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SET 4

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TOEFL PRACTICE TESTS

SET 4

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PREFACE

Are you preparing to take the TOEFL test? Why not study with the ultimate guide on the market that contains 8 full-length authentic TOEFL tests? TOEFL iBT Practice Tests, Set 4 will satisfy all your test prep practice needs so that you can achieve the highest score on the real test. This book contains eight TOEFL® practice tests with authentic reading, listening, speaking, and writing questions, plus an answer key and sample answers for each test. This guide reflects the all the latest changes and updates to the test, including the change to the Writing Test in July, 2023.

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The book features:

• 8 full-length sample TOEFL tests
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PRACTICE TEST 1

READING

PLATE BOUNDARIES

What the theory of plate tectonics has done for geology is what Charles Darwin's theory of evolution had done for biology. It offers a comprehensive perspective on geology by explaining "how the Earth works." The theory holds that the Earth is divided into several distinct layers, each with its own properties: the dense, iron-rich core: the mantle made of silicate rocks that are semi-molten at depth: the outermost, thin crust, which consists of a lower and denser oceanic crust and an upper, lighter continental crust.

The Earth is separated into layers based on mechanical properties as well as composition. The lithosphere, the outermost layer, comprises the crust and the solid portion of the upper mantle. The lithosphere is made up of many pieces called plates that move in relation to each other due to tectonic forces. The lithosphere floats on a fluid layer called the asthenosphere. This layer, lacking control over the solid lithosphere, lets it move freely. Each plate moves in a different direction at a different speed in relation to the others. Like cars in a demolition derby, the plates move around, sometimes crashing into each other, pulling apart, or sideswiping each other. The place where the two plates meet is called a plate boundary. Boundaries are named differently depending on how the two plates move in relation to one another.

Places where plates crash or crunch together are called convergent boundaries. There are several states of convergent boundaries. First, when a dense oceanic plate and a less dense buoyant continental plate meet, the

dense, leading edge of the oceanic plate actually pulls the rest of the plate into the flowing asthenosphere, and then a subduction zone is created. Where the two plates intersect, a deep trench is formed. As the subducting oceanic plate is pushed down more than 100 kilometers beneath the Earth's surface, temperature and pressure greatly increase, releasing the trapped water and gases which then work their way upward, causing a chain of chemical reactions that melt the mantle above the subducting plate. This hot, freshly melted liquid rock (magma) makes its way toward the surface. Over time, layer upon layer of erupting lava and ash build volcanic mountain ranges above the simmering cauldrons below. This subduction zone is known for producing earthquakes of great magnitudes.

When two huge plates of the continental lithosphere meet head-on, neither one can sink because both plates are too buoyant. It is at these plate boundaries that the highest mountains in the world are created. At these boundaries solid rock is crumpled and faulted. As a result, a towering mountain range forms as huge slivers of rocks, many kilometers wide, are forced on top of one another. The pressure here is so great that an enormous piece of Asia is being wedged sideways, slipping out of the way like a watermelon seed squeezed out between fingers. A magnificent example of continent versus continent collision can be seen in the Himalayan mountain range.

Places where plates are moving away from each other are called divergent boundaries. When the two drift apart, mid-ocean ridges are formed as magma soars up from the mantle through a crack in the oceanic crust and cools, in turn, causing the oceanic crust to grow. As the plates continue moving and more crust is formed, the ocean basin grows larger and a ridge system is established. The process which actually drives the motion at these ridges is known as convection. Convection currents push magma upwards through the ridge cracks. As some magma bursts out through the crust, the magma which does not erupt continues its movement under the crust with the current away from the ridge crest. These continual convection currents, known as convection cells, cause the plates to drift away from each other, allowing more crust to be created and the sea floor to develop. This phenomenon is called sea-floor spreading.

Places where plates are sliding past each other are called transform boundaries. There is a lot of strain in many of these boundaries where the two plates are sliding and scraping past each other like two ships passing on the water. The resulting strain from the sliding action of the plates causes cracks in the crust called faults. When the movement along the cracks or faults is great, we feel it in the form of earthquakes. A classic example of a transform plate boundary is the San Andreas Fault in California. The North American and Pacific Plates are moving past each other at this boundary and this is where many earthquakes take place.

