AP Biology Practice Test 17

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 molecules form hydrogen bonds with one another. Which property of water results directly from the large number of hydrogen bonds that must be broken to change its temperature?

(A) An inability to dissolve ionic compounds
(B) A high specific heat, so water temperature changes slowly
(C) A low surface tension at the air-water interface
(D) A low boiling point compared with similar-sized molecules

Q2. A student measures the pH of lemon juice (pH 2) and of baking soda solution (pH 9). How many times greater is the hydrogen ion concentration in the lemon juice?

(A) Ten million times greater, because each pH unit is a tenfold difference
(B) One hundred times greater, because pH is a linear scale
(C) Seven times greater, because the pH values differ by 7
(D) Two times greater, because 9 is roughly twice 2 in effect

Q3. Glycogen is stored in liver and muscle cells and can be broken down quickly to release glucose. Which structural feature of glycogen suits this role?

(A) Highly branched chains with many ends for enzymes to attack simultaneously
(B) Beta linkages that resist enzyme action
(C) Long straight chains that pack tightly into fibres
(D) A single unbranched chain of fructose units

Q4. Phospholipids have a hydrophilic head and two hydrophobic tails. In water, they spontaneously form a bilayer. Which arrangement is most stable?

(A) Heads facing the water on both sides, with tails hidden in the interior
(B) Heads and tails alternating randomly throughout the structure
(C) Tails facing the water and heads hidden in the interior
(D) A single layer with all heads pointing in the same direction

Q5. The R groups of amino acids determine how a protein folds. A mutation replaces a hydrophilic R group on the protein surface with a hydrophobic one. What is the most likely effect?

(A) The protein may misfold or aggregate, as the hydrophobic group avoids water
(B) The primary structure is unchanged, so folding is unaffected
(C) The protein becomes more soluble in water
(D) The peptide bonds in the backbone are broken

Q6. A DNA double helix contains 30 percent adenine. What percentage of the bases are guanine?

(A) 70 percent, because only adenine and guanine are present
(B) 40 percent, because guanine pairs with adenine
(C) 30 percent, because adenine equals guanine
(D) 20 percent, because cytosine equals guanine and the remainder is split equally

Q7. ATP hydrolysis releases energy used to power cellular work. Which change in ATP accounts for this energy release?

(A) Breaking the bond between the second and third phosphate groups
(B) Adding a phosphate group to ADP without any energy input
(C) Breaking the bond between adenine and ribose
(D) Forming a new covalent bond within the adenine base

Q8. A dehydration synthesis reaction joins two monosaccharides to form a disaccharide. What is removed in the process, and what bond forms?

(A) A carbon dioxide molecule is removed and a peptide bond forms
(B) A water molecule is added and a hydrogen bond forms
(C) An amino group is removed and an ester bond forms
(D) A water molecule is removed and a glycosidic bond forms

Cell Structure and Function

Q9. A cube-shaped cell has side length 2 micrometres. Its surface-area-to-volume ratio is 3. A second cube has side length 6 micrometres. What is its surface-area-to-volume ratio?

(A) 0.5, because the volume is eight times larger
(B) 1
(C) 9, because the ratio increases with side length
(D) 3, because the ratio is independent of size

Q10. Cholesterol is present in animal cell membranes. At high temperatures, cholesterol helps to stabilise the membrane. How does it do this?

(A) It restrains excessive movement of phospholipid tails, reducing fluidity
(B) It removes phospholipids from the bilayer entirely
(C) It forms channels that allow ions to cross freely
(D) It replaces the phospholipid bilayer with a rigid wall

Q11. A plant cell is placed in pure water. It swells but does not burst. Which structure prevents bursting, and what is the cell said to be?

(A) The cell wall prevents bursting; the cell is turgid
(B) The chloroplast prevents bursting; the cell is crenated
(C) The plasma membrane prevents bursting; the cell is plasmolysed
(D) The vacuole prevents bursting; the cell is flaccid

Q12. Oxygen diffuses across the plasma membrane of a cell much faster than glucose does. Which property of oxygen best explains this?

(A) Oxygen is small and nonpolar, so it passes directly through the lipid bilayer
(B) Oxygen is actively pumped across by ATP-driven transporters
(C) Oxygen is charged, so it is attracted to the membrane interior
(D) Oxygen binds to aquaporins that carry it across

Q13. In cotransport, glucose is moved into intestinal cells together with sodium ions. Sodium moves down its gradient while glucose moves against its gradient. Which term describes this mechanism?

