1. Faça uma tabela comparativa entre os vários tipos de metabolismo bacteriano citados pelo autor, enfatizando os aspectos bioquímicos.
2. Qual a diferença básica entre uma bactéria quimioautotrófica e uma bactéria fotossintetizadora?
3. Como as bactérias quimioautótrofas obtêm energia para suas reações químicas?
4. Explique o que é o processo de amonificação.

TEXT 1

BACTERIAL METABOLISM — PHOTOSYNTHESIS x CHEMISYNTHESIS

The metabolism among the bacteriae is done through many different forms, depending upon how the bacteria assimilates vital gases from the environment. Thus, we can easily distinguish some main forms:

a) heterotrophic bacteriae — these include the saprobiotyc species; heterotrophic bacteriae are decomposers which can be found in the soil or in water. Over 90% of the amount of CO_2 which is present in the biosphere is resulting from the decomposers' activity. These organisms are also called *edaphic bacteriae*. Some bacteriae of this group decompose aminate acids, freeing NH_4+. This process is known as *amonification*. The NH_4+ can be oxidated till it turns into NO_2- by bacteriae of the genum *Nitrosomonas*. Another important genus of soil bacteriae is *Nitrobacter*, which converts NO_2- into NO_3-.

b) photosynthetic forms — many genera of the Monera, more specifically three groups besides the cyanophyceae, assimilate carbon from CO_2 having H_2S as basis. The carbohydrate formation (CH_2O) and sulphur liberation (S-) follows the equation:

$CO_2 + 2\ H_2S \rightarrow CH_2O + H_2O + 2\ S$-

The reaction only occurs in the presence of light. Compare this process with the general chemical process of the photosynthesis:

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

The inconvenient of the first process is that it frees sulphur anion instead of oxygen, which is certainly something uninteresting to mankind.

c) chemiautotrophic bacteriae — this group of bacteriae does not employ sun light, although it requires oxygen. The energy these bacteriae use to lead carbohydrate synthesis comes from the inorganic mollecule oxidation, such as nitrogen compounds (N_2), sulphur (S_2), iron (Fe), hydrogen (H_2) and many other compounds.

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1. Faça uma lista de algumas áreas que fazem parte do estudo biológico. Explique seus radicais constituintes (exemplo: a palavra citologia *vem do grego* citós*, célula, e* logós*, estudo).*
2. Qual é a importância dos biólogos trabalharem com outros profissionais?
3. A ecologia ganhou popularidade recentemente, e é um dos assuntos mais comentados, em todas as instâncias científicas. O que, de fato, faz um ecólogo (ou ecologista)?

TEXT 2

SCIENCE

Biology is the study of the living things. Its name comes from the Greek words βιος (biós, life) and λογος (lógos, study). So to say, biologists are concerned with the way life is and how creatures interact in the ecosystems.

As with other subjects of the human knowledge, Biology can be subdivided into several topics or thematic matters, each one with its own difficulties and specific terms: cytology (the study of the cells), histology (the study of the tissues), genetics (the study of the chromosomes, genes and the hereditary problems), zoology (the study of animals), botany (the study of plants), biotechnology (the study of genetic improvements), biochemistry (the study of the chemicals and their effect on the body structure), ecology (the study of the ecosystems and the ecological interactions), physiology (the study of the functioning of animals and plants), anatomy (the study of the bones and related matters), biostatistics (the study of mathematical formulae related to biological samples) and so on. New areas have been developed and biologists have to follow the recent trends. Updating is something essential to biologists all over lands.

A biologist has also to be in contact with other professionals, interacting with them. Geographers, paleontologists, historians, chemists, physicists and mathematicians are some of the professionals who can work together with a biologist, in a mixed project.

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1. Por que o autor afirma que as florestas tropicais são ameaçadas pelo efeito estufa?
2. Como o efeito estufa traz problemas para os biomas existentes nas florestas tropicais?
3. Justifique a frase do autor: ".. the more they mess around in nature, the bigger the troubles will be".
4. Resuma o último parágrafo do texto, expressando sua opinião sobre o assunto tratado.

TEXT 3

BIOMA DESTRUCTION IN THE RAIN FORESTS

The rain forests all over the world — including those of Brazil, Indonesia, India and South America — are endandegered not only because of the deforestation process, which has cut down millions of trees every year; but mainly because of the greenhouse effect. It's worthless describing this effect, once it is known nowadays everywhere, but one fact deserves attention: the greenhouse effect is alone responsible for great part of the losing that is blowing off course the rain forests.

