem

Identify the element being oxidized, the element being reduced, the oxidizing agent, and the reducing agent in the following reactions:

a. $2Mg + CO_2 \rightarrow 2MgO + C$

Mg gains oxygen, therefore, it is oxidized.

CO2 loses oxygen; therefore, it is reduced.

If Mg is oxidized, CO2 must be the oxidizing agent. If CO2 is reduced, Mg must be the reducing agent.

b. $Cu + 2Ag^+ \rightarrow Cu_{2+} + 2Ag$

Cu loses electrons, therefore, it is oxidized (and is the reducing agent).

Ag+ gains electrons; therefore, it is reduced (and is the oxidizing agent).

Additional problems

Identify the substance oxidized, the substance reduced, the oxidizing agent, and the reducing agent in each of the following equations.

$CuO + H_2 \rightarrow Cu + H_2O$

$Fe + Cu^{2+} \rightarrow Fe^{2+} + Cu$

$5CO + I2O_5 \rightarrow J_2 + 5CO_2$

Self-test

1. Which substance is an oxidant?

   a. NaOH b. NaOCl c. HCL d. NaCl

2. Which substance is a reductant?

   a. H_2 b. F_2 c. Cl_2 d. I_2

3. When CH_4 is burned, the products are :

   a. $C + H_2$ b. $CH_2 + H_2O$ c. $CO_2 + H_2$ d. $CO_2 + H_2O$

4. When sulfur (S) burns in oxygen (O2), the product is:

   a. SO_2 b. H_2S c. H_2SO_4 d. CO_2

5. In which of the following is the reactant undergoing oxidation (these are not complete chemical equations)

   a. $CL_2 \rightarrow 2Cl^-$ b. $WO_3 \rightarrow W$ c. $2H^+ \rightarrow H_2$ d. $CO \rightarrow CO_2$

6. Which substance is the reductant?

   a. HCl b. F_2 c. C d. I_2

7. Which substance is an oxidant?

a. NaOH b. CL_2 c. H_2 d. NaCl

8. In the reaction : $SnO_2 + H_2 \rightarrow SnO + H_2O$ the SnO is:

a. oxidized b. reduced c. an acid d. a base

9. In the reaction $2I^- + Cl_2 \rightarrow I_2 + 2Cl^-$ the chlorine is:

a. oxidized b. reduced c. both oxidized and reduced

d. neither oxidized nor reduced

10. In a reaction, the substance undergoing oxidation serves as the

a. reductant b. oxidant c. electron acceptor d. proton acceptor

11. A substance is oxidized if it

a. gains oxygen atoms
b. b. gains hydrogen atoms
c. gains electrons
d. all of these

12. Desintectants often are

a. strong acids b. strong bases c. oxidants d. reductants