Anabolism and catabolism worksheet

At the end of this section, You will be able: Explain what the metabolic routes state the first and second laws of thermodynamics Explain kinetic differences and energy potential described endergonik and reaction exercises discussed how enzimes function as molecular catalysts scientists used bioegenic to terms describing the concept of energy flow (Figure 4.2) in living systems, like the cells. Cell processes such as the building and breaking down of complex molecules occur in stepwising chemical reactions. Some of these chemical reactions are spontaneous energy and warfare, whereas others require energy to continue. Just as living things must always consume food to fill up their energy supply, cells must still produce more energy to fill that is used by the many energy reactions that require chemical reactions that are still taking place. Together, all the chemical reactions that take place inside the cells, including those that consume or generate energy, are referred to as the cell's metabolism. Figure 4.2 Ultimate, more life forms get their energy from the sun. Plants use photosynthesis to take sunlight, and ebivores food plants to get energy. Carnivores eats the ebivores, and eventual decomposition of plants and animal materials contributes to the pool of nutrients. Consider the metabolism of sugar. This is a classic example of one of the many cellular processes that uses and produces energy. Living things consume sugar as a larger energy source, because sugar molecules have a great deal of energy stored in links. For the most part, photosynthesis organisms such as plants produce these sugars. During fotosynthesis, plants use energy (originally from sunlight) to convert carbon gas (CO_2) into sugar molecules (such as glucose: $C_6H_{12}O_6$). They consume carbon dioxide and produce oxygen as a waste product. This reaction is summarized as: $6CO_2+6H_2O$+ energy ——->$C_6H_{12}O_6+6O_2$ Because this process involves synthesizing an energy-storing molecule, it requires input energy to proceed. During the light reactions of fotosynthesis, the energy provided by a molecule called triphosphate adenosin (ATP), which is the primary energy currency of all cells. As is the dollar is used as currencies to buy goods, the cells use molecules in ATP as energy currencies to make immediate work. In contrast, energy-storage molecules such as glucose are consumed only to be broken down to use their energy. The reaction that recognizes the energy of a sugar molecule in cells that require the survival oxygen can be summarized by the reverse reaction of fotosynthesis. In this reaction, consuming oxygen and carbon dioxide is released as a waste product. The reaction is summarized as: $C_6H_{12}O_6$ $+6O_2$ --> $6CO_2$ + $6H_2O$ + energy both of these reactions involve many steps. The processes of making and breaking down sugar molecules show two is in the way of the etabolic. A metabolic path is a series of chemical reactions that take a starting molecule and modify it, step-by-step, through a range of metabolic intermediates, eventually providing a final product. In the example of sugar metabolism, the first metabolic route synthesis cycles from smaller molecules, and the other route breaks sugar down into smaller molecules. These two opposite---first processes that require energy and second energy products – are referred to as your route (build polymer) and carbohydrate pathways (breaking polymers in their monomers), respectively. Consequeously, metabolism consists of synthesis (anabolism) and degradation (catabolism) (Figure 4.3). It's important to know that chemical reactions to metabolic pathways don't take place on their own. Every facilitated reaction step, or catalyze, by a protein is called an enumemy. Enzimes are important to catalyze all kinds of biological reactions — those that require energy as well as people who release energy. Figure 4.3 Catabolic Road is the person who generates energy by breaking down larger molecules. Your route is those that require energy to synthesis larger molecules. Both types of paths are required to maintain the cell's energy balance. Thermodynamics refers to the study of energy and energy transfer involved in physical subjects. Important in relevant to a particular case of energy transfer called a system, and everything outside of this issue is called the environments. For example, when heating a pot of water on the stove, the system includes the stove, the pan, and the water. Energy transferred to the system (between the stove, pot, and water). There are two types of systems: open and closed. In an open system, energy can change with its environment. The stovetop system is open because heat can be lost in the air. A closed system cannot exchange energy with its environment. Biological organisms are open systems. Energy exchanges between them and their environment as they use energy from the sun to make photosynthesis or consume energy-storing molecules and energy released into the environment by doing work and releasing heat. Like everything in the physical world, energy is subject to physical law. The laws of thermodynamics govern the transfer of energy into and among all systems of the universe. In general, energy is defined as the ability to make jobs, or to create some kind of change. Energy exists in different forms. For example, electrical energy, light energy, and heat energy are all different types of energy. To appreciate ways to flow energy into and out of biological systems, it is important to understand two of the physical laws governing energy. The first law