Paragraph 1

What the theory of plate tectonics has done for geology is what Charles Darwin's theory of evolution had done for biology. It offers a comprehensive perspective on geology by explaining "how the Earth works." The theory holds that the Earth is divided into several distinct layers, each with its own properties: the dense, iron-rich core: the mantle made of silicate rocks that are semi-molten at depth: the outermost, thin crust, which consists of a lower and denser oceanic crust and an upper, lighter continental crust.

1. Why does the author mention Charles Darwin's theory of evolution in paragraph 1?

A. to explain the contribution of Charles Darwin to geology
B. to contrast it with the theory of plate tectonics

C. to give an example of a theory which most scientists agree on
D. to stress the importance of the theory of plate tectonics in geology

Paragraph 2

The Earth is separated into layers based on mechanical properties as well as composition. The lithosphere, the outermost layer, comprises the crust and the solid portion of the upper mantle. The lithosphere is made up of many pieces called plates that move in relation to each other due to tectonic forces. The lithosphere floats on a fluid layer called the asthenosphere. This layer, lacking control over the solid lithosphere, lets it move freely. Each plate moves in a different direction at a different speed in relation to the others. Like cars in a demolition derby, the plates move around, sometimes crashing into each other, pulling apart, or sideswiping each other. The place where the two plates meet is called a plate boundary. Boundaries are named differently depending on how the two plates move in relation to one another.

2. Which of the following is TRUE of the structure of the Earth?

A. The lithosphere lets the asthenosphere move freely.
B. The lithosphere is made up of several semi-liquid plates.
C. The topmost layer of the Earth is the crust.
D. The asthenosphere usually floats atop the lithosphere.

3. Why does the author mention cars in a demolition derby in paragraph 2?

A. to give an example of accidents caused by plates crashing into each other
B. to help readers to picture the way plates are formed
C. to describe the composition of the Earth
D. to explain that plates drift around

Paragraph 3

Places where plates crash or crunch together are called convergent boundaries. There are several states of convergent boundaries. First, when a dense oceanic plate and a less dense buoyant continental plate meet, the dense, leading edge of the oceanic plate actually pulls the rest of the plate into the flowing asthenosphere, and then a subduction zone is created. Where the two plates intersect, a deep trench is formed. As the subducting oceanic plate is pushed down more than 100 kilometers beneath the Earth's surface, temperature and pressure greatly increase, releasing the trapped water and gases which then work their way upward, causing a chain of chemical reactions that melt the mantle above the subducting plate. This hot, freshly melted liquid rock (magma) makes its way toward the surface. Over time, layer upon layer of erupting lava and ash build volcanic mountain ranges above the simmering cauldrons below. This subduction zone is known for producing earthquakes of great magnitudes.

4. It can be inferred from paragraph 3 that a subduction zone takes place when

A. plates with different densities collide with each other
B. underground temperature and pressure are too high
C. two oceanic plates meet near the edges of a continental plate
D. the density of a continental plate is greater than that of an oceanic plate

5. Which of the sentences below best expresses the essential information in the highlighted statement in the passage? *Incorrect* answer choices change the meaning in important ways or leave out essential information.

A. As the simmering cauldrons are formed above layer upon layer of erupting lava and ash, volcanic mountain ranges gradually emerge.
B. Lava and ash gush out and pile up in many layers, ultimately forming volcanic mountain ranges with boiling molten rock underneath.
C. Volcanic eruptions spew out lava and ash, resulting in the simmering cauldrons, which eventually produces new geological features such as

mountain ranges.
D. It took many years for volcanic mountain ranges to be built because erupting lava and ash stack up as slowly as simmering cauldrons do.