Scientists long ago used to attribute the losing of rain forests to their deforestation. This is no longer true. The greenhouse effect has made the temperature go up each year, leading to the disappearance of many species (both animal and vegetal) which can only survive under certain cooler conditions; it has also dried many lands, killing amphibians and plants which cannot dwell in dry and hot areas; and it has as well made mankind interfere even more in the environment, once men try to manage the environmental conditions according to their necessities (in this case, the greenhouse effect has made people react against the wild and aggressive nature in a more aggressive and stronger attitude). It is really impossible to determine when this menace to the environment — especially the rain forests — will ever stop.

Men have to become aware that the more they mess around in nature, the bigger the troubles will be. The greenhouse effect, along with many other important factors, is sweeping away the rain forests. A question should remain: where will these important ecosystems go and what will happen to the countries in which these forests develop? Waiting for the answer is for sure a bad option.

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1. Explique o proceso de separar o mercúrio da terra de garimpo (leito de rio), conforme descrição feita no texto..
2. Qual é a rota tomada pelo mercúrio após ser utilizado pelos garimpeiros?
3. Por que o autor utiliza a frase "Mercury effects in the organism are accumulative and methods to depollute waters are considered inefficient"?
4. Crie um texto em oposição ao uso do mercúrio no garimpo. Considere a afirmação que o autor faz sobre os reservatórios hidrográficos do Brasil.

TEXT 4

MERCURY ENDANGERS RIVER-EDGE DWELLERS

More than a million people in Brazil are submitted to mercury contamination every day — this metal is liquid and highly toxic, and presently used as gold separator by gold miners, without any control.

Mining at the river edges has led many ecological areas to complete destruction, and now it is considered a severe threat to the health of many of those river-edge dwellers (that is, people who live by the river) in Amazonia, Goias, Minas Gerais and the pantanal in Mato Grosso; the natural inhabitants, the Brazilian indians, do not escape from this menace. This mercury contamination is one the most hazardous forms of pollution which is in course in Brazil nowadays. Some researchers claim that almost all of the hydrographic reservoirs of the country have a slight trace of mercury.

The contamination route follows some definite phases. The gold miner takes out the limestones and little rocks from the river edge, and those are mixed up with mercury. In case there is any powdered gold in the water and limestone, this is immediately joined with the metal. The next step is to throw the remaining limestone away, take the set of mercury, gold and rock and submit it to directed high-temperature fire. As heat is increased, the metal, which is highly volatile, evaporates. Gold, free from any litter, remains pure. We could only take about 10% of the gold in the limestone if mercury wasn't used.

Health is damaged by the mercury gases, which is breathed by the gold miner. When this gas is burnt, it produces pollutant and toxic residues. Some part of the gas is spread into the atmosphere and eventually goes back to the soil and water, brought by rain drops, polluting them. Liquid metal is thrown into the water, where it will be swallowed by fish and other animals, making contamination even more dangerous to the ecosystem and to the people who feed on river plants and animals.

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Mercury effects in the organism are accumulative and methods to depollute waters are considered inefficient. In some areas in Mato Grosso, where gold mining has long been abolished, animals still die after having drunk water from the river; this is a real proving that mercury has dangerous and long term effects.

In our body, mercury and its derivatives may attack the central nervous system, the kidneys and the lungs, including also congenial problems in other generations.

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1. Como o ambiente imediato ao seu redor tem sido prejudicado? Procure, no início do texto, referências ao que é incluído no termo meio ambiente.
2. Pessoalmente, o que você pode fazer para combater a poluição?
3. Há uma relação direta entre os problemas de poluição e super-população ou ambos são o mesmo problema?
4. Se você fosse alertar alguém sobre a importância da preservação do meio ambiente, o que você falaria?

TEXT 5

POLLUTION: A THREAT TO OUR ENVIRONMENT

Ecology means the study of the relationship of plants and animals, or people and institutions, in their natural surroundings. But for all practical purposes it means *you* in your environment — and what you think of the world you live in.

Environment includes everything that affects the quality of your life: the air you breathe, the water you drink or swim in, your apartment or house, the numbers of people, the traffic, the noise, the streets, shops, parks, countryside, seashore, wildlife, factories, farming, mining. All these are in some way designed, controlled or ignored by the people in charge.

The different kinds of pollution are all connected. What happens to the air affects the land. What happens to the land affects the water around us. And what happens to the water affects the air.