(A) Facilitated diffusion, because no energy is used at all
(B) Secondary active transport, using the sodium gradient as the energy source
(C) Primary active transport, because ATP binds glucose directly
(D) Simple diffusion, because both solutes move freely

Q14. Ribosomes attached to the rough endoplasmic reticulum synthesise a protein that will be secreted from the cell. Which is the correct sequence of organelles the protein passes through?

(A) Nucleus, then lysosome, then Golgi apparatus, then plasma membrane
(B) Smooth ER, then mitochondrion, then Golgi apparatus, then nucleus
(C) Golgi apparatus, then rough ER, then nucleus, then plasma membrane
(D) Rough ER, then Golgi apparatus, then secretory vesicle, then plasma membrane

Q15. A cell fraction is found to contain many folded internal membranes and enzymes that detoxify drugs. Which organelle is most likely present in this fraction?

(A) Rough endoplasmic reticulum, which makes secretory proteins
(B) Golgi apparatus, which modifies proteins for export
(C) Smooth endoplasmic reticulum, which synthesises lipids and detoxifies chemicals
(D) Lysosome, which digests worn-out organelles

Q16. Tight junctions between cells in the lining of the intestine prevent fluid leaking between cells. Which type of cell junction is this, and what is its role?

(A) Desmosomes form channels for direct cytoplasmic exchange
(B) Gap junctions seal cells together to block all communication
(C) Plasmodesmata connect plant cells through their walls
(D) Tight junctions seal neighbouring cells together to block passage between them

Cellular Energetics

Q17. For a reaction, ΔH is negative and ΔS is positive. How does temperature affect whether the reaction is spontaneous?

(A) The reaction is never spontaneous, regardless of temperature
(B) The reaction is spontaneous only at high temperatures
(C) The reaction is spontaneous only at low temperatures
(D) The reaction is spontaneous at all temperatures

Q18. An enzyme works fastest at pH 7 but loses activity at pH 3. Which explanation is most likely?

(A) The enzyme is used up more quickly at low pH
(B) The substrate is destroyed by acid before it reaches the enzyme
(C) The enzyme is competitively inhibited by hydrogen ions binding the substrate
(D) The low pH alters charges on amino acid R groups, changing the active site shape

Q19. A competitive inhibitor is added to an enzyme reaction. What happens to the maximum rate (Vmax) and the Michaelis constant (Km) when substrate concentration is increased enough?

(A) Vmax increases and Km decreases
(B) Both Vmax and Km decrease
(C) Vmax decreases and Km is unchanged
(D) Vmax is unchanged and Km increases

Q20. In photosynthesis, ATP and NADPH produced in the light reactions are used in the Calvin cycle. If the light reactions stop, what happens first in the Calvin cycle?

(A) Oxygen production increases in the stroma
(B) Carbon fixation continues briefly, then stops as ATP and NADPH run out
(C) The Calvin cycle reverses and produces glucose from oxygen
(D) Water splitting moves into the stroma to compensate

Q21. A researcher measures oxygen release from algae at different light wavelengths. Oxygen release peaks in blue and red light but is low in green light. What does this indicate?

(A) Green light is absorbed best by chlorophyll a
(B) Chlorophyll absorbs blue and red light best
(C) Photosynthesis uses only green light efficiently
(D) Oxygen is produced by the Calvin cycle in green light

Q22. In cellular respiration, glucose is oxidised to carbon dioxide. Which stage releases carbon dioxide, and where does it occur?

(A) Glycolysis, in the cytoplasm
(B) The electron transport chain, on the inner mitochondrial membrane
(C) Fermentation, in the cytosol
(D) The Krebs cycle, in the mitochondrial matrix, and the link reaction

Q23. Cyanide blocks the final protein complex in the electron transport chain. Which effect would be observed first in affected cells?

(A) Oxygen consumption increases because the chain runs faster
(B) Glycolysis speeds up to replace all lost ATP indefinitely
(C) Electrons back up, the proton gradient collapses, and ATP synthesis falls sharply
(D) Carbon dioxide production rises as the Krebs cycle accelerates

Q24. A desert plant opens its stomata at night and stores carbon dioxide as an organic acid, then fixes it during the day with stomata closed. Which photosynthetic adaptation is this?