Paragraph 4

When two huge plates of the continental lithosphere meet head-on, neither one can sink because both plates are too buoyant. It is at these plate boundaries that the highest mountains in the world are created. At these boundaries solid rock is crumpled and faulted. As a result, a towering mountain range forms as huge slivers of rocks, many kilometers wide, are forced on top of one another. The pressure here is so great that an enormous piece of Asia is being wedged sideways, slipping out of the way like a watermelon seed squeezed out between fingers. A magnificent example of continent versus continent collision can be seen in the Himalayan mountain range.

6. According to paragraph 4, it is implied that the Himalayan mountain range resulted from

A. the collision of two plates of similar densities
B. the collision of two plates, one of which folds under the other
C. the collision of two plates of same sizes
D. the collision of two plates, one of which melts under the other

Paragraph 5

Places where plates are moving away from each other are called divergent boundaries. When the two drift apart, mid-ocean ridges are formed as magma soars up from the mantle through a crack in the oceanic crust and cools, in turn, causing the oceanic crust to grow. As the plates continue moving and more crust is formed, the ocean basin grows larger and a ridge system is established. The process which actually drives the motion at these ridges is known as convection. Convection currents push magma upwards through the

ridge cracks. As some magma bursts out through the crust, the magma which does not erupt continues its movement under the crust with the current away from the ridge crest. These continual convection currents, known as convection cells, cause the plates to drift away from each other, allowing more crust to be created and the sea floor to develop. This phenomenon is called sea-floor spreading.

7. Which of the following contributes most to the formation of the divergent boundaries?

A. discrepancy in density between plates
B. convection currents
C. lava and ash
D. underground pressure

Paragraph 6

Places where plates are sliding past each other are called transform boundaries. There is a lot of strain in many of these boundaries where the two plates are sliding and scraping past each other like two ships passing on the water. The resulting strain from the sliding action of the plates causes cracks in the crust called faults. When the movement along the cracks or faults is great, we feel it in the form of earthquakes. A classic example of a transform plate boundary is the San Andreas Fault in California. The North American and Pacific Plates are moving past each other at this boundary and this is where many earthquakes take place.

8. According to paragraph 6, which of the following is NOT true about transform boundaries?

A. Tension resulting from the sliding action of the plates at transform boundaries produces faults.
B. Movements along the faults produced at transform boundaries appear as earthquakes.

C. A typical example of a transform boundary is the San Andreas Fault in California.
D. No other places in the world have more earthquakes than transform boundaries have.

Paragraph 5

Places where plates are moving away from each other are called divergent boundaries. **[■]** When the two drift apart, mid-ocean ridges are formed as magma soars up from the mantle through a crack in the oceanic crust and cools, in turn, causing the oceanic crust to grow. As the plates continue moving and more crust is formed, the ocean basin grows larger and a ridge system is established. **[■]** The process which actually drives the motion at these ridges is known as convection. Convection currents push magma upwards through the ridge cracks. **[■]** As some magma bursts out through the crust, the magma which does not erupt continues its movement under the crust with the current away from the ridge crest. **[■]** These continual convection currents, known as convection cells, cause the plates to drift away from each other, allowing more crust to be created and the sea floor to develop. This phenomenon is called sea-floor spreading.

9. Look at the four squares [■] that indicate where the following sentence could be added to the passage. Where would the sentence best fit?

The formation of the new crust pushes plates apart, as in the case of the Mid-Atlantic Ridge which moves North America and Europe further and further apart.

Where would the sentence best fit? Click on a square **[■]** to add the sentence to the passage.

10. Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they

express ideas that are not presented in the passage or are minor ideas in the passage. ***This question is worth 2 points.***

There are three distinct plate boundaries.

-
-
-

Answer Choices

A. A deep trench forms when the two plates slide each other, discharging gases trapped deep in the Earth.
B. Where two plates bump into each other, one plate override the other or one sinks below the other; otherwise, both are crumpled.
C. Some plates drift away from each other under the force of convection currents, accompanied by the formation of more crust and the development of the sea floor.
D. The Himalayan mountain range was created when two light continents collided with each other.
E. Where plates slide past each other, the resulting tension and strain produce faults which are the source of many earthquakes.
F. The Earth's surface is classified into several different layers: core, the mantle, and crust.

