AP Biology Practice Test 16

60 original multiple-choice questions covering all 8 AP Biology CED units. Choose one answer for each question. The full answer key is on the last page — worked explanations for every question are free on the test page at QuaidianPoint.com.

Name: _____ Class: _____ Score: _____ / 60

Chemistry of Life

Q1. A researcher compares two solvents for dissolving table salt. Water dissolves the salt readily, whereas hexane does not. Which property of water best explains this result?

(A) Water has a low specific heat, so it warms quickly
(B) Water is polar, so its partial charges interact with dissolved ions
(C) Water molecules are uncharged and form no hydrogen bonds
(D) Water is nonpolar, so it repels charged particles

Q2. In a coastal forest, morning fog condenses on leaves and the droplets cling to leaf surfaces instead of falling immediately. Which pair of water properties is most directly involved?

(A) Cohesion between water molecules and adhesion to the leaf surface
(B) High heat of vaporisation and low density of ice
(C) Adhesion between water molecules and cohesion to the leaf surface
(D) Low specific heat and strong covalent bonds within each molecule

Q3. A lake in a cold climate freezes only at the surface, and fish survive below the ice all winter. Which property of water makes this possible?

(A) Liquid water is less dense than ice, so warm water rises to the surface
(B) Ice is less dense than liquid water, so it floats and insulates the water below
(C) Hydrogen bonds weaken as water cools, so ice sinks to the bottom
(D) Water has a low specific heat, so the lake cools evenly

Q4. A student adds a small amount of strong acid to two beakers: one holds pure water and the other holds a bicarbonate buffer at pH 7.4. The pH of the pure water falls sharply, while the buffer pH barely changes. What best explains the difference?

(A) The buffer contains only a strong acid, which neutralises the added acid
(B) Pure water contains hydrogen ions that amplify the added acid
(C) The buffer prevents all chemical reactions in the solution
(D) The buffer contains a weak acid and its conjugate base, which absorb added hydrogen ions

Q5. A marathon runner loses a large volume of sweat on a hot day. Which property of water helps limit the rise in body temperature during the run?

(A) A high heat of vaporisation, so evaporation of sweat removes much heat
(B) Strong covalent bonds, which store heat inside water molecules
(C) A low heat of vaporisation, so sweat evaporates without absorbing heat
(D) A low specific heat, so body temperature rises only slowly

Q6. Cellulose and starch are both polymers of glucose, yet cellulose forms strong fibres while starch is easily digested by humans. What structural difference best explains this?

(A) Starch is held together by peptide bonds and cellulose by glycosidic bonds
(B) Cellulose has beta linkages that human enzymes cannot hydrolyse, while starch has alpha linkages
(C) Starch has beta linkages and cellulose has alpha linkages
(D) Cellulose is a monomer and starch is a polymer of fructose

Q7. A diet rich in olive oil contains mostly unsaturated fats, while butter contains mostly saturated fats. At room temperature, olive oil is liquid and butter is solid. Which molecular feature best explains the difference?

(A) Kinks from double bonds in unsaturated fatty acids prevent tight packing
(B) Saturated fats contain double bonds that make them bend and pack loosely
(C) Unsaturated fatty acids have longer carbon chains than saturated ones
(D) Unsaturated fats contain glycerol, while saturated fats do not

Q8. A protein is heated to 90 degrees Celsius and loses its enzymatic activity, although its amino acid sequence is unchanged. Which level of protein structure has most directly been disrupted?

(A) The amino acid sequence, because heat changes the genetic code
(B) Tertiary structure, because the folded three-dimensional shape is lost
(C) Quaternary structure only, because single-chain proteins cannot denature
(D) Primary structure, because peptide bonds are broken by heat

Cell Structure and Function

Q9. A spherical cell with radius 1 micrometre and a second spherical cell with radius 3 micrometres are compared. Which statement about their surface-area-to-volume ratios is correct?