(A) C4 photosynthesis, which fixes carbon in bundle-sheath cells only at night
(B) Crassulacean acid metabolism (CAM), which reduces daytime water loss
(C) C3 photosynthesis, which opens stomata only during the day
(D) Photorespiration, which increases carbon gain in hot conditions

Cell Communication and Cell Cycle

Q25. A signal molecule is hydrophobic and passes through the plasma membrane to bind a receptor inside the cell. Which type of molecule and receptor is this most likely to be?

(A) A steroid hormone binding an intracellular receptor
(B) A neurotransmitter binding a ligand-gated ion channel
(C) A peptide hormone binding a G protein-coupled receptor
(D) A hydrophilic growth factor binding a receptor tyrosine kinase

Q26. Calcium ions act as a second messenger in many pathways. Where are calcium ions mainly stored in the cell before release?

(A) In the mitochondria, as part of ATP synthase
(B) In the nucleus, bound to DNA
(C) In the endoplasmic reticulum
(D) In the Golgi apparatus, inside secretory vesicles

Q27. A protein kinase adds phosphate groups to target proteins, while a protein phosphatase removes them. In a signalling cascade, what is the main role of the phosphatase?

(A) To transport the signal molecule across the membrane
(B) To synthesise the original signal molecule
(C) To switch off the signal by reversing phosphorylation
(D) To amplify the signal by adding more phosphate groups

Q28. During childbirth, contractions of the uterus cause the release of oxytocin, which causes stronger contractions. Which type of feedback is this, and why does it end?

(A) Negative feedback, because contractions reduce oxytocin release
(B) No feedback, because oxytocin acts independently of contractions
(C) Positive feedback, which ends when the baby is born and the stimulus is removed
(D) Positive feedback, which continues indefinitely after birth

Q29. A cell is in metaphase of mitosis. Which structure and arrangement would be observed?

(A) Chromosomes aligned at the cell equator
(B) Nuclear envelope reforming around two daughter nuclei
(C) Homologous chromosomes paired and crossing over
(D) Sister chromatids separated and moving to opposite poles

Q30. The spindle assembly checkpoint prevents anaphase until all chromosomes are correctly attached. What is the most likely consequence if this checkpoint fails?

(A) Daughter cells may receive the wrong number of chromosomes
(B) DNA replication is repeated before mitosis begins
(C) The cell cannot enter G1 after division
(D) Cytokinesis occurs before chromosome condensation

Q31. Cancer cells often divide without responding to normal growth controls. Which change could contribute to this behaviour?

(A) A mutation that increases the activity of the G2 checkpoint
(B) A mutation that inactivates a tumour suppressor gene such as p53
(C) Complete absence of growth factor receptors
(D) Loss of all cyclin proteins from the cell

Q32. A researcher treats cells with a drug that prevents microtubule assembly. Which stage of the cell cycle is most directly disrupted?

(A) S phase, because DNA cannot be replicated without microtubules
(B) Cytokinesis in plant cells only, because animal cells lack microtubules
(C) Mitosis, because the spindle cannot form to separate chromosomes
(D) G1 phase, because the cell cannot grow without microtubules

Heredity

Q33. During anaphase I of meiosis, homologous chromosomes separate. If this separation fails for one pair, what is the term for the error, and what results?

(A) Fertilisation, producing a diploid zygote
(B) Crossing over, producing recombinant chromatids
(C) Nondisjunction, producing gametes with an extra or a missing chromosome
(D) Independent assortment, producing gametes with random chromosome sets

Q34. A man with haemophilia (X-linked recessive) has a daughter with a woman who is not a carrier. What is the daughter genotype and phenotype?

(A) She is a carrier and is unaffected, having received the affected X from her father
(B) She is unaffected and is not a carrier, because the trait passes only to sons
(C) She has haemophilia, because she receives two affected X chromosomes
(D) She has haemophilia, because she receives the affected X from her father

Q35. In fruit flies, red eyes are dominant to white eyes. A heterozygous red-eyed female is crossed with a white-eyed male. What proportion of the male offspring is expected to have white eyes?

(A) 1 in 4, because the trait is autosomal recessive
(B) 1 in 2, because males receive their X chromosome from their mother
(C) None, because white eyes are dominant in males
(D) All male offspring, because eye colour is Y-linked

Q36. A genetic cross yields 400 offspring: 305 with the dominant phenotype and 95 with the recessive phenotype. Which expected ratio does this best fit?

