Chap 6 Review Questions

All the following statements are true of the FIRST law of thermodynamics except:
a. The amount of useful energy decreases.
b. The first law of thermodynamics is often called the law of the conservation of energy.
c. The total amount of energy within an isolated system remains the same.
d. One form of energy may be converted to a different form of energy.
e. All are true of the first law.

In an isolated system, all the following are true of the SECOND law of thermodynamics except:
a. Useful energy decreases.
b. Total energy remains constant.
c. All chemical reactions are exergonic.
d. There is a natural tendency toward greater disorder of the organization of matter.
e. All are true of the second law.

Entropy is a measure of:
a. Increase in orderliness
b. Gain of high-level energy
c. Increase in potential energy
d. Increase in randomness
e. Increase in kinetic energy

How is your body able to counteract the effects of entropy?
a. Regular exercise
b. Sunbathing
c. Eating a balanced diet
d. Bathing regularly
e. Buffers

Energy that is not converted to useful energy is usually given off as...
a. radioactivity
b. electricity
c. light
d. heat
e. entropy

Which of the following has the greatest amount of kinetic energy?
a. Tank of gasoline
b. Moving car
c. Hot car engine
d. Cool air surrounding the engine
e. An unlit firecracker

Why is it possible for living organisms to comply to the second law of thermodynamics?
a. Chemical reactions inside cells mostly cause an increase of high-level energy.
b. Living organisms are totally isolated systems which are not subjected to the laws of physics.
c. Photons of light function as an ultimate source of energy for most forms of life on Earth.
d. Living organisms are unique in that they do not require energy for survival.
e. Organisms are able to function efficiently on heat energy alone.

The second law of thermodynamics states that the _____, or disorder, of the universe is constantly increasing.

Energy transformations are not 100% efficient; often energy in the form of _____ is released, which fulfills the second law of thermodynamics.

. The energy of movement is _____ energy and stored energy is referred to as _____ energy.

Sitting at the top of a slide a child has _____ energy and when sliding down she is using _____ energy.

During photosynthesis, plants use light energy to synthesize glucose from carbon dioxide. However, plants do not use up energy during photosynthesis; they merely convert it from light energy to chemical energy. This is an illustration of
a. increasing entropy.
b. chemical equilibrium.
c. the first law of thermodynamics.
d. the second law of thermodynamics.
e. a spontaneous reaction.

Which of the following best illustrates the first law of thermodynamics?
a. The process of photosynthesis where solar energy is converted to chemical energy.
b. The burning of fossil fuels to heat a home.
c. The use of gasoline to allow your car to run.
d. A marathoner eating a high carbohydrate meal and then running a race the next day.
e. All of the above.

Which of the following is part of the first law of thermodynamics?
a. Energy cannot be created or destroyed.
b. Kinetic energy is stored energy.
c. Energy cannot be transferred or transformed.
d. Exergonic reactions are coupled with endergonic reactions.
e. Potential energy equals kinetic energy in a reaction.

In exergonic chemical reactions:
a. Reactants have more energy than products.
b. Reactants have less energy then products.
c. Reactants and products possess equal amounts of energy.
d. Energy is stored by the reactions.
e. Catalysts are required.

Why is photosynthesis considered an endergonic reaction in an isolated plant?
a. Activation energy is not required.
b. Photosynthesis do not comply with the physical laws of the universe.
c. Because sugar has less energy than the sun.
d. Chemically protein catalysts are not needed.
e. Low-energy reactants are converted into high-energy products.

The best description of a coupled reaction is...
a. two reactions that occur simultaneously
b. a reaction that occurs right after another reaction
c. two reactions that occur in the same organelle
d. reactions that occur during sexual reproduction
e. two reactions that involve one providing energy for the other

What is the ultimate source of energy for most forms of life on Earth?
a. Heat energy
b. Solar energy
c. Thermal energy
d. Chemical energy
e. Nuclear energy

Photosynthesis is classed as a coupled reaction because
a. it is exergonic and does not require an initial input of energy to proceed.
b. there is no net change in chemical equilibria between the reactants and products.
c. high-energy reactants are converted into low-energy products.
d. it requires the energy of endergonic reactions to proceed.
e. it produces a high energy product.

In chemical reactions _____ reactions release energy and _____ reactions require an input of energy.

Which of the following reactions could be coupled to the reactions ATP + $H_2O \rightarrow$ ADP + P(-7.3 kcal)?
a. A + P $\rightarrow$ AP(+9 kcal)
b. B + P $\rightarrow$ BP(+8 kcal)
c. CP $\rightarrow$ C + P(-4 kcal)
d. DP $\rightarrow$ D + P(-10 kcal)
e. E + P $\rightarrow$ EP(+5 kcal)

The burning of sugars as fuels for runners is an example of an _____ chemical reaction whereas the production of sugars during photosynthesis is an example of an _____ chemical reaction.

In chemical reactions, the _____ are converted into products.

An _____ chemical reaction releases energy while an _____ reactions requires an input of energy.
a. exergonic; endergonic
b. endergonic; exergonic
c. enzymatic; endergonic
d. endergonic; enzymatic
e. equilibrium; exergonic

The most common energy carrier molecule of living organisms is:
a. ATP
b. Inorganic phosphate
c. DNA
d. Glucose
e. NADPH

A "high-energy" bond of an ATP molecule is located between:
a. Adenine and ribose
b. Two phosphate groups
c. Ribose and first phosphate group
d. Adenine and first phosphate group
e. Both b and c

When a muscle cell demands energy to perform its work of contraction, what happens to ATP?
a. ATP manufactures more ATP.
b. ATP enters a metabolic pathway.
c. ATP is hydrolysed.
d. ATP is phosphorylated.
e. ATP catalyzes the reaction.

