

THE CHEMICALS OF LOVE

- **BEING IN LOVE IS A WONDERFUL FEELING, BUT IS IT SIMPLY A CHEMICAL REACTION? RESEARCHERS HAVE BEEN INTERESTED IN EXAMINING THIS QUESTION USING A SCIENTIFIC APPROACH. IN THIS LESSON YOU WILL LEARN THAT WHEN IN LOVE, WE FEEL THE WAY WE DO DUE TO CHEMICAL REACTIONS IN THE BODY.**

In addition, you will learn:

- the technique of reading aloud for improving comprehension
- the different effects passive and active sentences have on reading
- the structure of a topic sentence in writing
- techniques for conducting an effective group discussion

Before You Read

Discuss the following questions in small groups:

1. Have you ever had a crush on someone? When was this and how did it feel?
2. What is the most incredible part of being in love?
3. What unusual things do people do when they are crazy about another person?
4. Do you think we should be able to control our feelings by taking special drugs, such as to increase or reduce feelings of love?

Reading Skills, Thinking aloud—please carefully read the following explanation.

Reading researchers have suggested a method called “thinking aloud” to reveal the decoding process. Unlike normal reading aloud of a text word by word, in this approach the subject speaks out what is actually going on in their brain while reading the text, including their guessing the meaning of unknown words and interpretations of the theme. This process is recorded by video or audio equipment for later analysis. If the reader is reading a text in a foreign language, the speaking out process takes place in the reader’s native language to avoid any difficulties in self-expression.

Here are the steps for thinking-aloud at home to improve your reading skills:

1. You will need an audio recording device, a text that is preferably shorter than 400 words, and a quiet room.
2. First read through the text without any reference tools. You can read it several times until the point you are comfortable with it. This reading can be done aloud or in your head
3. Turn on the recording device and start speaking aloud what you are thinking about the text while you are also reading it aloud. You should not just pronounce the words when you read, but also explain your understanding of the words and sentences that you are perhaps not entirely sure about, and make clear any connections to other words or themes that these items inspire.
4. If you encounter any unknown words, make guesses about the possible grammar and meaning from the context.
5. Listen to the recording after the think-aloud reading is complete. Follow along in the text, mark the parts you had problems with and use a dictionary or other reference book to learn more about new or confusing vocabulary. After doing this, the text as a whole should make more sense to you. If not, then try to locate the specific area of difficulty and discuss the problem with your teacher or another classmate.

Exercise

Work in groups of 3-4 people. First everybody should read the text below. Then select one person to perform a “reading-aloud” of the passage to the group and note down any problematic words or sentences that they encounter. When the reading-aloud is complete, answer the questions that follow the text.

What is the first thought that comes to mind when you think of the word *love*? A scene from a movie? A heart breaking personal experience? Ever since the beginning of time, love has existed, from the love of Adam and Eve, to the union of a happy couple today. People still believe that the heart is the center of love—the Ancient Chinese created the character for love with a “heart” in the middle. However, a growing body of research results indicates that love has much to do with the synthesis, interaction and reception of different chemicals in our bodies in the presence of someone we find attractive. If you have ever been in love, you can probably relate the feeling to an addiction. This is not surprising, as love is in fact a set of chemicals that makes us feel high, and thus can be as addictive as any drug.

1. What are the words that confused the reader? How did the reader solve the problems during the read-aloud process?

2. What is the main idea of the passage?

3. Is your understanding toward the text different from the reader's? What are the differences and why?

Reading

The Chemicals of Love

What is the first thought that comes to mind when you think of the word *love*? A scene from a movie? A heart breaking personal experience? Ever since the beginning of time, love has existed, from the love of Adam and Eve, to the union of a happy couple today. People still believe that the heart is the center of love—the Ancient Chinese created the character for love with a “heart” in the middle. However, a growing body of research results indicates that love has much to do with the synthesis, interaction and reception of different chemicals in our bodies in the presence of someone we find attractive. If you have ever been in love, you can probably relate the feeling to an addiction. This is not surprising, as love is in fact a set of chemicals that makes us feel high and thus can be as addictive as any drug.

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When we are attracted to another person, a virtual explosion of chemicals is generated within the body. This cocktail of rapture is comprised of the chemicals dopamine, norepinephrine,

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and phenylethylamine (PEA), which gives the person a giddy feeling, along with sweaty palms, a racing heart and flushed cheeks. PEA is a natural amphetamine, and causes stimulation similar to the drug, whereas dopamine stimulates the production of oxytocin, often known as the “cuddle chemical.” Researchers have observed increased blood flow in areas of the brain with high concentrations of receptors for dopamine using functional Magnetic Resonance Imaging (fMRI). This state is often associated with addiction.