RIGHT-HANDEDNESS

Handedness is human attribute defined by an unequal distribution of fine motor skill between the left and right hands. An individual who is more dexterous with the right hand is called right-handed, and one who is more skilled with the left is said to be left-handed. The prevalence of right-handedness is universal across human cultures: about 90% of people are right-handed and about 10% are left-handed. Broadly speaking, the vast majority of humans seem to have been right-handed since the emergence of the *Homo sapiens,* with around 85% of individuals in all populations being right-handed for most manual actions. There is patchy evidence from older fossils and artifacts which indicates a preponderance of right-handed individuals.

The earliest evidence of right-handedness occurs with the appearance of the first stone tools. One can tell from the way these stone tools were made that they were made by right-handed people. This is what a right-handed person usually does during hard-hammer percussion. A right-handed individual normally holds the hammer stone in the dominant right hand, which gives more precision and power to the flaking blows and lessens the chance of hitting the fingers, and the cobble to be flaked in the more passive left hand. The role of the left hand is basically that of a vice, tightly holding down the cobble while the hammer stone repeatedly strikes it in succession, orienting the cobble in a proper position. Once a sequence of blows breaks flakes off one side of the cobble, the left hand holding the cobble tends to rotate it clockwise as the flakes are blown off. One hits off a flake, rotates the cobble a little, and strikes off another to the right of the first, rotates it slightly again and flakes again, and so forth. In the cobble or the thick cortical flake, evidence can be found of this tendency to rotate clockwise. On the left of the flake that has been struck off in succession, we find a scar of a previously blown-off flake, and on the right, we find part of the cortex of the cobble. Therefore, numerous samples of these flakes explain something about handedness; whether the cobble was being rotated in this way, as would a right-handed person, or whether it was being turned by a left-handed person in the opposite hand, producing the opposite pattern. This is an experimental result that can be applied directly to early Stone Age artifacts. Until today, the same pattern has been found in every site from the early Stone Age,

including those at Koobi Fora dated from around 1.9 to 1.5 million years ago. Thus, it appears that by the time of early tool-making in the archaeological record, these ancestral hominid populations may have already become preferentially right-handed. For whatever reason, right-handedness seems to be an ancient trait in humans.

Evidence can also be found in the scratches on the human teeth fossils. One important line of evidence comes from the fossils of the front teeth in Neanderthals and their predecessors. In both early and later samples of Neanderthals from Europe, Iraq and Israel, unidirectional scratches have been observed, which suggests that something held in the teeth was being cut with stone tools. When these tools penetrated the material in question, they left behind directional scratches on the teeth which tell us that these Neanderthals held the tools in their right hands because the scratches left on the front teeth show a left-to-right stroke direction. Scratches made with a left-to-right stroke direction (by right-handers) are more common than scratches in the opposite direction (by left-handers). Moreover, it is evident that this was an early behavior starting from childhood, as seen in the same characteristic scratches on a child's milk canine from the middle Pleistocene site of Atapuerca. The front teeth are an important general feature of early human behavior, especially emphasized in the Neanderthals.

The predominance of right-handedness is also witnessed in the shape of brains. The brain is made up of two distinct sides, or hemispheres, like the two sides of a sandwich cookie. The right hemisphere is almost completely separate from the left, with only a small band of nerve fibers connecting the two. Whereas the muscles on the left side of the body are controlled by the right hemisphere, those on the right are controlled by the left hemisphere. In the process of brain and spinal cord formation, nerves from one side of the body send out long extensions called axons toward the midline of the body. Most of the axons, then, cross over the midline and so become linked with the other side of the body. For right-handers, the hand control center in the left hemisphere of the brain is much more developed while that in the right hemisphere is more developed for left-handers.