(A) The ratio depends only on membrane thickness, not on cell radius
(B) Both cells have the same ratio because surface area and volume scale together
(C) The larger cell has the larger ratio, so it exchanges materials faster
(D) The smaller cell has the larger ratio, so exchange across its membrane is more efficient

Q10. A researcher raises the temperature of a membrane preparation from 10 to 37 degrees Celsius and measures lateral movement of phospholipids. Movement increases sharply. Which change in the membrane best explains this?

(A) Decreased fluidity because cholesterol is removed by heat
(B) Formation of new covalent bonds between phospholipid heads
(C) Increased fluidity as phospholipid tails move more freely at higher temperature
(D) Loss of all integral proteins from the bilayer

Q11. Red blood cells placed in a solution shrink and develop a crenated appearance. What can be concluded about the solution relative to the cells?

(A) It is isotonic, so no net water movement occurs
(B) It contains no solutes, so the cells lose ions by diffusion
(C) It is hypotonic, so water enters the cells by osmosis
(D) It is hypertonic, so water leaves the cells by osmosis

Q12. A cell actively accumulates potassium ions until the internal concentration is 30 times the external concentration. Which transport mechanism is most likely responsible?

(A) A sodium-potassium pump using ATP to move ions against their gradient
(B) Facilitated diffusion through a channel protein
(C) Osmosis through aquaporins
(D) Simple diffusion through the lipid bilayer

Q13. In an experiment, glucose uptake into intestinal cells continues even when the glucose concentration inside the cell exceeds that outside. Uptake stops when ATP production is blocked. What does this show?

(A) Glucose uptake depends on osmosis through aquaporins
(B) Glucose is transported by facilitated diffusion, which uses ATP directly
(C) Glucose is taken up by active transport, which requires ATP
(D) Glucose enters only by simple diffusion down its gradient

Q14. A white blood cell engulfs a bacterium and encloses it in a vesicle that then fuses with a lysosome. Which lysosomal feature makes this an effective defence?

(A) Lysosomes produce ATP to power the engulfing process
(B) Lysosomes synthesise antibodies against the bacterium
(C) Lysosomes store the bacterium as a nutrient reserve
(D) Lysosomes contain hydrolytic enzymes that work best at low pH

Q15. Mitochondria and chloroplasts both contain their own circular DNA and double membranes. Which hypothesis do these features best support?

(A) Spontaneous generation of organelles from the nucleus
(B) Formation of both organelles by invagination of the plasma membrane only
(C) Direct descent of both organelles from the endoplasmic reticulum
(D) Endosymbiosis, in which free-living bacteria were engulfed by ancestral cells

Q16. A mutation prevents the Golgi apparatus from adding carbohydrate tags to proteins. Which process is most likely to be disrupted in the affected cells?

(A) Replication of DNA in the nucleus
(B) Synthesis of amino acids on free ribosomes
(C) Production of ATP in the mitochondria
(D) Sorting and targeting of proteins to their correct destinations

Cellular Energetics

Q17. A reaction has a negative change in free energy (ΔG less than 0). Which statement about the reaction is correct?

(A) It is endergonic and requires a net input of free energy
(B) It is at equilibrium, so no net change occurs
(C) It cannot occur in a cell under any conditions
(D) It is exergonic and can proceed spontaneously under the stated conditions

Q18. An enzyme-catalysed reaction is run at increasing substrate concentrations. The rate rises steeply at first, then levels off at a maximum. What best explains the plateau?

(A) All active sites are saturated with substrate, so adding more cannot increase the rate
(B) The enzyme is denatured by the excess substrate
(C) The substrate inhibits the enzyme competitively at high concentrations
(D) The reaction reaches equilibrium and the enzyme is consumed

Q19. A molecule binds to a site other than the active site of an enzyme and changes the enzyme shape so its activity falls. Which term describes this molecule?

(A) A noncompetitive inhibitor acting at an allosteric site
(B) A competitive inhibitor competing for the active site
(C) A cofactor required for the enzyme to function
(D) A substrate analogue that is converted to product

Q20. In the light reactions of photosynthesis, water is split and oxygen is released. What is the primary role of the electrons obtained from water?