Man has been polluting the Earth from the time he first lit his first fire, washed his clothes in the river and threw his trash on the ground. When land was used up or the river dirty, man moved on to another place. At first, the Earth could handle this problem because there was plenty of fresh air, land and water. This is no longer true. The rise in population and the spread of industry have changed that. New kinds of waste, such as plastics, will not rot into the soil. New chemicals will not dissolve in water. Our environment is becoming overloaded with waste. Every year about 150,000,000 tons of dirt, sprays and gases are released into the air over the USA. Polluted air damages paint and metal, makes your clothes dirty, keeps plants from growing and can also cause lung diseases — and death. There are two main causes of air pollution: *fumes from cars, trucks and buses; fumes from industrial plants.*

Motor vehicles cause most of our air pollution. They release more than 60 per cent of the dangerous gases into the air. In large cities cars are responsible for about 80 per cent of the air pollution.

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Gasoline engines give off a colorless, odorless gas called carbon monoxide (formula CO) that will make you sleepy, give you a headache and finally kill you. Scientists say that breathing the air of New York is like smoking forty cigarettes a day.

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1. Os plásticos são descritos como "os principais vilões". Por quê?
2. Por que o autor utiliza a frase "strange as it may seem" ao discutir a questão sobre a categoria mais difícil de lixo?
3. O que o autor quer dizer quando menciona que as fábricas de reciclagem "have to be paid for because we need them more than we need the cash profit"?
4. Qual é o significado da última sentença do artigo?
5. Você concorda com o autor quando ele diz que os carros são o símbolo do século XX? Por quê? Por quê não?
6. Escreva um resumo do texto, utilizando, no máximo, 30 linhas.

TEXT 6

SAVING THE LEFT-OVERS

From the time of the Industrial Revolution wealth and fame have gone to the men who invented machines and processes to eat up the world's resources of coal, oil and metals. The time may be very close when we begin to reward those who are able to devise ways of using "secondary" materials, the left-overs of industry.

From the very beginning Man has used the materials near at hand. His tools, weapons and clothes were chipped, cut or sewn from the stone, wood or the hides of animals. He did not change the nature of his materials, only their shapes. Thus, when he grew tired of his clothes or they became too worn, he threw them away. The sun and the rain and the passing of time broke them down until they were finally absorbed into the earth.

At some time or other Man became more skillful at making things: he no longer needed to throw away his tools and clothes quite so often. By changing the nature of his raw materials he was able to create more durable versions of natural substances, or substances which were entirely artificial. He made the mistake of making almost indestructible objects. The result, especially in the industrialized world, has been an ever-increasing mountain of rubbish.

What is the most difficult sort of rubbish? Strange as it may seem, plastics are the chief villains even though they make up only one-fiftieth of the total amount of solid waste in an industrialized country. Small as it sounds, this one-fiftieth represents well over four million tons a year of rubbish which is seldom profitable to recycle.

Recycling is the process by which materials are given a second life. Plastic bottles, toys, wrappings and other gadgets are melted down and used to make other objects. Of course, the problem is that it is often much less trouble and far cheaper to produce new products by using fresh raw materials than collecting and treating rubbish, waste and left-overs.

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What other ways are there of treating left-over plastics? Destruction is an obvious answer. The main difficulty here is that burning many types of plastics produces toxic fumes while others ruin the insides of incinerators used for melting them. The situation could be made better by a more widespread use of biodegradable plastics which break down after a while under the action of soil and weather like natural materials. Unfortunately, these plastics cannot be used in the construction of buildings or vehicles, for obvious reasons.

By the middle of the eighties we expect to have fifteen million tons of waste plastics per year.

Each year, household rubbish is estimated to contain ten million tons of iron and steel, and fifteen million tons of glass and other usable materials. Naturally enough, people who handle this rubbish expect to do so at a profit. The problem, quite simply, is that the authorities reluctant to spend money on efficient sorting systems — it is cheaper to dump rubbish on waste ground or in an old quarry. Some day there will be no more open spaces and holes in the ground. When that day comes, perhaps local councils and governments will realize that recycling factories, just like hospitals and other social services, have to be paid for because we need them more than we need the cash profit.

The motor car, the symbol of the twentieth century, has given birth to a whole new industry — the scrap industry.

Those bright shining objects built of valuable steel, copper and other materials that begin to fall apart after a few years are abandoned at the roadside, dumped in fields, left to rot in the back streets of our cities. Crushing machines press them into slabs no thicker than 18 inches which are then shredded before being fed into steel furnaces to begin the industrial cycle all over again.

