- Why does the DNA double helix have a uniform diameter?
  A. Purines pair with pyrimidine
  B. C nucleotides pair with A nucleotides
  C. Deoxyribose sugars bind with ribose sugars
  D. Nucleotides binds with nucleosides
  E. Nucleotides bind with nucleoside triphosphate

- Which enzyme catalyzes the elongation of DNA strand in the 5'------3' direction?
  A. Primase
  B. DNA ligase
  C. DNA polymerase III
  D. Topoisomerase
  E. Helicase

- To repair a thymine dimer by nucleotide excision repair in which order do necessary enzymes act?
  A. Exonuclease, DNA polymerase III, RNA primase
  B. Helicase, DNA polymerase I, DNA ligase
  C. DNA ligase, nuclease, helicase
  D. DNA polymerase I, DNA polymerase III, DNA ligase
  E. Endonuclease, DNA polymerase III, DNA ligase

- Which of the following separates the DNA strands during replication?
  A. Helicase
  B. DNA polymerase III
  C. Ligase
  D. DNA polymerase I
  E. Primase

- Which of the following covalently connects segments of DNA?
  A. Helicase
  B. DNA polymerase III
  C. Ligase
  D. DNA polymerase I
  E. primase

- Which of the following synthesizes short segments of RNA?
  A. Helicase
  B. DNA polymerase III
  C. Ligase
  D. DNA polymerase I
  E. Primase

- Which of the following represents the order of increasingly higher levels of organization of chromatin?
  A. Nucleosome, 30-nm chromatin fiber, looped domain
  B. looped domain, 30-nm chromatin fiber, nucleosome
  C. looped domain, nucleosome, 30-nm chromatin fiber
  D. nucleosome, looped domain, 30-nm chromatin fiber
  E. 30-nm chromatin fiber, nucleosome, looped domain

- Which of the following statements is true of chromatin?
  A. Heterochromatin is composed of DNA, whereas euchromatin is made of DNA and RNA.
  B. Both heterochromatin and euchromatin are found in the cytoplasm.
  C. Heterochromatin is highly condensed, whereas euchromatin is less compact.
  D. Euchromatin is not transcribed, whereas heterochromatin is transcribed.
  E. Only euchromatin is visible under the light microscope.

- In a nucleosome, the DNA is wrapped around
  A. Polymerase molecules.
  B. Ribosomes.
  C. Histones.
  D. A thymine dimer.
  E. Satellite DNA.

- Which of the following help to hold the DNA strands apart while they are being replicated?
  A. Helicase
  B. Ligase
  C. DNA polymerase I
  D. Single-strand binding proteins
  E. Topoisomerase

- An Okazaki fragment has which of the following arrangements?
  A. primase, polymerase, ligase
  B. 3' RNA nucleotides, DNA nucleotides 5'
  C. 5' RNA nucleotides, DNA nucleotides 3'
  D. DNA polymerase I, DNA polymerase III
  E. 5' DNA to 3'

- What determines the nucleotide sequence of the newly synthesized strand during DNA replication?
  A. the particular DNA polymerase catalyzing the reaction
  B. the relative amounts of the four nucleoside triphosphates in the cell
  C. the nucleotide sequence of the template strand
  D. the primase used in the reaction
  E. the arrangement of histones in the sugar phosphate backbone

- Replication in prokaryotes differs from replication in eukaryotes for which of these reasons?
  A. The prokaryotic chromosome has histones, whereas eukaryotic chromosomes do not.
  B. Prokaryotic chromosomes have a single origin of replication, whereas eukaryotic chromosomes have many.
  C. The rate of elongation during DNA replication is slower in prokaryotes than in eukaryotes.
  D. Prokaryotes produce Okazaki fragments during DNA replication, but eukaryotes do not.
  E. Prokaryotes have telomeres, and eukaryotes do not.