(A) They replace electrons lost by chlorophyll and are passed along the electron transport chain
(B) They are stored in ATP for use in the Calvin cycle
(C) They are used to pump protons out of the chloroplast into the cytoplasm
(D) They combine directly with carbon dioxide to form glucose

Q21. A plant is kept in light with carbon dioxide labelled with radioactive carbon (14C). After a short time, the label is first detected in a three-carbon compound. Which stage of photosynthesis does this identify?

(A) Carbon fixation in the Calvin cycle, producing 3-phosphoglycerate
(B) Photorespiration, producing glycolate
(C) The electron transport chain, producing ATP
(D) The light reactions, producing oxygen from water

Q22. During cellular respiration, most ATP is produced during oxidative phosphorylation. What drives ATP synthesis at this stage?

(A) Fermentation of pyruvate to lactate in the cytosol
(B) Splitting of water in the mitochondrial matrix
(C) A proton gradient across the inner mitochondrial membrane powering ATP synthase
(D) Direct transfer of phosphate from glucose to ADP in the cytoplasm

Q23. Muscle cells working anaerobically convert pyruvate to lactate. What is the main benefit of this conversion?

(A) It removes carbon dioxide from the muscle cells
(B) It regenerates NAD+ so glycolysis can continue to make ATP
(C) It produces most of the ATP used during exercise
(D) It increases the amount of oxygen available to the cells

Q24. A C4 plant and a C3 plant are grown in hot, dry conditions. The C4 plant maintains a higher photosynthetic rate. Which feature best explains this advantage?

(A) Carbon dioxide is first fixed into a four-carbon compound in mesophyll cells
(B) C4 plants lack a Calvin cycle and use only the light reactions
(C) Stomata remain open all day, increasing water loss
(D) Rubisco fixes oxygen more efficiently in C4 plants

Cell Communication and Cell Cycle

Q25. Adrenaline binds to a receptor on the surface of a liver cell and triggers glycogen breakdown, although adrenaline never enters the cell. What does this show about the signalling pathway?

(A) The signal is relayed inside the cell by a transduction pathway after receptor binding
(B) The receptor transports adrenaline into the nucleus
(C) Glycogen breakdown occurs outside the cell
(D) Adrenaline diffuses through the membrane to act directly on glycogen

Q26. In a G protein-coupled receptor pathway, binding of the signal molecule activates a G protein, which then activates adenylyl cyclase. What is the immediate result of adenylyl cyclase activation?

(A) Opening of the receptor channel to admit the signal molecule
(B) Synthesis of new receptor proteins
(C) Production of cyclic AMP as a second messenger
(D) Direct phosphorylation of the signal molecule

Q27. A cell receives a growth factor signal through a receptor tyrosine kinase. The receptor dimerises and each subunit phosphorylates the other. What is the main purpose of this phosphorylation?

(A) To convert the growth factor into ATP
(B) To transport the growth factor into the nucleus
(C) To create binding sites for relay proteins that continue the signal cascade
(D) To destroy the receptor and end signalling immediately

Q28. After eating a meal, blood glucose rises and insulin is released. Insulin promotes glucose uptake, and blood glucose falls back toward normal. Which type of regulation is this?

(A) Positive feedback, because the response amplifies the original change
(B) Negative feedback, because the response reverses the original change
(C) Feedforward control, because the response occurs before glucose rises
(D) No feedback, because insulin acts independently of glucose level

Q29. During the cell cycle, a cell with damaged DNA is arrested before it enters mitosis. Which checkpoint is most directly involved?

(A) The cytokinesis checkpoint, which checks cytoplasmic division
(B) The G2 checkpoint, which checks DNA integrity before mitosis
(C) The metaphase checkpoint, which checks spindle attachment
(D) The G1 checkpoint, which checks only cell size

Q30. A drug blocks the formation of cyclin-dependent kinase complexes required for the G1 to S transition. What is the most likely effect on a dividing cell population?