This sort of organized attack on the waste and rubbish in our cities is needed if we are to have fewer worries about the limited resources of our world. The motor car industry and the paper industry have both set a good example, but for sheer imagination it would be hard to

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beat the solution to the problem as proposed by two American scientists.

According to current scientific theory, the earth's surface is composed of sections fitted together like a jigsaw puzzle. These sections are continually moving up and down. The edge of one section may slide under the edge of its neighbor and be pressed deep down into the earth where it melts. This is a very slow process, normally speaking, but in certain places under the oceans it takes place more rapidly. The solution proposed by the two scientists is that unusable rubbish be placed at such spots so that it would be drawn down into the center of the earth and destroyed. The solution in itself is not really remarkable. After all, we've been sweeping the dust under our carpets for generations!

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1. Explique o significado do termo pesticida.
2. Explique cada categoria de pesticida, conforme mencionadas no texto.
3. Quais são, segundo o autor, as vantagens e as desvantagens do emprego de pesticidas?
4. Por que o autor afirma "pesticides are enemies and angels"?
5. Qual é a relação entre os pesticidas e os agricultores, e em que aspecto essa relação pode ser prejudicial?

TEXT 7

PESTICIDES

Pesticides are chemicals world-wide known for their capacity of eliminating various kinds of plagues, such as insects in general, bacteriae, fungi, viruses and other damaging creatures. Depending on their use in agricultural areas, these compounds are divided into several categories, being these the herbicides (specifically applied against herbs), insecticides (specifically used against six-legged beings), bactericides (specifically used to kill and combat bacteriae in general) and fungicides (specifically used to put out of action all kinds of fungi). Several other categories might be included, but the mentioned above are the most commonly employed.

Despite all the benefits that these chemicals bring to mankind, in terms of improving the crop production — by letting the cause of damage out of reach —, there are, however, other negative sides of the story. Pesticides are sometimes used in unscrupulous ways, by people who do not have the slightest care concerning the environment. It is quite an ordinary thing to hear or watch matters on TV or written media referring to farmers and other related soil-producers who have been involved in illegal pesticide applying. In most cases, this illegal and hazardous act may risk the life of a complete town, once rivers, water bodies and many more important sources of welfare may be contaminated by the dumping of chemical waste, or even by the infiltration of contaminated residues into the soil. The latter is worsened by the rain, which makes the chemicals go deeper down into the earth. Many developed countries are aware of this problem, which still remains a bewildering matter for many underdeveloped nations.

The other side of this two-edged sword is that pesticides are to be used by farmers. By applying them, producers may guarantee a good yield and bring betterment to their crops. When employed with care — and, mainly, following the instructions supplied by the

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manufacturer — and by scrupulous and conscientious people, pesticides are a precious tool men have in hand. By going against the growth of fast and efficient living beings which outstandingly surpass the growth of the host, pesticides make plantations develop better, healthier and free from the threaten of a massive attack.

Pesticides are enemies and angels. Two thoroughly and paradoxically different sides of the same cursed, though profitable, solution of chemical compounds which possess the ability to kill and quench one's hunger. Blame them or set them innocent? That is something which is left unanswered for the reader to decide.

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1. Descreva o processo pelo qual os Himalaias surgiram.
2. Qual é a origem do nome Himalaia?
3. Por que a maior montanha do mundo foi batizada de Everest?
4. Como foi possível medir com precisão a altura correta do Everest?

TEXT 8

THE HIMALAYAS

The Himalayas are a range of mountains and summits which constitute the so-called “roof of the world”, located in the frontier of Tibet and Nepal, north of India. It is world-wide known by scientists in general that the Himalayas — the name means “mountains of the heaven” in the original Tibetan tongue — were formed by an abrupt collision of the Asian undersea plate of the Philippines with the dry and massive area of the Gobi Desert, which brought to the surface this uneven and steep wall of tall hills. This event occurred 340 million years ago.

Most of the Himalayan mountains have summits which easily go higher than 24,242 feet high (approximately 8,000 meters), culminating with the top peak of the world: the Everest, the tallest locality on the Earth crust. Man had long wanted to measure its highest spot, but that only came true in 1954, when the Indian government carried out a topographic survey. Precise measurements were taken of the majestic mountain and the correct data showed up: it is 26,812 feet high (8,848 m). The Everest was given this name after *sir* George Everest (1790-1866), an English topographer who dwelt in India. The peoples from the Tibet are used to calling it *Chomolungma,* and the ones from Nepal, *Sagarmatha.*

Some people from Nepal say that a weird creature, called *Ieti,* or “The Abominable Man of the Snow”, lives next to the Everest. Mountaineers, however, have never seen this legendary and huge-shaped monster.