- Which of the following removes the RNA nucleotides from the primer and adds equivalent DNA nucleotides to the 3' end of Okazaki fragments?
  A. Helicase
  B. DNA polymerase III
  C. Ligase
  D. DNA polymerase I

- The difference between ATP and the nucleoside triphosphates used during DNA synthesis is that
  A. The nucleoside triphosphates have the sugar Deoxyribose; ATP has the sugar ribose.
  B. The nucleoside triphosphates have two phosphate groups; ATP has three phosphate groups.
  C. ATP contains three high-energy bonds; the nucleoside triphosphates have two.
  D. ATP is found only in human cells; the nucleoside triphosphates are found in all animal and plant cells.
  E. Triphosphate monomers are active in the nucleoside triphosphates, but not in ATP.

- The leading and the lagging strands differ in that
  A. The leading strand is synthesized in the same direction as the movement of the replication fork, and the lagging strand is synthesized in the opposite direction.
  B. The leading strand is synthesized by adding nucleotides to the 3′ end of the growing strand, and the lagging strand is synthesized by adding nucleotides to the 5′ end.
  C. The lagging strand is synthesized continuously, whereas the leading strand is synthesized in short fragments that are ultimately stitched together.
  D. The leading strand is synthesized at twice the rate of the lagging strand.

- A new DNA strand elongates only in the 5′ to 3′ direction because
  A. DNA polymerase begins adding nucleotides at the 5′ end of the template.
  B. Okazaki fragments prevent elongation in the 3′ to 5′ direction.
  C. The polarity of the DNA molecule prevents addition of nucleotides at the 3′ end.
  D. Replication must progress toward the replication fork.
  E. DNA polymerase can only add nucleotides to the free 3′ end.

- Individuals with the disorder xeroderma pigmentosum are hypersensitive to sunlight. This occurs because their cells have which impaired ability?
  A. They cannot replicate DNA.
  B. They cannot undergo mitosis.
  C. They cannot exchange DNA with other cells.
  D. They cannot repair thymine dimers.
  E. They do not recombine homologous chromosomes during meiosis.

- Why do histones bind tightly to DNA?
  A. Histones are positively charged, and DNA is negatively charged.
  B. Histones are negatively charged, and DNA is positively charged.
  C. Both histones and DNA are strongly hydrophobic.
  D. Histones are covalently linked to the DNA.
  E. Histones are highly hydrophobic, and DNA is hydrophilic.

- How do cells capture the energy released by cellular respiration?
  A. They produce glucose
  B. They produce ATP
  C. They store in the molecule of carbon dioxide
  D. The energy is coupled to oxygen
  E. None of the options are correct

- Which of the following statements is true concerning catabolic pathways?
  A. They are spontaneous and do not need enzyme catalysis
  B. They combine molecules into more energy rich molecules
  C. They build up complex molecules such as protein from simpler compounds
  D. They are endergonic
  E. They supply energy primarily in the form of ATP for cell's work

- What kind of chemical bonds is found between paired bases of DNA double helix?
  A. Hydrogen
  B. Double or triple covalent
  C. Coordinate
  D. Phosphodiester
  E. Ionic

- Which of the following processes include all other:
  A. Transport of an ion down its electrochemical gradient
  B. Passive transport
  C. Osmosis
  D. Facilitated diffusion
  E. Diffusion of a solute across membrane

- Which of the following is INCORRECT about the genetic code?
  A. Doublets of nucleotides
  B. Nearly universal for all species
  C. Redundancy
  D. Read in 5' to 3' direction
  E. None of the options is incorrect

- At the end of electron transport chain found in the thylakoid membrane the electrons are transferred to a molecule of:
  A. Oxygen
  B. ATP
  C. Water
  D. Glucose
  E. NADP+

- Which of the following is true about anabolic pathways?
  A. They consume energy to decrease the free energy of the molecules
  B. They consume energy to build up polymers from monomers
  C. They release energy as they degrade polymers to monomers
  D. They do not depend on enzymes
  E. They are usually highly spontaneous chemical reactions

- Which of the following occurs in the cytosol of the cell?
  A. Oxidative phosphorylation
  B. Citric acid cycle
  C. Oxidation of pyruvate to acetyl CoA
  D. Glycolysis and fermentation
  E. Fermentation and chemiosmosis