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Chocolate has long been associated with love. The cocoa bean was used by the Maya and Aztec cultures more than 1500 years ago as an aphrodisiac, and scientists now know that chocolate contains a significant dose of PEA. Is it possible that when people consume a few pieces of chocolate, a traceable amount still reaches the brain, even though PEA is rapidly metabolized by the enzyme MOA-B? And does this cause the feeling of being attracted to someone? It seems a logical assumption that when people give chocolate to their loved ones on Valentine’s Day, they are not only showing a sign of affection, but also hoping that they will look more attractive in the eyes of those who eat the chocolates.

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Pheromones, a term coined by two German biochemists in 1959, are believed to play an important role in the attraction of the opposite sex. Pheromones are chemical signals that trigger a natural response in another member of the same species. It is said that two tiny pits in the nose, known as “vomeronasal organs” (VNOs), are responsible for processing the pheromones that we smell. Studies have shown that different women are attracted to the smell of sweat from different men, and women who wear perfume with synthesized female pheromones are more attractive to men. No wonder pheromones have attracted considerable commercial interest, with a number of products now being marketed as containing pheromones in order to make the user more attractive to others.

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However, to date there is still no conclusive evidence that such products work, and so there is a danger that the hype surrounding pheromones will mean that the real value in learning more about them will be forgotten. Moreover, regardless of whether the feeling of love is purely chemical or not, it seems clear that the emotion does trigger feelings of addiction in some people. In addition, chemical or not, care, understanding, persistence, communication and self-sacrifice are all needed to maintain a successful and loving relationship.

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After You Read

I *Reading Comprehension Check*—read the following statements and decide if they are true (T) or false (F), according to the article, or unknown (U), not mention in the article.

- _____ 1. Pheromones are popular in advertising campaigns.
- _____ 2. Chocolates contain pheromones.
- _____ 3. The word “pheromones” was first used by 2 British scientists.
- _____ 4. Love is solely due to chemical reactions.
- _____ 5. Oxytocin is also referred to as the “cuddle chemical.”

II *Summarizing*—use the following steps to write one sentence summarizing the main point of each paragraph.

Step 1: Read the paragraph carefully and decide what information is important. Underline these important concepts.

Step 2: Write one sentence that includes all of these important concepts.

Step 3: If it's too long, try to shorten it. Use the fewest words possible to describe the main points of the paragraph.

	Summary
Paragraph 1	
Paragraph 2	
Paragraph 3	
Paragraph 4	
Paragraph 5	

Exercise

Find a partner. Compare your sentences to check how similar they are and explain what differences exist and why.

Vocabulary Comprehension

ESP Vocabulary

This vocabulary is commonly used in the field of bio- and medical science.

synthesis	<i>n</i>	the natural or artificial production of a substance through a chemical or biological reaction
addiction	<i>n</i>	a strong need that someone feels to regularly take a substance, often an illegal drug
dopamine	<i>n</i>	a chemical produced in the brain that carries messages between nerve cells
norepinephrine	<i>n</i>	a kind of stress hormone that increases the heart rate and blood flow and releases energy
amphetamine	<i>n</i>	an illegal drug that increases energy, and makes you feel more excited and less hungry
aphrodisiac	<i>n</i>	a food, drink or drug that makes people want to have sex
enzyme	<i>n</i>	a natural chemical produced by animal and plant cells that speeds up reactions and other processes
pheromones	<i>n</i>	animal produced chemical messengers that spread in the air and influence the behavior of other individuals of the same species

General Vocabulary

This vocabulary is used for general purposes.

accumulate	<i>v</i>	to increase in quantity over a period of time
presence	<i>n</i>	the existence of someone or something in a particular place
classify	<i>v</i>	to decide which group someone or something belongs to, according to the particular features they have
explosion	<i>n</i>	a very large increase in the size, amount or importance of something over a very short period of time
cocktail	<i>n</i>	a combination of substances
rapture	<i>n</i>	a feeling of great happiness or excitement

giddy	<i>adj</i>	very excited and happy
cuddle	<i>v</i>	if you cuddle with someone, you put your arms around them and hold them close to show that you like or love them
consume	<i>v</i>	to eat, drink or use something
adore	<i>v</i>	to love someone very much
affection	<i>n</i>	a feeling of liking and caring about someone or something
coin	<i>v</i>	to create a word or phrase that no one has used before
trigger	<i>v</i>	to make something happen
hype	<i>n</i>	the use of a lot of advertisements and publicity to influence people or attract attention to something

Exercise

Form a small group. Each person takes turns making a sentence from any of the new words listed in the General Word Bank or ESP focus. The first student makes a sentence and then picks a different word for the second student, the second student does the same and picks the word for the third student, and so on.

