AP Biology Practice Test 3

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. Water has a high heat of vaporization. Which biological consequence of this property is most important for humans?

(A) Sweating raises body temperature by releasing heat stored in water molecules
(B) A high heat of vaporization prevents water from ever evaporating from the skin
(C) Evaporation of sweat removes large amounts of heat from the body
(D) It allows blood to carry more oxygen than it otherwise could

Q2. Which type of bond holds the two strands of a DNA double helix together?

(A) Peptide bonds between amino acids in the backbone
(B) Hydrogen bonds between complementary nitrogenous bases
(C) Phosphodiester bonds between the two strands
(D) Ionic bonds between phosphate groups

Q3. A lipid molecule is composed of glycerol and three fatty acids. What is this molecule called, and what is its main function?

(A) A phospholipid, which forms the cell membrane
(B) A triglyceride, which stores energy in animals and plants
(C) A steroid, which acts as a hormone
(D) A wax, which waterproofs feathers and leaves

Q4. Which statement correctly describes the structure of an amino acid?

(A) It has a central carbon bonded to an amino group, a carboxyl group, a hydrogen atom
(B) It has a central nitrogen bonded to four different carbon groups
(C) It consists of a phosphate group, a sugar, and a nitrogenous base
(D) It is made of a glycerol backbone with three fatty acid chains

Q5. A researcher compares the primary structure of two proteins and finds that they differ at only one amino acid position. Which level of structure is directly affected by this difference?

(A) Quaternary structure, because the proteins can no longer bind together
(B) Primary structure, because the amino acid sequence itself is changed
(C) Secondary structure only, because the sequence does not determine folding
(D) The proteins are identical, because one amino acid cannot change a protein

Q6. Cholesterol is a steroid found in animal cell membranes. Which statement best describes its role?

(A) It forms the main structural framework of the membrane, replacing phospholipids
(B) It helps regulate membrane fluidity
(C) It transports glucose across the membrane by active transport
(D) It breaks down the membrane when the cell needs energy

Q7. A solution has a pH of 3. How does its hydrogen ion concentration compare with a solution of pH 5?

(A) It is 100 times greater
(B) It is 2 times greater, because pH 3 is two units lower than pH 5
(C) It is 100 times smaller, because lower pH means fewer hydrogen ions
(D) It is the same, because pH is measured on a linear scale

Cell Structure and Function

Q8. A cell contains many ribosomes attached to the endoplasmic reticulum and a well-developed Golgi apparatus, but few lysosomes. Which function is this cell most likely specialized for?

(A) Digestion of engulfed bacteria, such as a white blood cell
(B) Photosynthesis, such as a leaf mesophyll cell
(C) Secretion of proteins
(D) Storage of lipids, such as an adipose cell

Q9. Which statement best explains why the plasma membrane is described as a fluid mosaic?

(A) Phospholipids and proteins move laterally within the bilayer
(B) The membrane is a solid wall of protein with no lipids at all
(C) The membrane is made of a single layer of identical molecules
(D) The membrane dissolves and reforms every few minutes

Q10. A scientist injects a dye into one cell of a plant tissue. The dye quickly spreads to neighboring cells but not to cells in a different tissue. What explains this pattern?

(A) The dye diffuses freely through the air between all cells
(B) Tight junctions prevent the dye from leaving the original cell
(C) The dye is actively transported out of the tissue by the xylem
(D) Plasmodesmata connect the cytoplasms of cells within the tissue

Q11. A red blood cell is placed in a 0.9 percent salt solution and neither swells nor shrinks. What can be concluded about the solution?

(A) It is hypertonic, but the cell wall prevents water loss
(B) It is isotonic to the red blood cell
(C) It is hypotonic, but the cell actively pumps water out
(D) It is isotonic, so solutes move freely across the membrane

Q12. Which process requires ATP and moves substances across the membrane against their concentration gradient?

(A) Simple diffusion through the lipid bilayer
(B) Active transport
(C) Facilitated diffusion through a channel protein
(D) Osmosis of water through aquaporins

Q13. Mitochondria and chloroplasts share which feature that supports their endosymbiotic origin?

(A) Both carry out photosynthesis using chlorophyll
(B) Both are found only in plant cells
(C) Both have a double membrane and their own circular DNA
(D) Both contain a nucleus with linear chromosomes

Q14. A cell is exposed to a toxin that destroys microtubules. Which cellular process would be most directly affected?