- In glycolysis glucose undergoes:
  A. Both oxidation and catabolism
  B. Catabolism
  C. Oxidation
  D. Polymerization
  E. Reduction

- Which is not required by the Calvin cycle?
  A. O2
  B. ATP
  C. NADPH
  D. CO2
  E. All of the options are correct

- Which plant cell organelle contains its own DNA and ribosomes?
  A. Peroxisome
  B. Chloroplasts
  C. Golgi apparatus
  D. Vacuole
  E. Glyoxysome

- During protein biosynthesis, targeting polypeptides to endoplasmic reticulum does not involve:
  A. Translocation complex
  B. Signal recognition particle
  C. SRP receptor
  D. RNA polymerase
  E. Signal peptide

- Which of the following components is not directly involved in translation?
  A. RNA polymerase
  B. Ribosome
  C. tRNA
  D. mRNA
  E. GTP

- Which structure is the site of the synthesis of proteins that may be exported from the cell?
  A. Golgi apparatus
  B. Rough ER
  C. Free cytoplasmic ribosomes
  D. Lysosomes
  E. Plasmodesmata

- Which of the following is translation initiation codon?
  A. AUU
  B. ACG
  C. UAA
  D. AUG
  E. AGG

- What is likely to happen to a plant cell that is placed in pure water?
  A. It undergoes plasmolysis
  B. It became flaccid
  C. It becomes turgid
  D. It bursts
  E. None of the options are correct

- According to the fluid mosaic model of membrane structure, proteins of the membrane are mostly:
  A. Confined to the hydrophobic core of the membrane
  B. Fluid in nature
  C. Non-functional
  D. Embedded in phospholipid bilayer
  E. Spread as a continuous layer over the inner and outer surface of the membrane

- What maintains the secondary structure of a protein?
  A. Peptide bonds
  B. Hydrophobic interactions
  C. Hydrogen bonds between the amino group of one peptide bond and the carboxyl group pf another peptide bond
  D. Disulfide bond
  E. Hydrogen bonds between the R groups

- Which of the following statements about nucleosomes is INCORRECT?
  A. The nucleosome core contains an octet of 8 histone proteins
  B. There are two copies of each histone protein in the nucleosome core
  C. Four copies of histone H1 are present in the nucleosome core
  D. Are the units of DNA packing
  E. The nucleosome core is wrapped by the DNA double helix

- Which of the following is mis-matched?
  A. (G=C) and (A=T): Chargaff's rules
  B. TATA box: DNA polymerase binding
  C. DNA: Double helix
  D. Splicing: Eukaryotic pre-mRNA
  E. Lagging strand: Okazaki fragments

- Which of the following polymers contain nitrogen?
  A. Starch
  B. Chitin
  C. Glycogen
  D. Amylopectin
  E. Cellulose

- The point mutation that doesn't produce a change in the amino acid sequence of protein in known as:
  A. Non-sense mutation
  B. Missense mutation
  C. Chromosomal mutation
  D. Frame-shift mutation
  E. Silent mutation

- Okazaki fragments:
  A. Are fragments of discontinuously synthesized DNA strand
  B. Demonstrate that DNA replication is dispersive
  C. Are fragments of the template DNA during replication
  D. None of the options are correct
  E. Are fragments produced by DNA polymerase I

- Liquid water's high specific heat is mainly a consequence of:
  A. Small size of water molecule
  B. High specific heat of oxygen and hydrogen atoms
  C. Absorption and release of heat when hydrogen bonds break and form
  D. Fact that water is a poor heat conductor
  E. Higher density of liquid water than solid water (ice)

- Chemical reactions that has a positive delta G is correctly described as:
  A. Endothermic
  B. Exergonic
  C. Exothermic
  D. Endergonic
  E. Enthalpic

- The liver is involved in detoxification of many poisons and drugs. Which of the following structures is primarily involved in the process?
  A. Rough ER
  B. Transport vesicle
  C. Golgi apparatus
  D. Smooth ER
  E. Nuclear envelope