of thermodynamics stated that the total amount of energy in the universe is constant and maintained. In other words, there has always been, and always will be, exactly the same amount of energy in the universe. in many different forms. According to the initial law of termodynamics, energy can be transferred from place to place or transformed into different forms, but cannot be created or destroyed. Their transfer and transformation of energy take place beside us all the time. Bulbs transform electrical energy into light and energy heat. Stove gas transformed chemical energy from natural gas to heat energy. Plant makes one of the most useful biological energy transformations on Earth: that of converting the energy of sunlight into chemical energy stored in organic molecules (Figure 4.2). Some examples of energy transformation are shown in Figure 4.4. The challenge for all living organisms is to gain energy from the environments in the forms that they can transfer or transform into energy use to perform tasks. Living cells evolve to meet this challenge. Chemical energy stored in organic molecules such as sugar and fat transferred and transformed into a range of cellular chemical reactions in energy into ATP molecules. The energy of ATP molecules is easily accessible to perform tasks. Examples of the type of work that cells need to do include complex complex molecules, material carriers, power the movement of cilia or bondage, and muscle fiber contractions to create movement. Figure 4.4 Shows are some examples of transferring energy and transforming from one system to another and from one form to another. The food we consume provides our cells with the energy needed to carry out coating functions, as light energy provides plants and means to create the chemical energy they need. (ice cream credits: modification of work by D. Sharon Pruitt; child Credit: Modification of Works by Max from Baynce; Folk Credit: Modification of Works by Cory Zanker) The primary tasks of a cell living in finding, transforming, and using energy to do work can seem simple. However, the second law in thermodynamics explains why such acts are harder than they appear. All energy transfer and transformation are never completely efficient. In each energy transfer, some amount of energy is lost in a form that is capable. In most cases, this form is heat energy. Thermodynamical, heat energy is defined as the energy transferred from one system to another that does not work. For example, when a light bulb is turned on, some of the energy being converted into electrical energy into light energy is lost as heat energy. Similarly, some energy is absorbed as heat energy during metabolic cell reactions. An important concept of physical system is that of order and disease. The more energy is absorbed by a system in its environment, the less being ordered and more random the system is. Scientists refer to the measurement of random or disease in a system as enterprises. High entrance means high illness and low energy. Molecules and chemical reactions have various maintenance as well. For example, enterprises increase as molecules to a high in one difficult place and spread out. The second law in thermodynamics says energy will still be absorbed as heat of energy transfer or transformation. Living things are highly ordered, which requires constant energy to be kept in a state of low enterprises. When an object is in motion, there is the energy associated with that object. Think about a black ball. Even a slowly moving move ball can do a great deal of damage to other objects. The energy associated with objects in motion is called kinetic energy (Figure 4.5). A speed bullet, a walking man, and the rapid movement of molecules in the air (which produces heat) all have kinetic energy. Now what if that same motionless wrecking ball is up to two stories above ground with a technique? If the ball stop wrecking is unmoving, is there energy associated with it? The answer is yes. The energy that had to lift the wrapping ball didn't disappear, but is now stored in the ball stuck by virtue of its position and the strength of gravity acting on it. This is the type of energy called energy potential (Figure 4.5). If the ball fell, the potential energy would be transformed into kinetic energy until all of the potential energy was being utilized when the ball rested on the ground. Wrecking balls also swung like a pendula; through the swing, there is a constant shift in energy potential (above to the top of the sway) in kinetic energy (higher at the bottom of the swing). Other examples of potential energy include the energy of water that has been done behind a damage or someone on the skydive from an aircraft. Figure 4.5 Still water has energies potential; moving water, such as in a waterfall or a rapidly riding river, has kinetic energy. (credit Bam: Modification of Works by Pascal/Flickr; Cascade Credit: Modification of Work by Frank Gualtieri) Potential energy is not only associated with the location of questions, but also with the structure of question. Even a spring on earth has potential energy if it is compressed; so a lot of tires that pull off road. On a molecular level, the links that hold the atoms of molecules together exist in a particular structure that contains energy potential. Remember that your cellular route requires energy to synthesis complex molecules from the simplest and catabolic energy release when complex molecules are collapsed. The fact that energy can be released by the outcome of certain chemical links implicates that bonding people have potential energy. In