(A) Protein synthesis, because ribosomes are made of microtubules
(B) ATP production, because mitochondria are made of microtubules
(C) Storage of genetic material, because the nucleus is made of microtubules
(D) Movement of chromosomes during mitosis

Cellular Energetics

Q15. A researcher increases the temperature of an enzyme-catalyzed reaction from 20 to 40 degrees Celsius and the rate increases. When the temperature is raised to 70 degrees, the rate falls to zero. Which explanation best accounts for the fall?

(A) At 70 degrees the enzyme denatures, losing the shape of its active site
(B) At high temperature the substrate is converted into a different molecule
(C) The activation energy becomes negative at high temperature
(D) The enzyme works faster at high temperature but the product is destroyed

Q16. Which molecule is the final electron acceptor in the electron transport chain of cellular respiration?

(A) Carbon dioxide, which is reduced to form glucose
(B) NAD+, which accepts electrons to become NADH
(C) Oxygen, which combines with electrons and hydrogen ions to form water
(D) ATP, which accepts electrons to become ADP

Q17. In photosynthesis, which events occur during the light-dependent reactions?

(A) Carbon dioxide is fixed into glucose and oxygen is consumed
(B) Water is split, oxygen is released, ATP and NADPH are produced
(C) Glucose is broken down to release ATP and carbon dioxide
(D) Starch is synthesized from glucose in the stroma

Q18. A C4 plant is better adapted to hot, dry conditions than a C3 plant. Which feature of C4 photosynthesis explains this advantage?

(A) C4 plants open their stomata wider during the day, increasing water loss
(B) C4 plants do not use rubisco at all in the Calvin cycle
(C) C4 plants fix CO2 into a four-carbon compound in mesophyll cells
(D) C4 plants carry out photosynthesis only at night

Q19. Which statement correctly describes the role of NAD+ in cellular respiration?

(A) NAD+ accepts electrons during glycolysis and the citric acid cycle
(B) NAD+ donates phosphate groups to ADP to make ATP
(C) NAD+ is the final electron acceptor, forming water
(D) NAD+ is produced only during fermentation

Q20. A graph shows the rate of photosynthesis increasing with light intensity and then leveling off. At high light intensity, which factor is most likely limiting the rate?

(A) Water availability in the thylakoid lumen, because water is used up instantly
(B) Chlorophyll concentration, because all chlorophyll is destroyed by bright light
(C) Oxygen concentration, because oxygen inhibits the light reactions
(D) Carbon dioxide concentration

Q21. During fermentation in yeast, glucose is converted to ethanol and carbon dioxide. What is the net ATP yield per glucose, and why is fermentation necessary?

(A) 36 ATP, and fermentation replaces the electron transport chain entirely
(B) 0 ATP, because fermentation only produces ethanol
(C) 4 ATP, and fermentation is needed to produce oxygen for the cell
(D) 2 ATP, and fermentation regenerates NAD+ so glycolysis can continue without oxygen

Q22. Which statement best explains the relationship between photosynthesis and cellular respiration in terms of energy?

(A) Photosynthesis stores light energy in glucose
(B) Photosynthesis and cellular respiration both release energy from glucose
(C) Cellular respiration stores energy in glucose, and photosynthesis releases it
(D) The two processes are unrelated and occur in different organisms only

Cell Communication and Cell Cycle

Q23. A steroid hormone enters a target cell and binds to a receptor inside the cell. How does this differ from the action of a peptide hormone?

(A) Steroid hormones cannot enter cells, so they act only on the cell surface
(B) Peptide hormones enter the nucleus directly, while steroid hormones cannot
(C) Steroid hormones are hydrophobic
(D) Steroid hormones are always produced by the target cell itself

Q24. In a signal transduction pathway, a protein kinase adds a phosphate group to a target protein. Which enzyme reverses this modification?

(A) A second kinase, which adds another phosphate group
(B) Adenylyl cyclase, which converts ATP to cAMP
(C) A G protein, which activates the kinase again
(D) A protein phosphatase

Q25. A cell is exposed to a signal molecule, but the response continues long after the signal is removed. Which failure best explains the prolonged response?

(A) The signaling pathway is not being terminated, perhaps
(B) The receptor is working correctly but the ligand is too small to bind
(C) The cell has too few receptors to detect the signal
(D) The signal molecule is being produced by the target cell itself

Q26. Which statement best describes the role of checkpoints in the cell cycle?