- Which organelles or structure is absent in plant cells?
  A. Golgi apparatus
  B. Mitochondria
  C. Microtubules
  D. Centrosomes
  E. Peroxisomes

- Which of the following are products of the light reactions of photosynthesis that are utilized in the Calvin cycle?
  A. CO_2 and glucose
  B. H_2O and O_2
  C. ADP, Pi, and NADP+
  D. electrons and H+
  E. ATP and NADPH

- What are the products of the light reactions that are subsequently used by the Calvin cycle?
  A. oxygen and carbon dioxide
  B. Carbon dioxide and RuBP
  C. water and carbon
  D. electrons and photons
  E. ATP and NADPH

- Where does the Calvin cycle take place?
  A. Stroma of the chloroplast
  B. Thylakoid membrane
  C. Cytoplasm surrounding the chloroplast
  D. Chlorophyll molecule
  E. Outer membrane of the chloroplast

- When oxygen is released as a result of photosynthesis, it is a by-product of which of the following?
  A. reducing NADP+
  B. splitting the water molecules
  C. chemiosmosis
  D. the electron transfer system of photosystem I
  E. the electron transfer system of photosystem II

- In the thylakoid membranes, what is the main role of the antenna pigment molecules
  A. split water and release oxygen to the reaction-center chlorophyll
  B. harvest photons and transfer light energy to the reaction-center chlorophyll
  C. synthesize ATP from ADP and Pi
  D. transfer electrons to ferredoxin and then NADPH
  E. concentrate photons within the stroma

- The reaction-center chlorophyll of photosystem I is known as P700 because
  A. There are 700 chlorophyll molecules in the center.
  B. This pigment is best at absorbing light with a wavelength of 700 nm.
  C. There are 700 photosystem I components to each chloroplast.
  D. It absorbs 700 photons per microsecond
  E. The plastoquinone reflects light with a wavelength of 700 nm.

- Which of the events listed below occur in the light reactions of photosynthesis?
  A. NADP is produced.
  B. NADPH is reduced to NADP+.
  C. Carbon dioxide is incorporated into PGA.
  D. ATP is phosphorylated to yield ADP.
  E. Light is absorbed and funneled to reaction-center chlorophyll a.

- In a plant cell, where are the ATP synthase complexes located?
  A. thylakoid membrane
  B. plasma membrane
  C. inner mitochondrial membrane
  D. A and C
  E. A, B, and C

- In mitochondria, chemiosmosis translocate protons from the matrix into the inter-membrane space, whereas in chloroplasts, chemiosmosis translocate protons from
  A. The stroma to the photosystem II.
  B. The matrix to the stroma.
  C. The stroma to the thylakoid space.
  D. The inter-membrane space to the matrix.
  E. ATP synthase to NADP+ reductase.

- In analyzing the number of different bases in a DNA sample, which result would be consistent with the base-pairing rules?
  A. A = G
  B. A + G = C + T
  C. A + T = G + T
  D. A = C
  E. G = T

- The nitrogenous base adenine is found in all members of which group?
  A. Proteins, triglycerides, and testosterone
  B. Proteins, ATP, and DNA
  C. ATP, RNA, and DNA
  D. Alpha glucose, ATP, and DNA
  E. Proteins, carbohydrates, and ATP

- If proteins were composed of only 12 different kinds of amino acids, what would be the smallest possible codon size in a genetic system with four different nucleotides?
  A. 1
  B. 2
  C. 3
  D. 4
  E. 12

- A mutation in which of the following parts of a gene is likely to be most damaging to a cell?
  A. Intron
  B. Exon
  C. 5' UTR
  D. 3' UTR
  E. All would be equally damaging.

- Which component is not directly involved in translation?
  A. mRNA
  B. DNA
  C. tRNA
  D. ribosomes
  E. GTP

- Which of the following mutations would be most likely to have a harmful effect on an organism?
  A. a base-pair substitution
  B. a deletion of three nucleotides near the middle of a gene
  C. a single nucleotide deletion in the middle of an intron
  D. a single nucleotide deletion near the end of the coding sequence
  E. a single nucleotide insertion downstream of, and close to, the start of the coding sequence

- Sickle-cell disease is probably the result of which kind of mutation
  A. Point
  B. Frameshift
  C. Nonsense
  D. Nondisjunction
  E. Both B and D

- A Frameshift mutation could result from
  A. A base insertion only.
  B. A base deletion only.
  C. A base substitution only.
  D. Deletion of three consecutive bases.
  E. Either an insertion or a deletion of a base.