fact, there is potential energy stored in the links of all the food molecules we eat, which is eventually harnessed for use. This is because these links can release energy when broken. That kind of potential energy exists in chemical links, and is released when these links are broken, called chemical energy. The chemical energy is responsible for providing living and energy cells through food. The freedom of energy occurs when the molecular links to the food molecules Visit the site and select Pendulum from the Work and Energy menu to see the change kinetics and energy potential in a pendulum of movement. After learning that chemical reactions release energy when energy-storing links are broken, an important next question is the following: How is the energy associated with these chemical reactions caffified and expressed? How can the energy release from a reaction be compared to those of another reaction? A free energy measurement used to identify these energy transfers. Remember that according to the second law of thermodynamics, all energy transfers involve the loss of some amount of energy in a form that cannot be used like heat. Free energy specifically refers to the energy associated with a chemical reaction available after the losses are accounted for. In other words, free energy is energy use, or energy is available to perform tasks. If energy is released during a chemical reaction, then the change in free energy, significed as ΔG (delta G) will be a negative number. A negative change in free energy also means that the products of the reaction have less free energy than their reactions, because they release some free energy during the reaction. Reactions that have a negative change in free energy and the consequences of free energy warfare are called hexagonical reactions. Think: Hexagonic means energy will exit the system. These reactions are also referred to as spontaneous reactions, and their products have less stored energy than the reactants. An important distinction must be mapped between the spontaneous theme and the idea of a chemical reaction that occurs immediately. Unlike the daily use of the term, a spontaneous reaction is not one that suddenly or quickly occurs. Running the iron is an example of a spontaneous reaction that occurs slowly, little by little, over time. If a chemical reaction absorbs energy rather than energy release on balance, then ΔG for this reaction will be a positive value. In this case, products are more energy free than the reactants. So the products of these reactions can be thought of as energy-storing molecules. These chemical reactions are called endegoic reactions and are not spontaneous. A fenergonik reaction won't take place on its own without the addition of free energy. Figure 4.6 Shows are some examples of endergonik processes (those that require energy) and hexagonic processes (they are energy release). (credit a: modification of work by Natalie Mayor; credit b: modification of USDA works; credit: modification of work by Cory Zanker; credit screenshot: modification of work by Harry Malsch) Look at each of the processes to show and decide whether it is endergonic or hexagonic. There is another important concept that must be regarded as endegonik and hexagonic reactions. Hexagonic reaction requires a small amount of input energy to gain before they can proceed with their energy steps. These reactions have a net release of energy, but they still require some energy input at the beginning. This is the small amount of input energy needed for all chemical reactions to occur called the activation energy. See an animation of the movement from free energy to state transition to the reaction. A substance that helps a chemical reaction occur is called a catalyst, and the molecules that catalyze reactions to catalysts are called enzimes. Most enzimes are proteins and perform the critical work of lowering the activation energy of chemical reactions inside the cell. Most of the critical reactions to a living cell happening too slowly at normal temperatures must be in any use in the cell. Without their enzimes soon these reactions, the life could not persist. Enzimes do so by binding the reactant molecules and keeping them in such a way as making the good-breaking chemical processes and -forming processes take place easier. It is important to remember that enzimes don't change if a reaction is exercise (spontaneous) or undegoical. This is because they don't change the free energy of their reactants or products. They only reduce the activation energy needed for the reaction going forward (Figure 4.7). In addition, an enzime itself is changed by the reaction it catalyze. Once a reaction has been catalyzed, the enzim is able to participate in other reactions. Figure 4.7 Enzim lowers the activation energy of the reaction, but doesn't change the free energy of the reaction. The chemical reactants that an enumerous link is called the enzim's substrates. There may be one or more substrates, depending on the particular chemical reaction. In some reactions, a substrate reactant is single broken down into multiple products. In others, two substrates can come together to create one larger molecule. Two reactants might also enter a reaction and both become modified, but they leave the reaction as two products. The location of the enumery where the substrate links call the enzim's active site. The active site is where the action happens. Since the enzimes are proteins, there is a unique combination of amino acid side ranges at the active site. Each side dog is characterized by different owners. They may be large