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1. Explique por quê a maioria das pessoas reconhece a água como sendo um líquido incolor, embora ela possa ser sólida ou gasosa.
2. Como se comporta a água, do ponto de vista químico?
3. É possível converter metais, como o ferro, por exemplo, em líquidos ou até mesmo gases? Responda a pergunta, justificando a resposta com base no texto.
4. Explique o significado da primeira frase do último parágrafo do texto.

TEXT 9

WATER

Most people would recognize water as a colorless liquid. They would know that in very cold conditions it becomes a solid called ice, and that when heated on a fire it becomes a vapor called steam. But water, they would say, is a liquid.

We have learned that water consists of molecules composed of two atoms of hydrogen and one of oxygen, which we describe as the formula H_2O. But this is also true of the solid called ice and the gas called steam. Chemically there is no difference between the gas, the liquid and the solid, all of which are composed of molecules with the formula H_2O. And this is true of other chemical substances; most of them can be presented as gases or as liquids or as solids. We normally think of iron as a solid, but if we heat it in a furnace it will melt and become a liquid, and at very high temperatures it will become a gas. We may currently think of air as a mixture of gases, but at very low temperatures it becomes a liquid and at lower temperatures still it becomes a white solid.

Nothing very permanent occurs when a gas changes into a liquid or a solid. Everyone knows that ice, which has been made out of freezing water, can be melted again by being warmed; and that steam can be spread onto a cold surface to become liquid water.

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1. Explique por quê o Rio Amazonas passou a ser considerado o maior rio do mundo, já que, até pouco tempo, o Rio Nilo mantinha o primeiro lugar.
2. Como atua o hormônio serotonina no organismo humano?
3. Por que os conservacionistas estão preocupados com o futuro da águia-calva americana, que é o símbolo dos Estados Unidos da América?

TEXT 10

SHORT PASSAGES

THE AMAZON RIVER

Until recently, it was said that the longest river in the world was the Nile River. According to some specialists in the field, the Brazilian river, the Amazon, is the biggest river. This credit was given to the South American river after several surveys which showed that, undoubtedly, the Amazon has some meters more than the Egyptian river.

SEROTONIN

The hormone serotonin — a chemical substance produced in the brain and released into the blood circulation regularly — is granted the title “the mood controller”. Actually, this hormone does control the mood change of a person: the feeling of sadness, of depression, of ecstasy and many other feelings are controled by this chemical.

THE BALD EAGLE

The national bird of the USA is the bald eagle, a large bird-of-prey which is now endangered. The cherokee indians used to believe that this animal was the creator of all beings on Earth, and that the movement of its wings could generate life. From the huge population that one day used to spread all over America, today only few individuals survive. Conservationists are worried about the fate this animal can have in a short time.

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1.Quais são as principais razões pelas quais as cavernas nacionais estão sendo ameaçadas?
2. Quais são as condições encontradas no interior de uma caverna preservada, de acordo com Ferreira Filho?
3. Quais são os principais problemas encontrados na Caverna do Diabo?
4. Que medidas foram tomadas para controlar o acesso de pessoas à Caverna de Santana?
5. Como os visitantes devem estar vestidos em uma caverna preservada?

TEXT 11

CAVERNS

Alongside Vale do Ribeira, in the São Paulo State of Brazil, the biggest set of caverns throughout the country (more than 360 caverns have been reported) is at risk. The infrastructure to host tourists and the huge flow of visitors have been changing the original features of the place and have brought destruction to the caverns, at various levels.

According to one of the members of the National Counseling for the Mata Atlantica Reservoirs, Clayton Ferreira Filho, in an untouched cavern the inside environment is humid and the temperature does not go higher than 64.4ºF (18ºC) throughout the year. People can find artwork that nature has built in millions of years.

At Caverna do Diabo (Devil's Cavern), one of the most popular sites in the Valley, in Eldorado, the access ramps and the powerlight have harmed the preservation of the natural treasure. The lamps, which light the path for visitors, put animals away and benefit the development of plants which would normally not grow in dark places.

At Caverna de Santana (Saint Anna's Cavern), in Iporanga, with the frequent destruction which has taken place, a grid had to be installed in order to control people's entry. "Tramps used to come in to break stalagtites, write on grafitti, spread litter and break other things inside", said Ferreira Filho. According to him, the walking of people inside the cavern is also a threaten.

In caverns which are under preservation procedures, visitors should go inside wearing helmets with carburet light (miner's helmet).

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