Finally, right-hand dominance could be explained by the stronger development of right arms. The so-called warrior and his shield theory claims

that in the early days when swords and shields were the tools of fighting, right-handers had a better chance of surviving than left-handers. The theory holds that since the heart is located a little to the left in the chest, right-handed fighters who held their shield in the left hand could protect their heart from their opponents whereas the left-handed fighters who held the shield in the right had their heart exposed, resulting in more frequent deaths.

Paragraph 1

Handedness is human attribute defined by an unequal distribution of fine motor skill between the left and right hands. An individual who is more dexterous with the right hand is called right-handed, and one who is more skilled with the left is said to be left-handed. The prevalence of right-handedness is universal across human cultures: about 90% of people are right-handed and about 10% are left-handed. Broadly speaking, the vast majority of humans seem to have been right-handed since the emergence of the *Homo sapiens*, with around 85% of individuals in all populations being right-handed for most manual actions. There is patchy evidence from older fossils and artifacts which indicates a preponderance of right-handed individuals.

1. The word dexterous in paragraph 1 is closest in meaning to

A. dependent
B. skillful
C. intimate
D. eligible

Paragraph 2

The earliest evidence of right-handedness occurs with the appearance of the first stone tools. One can tell from the way these stone tools were made that they were made by right-handed people. This is what a right-handed person usually does during hard-hammer percussion. A right-handed individual normally holds the hammer stone in the dominant right hand, which gives more precision and power to the flaking blows and lessens the chance of hitting the fingers, and the cobble to be flaked in the more passive left hand. The role of the left hand is basically that of a vice, tightly holding down the cobble while the hammer stone repeatedly strikes it in succession, orienting the cobble in a proper position. Once a sequence of blows breaks flakes off one side of the cobble, the left hand holding the cobble tends to rotate it clockwise as the flakes are blown off. One hits off a flake, rotates the cobble a little, and strikes off another to the right of the first, rotates it slightly again and flakes again, and so forth. In the cobble or the thick cortical flake, evidence can be found of this tendency to rotate clockwise. On the left of the flake that has been struck off in succession, we find a scar of a previously blown-off flake, and on the right, we find part of the cortex of the cobble. Therefore, numerous samples of these flakes explain something about handedness; whether the cobble was being rotated in this way, as would a right-handed person, or whether it was being turned by a left-handed person in the opposite hand, producing the opposite pattern. This is an experimental result that can be applied directly to early Stone Age artifacts. Until today, the same pattern has been found in every site from the early Stone Age, including those at Koobi Fora dated from around 1.9 to 1.5 million years ago. Thus it appears that by the time of early tool-making in the archaeological record, these ancestral hominid populations may have already become preferentially right-handed. For whatever reason, right-handedness seems to be an ancient trait in humans.

2. Which of the sentences below best expresses the essential information in the highlighted statement in the passage? *Incorrect* answer choices change the meaning in important ways or leave out essential

information.

A. There is more precision and power when a right-handed individual holds a hammer stone in the dominant right hand, which makes the left hand useless.
B. Right-handed people are less likely to hit their fingers during percussion than left-handed people, which explains why there are more right-handed people.
C. Holding a tool in the dominant right hand, a right-handed person lessens the probability of missing hits and has more power during percussion.
D. People use the more passive left hand when they flake the cobble, which requires more precision and power, thereby lessening the chance of hitting their fingers.

3. The word sequence in paragraph 2 is closest in meaning to

A. order
B. number
C. array
D. succession

4. If a person is left-handed, where does paragraph 2 imply that the mark from a previously blown-off flake is found?

A. on the right of the flake
B. on the left of the flake
C. on upper side of the core
D. at the base of the core

5. Why does the author mention Koobi Fora in paragraph 2?

A. to introduce an ancient tribe whose toolmaking skill was outstanding compared to any other tribe in the past
B. to give an example of people who were able to make tools with their right hands

C. to introduce a place where numerous skeletons of people believed to be right-handed were found
D. to give an example of locales where evidence of right-handedness was found