or small, weak or basic acid, hydrophil or hydrophobic, positively or negatively charged, or neutral. Unique combinations of side ranges create a very specific chemical environment of the active site. This specific setting is adapted to bind to a specific chemical substrate (or substrates). Active sites are subject to influence in the local environment. Increasing the environmental temperature generally increases reaction rates, enzime-catalyzed or otherwise. However, outside temperatures in a range better decrease the percentage at which a catalyzed enthusiasts a reaction. Hot temperatures will eventually cause enzim in denature, an ireversible in the three-dimensional form and therefore the function of the enzim. Enzimes are also inhibited to function better in a certain pH with single fix concentration, and, similar to temperature, extreme pH, and single concentration can cause the enzimes to denature. For many years, scientists have thought that enzim-substrate ideas have taken place in a simple close and clear fashionable way. This pattern declares that the enzim and substrate fit together perfectly in one activation step. However, current query supports a model called induced Fit (Figure 4.8). The induced-fit template expands on the lock-and-key model by describing a more dynamic license between enzim and substrate. As the enzim and substrate come together, their interactions cause a serious change in the enzim's structure that forms an ideal liaison arrangement between enzim and substrate. See an animation to fit commodities. When an enzim binds to its substrate, an enzim-substrate complex is formed. This complex lowered the activation energy of the reaction and encouraged its rapid progression in one of several possible ways. On a core level, enigma encourages chemical reactions involving more than one substrate by bringing the substrate together into a better orientation for reaction. Another way in which enzims encourage the reaction of the substrates is by creating a better environment of the active site for the reaction to occur. The chemical properties from the particular arrangement of class Amine R active in an active site create the perfect environment for a specific enzim's substrates to react. The enzim-substrate complex can also lower energy triggers by compromising the bond structure so that it is easier to break. Ultimately, enzimes can also lower triggers energy by taking part in the chemical reaction itself. In these cases, it's important to remember that the envemy will always return to its original state by the end of the reaction. One of the hallmark properties of enzimes is that they remain ultimately changed by the reactions they catalyze. After an enzim has catalyzed a reaction, it releases its product(s) and can catalyze a new reaction. Figure 4.8 The induced-fit model is an adjustment to the lock-and-key model and explains how enigma and substrate undergo dynamic modification while the transition state increases the affinity of the substrate for the active site. It would seem ideal to have a scenario in which all of the enrypts of an organism exist in abundant equipment and functioning optimally under all cellular conditions, in all cells, at all times. However, a variety of mechanisms ensure that this doesn't happen. Cell needs and conditions always will vary from cell to cell, and switch to individual cells over time. Enzimes are required in stomach cells different from those of fat storage cells, skin cells, blood cells, and nerve cells. In addition, an organ digestive cell will work harder to process and break nutrients during time nearly followed a meal compared to many hours after a meal. As these cell demands and conditions vary, so the amounts and functionality of enzimes differ. Since the rates of biochemical reactions are controlled by activation energy, and lower enzimes and determine determined energy for chemical reactions, the relative and functioning quantities of the enzime varieties in a cell ultimately determine which reaction will continue and at that rate. This determination is well controlled in cells. In certain cellular environments, envelous activity is enzimes controlled by environmental factors such as pH, temperature, single concentration and, in some cases, cofactors or cozenymes. Enzimes can also be regulated in ways that either promote or reduce entice activity. There are many types of molecules that inhibit or promote enigma functions, and various mechanisms by which they do so. In some cases of enzim inhibition, an inibitor molecule is similar enough to a substrate that it can bind to the active site and simply block the substrate from binding. When this happens, the enuremy is prohibited in inhibitor of competitive inibition, because an inibitor molecule competing with the substrate for binding to the active site. On the other hand, in non-inconvenient, an inibitor licensing molecule in the enzime of a location other than the active site, called an allosteric site, but still managed to block substrate binding to the active site. Some inibitor molecules bind to enzimes in a location where binding to produce a compliance change that decreases the afinity of the enzim for its substrate. This is the type of inhibition called alosteric inhibitions (Figure 4.9). Most enzime controller alliances are made up of more than one polipeptide, meaning they have more than one subunit protein. When an alosteric inhibitor is bound to a region on an enzim, all active sites on the protein subunits are changed slightly like they are bound to their substrates with less efficiency. There are