Which of the following is not a common energy carrier in the cell?
a. ATP
b. ADP
c. NAD^+
d. FAD
e. All of the above

When a high-energy bond of ATP is broken, primarily what happens to the released energy?
a. It is lost as heat.
b. It functions as a second messenger.
c. It polarizes the cell.
d. It converts inorganic phosphates into energy carrier molecules.
e. It drives endergonic reactions in the cell.

Which molecule results in short-term storage of energy?
a. Glycogen
b. Fat
c. Sucrose
d. Adenosine triphosphate
e. Protein

Why is ATP such a capable carrier of energy?
a. ATP hydrolysis drives cellular endergonic reactions.
b. Enormous amounts of energy are located in chemical bonds of ATP.
c. Phosphorylation releases significant amounts of energy.
d. The energy-containing bonds are not broken easily.
e. ATP is found throughout the cell.

ATP is an energy carrier. Where is the energy actually located?
a. attached to the phosphate group
b. in the bonds between phosphate groups
c. attached to the nucleotide
d. inside the phosphate
e. between the sugar and the phosphate

Special molecules like NAD^+ and FAD transport _____ in cells, which can then be used as energy in the cell.

The molecule _____ is the major energy carrier in cells.

ATP is considered a short-term form of energy for the cell, while _____ represents more stable, long term energy stores.

Why are enzymes important?
a. because they're proteins
b. because they can evade the laws of thermodynamics
c. because they bind to substrates
d. because they allow reactions to occur at body temperature
e. because they increase body temperature

Which of the following functions as a biological catalyst?
a. Energy carrier molecule
b. Amino acid
c. Enzyme
d. Substrate
e. Steroids

Which of the following lowers the activation energy of a biochemical reaction?
a. Presence of catalysts
b. High temperature
c. Low concentration of reactants
d. Altering pH to 7
e. High concentration of products

All the following statements pertaining to catalysts are true <u>except</u>:
a. Biological catalysts are specific enzymes.
b. Catalysts increase activation energy requirements.
c. Catalysts increase reaction rate.
d. Catalysts are not permanently altered during reaction.
e. All are true.

Which statement best describes the relationship between an enzyme and a reactant molecule?
a. The relationship is temporary.
b. Covalent chemical bonds stabilize the relationship.
c. The enzyme and reactant molecule are both permanently changed.
d. The resultant product and the enzyme are permanently bonded together.
e. The reactant can not function without the enzyme.

Coenzymes function by ...
a. bonding to the enzyme and weakening the bonds of the substrate.
b. binding to the substrate and weakening the bonds of the enzyme.
c. binding two or more substrates and joining them.
d. helping substrates find enzymes.
e. joining together to form an enzyme.

Which enzyme characteristic best explains the fact that animals have enzymes that break apart starch molecules but not cellulose despite the fact that both basically are made up of glucose subunits?
a. Enzyme activity is regulated.
b. Enzymes usually speed up chemical reactions.
c. Enzymes are not permanently changed by the reactions they promote.
d. Enzymes are highly specific.
e. All enzymes are proteins.

_____ are biological catalysts.

Which is the organic molecule which is sometimes required for certain enzyme activity called?
a. an accessory enzyme
b. an allosteric enzyme
c. a coenzyme
d. a functional group
e. an activator

Which of these statements regarding enzymes is FALSE?
a. Enzymes are proteins that function as biological catalysts.
b. Enzymes display specificity for certain molecules to which they attach.
c. Enzymes provide energy for the reactions they catalyze.
d. The activity of enzymes can be regulated by factors in their environment.
e. An enzyme may be used many times over for a specific reaction.

Endproducts of biosynthetic pathways often act to block the initial step in that pathway. This phenomenon is called
a. allosteric inhibition.
b. denaturation.
c. irreversible inhibition.
d. feedback inhibition.
e. endproduct inhibition.

Competitive and noncompetitive enzyme inhibitors differ with respect to
a. the precise location on the enzyme to which they bind.
b. their pH.
c. their binding affinities.
d. their energies of activation.
e. none of the above.

The hydrolysis of sucrose to glucose and fructose is a spontaneous reaction. However, if you dissolve sucrose in water and keep the solution overnight at room temperature, there is no detectable conversion to glucose and fructose. Why?
a. The reaction is at equilibrium.
b. The activation energy of the reaction increases.
c. The activation energy of the reaction decreases.
d. The reaction is endergonic.
e. The free energy of the products is higher than the free energy of the reactants.

In the presence of alcohol dehydrogenase, the rate of reduction of acetaldehyde to ethanol increases as you increase the concentration of acetaldehyde. Eventually the rate of the reaction reaches a maximum, where further increases in the concentration of acetaldehyde have no effect. Why?
a. All of the alcohol dehydrogenase molecules are bound to acetaldehyde molecules.
b. At high concentrations of acetaldehyde, the activation energy of the reaction increases.
c. At high concentrations of acetaldehyde, the activation energy of the reaction decreases.
d. The enzyme is no longer specific for acetaldehyde.
e. At high concentrations of acetaldehyde, the change in free energy of the reactions decreases.

The organic molecule FAD attaches to the enzyme succinate dehydrogenase where it accepts hydrogen atoms from the substrate succinate. FAD is called
a. a protein.
b. a coenzyme.
c. an enzyme.
d. an enzyme-substrate complex.
e. an active site.

The addition of the competitive inhibitor mevinolin slows the reaction HMG-CoA $\rightarrow$ mevalonate, which is catalyzed by the enzyme HMG-CoA reductase. How could you overcome the effects of mevinolin and increase the rate of the reaction?
a. Add more mevalonate.
b. Add more HMG-CoA.
c. Lower the temperature of the reaction.
d. Add a coenzyme.
e. Allow the reaction to reach equilibrium.