Paragraph 3

Evidence can also be found in the scratches on the human teeth fossils. One important line of evidence comes from the fossils of the front teeth in Neanderthals and their predecessors. In both early and later samples of Neanderthals from Europe, Iraq and Israel, unidirectional scratches have been observed, which suggests that something held in the teeth was being cut with stone tools. When these tools penetrated the material in question, they left behind directional scratches on the teeth which tell us that these Neanderthals held the tools in their right hands because the scratches left on the front teeth show a left-to-right stroke direction. Scratches made with a left-to-right stroke direction (by right-handers) are more common than scratches in the opposite direction (by left-handers). Moreover, it is evident that this was an early behavior starting from childhood, as seen in the same characteristic scratches on a child's milk canine from the middle Pleistocene site of Atapuerca. The front teeth are an important general feature of early human behavior, especially emphasized in the Neanderthals.

6. According to paragraph 3, it can be inferred that unidirectional scratches found in the fossils of the front teeth in Neanderthals are usually

A. in a left-to-right direction
B. in a right-to-left direction
C. unknown
D. random

7. Why does the author mention a child's milk canine in paragraph 3?

A. to give an example of a tool ancient children used
B. to argue that handedness was determined early
C. to introduce one of the most frequently excavated ancient tools
D. to explain the process during which children learned from adults how to use tools

Paragraph 5

Finally, right-hand dominance could be explained by the stronger development of right arms. The so-called warrior and his shield theory claims that in the early days when swords and shields were the tools of fighting, right-handers had a better chance of surviving than left-handers. The theory holds that since the heart is located a little to the left in the chest, right-handed fighters who held their shield in the left hand could protect their heart from their opponents whereas the left-handed fighters who held the shield in the right had their heart exposed, resulting in more frequent deaths.

8. According to paragraph 5, why were right-handed warriors more likely to survive than left-handed ones?

A. because right-handed warriors were able to use swords more skillfully than left-handed ones
B. because right-handed warriors could use both swords and shields in their right hands alternatively
C. because right-handed warriors could protect their hearts with shields in their hands not holding swords
D. because right-handed warriors were born to be superior to left-handed ones

Paragraph 4

The predominance of right-handedness is also witnessed in the shape of brains. The brain is made up of two distinct sides, or hemispheres, like the two sides of a sandwich cookie. The right hemisphere is almost completely separate from the left, with only a small band of nerve fibers connecting the

two. **[■]** Whereas the muscles on the left side of the body are controlled by the right hemisphere, those on the right are controlled by the left hemisphere. **[■]** In the process of brain and spinal cord formation, nerves from one side of the body send out long extensions called axons toward the midline of the body. **[■]** Most of the axons, then, cross over the midline and so become linked with the other side of the body. For right-handers, the hand control center in the left hemisphere of the brain is much more developed while that in the right hemisphere is more developed for left-handers. **[■]**

9. Look at the four squares [■] that indicate where the following sentence could be added to the passage. Where would the sentence best fit?

This switch-over is hard-wired in the developing brain.

Where would the sentence best fit? Click on a square **[■]** to add the sentence to the passage.

10. Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. ***This question is worth 2 points.***

There are several evidences that human beings have long been predominantly right-handed.

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Answer Choices

A. The unidirectional scratches found on the frontal teeth of Neanderthals can explain handedness.
B. Humans are the only creatures which have the trait of handedness.
C. By observing the shape of brains and the developmental state of arms, people can tell if the subject was right-handed or left-handed.
D. The right hemisphere of the brain controls the left side of the body while the left hemisphere governs the right side.
E. The right-handers have had the upper hand over left-handers in hunting and gathering.
F. The characteristic patterns made when people fashioned stone tools show whether they were right-handed or left-handed.

YAWNING

Yawning is a reflex or involuntary action, which involves inhaling a large volume of air that is then immediately exhaled. Yawning is commonly associated with stress, overwork, fatigue, sleepiness, or simply boredom. Many theories have been proposed to explain the causes and purposes of yawning. It is quite plausible that yawning is, in fact, triggered by multiple factors rather than just one.