allosteric activators as well as inhibitors. The Allosteric activator tied to locations on an enzim away from the active site, inducing a compliance change that increases the afinity of enzim's active site(s) for its substrate(s) (Figure 4.9). Figure 4.9 Allosteric Ban is working by indirectly producing a compliance change in the active site such that the substrate no longer fits. In contrast, in alosterical triggers, modify the activated molecule to modify the form of the active site to enable a better fit of the substrate. Pharmaceutiical Drug Developer Figure 4.10 Have you ever wondered how pharmaceutiical drugs are developed? (credit: Deborah Austin) Enzimes are key elements of metabolic routes. Understand how enthusiasts work and how they can control are key principles behind the development of many of the pharmaceutiical drugs on the market today. Byologists working in this field collaborate with other drug design scientists 4.10). Consider statins for example--statins are the given names of a drug grade that can decrease cholesterol levels. These compounds are inibitors of reduced the enencylate HMG-CoA, which is the enzim in which cholesterol synthesizes from lipids in the body. By banning this enzim, the level of cholesterol synthesis in the body can be reduced. Similarly, acetaminophen, popularly marked under the Tylenol Name brand, is an inibitor of the enzime squash. While it is used to provide fever relief and inflammation (pain), its mechanism of action is still not understood fully. How to discover drugs? One of the biggest challenges of drug discovery is identifying a drug target. A drug target is a molecule that literally targets the drug. In the case of statins, HMG-CoA reduced is the drug target. Target drugs are identified in pain research in the lab. Identifying the target alone is not enough; Scientists also need to know how the act targets inside the cell and what reaction goes premium to the case of disease. Once the target and the path are identified, then the actual process of drug design begins. At this stage, chemistry and biologies work together to design and synthesis molecules that can block or activate a particular reaction. However, this is only the beginning: If and when a drug prototype is successful in doing its functions, then it is subject to many tests from at vitro experience in clinical trials before it can get approval from American Food and Drug Administration to be on the market. Many enzimes do not work optimally, or even at all, unless tied to other non-protein protein molecules. They may be temporarily enslaved in hydrogen bonds or hydrogen, or permanently via stronger covalent bonds. Linding of these molecules promotes better forms and functions of their respective enzimes. These two examples types of molecules help them are cofactors and coenzymes. Cofactors are inorganic ions like ions of iron and magnesium. Coenzymes are organic assisted molecules, those with a basic atomic structure made up of carbon and hydrogen. Like enzimes, these molecules are involved in reactions without changing themselves and are ultimately recycled and reused. Vitamins are the source of coenzymes. Some vitamins are the prcursors of coenzymes and others act directly as coenzymes. Vitamin C is a direct coalition for multiple enveyms that takes part in building the important connection tissue, collages. Therefore, enzyme functions are, in part, controlled by the abundance of various cofactors and coenzymes, which can be supplied by a diet of an organism or, in some cases, produced by the organism. Figure 4.11 Vitamins are important coenzymes or precursors of coenzymes, and are required for enzymes to function properly. Multivitamin capsules usually have mixture of all the vitamins at different rates. Molecules can control enzim functions in several ways. The Biggest however: What molecules do they come from and where do they come from? Some are cofactors and coenzymes, as you've learned. What are other molecules in the cell providing enzimatic policies such as alosterical modules, and competitive and non-competitive inhibitions? Perhaps the most important source of regulatory molecules, with respect to enzimatic cell metabolism, are the products of the metabolic reactions themselves. In a more efficient and elegant way, cells have evolved to use their products in their own reactions to ban feedback from enzime activities. Ban Feedback involves the use of a reaction product to control its own (Figure 4.12). The cell responds to an abundance of the products by slowing down production during or catabolic reactions. These reaction products can prevent the enzimes that catalyze their production of the mechanisms described above. Figure 4.12 Metabolic routes are a series of reactions catalyticized by multiple enzimes. Feedback inhibitions, where the end product of the path unhibits a bug process, is an important regulatory mechanism in cells. Production of both amino acids and nucleotides controls to ban feedback. In addition, ATP is an alosteric regulator of some of the enzimes involved in the catabolic outage of sugar, the process that creates ATP. In this way, when ATP is in abundant reserves, the cell can prevent ATP output. On the other hand, ADP serves as a positive alosterical regulation (an alosteric activator) for some of the same enzimes banned by the ATP. So when relative levels of ADP are high compared to ATP, the cell is triggered to produce more ATP of sugar catabolism. Cells perform the functions of life in various chemical reactions. The cell metabolism refers to the combination of chemical reactions