(A) 9:3:3:1, consistent with a dihybrid cross
(B) 1:2:1, consistent with incomplete dominance
(C) 3:1, consistent with a monohybrid cross between two heterozygotes
(D) 1:1, consistent with a test cross

Q37. In a pedigree, a trait appears in every generation, affects males and females equally, and every affected person has an affected parent. Which inheritance pattern is most likely?

(A) Autosomal recessive, because affected people have unaffected parents
(B) Autosomal dominant, because the trait never skips a generation
(C) X-linked recessive, because it affects males more often
(D) Mitochondrial, because it passes only through mothers

Q38. A flower colour gene shows incomplete dominance: red (RR) crossed with white (WW) gives pink (RW) offspring. Two pink flowers are crossed. What is the expected phenotypic ratio?

(A) 3 red : 1 white
(B) 1 red : 2 pink : 1 white
(C) All pink, because pink is dominant
(D) 1 pink : 1 white, because red is lost

Q39. Two genes are 20 map units apart on the same chromosome. A heterozygous parent (AB/ab) is test-crossed. What percentage of offspring is expected to be recombinant?

(A) 0 percent, because linked genes never recombine
(B) 50 percent, because the genes assort independently
(C) 20 percent, because recombination frequency equals map distance
(D) 10 percent, because only half of the crossovers are detected

Gene Expression and Regulation

Q40. DNA replication is described as semiconservative. What does this mean?

(A) The original double helix remains intact and a copy is made separately
(B) Each new double helix contains two newly synthesised strands
(C) Each new double helix contains one original strand and one newly synthesised strand
(D) Only one strand of DNA is replicated in each cell division

Q41. During transcription, RNA polymerase reads the template strand of DNA. In which direction does it synthesise RNA, and which base pairs with adenine in DNA?

(A) RNA is synthesised 3′ to 5′, and thymine in RNA pairs with adenine in DNA
(B) RNA is synthesised 3′ to 5′, and cytosine in RNA pairs with adenine in DNA
(C) RNA is synthesised 5′ to 3′, and uracil in RNA pairs with adenine in DNA
(D) RNA is synthesised 5′ to 3′, and thymine in RNA pairs with adenine in DNA

Q42. A tRNA molecule has the anticodon 3′-AAU-5′. Which mRNA codon does it recognise, and which amino acid does it carry if that codon specifies leucine?

(A) The codon 5′-UUA-3′, and it carries asparagine
(B) The codon 3′-UUA-5′, and it carries leucine
(C) The codon 5′-AAU-3′, and it carries asparagine
(D) The codon 5′-UUA-3′, and it carries leucine

Q43. A point mutation changes one nucleotide but the amino acid sequence of the protein is unchanged. Which term describes this mutation?

(A) A missense mutation, because a different amino acid is inserted
(B) A nonsense mutation, because translation stops early
(C) A frameshift mutation, because the reading frame shifts
(D) A silent mutation, because the genetic code is degenerate

Q44. In the trp operon, tryptophan is abundant in the cell. What happens to transcription of the trp operon genes?

(A) Transcription is unaffected, because the trp operon is not regulated
(B) Transcription increases, because tryptophan is an inducer
(C) Transcription is repressed
(D) Transcription increases, because tryptophan binds the promoter directly

Q45. A eukaryotic cell methylates the DNA of a gene and modifies its histones so the chromatin is tightly packed. What is the most likely effect on that gene?

(A) DNA replication stops throughout the whole genome
(B) Transcription increases, because methylation attracts RNA polymerase
(C) Translation increases, because the mRNA is more stable
(D) Transcription decreases, because the DNA is less accessible to RNA polymerase

Q46. A scientist inserts a human insulin gene into a bacterial plasmid and the bacteria produce insulin. Which feature of the genetic code makes this possible?

(A) Bacteria naturally produce human insulin
(B) Bacterial ribosomes translate only human mRNA
(C) Plasmids contain human chromosomes
(D) The genetic code is nearly universal

Natural Selection

Q47. In a population at Hardy-Weinberg equilibrium, 9 percent of individuals show a recessive phenotype. What is the frequency of the dominant allele?

(A) 0.3, equal to the recessive allele frequency
(B) 0.09, equal to the recessive phenotype frequency
(C) 0.7, because q = 0.3 and p = 1 – q
(D) 0.91, because the dominant phenotype is 91 percent

Q48. A population of moths is split by a new highway. The two groups evolve different wing patterns over many generations without any exchange of genes. Which mechanism is most directly responsible for the divergence?