For example,

Student 1: **adore**—I adore my dog. **cuddle**

Student 2: I like to cuddle with my dog at night when I watch TV. **amphetamine**

Student 3: Amphetamine is an illegal and highly addictive drug. **trigger**

Phrases

The following phrases are useful in speaking and/or writing. Work in pairs to discuss the meaning of these phrases and then practice the dialogs that follow.

come to mind

A: Do you have any idea how to resolve this crisis?

B: Nothing **comes to mind**. I'm sorry.

not only..., but also...

A: I thought you lost your job.

B: **Not only** did I get laid off, **but I also** lost my insurance.

Language Focus

Active and Passive Voice

Verbs are said to be either active or passive in voice. In the active voice, the subject and verb relationship is straightforward: the subject is a “be-er” or a “do-er” and the verb moves the sentence along. The focus is often on the subject.

For example:

I ate an apple.

In this sentence the subject “I” is the do-er of the action “eat.”

Usually the subject of the sentence in the passive voice is neither the do-er nor the be-er, but rather the focus of the action.

For example:

My bike was stolen by a bank robber.

My bike was stolen.

While the active voice helps to create clear and direct sentences, writers find using an indirect expression more effective in certain situations, so they choose the passive voice. Also, science writers conventionally use the passive voice more often than writers in other fields, as they want to keep the focus on the action and results of their experiments and observations, not on the person who is doing them.

The passive voice makes sense when the do-er is obvious, unimportant or unknown, or when a writer wishes to postpone mentioning the do-er, or even to completely avoid mentioning the do-er.

Exercise

I Change the following sentences from the active to passive voice.

- a. She sang a song. _____
- b. Somebody hit me. _____
- c. We stopped the bus. _____
- d. They didn't let him go. _____
- e. They have not read the book. _____
- f. You have not sent the parcel. _____
- g. We have not agreed on this issue. _____
- h. They have not caught the thieves. _____

II Circle all the examples of the passive voice in the main reading. Change them into active voice sentences and with a partner discuss the effect, if any, that this has on the meaning of the text.

Tasks

Speaking: Discussion Skills

Leading an effective group discussion requires different skills and strategies from giving a presentation—the abilities to synthesize ideas, negotiate between opposite opinions, and reach a group conclusion. Language learners can specifically benefit from taking part in a group discussion, because they are forced to “use” English for communicating thoughts and expressing opinions.

During a group discussion, each member should:

1. Be a careful observer. Observe how others express and communicate their ideas and identify why some are better at this than others.
2. Be a good listener. Pay attention to what others say so that you can state your agreement or disagreement accordingly.
3. Be an active participant. In addition to listening to others, you are expected to answer questions, justify your opinions and support them with examples.
4. If the discussion is a goal-directed exercise, then no matter what conclusion is eventually made, respect and support the group decision.

Here are some useful expressions you can use when taking part in a group discussion.

1. To start your turn speaking

May I say something?/ I have something to say.

My idea is.../ In my opinion, .../ I think...

2. To invite contributions from others

It's your turn. / What do you think?/ What's your opinion?

Would you say...?

3. To ask for clarification

Do you mean...?/ The opinion you have is...

Could you give us some examples?/ Could you further elaborate your point?

Correct me if I'm wrong, but what you mean is...

4. To state agreement or disagreement

I am afraid if we do it your way then... (disagree)

I am with you. (agree)

You are right, but... (politely disagree)

Exercise

Work in small groups and discuss the following topic. Use the above tips for discussion and present your conclusion to the class.

Topic: "Can love be explained in purely chemical terms?"

Writing: Themes and Ideas

After generating and organizing ideas based on a topic, it is time to begin writing. In academic writing, an essay is usually composed of an introduction, several body paragraphs and a conclusion. The introduction states the main idea of the essay, so that the reader is prepared for what comes next. Each body paragraph then elaborates on one of the ideas from the introduction, along with supporting examples. The conclusion summarizes the argument made in the article and restates the final opinion of the author. In academic writing, a paragraph is often like a small essay. It has a topic sentence to introduce the main idea of the paragraph, several sentences to elaborate on and

support this idea, and a concluding sentence to end the paragraph.

The topic sentence is usually placed at the beginning of a paragraph, so when you have to find the main idea of a paragraph, this is often the best place to look. This sentence states the focus of the paragraph, or theme, and then indicates the angle the text will take on this theme or “controlling idea.”

For example, the topic sentence of Paragraph 4 is:

Pheromones, a term coined by two German biochemists in 1959, are believed to play an important role in the attraction of the opposite sex.

The theme of this sentence is *pheromones*, which will be the theme of the entire paragraph. The controlling idea is the role these chemicals play in sexual attraction.

In a sentence like the following:

Some healthy habits can help us improve our memories.