(A) Cells complete mitosis more rapidly than normal
(B) Cells undergo apoptosis immediately regardless of DNA condition
(C) Cells skip S phase and enter mitosis with unreplicated DNA
(D) Cells accumulate in G1 and DNA replication does not begin

Q31. In apoptosis, a cell shrinks, its DNA fragments, and it is engulfed by neighbouring cells without triggering inflammation. Which feature distinguishes apoptosis from necrosis?

(A) Necrosis is triggered by internal signals during development
(B) Apoptosis releases cell contents that inflame surrounding tissue
(C) Apoptosis always results from physical injury to the cell
(D) Apoptosis is a controlled, programmed process that avoids damaging nearby tissue

Heredity

Q32. During meiosis I, a pair of homologous chromosomes fails to separate. Which result is expected in the gametes?

(A) All gametes receive exactly one copy of the chromosome
(B) Two gametes receive an extra copy and two receive none
(C) The chromosome number doubles in every gamete
(D) Sister chromatids separate one division early

Q33. A woman is a carrier of a recessive X-linked disorder. She has a son with an unaffected man. What is the probability that the son inherits the disorder?

(A) 0, because sons cannot inherit X-linked traits
(B) 1 in 2, because he receives his only X chromosome from his mother
(C) 1 in 4, because the disorder is recessive
(D) 1 in 2, because he receives his X chromosome from his father

Q34. Two genes are located close together on the same chromosome. In a test cross, 8 percent of the offspring show recombinant phenotypes. What does this indicate?

(A) The genes assort independently, with 50 percent recombination
(B) The genes are linked, with a recombination frequency of 8 map units
(C) The genes are on different chromosomes
(D) The genes show complete linkage with no crossing over

Q35. A pea plant heterozygous for seed colour (Yy) and seed shape (Rr) is crossed with a homozygous recessive plant (yyrr). What proportion of offspring is expected to be yellow and round?

(A) 1 in 4, from the 1:1:1:1 ratio of a dihybrid test cross
(B) 9 in 16, as in a dihybrid self-cross
(C) 1 in 2, because both traits are dominant
(D) 3 in 4, because yellow and round are both dominant

Q36. A couple has three children, all with blood type O. Both parents have blood type A. What is the most likely explanation?

(A) Both parents are heterozygous (IAi) and each child inherited the i allele from both
(B) The children inherited type O from a mutation in the ABO gene
(C) One parent must actually have blood type O
(D) Blood type O is dominant over blood type A

Q37. A student crosses two heterozygous pea plants (RrYy × RrYy) and counts 320 offspring: 190 round yellow, 58 round green, 52 wrinkled yellow and 20 wrinkled green. The chi-square statistic is 1.69 with 3 degrees of freedom; the critical value at p = 0.05 is 7.82. What should the student conclude?

(A) The genes are linked, because the value is below the critical value
(B) The 9:3:3:1 ratio is rejected, because the counts are not exact
(C) The degrees of freedom are 2, so a different critical value applies
(D) The observed counts fit the expected 9:3:3:1 ratio, so the hypothesis is not rejected

Q38. A human cell undergoing meiosis fails to separate homologous chromosome 21 during anaphase I. Which condition can result in the offspring if the affected gamete is fertilised?

(A) Turner syndrome, from a missing X chromosome
(B) Cystic fibrosis, from a recessive gene mutation
(C) Down syndrome, from an extra copy of chromosome 21
(D) Klinefelter syndrome, from an extra X chromosome

Gene Expression and Regulation

Q39. During DNA replication, the lagging strand is synthesised in short segments. What are these segments called, and which enzyme joins them?

(A) Introns, joined by RNA ligase
(B) Telomeres, joined by telomerase
(C) Primers, joined by DNA polymerase
(D) Okazaki fragments, joined by DNA ligase

Q40. A mutation changes a codon from UAU to UAA in the coding region of a gene. What is the most likely effect on the protein?

(A) The mRNA is spliced differently and gains an intron
(B) Translation stops early, producing a shortened protein
(C) DNA replication stops at that point in the gene
(D) The protein gains an extra amino acid at that position

Q41. In the lac operon, lactose is present and glucose is absent. Which regulatory state best describes the operon?