(A) Checkpoints are control points where the cell verifies conditions before proceeding to the next phase
(B) Checkpoints are points where the cell divides its cytoplasm
(C) Checkpoints are enzymes that replicate DNA during S phase
(D) Checkpoints are structures that pull chromosomes apart during anaphase

Q27. A drug blocks the synthesis of cyclin proteins. What is the most likely effect on the cell cycle?

(A) The cell cycle will speed up because kinases will work without regulation
(B) DNA replication will occur twice in each cycle
(C) The cell will divide without replicating its DNA
(D) The cell cycle will arrest

Q28. During which phase of the cell cycle is DNA replicated?

(A) S phase, when each chromosome is duplicated to form two sister chromatids
(B) G1 phase, when the cell grows and prepares for replication
(C) M phase, when chromosomes are separated into daughter cells
(D) G2 phase, when the cell checks DNA for errors before mitosis

Q29. A tissue is damaged, and nearby cells receive growth factors that stimulate division to repair the wound. This response depends on which type of signaling?

(A) Endocrine signaling, because the factors travel through the bloodstream
(B) Synaptic signaling, because the factors cross a synapse
(C) Autocrine signaling, because each cell signals only itself
(D) Paracrine signaling, because growth factors act on nearby cells

Q30. A cancer cell is found to have a mutation that inactivates the p53 tumor suppressor gene. What is the most likely consequence?

(A) The cell will stop dividing permanently and cannot form a tumor
(B) The cell may continue dividing despite DNA damage
(C) The cell will repair all DNA damage more quickly than normal cells
(D) The cell will lose its ability to replicate DNA entirely

Heredity

Q31. Homologous chromosomes separate during meiosis I, while sister chromatids separate during meiosis II. What is the chromosome number of a cell at the end of meiosis I, compared with the start?

(A) Diploid, because sister chromatids have not yet separated
(B) Tetraploid, because DNA was replicated twice
(C) Haploid, because the number of chromosomes is halved even though each chromosome still has two chromatids
(D) Haploid, because each chromosome now has only one chromatid

Q32. A gene for flower color has two alleles: R (red, dominant) and r (white, recessive). A red-flowered plant of unknown genotype is crossed with a white-flowered plant, and half the offspring are white. What is the genotype of the red-flowered parent?

(A) RR, because a homozygous dominant parent produces only red offspring
(B) rr, because the parent must carry the white allele twice
(C) RW, because red and white are codominant
(D) Rr, because a test cross with a recessive parent reveals heterozygosity when half the offspring show the recessive trait

Q33. Two genes, A and B, are linked on the same chromosome. A cross between a dihybrid (AB/ab) and a homozygous recessive (ab/ab) produces 45 percent AB/ab, 45 percent ab/ab, 5 percent Ab/ab, and 5 percent aB/ab offspring. What is the map distance between the genes?

(A) 50 map units, because the parental types total 90 percent
(B) 10 map units, because the recombinant offspring total 10 percent
(C) 5 map units, because each recombinant class is 5 percent
(D) 90 map units, because the parental types are the most frequent

Q34. A pedigree shows a trait affecting mostly males, passed from an affected mother to about half her sons, and never passed from father to son. This pattern is most consistent with which inheritance mode?

(A) X-linked recessive
(B) Autosomal dominant, because the trait appears in every generation
(C) Y-linked, because the trait is passed only through males
(D) Mitochondrial, because the trait is passed only through females to all children

Q35. In a population, the frequency of a recessive genetic disorder is 1 in 10,000 births. Assuming Hardy-Weinberg equilibrium, what is the frequency of carriers in the population?

(A) 1 in 10,000, because carriers are as common as affected individuals
(B) 1 in 100, because q squared equals 0.01
(C) 1 in 200, because the dominant allele frequency is 0.99
(D) Approximately 1 in 50

Q36. A trait is determined by two genes that interact, where one gene masks the expression of another. This phenomenon is called what?

(A) Pleiotropy, because one gene affects multiple traits
(B) Polygenic inheritance, because many genes contribute to one trait
(C) Incomplete dominance, because the heterozygote shows a blended phenotype
(D) Epistasis, because the allele of one gene affects the expression of another gene

Q37. A chi-square test is used to test whether observed offspring numbers fit a 3:1 ratio. The test has how many degrees of freedom?