- What type of bonding is responsible for maintaining the shape of the tRNA molecule?
  A. Covalent bonding between sulfur atoms
  B. Ionic bonding between phosphates
  C. Hydrogen bonding between base pairs
  D. Van der Waals interactions between hydrogen atoms
  E. Peptide bonding between amino acids

- Accuracy in the translation of mRNA into the primary structure of a polypeptide depends on specificity in the
  A. Binding of ribosomes to mRNA.
  B. Shape of the A and P sites of ribosomes.
  C. Bonding of the anticodon to the codon.
  D. Attachment of amino acids to tRNAs.
  E. Both C and D

- During splicing, which molecular component of the spliceosome catalyzes the excision reaction?
  A. Protein
  B. DNA
  C. RNA
  D. Lipid
  E. Sugar

- Alternative RNA splicing
  A. Is a mechanism for increasing the rate of transcription
  B. Allow the production of proteins of different sizes from a single mRNA.
  C. Can allow the production of similar proteins from different RNAs.
  D. Increases the rate of transcription.
  E. Is due to the presence or absence of particular snRNPs.

- Once transcribed, eukaryotic mRNA typically undergoes substantial alteration that includes
  A. Union with ribosomes.
  B. Fusion into circular forms known as plasmids
  C. Linkage to histone molecules.
  D. Excision of introns.
  E. Fusion with other newly transcribed mRNA.

- What is a ribozyme?
  A. an enzyme that uses RNA as a substrate
  B. an RNA with enzymatic activity
  C. an enzyme that catalyzes the association between the large and small ribosomal subunits
  D. an enzyme that synthesizes RNA as part of the transcription process
  E. E) an enzyme that synthesizes RNA primers during DNA replication

- What are the coding segments of a stretch of eukaryotic DNA called?
  A. introns
  B. exons
  C. codons
  D. replicons
  E. transposons

- Which of the following help(s) to stabilize mRNA by inhibiting its degradation?
  A. TATA box
  B. spliceosomes
  C. 5′ cap and poly (A) tail
  D. introns
  E. RNA polymerase

- In eukaryotes there are several different types of RNA polymerase. Which type is involved in transcription of mRNA for a globin protein?
  A. Ligase
  B. RNA polymerase I
  C. RNA polymerase II
  D. RNA polymerase III
  E. Primase

- Transcription in eukaryotes requires which of the following in addition to RNA polymerase?
  A. The protein product of the promoter
  B. Start and stop codons
  C. Ribosomes and tRNA
  D. Several transcription factors (TFs)
  E. Aminoacyl synthetase

- RNA polymerase moves in which direction along the DNA?
  A. 3′ → 5′ along the template strand
  B. 3′ → 5′ along the coding (sense) strand
  C. 5′ → 3′ along the template strand
  D. 3′ → 5′ along the coding strand
  E. 5′ → 3′ along the double-stranded DNA

- Which of the following is true for both prokaryotic and eukaryotic gene expression?
  A. After transcription, a 3′ poly-A tail and a 5′ cap are added to mRNA.
  B. Translation of mRNA can begin before transcription is complete.
  C. RNA polymerase binds to the promoter region to begin transcription.
  D. mRNA is synthesized in the 3′ → 5′ direction.
  E. The mRNA transcript is the exact complement of the gene from which it was copied.