(A) Transcription is low, because CAP cannot bind without glucose
(B) Transcription is off, because lactose acts as a corepressor
(C) Transcription is high, because the repressor is inactive and CAP is bound
(D) Transcription is off, because the repressor blocks the operator

Q42. A eukaryotic gene is transcribed, but the mature mRNA is much shorter than the original transcript. What process accounts for this difference?

(A) Translation removes the introns from the mRNA
(B) The promoter is deleted after transcription begins
(C) Splicing removes introns and joins exons together
(D) The poly-A tail is added to the coding region

Q43. Two genetically identical cells in the same organism produce very different proteins. Which mechanism best explains this difference?

(A) Different numbers of chromosomes in the two cell types
(B) Mutations that occur every time a cell divides
(C) Differential gene expression
(D) Different DNA sequences in the two cell types

Q44. A DNA sample is cut with a restriction enzyme and the fragments are separated by gel electrophoresis. The smallest fragment travels furthest. What property determines how far each fragment moves?

(A) The number of hydrogen bonds in each fragment
(B) The GC content of each fragment only
(C) Fragment length, with shorter fragments moving further through the gel
(D) The temperature of the gel during the run

Q45. A researcher uses PCR to amplify a specific DNA segment. Which component is required to start synthesis of each new strand?

(A) Ribosomes to translate the amplified DNA
(B) Primers that anneal to the target sequence
(C) DNA ligase to join Okazaki fragments
(D) Restriction enzymes to cut the template

Natural Selection

Q46. In a population of beetles, green beetles are eaten by birds more often than brown beetles on brown soil. Over generations, brown beetles become more common. Which process best explains this change?

(A) Natural selection favouring the better-camouflaged phenotype
(B) Gene flow from a neighbouring population of green beetles
(C) Mutation creating brown beetles in a single generation
(D) Genetic drift, because the population is very large

Q47. In a population in Hardy-Weinberg equilibrium, 9% of individuals show a recessive phenotype. What is the expected frequency of heterozygous carriers?

(A) 0.09, the frequency of the recessive phenotype
(B) 0.30, the frequency of the recessive allele
(C) 0.42, calculated as 2pq where q = 0.3 and p = 0.7
(D) 0.49, the frequency of dominant homozygotes

Q48. A small group of birds colonises an isolated island. By chance, the allele frequencies in the founders differ sharply from the mainland population. Which evolutionary mechanism is this?

(A) Natural selection acting on beak size
(B) Directional selection for island traits
(C) Gene flow between the island and the mainland
(D) The founder effect, a form of genetic drift

Q49. Two populations of salamanders live on opposite sides of a river and no longer interbreed, although they were once a single population. Which type of speciation has occurred?

(A) Allopatric speciation, driven by geographic isolation
(B) Speciation by polyploidy within a single habitat
(C) Sympatric speciation, driven by behavioural differences alone
(D) Artificial selection by human breeders

Q50. A phylogenetic tree shows that species A and B share a more recent common ancestor with each other than either does with species C. Which conclusion is best supported?

(A) B is the ancestor of both A and C
(B) A, B and C are equally related to one another
(C) A and C evolved from B directly
(D) A and B are more closely related to each other than to C

Q51. The forelimbs of humans, bats and whales have the same basic bone arrangement but are used for different functions. What does this pattern best illustrate?

(A) Fossil evidence of gradual change in a single lineage
(B) Vestigial structures with no function in any species
(C) Homologous structures, evidence of descent from a common ancestor
(D) Analogous structures, evidence of convergent evolution

Q52. A population of bacteria is exposed to an antibiotic. Most cells die, but a few survive and reproduce. Which statement best describes the outcome?

(A) The surviving bacteria learned to resist the antibiotic during exposure
(B) The antibiotic increased the mutation rate so all cells became resistant
(C) The antibiotic selected for pre-existing resistant variants already present in the population
(D) The antibiotic caused the resistance mutation in every surviving cell

Ecology

Q53. In a grassland ecosystem, the net primary productivity is 10,000 kilojoules per square metre per year. Approximately how much energy is available to secondary consumers?