(A) Reduced gene flow, allowing the separated populations to evolve independently
(B) Increased gene flow, which homogenises the populations
(C) Stabilising selection in both groups
(D) A single mutation shared by both groups

Q49. In a large population, allele frequencies remain stable for many generations. Which condition of Hardy-Weinberg equilibrium is most likely violated if a new predator selectively eats one phenotype?

(A) Large population size, because predation reduces the population
(B) No natural selection, because the predator changes survival by phenotype
(C) No mutation, because predators cause mutations
(D) Random mating, because predators choose mates

Q50. A cladogram shows a node where feathers first appear, shared by birds and a group of dinosaurs. What does this node represent?

(A) The oldest fossil of a bird ever found
(B) A shared derived character inherited from a common ancestor
(C) A character lost in all other lineages
(D) A trait that evolved independently in each group by convergence

Q51. Fossils of the same freshwater reptile are found in South America and Africa. Which explanation best fits this distribution?

(A) The fossils were carried by ocean currents after death
(B) The species evolved independently on both continents
(C) The reptile swam across the Atlantic Ocean recently
(D) The continents were once joined

Q52. A population of finches experiences a severe drought. Birds with larger beaks survive better because they can crack hard seeds. Over time, average beak size increases. Which type of selection is this?

(A) Stabilising selection, favouring the average beak size
(B) Directional selection, favouring one extreme of the trait
(C) Sexual selection, favouring traits that attract mates
(D) Disruptive selection, favouring both extremes equally

Q53. Two species of frogs live in the same pond but breed at different times of year. Which reproductive barrier is this?

(A) Geographic isolation, because the frogs live in different ponds
(B) Temporal isolation, a prezygotic barrier based on breeding timing
(C) Hybrid inviability, a postzygotic barrier
(D) Behavioural isolation, because their mating calls differ

Ecology

Q54. A researcher measures the biomass at each trophic level in a forest: producers 20,000 kg, primary consumers 2,000 kg, secondary consumers 200 kg. What does this pattern illustrate?

(A) A pyramid of biomass, with roughly 90 percent of energy lost at each transfer
(B) An inverted pyramid, because consumers outweigh producers
(C) A pyramid of numbers, with producers outnumbered by consumers
(D) A food web, because all species eat the same food

Q55. A population of bacteria doubles every 20 minutes in ideal conditions. Starting from 100 cells, how many cells are present after 2 hours?

(A) 200, after a single doubling
(B) 3,200, after five doublings
(C) 1,200, after a linear increase
(D) 6,400, after six doublings

Q56. A lynx population and a snowshoe hare population are studied for 40 years. Hare numbers peak, then lynx numbers peak about a year later. What is the best explanation for the lag?

(A) Lynx numbers respond to hare abundance, with a time lag
(B) Both populations respond to the same weather with different delays
(C) Hares eat lynx, so hare numbers control lynx directly
(D) Lynx numbers determine hare numbers with no delay

Q57. Two species of barnacles compete for space on a rock. One species occupies the upper shore and the other the lower shore. When the lower-shore species is removed, the upper-shore species expands downwards. What does this show?

(A) Competition has no effect on where barnacles live
(B) The realised niche is smaller than its fundamental niche
(C) The two species are mutualists that help each other
(D) The fundamental niche of the upper-shore species is only the upper shore

Q58. In a grassland, a fire burns the vegetation but the soil remains intact. Within a year, grasses regrow from roots and seeds. Which term describes this recovery?

(A) Competitive exclusion, because grasses eliminate all other plants
(B) Climax community formation, because the fire creates a stable forest
(C) Secondary succession, because soil and some organisms remain
(D) Primary succession, because the land is completely bare

Q59. An invasive plant species spreads rapidly in a new habitat, outcompeting native plants. Which feature most likely contributes to its success?

(A) It is eaten more readily by local herbivores
(B) It is less able to reproduce than native species
(C) It requires more specific soil conditions than natives
(D) It has no natural predators or diseases in the new habitat

Q60. A country reduces its carbon dioxide emissions and protects large areas of forest. Which global environmental problem are these actions most directly addressing?

(A) Acid rain, by reducing sulphur dioxide from power stations
(B) Ozone depletion, by removing chlorofluorocarbons from the atmosphere
(C) Climate change, by reducing greenhouse gases and preserving carbon stores
(D) Eutrophication, by reducing nutrient run-off into lakes

Answer Key

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-17/