It is clear that the paragraph will focus on what these healthy habits are. The phrase “improve our memories” indicates what the discussion will then move on to.

Now identify the theme and the controlling idea in each of the following topic sentences. Circle the theme, underline the controlling idea and predict what the paragraph is about.

1. There are two types of memories: short-term and long-term.
2. Not all researchers agree that short-term and long-term memory are separate systems.
3. The relationship between short-term memory and working memory is described differently in various theories, but it is generally acknowledged that the two concepts are distinct.
4. Speed reading courses and books take a variety of approaches to the concept of reading comprehension.

Exercise

- I** *Re-think the statements or points you made in the “Speaking” activity: “Can love be explained in scientific terms?” Then, plan a paragraph about one particular point discussed in your group. Write the topic sentence with a theme and controlling idea. Exchange sentences with a partner. Identify the theme and the controlling idea and predict what your partner is going to say in this paragraph. Discuss your answers with your partner and compare your ideas.*
- II** *Write your own paragraph on the topic and exchange paragraphs with your partner. Discuss your opinions of the ideas and language presented.*

Further Reading: Inside the Technology**Website of the Day**

Read more about love as a chemical reaction from the Royal Society of Chemistry
<http://www.rsc.org/chemistryworld/Issues/2006/February/CupidChemistry.asp>

Extra Info: What are pheromones exactly?

Pheromones were originally discovered in insects. Researchers found specific chemicals that, when emitted by one member of species, affected another member of the species in a predictable way, of attracting a male insect to a female insect, or stalling sexual maturation in female bees who then became worker bees.

Most of the work on mammalian pheromones has been conducted in rodents, particularly rats, field mice and hamsters. Researchers have identified a few specific chemical signals in mammals that could be called pheromones. But they have also found that chemical mixtures contained in scent gland secretions, saliva, urine and sweat can provide equally strong signals.

Researchers believe that mammals have at least two types of pheromones:

1. Primer pheromones cause a shift in the endocrine system of the receiving animal. For example, young female mice exposed to chemical signals of adult males mature faster. And a signal from a male mouse of one strain can induce a miscarriage in a female pregnant by a male of another strain, up to 17 days in a 21-day pregnancy.
2. Releaser pheromones elicit specific behavior patterns. One of these is responsible for the “sexual attraction” affect: Male hamsters, for example, are attracted by a secretion females release in greatest amounts just before they ovulate. Also, stressed rats produce a signal that alerts other rats to beware.

Other signals, which some researchers call “information pheromones,” provide information about an animal’s identity. Animals can sniff another of their species and know what they ate last, how dominant they are, how healthy they are and whether they’re in heat, says Cornell

University psychologist Robert Johnston, PhD. He finds that hamsters can use a mixture of olfactory and pheromonal secretions to identify individuals. It's unclear whether this type of chemical communication is pheromonal because it only provides information and doesn't elicit behavioral or chemical changes in other animals.

Pheromones themselves seem to be critical to sexual behavior in some mammals, including hamsters, rats and pigs. They allow males and females to find each other and they induce mating behavior in receptive animals. However, learning also appears to be critical to mating behavior, research shows. In fact, some pheromones may simply help lay down a behavioral scaffolding in young animals. Social learning then takes over as the animals age, says Charles Wysocki, PhD, of Monell Chemical Senses Center.

Source: American Psychological Association (<http://www.apa.org/monitor/jan98/phero.html>)



End-of-Lesson Quiz

Test yourself to see how much information you can remember from this lesson.

Choose the most appropriate answer for each question.

1. According to the article, why is love considered an addiction?
 - a. The more you have, the more you want.
 - b. The chemicals released into the brain during feelings of attraction create symptoms that are often associated with addiction.
 - c. Because when you love someone, your body releases pheromones.
 - d. People lose their mind when they fall in love, so they do crazy things as if they were high on an illegal drug.
2. What is a pheromone?
 - a. a chemical
 - b. an enzyme
 - c. an antiperspirant
 - d. an addiction
3. According to the article, why may eating chocolate cause people to be attracted to each another?
 - a. Chocolate contains pheromones, which attract people.
 - b. Chocolate tastes good, and good food promotes good feelings.
 - c. Chocolate contains a significant dose of phenylethylamine (PEA), which gives people the

feeling of being in love.

- d. The aroma of chocolate generates pheromones in our body, which gives people romantic feelings.
4. According to the article, are the aphrodisiac effects of pheromones on humans just hype or are they real?
- They're real, and that's why there's a lot of marketing focused on these substances.
 - Strong scientific evidence has shown how pheromones work on humans.
 - Love and pheromones have no connection.
 - This is not a scientific research question, so no experiments have been done on this topic.