(A) About 100 kilojoules, after two transfers at roughly 10 percent efficiency each
(B) About 1,000 kilojoules, after a single transfer at 10 percent efficiency
(C) About 10 kilojoules, after three transfers at 10 percent efficiency
(D) About 10,000 kilojoules, because energy is recycled like nutrients

Q54. A population of deer grows rapidly at first, then levels off as food becomes scarce. Which growth model and limiting factor best describe this pattern?

(A) Exponential growth, limited only by the birth rate
(B) Logistic growth, limited by the age of the deer
(C) Logistic growth, limited by the carrying capacity of the habitat
(D) Exponential growth, with no limiting factors acting

Q55. In a forest, two species of warbler feed on insects in different parts of the same trees. Which ecological concept best explains how they coexist?

(A) Mutualism, because each species benefits the other directly
(B) Competitive exclusion, which eliminates one species entirely
(C) Predation, because one warbler eats the other
(D) Resource partitioning, which reduces direct competition between the species

Q56. A lake is fertilised by nutrient run-off from nearby farms. Algal growth explodes, then oxygen levels fall and fish die. Which process best explains the fish deaths?

(A) Thermal pollution warming the lake to boiling point
(B) Eutrophication, followed by decomposition of dead algae consuming oxygen
(C) Acid rain dissolving the fish gills directly
(D) Increased photosynthesis raising oxygen to toxic levels

Q57. After a volcanic eruption, bare rock is gradually colonised by lichens, then mosses, then shrubs and trees. Which term describes this sequence?

(A) Competitive exclusion, removing the pioneer species
(B) Climax community collapse, ending in bare rock
(C) Primary succession, beginning on a lifeless substrate
(D) Secondary succession, beginning after a forest fire

Q58. A researcher samples a coral reef and finds many species, with no single species dominating. Compared with a nearby reef dominated by one species, the diverse reef is expected to be more resilient. Why?

(A) A dominant species always stabilises an ecosystem better than many species
(B) Greater biodiversity provides functional redundancy, so the loss of one species is less disruptive
(C) More species always means faster population growth for every species
(D) Diverse reefs have fewer predators and no competition

Q59. A species of sea otter preys on sea urchins, which graze on kelp. When otters are removed, urchin numbers rise and kelp forests collapse. What is the otter in this system?

(A) A decomposer, because it recycles nutrients from urchins
(B) A primary producer, because it supports the kelp
(C) An invasive species, because it was introduced by humans
(D) A keystone species

Q60. A population of rabbits is preyed on by foxes. When rabbit numbers rise, fox numbers rise a season later; when rabbits fall, foxes fall later. Which interaction best explains this pattern?

(A) Commensalism, because foxes benefit and rabbits are unaffected
(B) Predator-prey cycling, with the predator population tracking the prey with a lag
(C) Mutualism, because both populations benefit equally
(D) Competition, because foxes and rabbits eat the same food

Answer Key

Q1: B	Q11: D	Q21: A	Q31: D	Q41: C	Q51: C

Q2: A	Q12: A	Q22: C	Q32: B	Q42: C	Q52: C
Q3: B	Q13: C	Q23: B	Q33: B	Q43: C	Q53: A
Q4: D	Q14: D	Q24: A	Q34: B	Q44: C	Q54: C
Q5: A	Q15: D	Q25: A	Q35: A	Q45: B	Q55: D
Q6: B	Q16: D	Q26: C	Q36: A	Q46: A	Q56: B
Q7: A	Q17: D	Q27: C	Q37: D	Q47: C	Q57: C
Q8: B	Q18: A	Q28: B	Q38: C	Q48: D	Q58: B
Q9: D	Q19: A	Q29: B	Q39: D	Q49: A	Q59: D
Q10: C	Q20: A	Q30: D	Q40: B	Q50: D	Q60: B

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-16/