(A) 1, because degrees of freedom equal the number of categories minus one
(B) 2, because there are two phenotypes in the ratio
(C) 3, because the ratio is 3:1
(D) 0, because the expected ratio is already known

Q38. Environmental factors can influence the expression of a genotype. Which example best illustrates this?

(A) A plant with the genotype for tall height always grows tall regardless of sunlight
(B) Eye color in humans changes with diet
(C) Hydrangea flowers are blue in acidic soil and pink in alkaline soil
(D) A mutation changes the DNA sequence of a gene

Gene Expression and Regulation

Q39. Which enzyme adds nucleotides to the growing DNA strand during replication, and in which direction does it work?

(A) Helicase, which adds nucleotides in the 3′ to 5′ direction
(B) Ligase, which adds nucleotides to the 5′ end of the leading strand
(C) DNA polymerase, which adds nucleotides to the 3′ end and synthesizes in the 5′ to 3′ direction
(D) Primase, which adds nucleotides continuously on both strands

Q40. A messenger RNA molecule has the codon 5′-UGG-3′. Which amino acid does it specify, and what is the anticodon of the tRNA that carries that amino acid?

(A) Methionine, carried by a tRNA with the anticodon 3′-UAC-5′
(B) Glycine, carried by a tRNA with the anticodon 3′-CCG-5′
(C) Stop, because UGG is a stop codon
(D) Tryptophan, carried by a tRNA with the anticodon 3′-ACC-5′

Q41. A mutation changes a codon from UAU to UAA. What is the most likely effect on the resulting protein?

(A) The protein gains an extra amino acid at that position
(B) Translation stops early
(C) The protein is unchanged because UAA codes for the same amino acid
(D) The reading frame shifts, changing all downstream amino acids

Q42. Which statement best describes the function of a promoter in eukaryotic gene expression?

(A) It is a DNA sequence where RNA polymerase and transcription factors bind to begin transcription
(B) It is the site where ribosomes attach to begin translation
(C) It is a protein that splices introns out of the primary transcript
(D) It is the sequence that terminates transcription at the end of a gene

Q43. Alternative splicing of a primary transcript can produce different proteins from the same gene. How does this increase protein diversity?

(A) The DNA sequence of the gene changes each time it is transcribed
(B) Introns are translated into additional amino acids
(C) The gene is duplicated and each copy is expressed differently
(D) Different combinations of exons are joined together

Q44. A researcher wants to determine whether a gene is expressed in a particular tissue. Which technique would best detect the presence of the gene mRNA?

(A) Gel electrophoresis of genomic DNA alone, which shows all genes present
(B) DNA sequencing of the entire genome, which shows only the DNA sequence
(C) Karyotyping, which shows the number of chromosomes
(D) Reverse transcription PCR (RT-PCR)

Q45. In a bacterial operon, a repressor protein binds to the operator and blocks transcription. Which molecule can bind to the repressor and cause it to release from the operator?

(A) A ribosome, which removes the repressor from the DNA
(B) ATP, which provides energy to break the repressor apart
(C) An inducer, such as allolactose in the lac operon
(D) A transcription factor, which always activates the operon

Q46. A scientist uses CRISPR-Cas9 to edit a gene in a human cell. What is the role of the guide RNA in this system?

(A) It cuts the DNA at a random location in the genome
(B) It repairs the DNA after Cas9 makes a cut
(C) It directs Cas9 to the specific DNA sequence to be cut by base-pairing with the target
(D) It translates the edited gene into protein

Natural Selection

Q47. A population of lizards on an island shows a range of body sizes. During a drought, medium-sized lizards survive best because they need less food than large lizards but are less vulnerable to predators than small lizards. This is an example of what?

(A) Stabilizing selection
(B) Directional selection, because it favors larger lizards over time
(C) Disruptive selection, because it favors both extremes
(D) Genetic drift, because the change is random

Q48. Gene flow between two populations has which effect on the genetic variation of the populations?

(A) It increases differences between populations by isolating them
(B) It reduces differences between populations and can introduce new alleles into a population
(C) It eliminates all genetic variation within each population
(D) It has no effect on allele frequencies in either population

Q49. Sexual selection can lead to the evolution of traits that seem harmful to survival, such as the bright plumage of male peacocks. What best explains this?

(A) The trait increases survival by camouflaging the male from predators
(B) The trait is a result of genetic drift, not selection
(C) The trait increases reproductive success by attracting mates
(D) Female peacocks do not choose mates based on plumage

Q50. Two species of frogs live in the same pond but breed at different times of the year. Which reproductive barrier separates them?