Although there are many factors that can produce a yawn, scientists boil it all down into two main theories. The first of these is that yawning is triggered by either an increase in the concentration of carbon dioxide or a decrease in oxygen levels in the blood or lungs, particularly in the alveoli of the lungs. Therefore, yawning is a reflex action that increases the body's intake of oxygen into the lungs and ultimately into the bloodstream. This seems highly possible and reasonable. According to this theory, people tend to breathe at a slower rate when they get tired or bored. Since slower breathing means less

exchange of gases, which also means less oxygen to the lungs, carbon dioxide will eventually start to accumulate in the blood. As carbon dioxide builds up in the blood, a message is sent to the brain where it initiates a long, deep breath in the form of a yawn. However, experiments indicate that this theory of excess carbon dioxide may be flawed. Robert Provine, a neuroscientist, and his colleagues carried out an experiment in 1987 to determine whether high carbon dioxide/low oxygen levels in the blood produces yawning. Air is normally made up of 20.95% oxygen, 79.02% nitrogen, 0.03% carbon dioxide, and a few other gases in low concentrations. The researchers carried out their experiment by giving volunteering college students the following mixes of gases to breathe for a total duration of 30 minutes: 100% oxygen; 3% carbon dioxide and 21% oxygen; 5% carbon dioxide and 21% oxygen; normal air. Breathing 100% oxygen or either of the gas mixes including carbon dioxide did cause the students to breathe at a faster rate; however, none of these gas mixes induced more yawns from the students. Moreover, oxygen was found to be inhaled in smaller quantities during yawning than during normal respiration.

A second theory suggests that increased brain temperature triggers yawning, as the brain attempts to cool itself. Andrew C. Gallop and Gordon G. Gallup, Jr., researchers at a prominent university, performed a variety of experiments on college students to understand the reasons for yawning. They discredited the theory that a lack of oxygen in the blood triggers yawning; instead, they proved that yawning is the body's means of cooling an overheated brain. Over the course of a day, our brain heats up as it burns as much as a third of all the calories we consume. In order to function efficiently, the temperature of the brain has to be maintained within a narrow range, which means when necessary, the brain needs to be cooled down. One way that the body cools the brain is by breathing through the nose. Consequently, people who are not breathing through the nose are more likely to yawn as a way of cooling the brain. In one experiment, students were required to watch videos of people yawning. The students were then divided into two groups, and half of them were asked to breathe through their mouths, while the other half was asked to breathe through their noses. As a result, those who were breathing through their noses showed no signs of yawning, while the rest were more likely to react to the videos by yawning. In another experiment, students were divided into two groups. Some students were told to hold a cold pack to their

forehead. Others were given a warm pack to hold up to their foreheads. Those with the cold packs showed no sign of yawning. The first experiment has concluded to show that brain cools down through nose breathing as it delivers cool blood to the brain. Other methods of cooling the head results in the same effect, which is why in the second experiment, the students did not yawn.

Whatever the reasons, it is possible that yawning is contagious: someone observing another person yawning is very likely to yawn. Not only is it contagious by sight, but even reading or thinking about it has been shown to stimulate yawning in some people. It is suggested that yawning may be caused by mirror neurons in the frontal cortex of the brain, which makes us imitate others' actions. These neurons become activated when a particular individual is exposed to an action carried out by another from the same species. However, a recently-proposed theory claims that yawning is a contagious social reflex that is not generated by the mirror neuron network. Rather, a person yawns as an empathic response in order to unify members while establishing cooperation within a group. The theory holds that contagious yawning is associated with the same parts of the brain that deal with empathy. It assumes that humans, as well as other primates and some other mammals, display an empathetic behavior in response to another's conduct as a way of conveying their understanding of the others' situation. Moreover, the contagiousness of yawning can be regarded as a herd instinct used to communicate tiredness and the need to sleep to other individuals in a group. Thus, yawning is not only associated with tiredness or other physiological conditions, but can be considered a form of non-verbal communication that can be interpreted to mean several different things.

Paragraph 1

Yawning is a reflex or involuntary action, which involves inhaling a large