that take place in it. Catabolic reactions break complex chemicals into simpler ones and are associated with energy release. Anabolic processes build complex molecules from simpler ones and require energy. In studying energy, the term system refers to the problem with environments involved in energy transfer. Entropy is a measure of the disease in a system. The physical laws that describe the transfer of energy are the laws of thermodynamics. The first law states that the total amount of energy in the universe is constant. The second law in thermodynamics stated that every energy transfer involves some loss of energy in a form that cannot be used, such as heat energy. Energy comes in different forms: kinetic, potential, and free. The shift in free energy to a negative case reaction (releases energy, hexagonic) or positive (energy consumer, endergonic). All the reactions require a first opinion of energy to continue, called the activation energy. Enzimes are chemical catalysts that speed up chemical reactions by lowering their cleavage energy. Enzimes have an active site and a unique environments that adapt particular chemical reactants for this enzim, called substrates. Enzimes and substrates are thought bound according to an induced-fit model. Enzime controller actions conserve resources and respond better to the environment. Who of the following is not an example of an energy transformation? Heating up Dine in a Microwave Solar Panel to Work Training of Electricity None of the above Which of the following is not true about the enzimes? They are consumed by the reactions they catalyze. They are usually made of amino acids. They lowered the activation energy to chemical reactions. Each one is specific to the particular substrate(s) that it binds to. Does physical exercise increase in musk-density involve you and/or catabolic processes? Give evidence for your answer. Explain in your own terms the difference between a spontaneous reaction and one that occurs a lot, and what causes this difference. With regard to enzimes, why are vitamins and minerals needed for good health? Provides examples. Responding to a decomposed pile compound is a surplus process. A burgeoning baby develops into a fertilizer egg is an inegonical process. Tea dissolving in water is a expressable process. A ball rolling down is an egzergonik process. D A physical exercise involves both your process and catabolic. Body cells break sugar provided by atp for doing the necessary work to exercise, such as muscle twinge. This is catabolism. Muscle cells also must repair muscle toilet paper damaged by exercise by building new muscles. This is oubolism. A spontaneous reaction is one that has a negative ΔG and thus release energy. However, a spontaneous reaction doesn't need to happen quickly or suddenly like an instant reaction. It can happen over time periods due to a high energy in activation, which prevents the reaction from partying quickly. Most vitamins and minerals act as cofactors and coenzymes for enzyme action. Numerous enzymes require tying to certain certain cofactors or coenzymes to be able to catalyze their reactions. Since enzimes catalyze many important reactions, it is important to get enough vitamins and minerals from diet and supplements. Vitamin C (ascorbic ascorbic) is a coensure needed for enzim actions that build collages. energy activation: The amount of first energy needed for reactions to reach active sites: a specific region on the enzim where the substrate is required: the mechanism for preventing enzime enzim actions in which a regulatory molecule is bound to a second site (by the active site) and initiated a compliance change to the active site, prevent lines with your substrate: Describes the path that requires an input net energy to synthesis complex molecules from simpler bioegenic ones: the concept of energy flow in living catabolic systems: paths where complex molecules are broken into the simplest ones, energy yield as an additional product of the competitive reaction unimagination: a general mechanism to rule enzime activity in which a molecule other than the enzim substrate is able to bind the active site and prevent the substrate itself from laundry, thus preventing the overall rate of reaction for endergonik to enzim : describes a chemical reaction that results in products that store more chemical potential energy than the enzim reacts: a molecule that catalyzes a biochemical hexagonic: describes a chemical reaction that results in products that have less chemical potential energy than the reactants, plus the freedom of free feedback ban: a mechanism to rule enzim activity in which the product of a reaction or the final product of a series of sequence reactions unhide an enzim for an earlier stage in energy to heat serial reaction energy: the energy is transferred from one system to another non-kinetic energy task: the type of energy associated with objects of metabolism movement: all the chemical reactions that take place inside the cells, including those that use energy and those that release non-japetive energy: a general mechanism of activity enrollment policies in which a regulatory molecule is tied to a site other than the active site and prevent the active site from the subtraction list; thus the inibitor molecule does not compete with the substrate for the active site; inhibition allowance is a form of non-prohibited energy potential: the type of energy that refers to the potential to perform substrate work: a molecule on which the energetic act termodynamics: the science of the relationship between heat, energy, and labor