- A particular triplet of bases in the template strand of DNA is 5' AGT 3'. The corresponding codon for the mRNA transcribed is
  A. 3' UCA 5'
  B. 3' UGA 5'
  C. 5' TCA 3'
  D. 3'ACU 5'
  E. Either UCA or TCA, depending on wobble in the first base

- In which of the following actions does RNA polymerase differ from DNA polymerase?
  A. RNA polymerase uses RNA as a template, and DNA polymerase uses a DNA template.
  B. RNA polymerase binds to single-stranded DNA, and DNA polymerase binds to double-stranded DNA.
  C. RNA polymerase is much more accurate than DNA polymerase.
  D. RNA polymerase can initiate RNA synthesis, but DNA polymerase requires a primer to initiate DNA synthesis.
  E. RNA polymerase does not need to separate the two strands of DNA in order to synthesize an RNA copy, whereas DNA polymerase must unwind the double helix before it can replicate the DNA.

- Which of the following statements best describes the termination of transcription in prokaryotes?
  A. RNA polymerase transcribes through the polyadenylation signal, causing proteins to associate with the transcript and cut it free from the polymerase.
  B. RNA polymerase transcribes through the terminator sequence, causing the polymerase to fall off the DNA and release the transcript.
  C. RNA polymerase transcribes through an intron, and the snRNPs cause the polymerase to let go of the transcript.
  D. Once transcription has initiated, RNA polymerase transcribes until it reaches the end of the chromosome.
  E. RNA polymerase transcribes through a stop codon, causing the polymerase to stop advancing through the gene and release the mRNA.

- What best characterizes the role of ATP in cellular metabolism?
  A. Its free energy coupled to an endergonic process
  B. It takes phosphate from other enzyme substrate
  C. The release of free energy during ATP hydrolysis heats the surrounding environment
  D. It is catabolized to carbon dioxide and water
  E. The delta G associated with its hydrolysis is positive

- Enzymes are described as catalyst, this means that they:
  A. Are proteins
  B. Provide activation energy for the reaction the facilitate
  C. Stabilize molecules in the transition state
  D. Elevate the activation energy barrier of the reaction
  E. Change the rate of a reaction without being consumed by the reaction

- Which of the following is not formed during non-cyclic photosynthetic electron flow:
  A. ATP
  B. PMF
  C. NADPH
  D. Oxygen
  E. All of the options

- The end product of the citric acid cycle include all of the following except:
  A. NADH
  B. ATP
  C. Pyruvic acid
  D. FADH2
  E. CO2

- The term anaerobic means:
  A. With oxygen
  B. Without oxygen
  C. Without ATP
  D. Without bacteria
  E. Without carbon dioxide

- Which of the following is true?
  A. Neither cellular respiration nor photosynthesis occurs in mitochondria and in chloroplasts
  B. Cellular respiration occurs in mitochondria and chloroplasts
  C. Photosynthesis occurs in mitochondria and cellular respiration occurs in chloroplasts
  D. Photosynthesis occurs in chloroplasts and cellular respiration occurs in mitochondria
  E. Photosynthesis occurs in mitochondria and chloroplasts

- Enzymes catalyze a reaction by:
  A. Decreasing the amount of activation energy needed to drive the reaction
  B. Decreasing the amount of energy released by the reaction
  C. Increasing the amount of energy released by reaction
  D. Increasing the amount of activation energy needed to drive the reaction
  E. Stabilizing its substrate

- What is the product of the reaction catalyzed by RubsiCo in Calvin cycle?
  A. 3-phospholglycerate
  B. G3P
  C. Dihydroxyacetone phosphate
  D. Fructose 6-phosphate
  E. Ribose 5-phosphate

- The correct order of Calvin cycle stages is:
  A. Reduction – Regeneration – Glucose formation
  B. Oxidation – Reduction – Carbon fixation
  C. Carbon fixation – Oxidation – Regeneration
  D. Carbon fixation – Reduction – Regeneration
  E. Reduction – Carbon fixation – Regeneration

- Oxidation is the ------- and reduction is the ---------
  A. Loss of oxygen --- gain of oxygen
  B. Gain of protons --- loss of protons
  C. Gain of oxygen --- loss of oxygen
  D. Loss of electrons --- gain of electrons
  E. Gain of electrons --- loss of electrons