(A) Temporal isolation
(B) Mechanical isolation, because their reproductive organs are incompatible
(C) Gametic isolation, because their gametes cannot fuse
(D) Hybrid breakdown, because their offspring are sterile

Q51. A phylogenetic tree is constructed from DNA sequence data. Species X and Y share a derived character that species Z lacks. What does this imply about their relationships?

(A) X and Z are more closely related than X and Y
(B) X and Y share a more recent common ancestor with each other than either does with Z
(C) Y evolved directly from Z
(D) The derived character evolved independently in X and Y

Q52. The fossil record shows a gradual transition from fish-like fins to tetrapod limbs over millions of years. What does this best support?

(A) That fins and limbs evolved independently with no connection
(B) That tetrapods appeared suddenly with no ancestors
(C) That fish evolved from tetrapods
(D) That tetrapods evolved from lobe-finned fish through gradual evolutionary change

Q53. Which statement best describes the role of mutation in evolution?

(A) Mutation always produces traits that are harmful to the organism
(B) Mutation is the only mechanism that changes allele frequencies in a population
(C) Mutation is the ultimate source of new genetic variation on which natural selection acts
(D) Mutation occurs in response to environmental needs

Ecology

Q54. An organism maintains a stable internal body temperature despite changes in the external temperature. This ability is best described as what?

(A) Ectothermy, because the organism absorbs heat from the environment
(B) Thermoregulation
(C) Acclimation, because the organism changes its behavior seasonally
(D) Hibernation, because the organism becomes inactive in cold weather

Q55. A population grows exponentially with a per capita growth rate of 0.2 per year and an initial size of 100 individuals. Approximately how many individuals will there be after one year?

(A) 200, because exponential growth doubles the population each year
(B) 120, because the population increases by 0.2 x 100 = 20 individuals
(C) 102, because the growth rate adds only 2 individuals
(D) 100, because exponential growth does not change population size

Q56. In a food web, decomposers play which essential role?

(A) They produce energy through photosynthesis for the entire food web
(B) They consume only living plants and animals
(C) They prevent nutrients from being recycled
(D) They break down dead organic matter

Q57. Which of the following is an example of mutualism?

(A) A bee pollinates a flower while obtaining nectar
(B) A lion hunts and eats a zebra, benefiting only the lion
(C) A barnacle attaches to a whale, benefiting the barnacle without affecting the whale
(D) A cuckoo lays its eggs in another bird nest, harming the host

Q58. A lake ecosystem loses its top predator, and the herbivore population explodes, overgrazing the producers. This chain of effects is called what?

(A) Succession, because the community changes over time
(B) A trophic cascade
(C) Eutrophication, because nutrients increase in the lake
(D) Competitive exclusion, because one species outcompetes another

Q59. Which human activity is most directly responsible for the increase in atmospheric carbon dioxide over the past century?

(A) Planting trees, which removes CO2 from the atmosphere
(B) Recycling paper, which reduces the need for new trees
(C) Burning fossil fuels
(D) Using solar power, which produces no carbon dioxide

Q60. A conservation biologist measures species richness and relative abundance in two forests. Forest A has 20 species with even abundances, while Forest B has 20 species but one species makes up 90 percent of individuals. Which forest has greater biodiversity?

(A) Forest B, because the dominant species is more successful
(B) Both forests have equal biodiversity because they have the same number of species
(C) Forest A, because evenness is an important component of diversity along with richness
(D) Forest B, because it has more individuals in total

Answer Key

Q1: C	Q11: B	Q21: D	Q31: C	Q41: B	Q51: B
Q2: B	Q12: B	Q22: A	Q32: D	Q42: A	Q52: D
Q3: B	Q13: C	Q23: C	Q33: B	Q43: D	Q53: C
Q4: A	Q14: D	Q24: D	Q34: A	Q44: D	Q54: B
Q5: B	Q15: A	Q25: A	Q35: D	Q45: C	Q55: B
Q6: B	Q16: C	Q26: A	Q36: D	Q46: C	Q56: D
Q7: A	Q17: B	Q27: D	Q37: A	Q47: A	Q57: A
Q8: C	Q18: C	Q28: A	Q38: C	Q48: B	Q58: B
Q9: A	Q19: A	Q29: D	Q39: C	Q49: C	Q59: C
Q10: D	Q20: D	Q30: B	Q40: D	Q50: A	Q60: C

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-3/