- A high concentration of H+ in the thylakoid lumen provides potential energy for the:
  A. Reduction of CO2
  B. Formation of NADPH
  C. Breakdown of water
  D. Release of O2
  E. Production of ATP

- Cellular respiration is an example of:
  A. A catabolic pathway
  B. An anabolic pathway
  C. Extracellular activity
  D. Thermodynamic
  E. Entropy

- A gene promoter is:
  A. Is a nucleotide sequence that signals the start of translation
  B. Contains the polyadenylation signal
  C. Is a nucleotide sequence the signals the end of transcription
  D. Is the binding site of RNA polymerase
  E. None of the options is correct

- The E site on the ribosome is:
  A. The site which the empty tRNA leaves the ribosome
  B. The site which holds the tRNA carrying the growing polypeptide chain
  C. The site from which developed polypeptide chain leaves the ribosome
  D. The site which holds aminoacyl tRNA
  E. None of the options is correct

- If 10 molecules of acetyl CoA enter the citric acid cycle. How many molecules of ATP will be made by substrate level phosphorylation?
  A. 18
  B. 4
  C. 20
  D. 32
  E. 10

- Which is incorrect for RNA polymerase?
  A. Is binding of DNA template strand is mediated by transcription factors
  B. Several are RNA polymerases can transcribe a gene simultaneously
  C. It needs a primer
  D. It can unwind the two strands of DNA to initiate transcription
  E. All of the options are incorrect

- Pinocytosis is one type of:
  A. Active transport
  B. Diffusion
  C. Exocytosis
  D. Facilitated transport
  E. Endocytosis

- Rubsico :
  A. Is found in the stroma of chloroplasts
  B. CO2 and RUBP are its substrate
  C. Is a Calvin cycle enzyme
  D. Catalyze carbon fixation in chloroplasts
  E. All of the options are correct

- Which of the following stages of translation require energy:
  A. Formation of translation initiation complex
  B. Elongation
  C. Termination
  D. Formation of aminoacyl-tRNA
  E. All of the options are correct

- Water molecules are able to form hydrogen bonds with
  A. A oxygen gas molecules
  B. Any compounds that is not soluble in water
  C. Compounds that have polar covalent bonds
  D. Chloride ions
  E. Oils

- Which of the following is incorrect for P680 and P700?
  A. Participate in linear electron flow
  B. Directly involved in chemiosmosis
  C. Are found in the thylakoid membrane
  D. Are oxidized following excitation
  E. Are modified chlorophyll a

- Which of the following help to hold the DNA strands apart while they are being replicated?
  A. Helicase
  B. Ligase
  C. DNA polymerase I
  D. Single-strand binding proteins
  E. Topoisomerase

- Which of the following contains nine doublets of microtubules surrounding a pair of single microtubules?
  A. Both flagella and motile cilia
  B. Centrioles only
  C. Both basal bodies and microvilli
  D. Both motile cilia and microvilli
  E. Both centrioles and basal bodies

- The pH of the inner thylakoid space has been measured, as have the pH of the stroma and of the cytosol of a particular plant cell. Which, if any, relationship would you expect to find?
  A. The pH within the thylakoid is less than that of the stroma.
  B. The pH of the stroma is higher than that of the other two measurements.
  C. The pH of the stroma is higher than that of the thylakoid space but lower than that of the cytosol.
  D. The pH of the thylakoid space is higher than that anywhere else in the cell.
  E. There is no consistent relationship.

- In the process of carbon fixation, RuBP attaches a CO_2 to produce a 6 carbon molecule, which is then split in two. After phosphorylation and reduction, what more needs to happen in the Calvin cycle?
  A. Addition of a pair of electrons from NADPH
  B. Inactivation of RuBP carboxylase enzyme
  C. Regeneration of ATP from ADP
  D. Regeneration of rubisco
  E. A gain of NADPH

- Produces three-carbon sugars
  A. light reactions alone
  B. the Calvin cycle alone
  C. both the light reactions and the Calvin cycle
  D. neither the light reactions nor the Calvin cycle
  E. occurs in the chloroplast but is not part of photosynthesis

- Produces NADPH
  A. light reactions alone
  B. the Calvin cycle alone
  C. both the light reactions and the Calvin cycle
  D. neither the light reactions nor the Calvin cycle
  E. occurs in the chloroplast but is not part of photosynthesis

- Produces molecular oxygen (O2)
  A. light reactions alone
  B. the Calvin cycle alone
  C. both the light reactions and the Calvin cycle
  D. neither the light reactions nor the Calvin cycle
  E. occurs in the chloroplast but is not part of photosynthesis

- Requires ATP
  A. light reactions alone
  B. the Calvin cycle alone
  C. both the light reactions and the Calvin cycle
  D. neither the light reactions nor the Calvin cycle
  E. occurs in the chloroplast but is not part of photosynthesis

- Where do the enzymatic reactions of the Calvin cycle take place?
  A. stroma of the chloroplast
  B. thylakoid membranes
  C. outer membrane of the chloroplast
  D. electron transport chain
  E. thylakoid space

- What is the primary function of the Calvin cycle?
  A. use ATP to release carbon dioxide
  B. use NADPH to release carbon dioxide
  C. split water and release oxygen
  D. transport RuBP out of the chloroplast
  E. synthesize simple sugars from carbon dioxide

- Carotenoids are often found in foods that are considered to have antioxidant properties in human nutrition. What related function do they have in plants?
  A. They serve as accessory pigments.
  B. They dissipate excessive light energy.
  C. They cover the sensitive chromosomes of the plant.
  D. They reflect orange light.
  E. They take up toxins from the water.

- Which of the following statements best represents the relationships between the light reactions and the Calvin cycle?

A. The light reactions provide ATP and NADPH to the Calvin cycle, and the cycle returns ADP, Pi, and NADP+ to the light reactions.
B. The light reactions provide ATP and NADPH to the carbon fixation step of the Calvin cycle, and the cycle provides water and electrons to the light reactions.
C. The light reactions supply the Calvin cycle with CO2 to produce sugars, and the Calvin cycle supplies the light reactions with sugars to produce ATP.
D. The light reactions provide the Calvin cycle with oxygen for electron flow, and the Calvin cycle provides the light reactions with water to split.
E. There is no relationship between the light reactions and the Calvin cycle.

- What is the relationship between wavelength of light and the quantity of energy per photon?
  A. They have a direct, linear relationship.
  B. They are inversely related.
  C. They are logarithmically related.
  D. They are separate phenomena.
  E. They are only related in certain parts of the spectrum.

- Reduction of NADP+ occurs during
  A. Photosynthesis.
  B. Respiration.
  C. Both photosynthesis and respiration.
  D. Neither photosynthesis nor respiration.
  E. Photorespiration.

- The splitting of carbon dioxide to form oxygen gas and carbon compounds occurs during
  A. Photosynthesis.
  B. Respiration.
  C. Both photosynthesis and respiration.
  D. Neither photosynthesis nor respiration.
  E. Photorespiration.

- Generation of proton gradients across membranes occurs during
  A. Photosynthesis.
  B. Respiration.
  C. Both photosynthesis and respiration.
  D. Neither photosynthesis nor respiration.
  E. Photorespiration

- Synthesis of ATP by the chemiosmosis mechanism occurs during
  A. Photosynthesis.
  B. Respiration.
  C. Both photosynthesis and respiration.
  D. Neither photosynthesis nor respiration.
  E. Photorespiration.

- Reduction of oxygen which forms water occurs during
  A. Photosynthesis.
  B. Respiration.
  C. Both photosynthesis and respiration.
  D. Neither photosynthesis nor respiration.
  E. Photorespiration.

- Which of the following statements best describes the relationship between photosynthesis and respiration?
  A. Respiration is the reversal of the biochemical pathways of photosynthesis.
  B. Photosynthesis stores energy in complex organic molecules, while respiration releases it.
  C. Photosynthesis occurs only in plants and respiration occurs only in animals.
  D. ATP molecules are produced in photosynthesis and used up in respiration.
  E. Respiration is anabolic and photosynthesis is catabolic.