AP Biology Practice Test 6

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 adds 0.01 mol of hydrochloric acid to 1 L of human blood plasma and to 1 L of pure water. The plasma pH falls by only 0.1 unit, while the water pH falls by several units. Which system best explains the plasma result?

(A) The plasma contains enzymes that break down hydrochloric acid
(B) A bicarbonate buffer in the plasma absorbs the added hydrogen ions
(C) Blood cells actively pump hydrogen ions out of the plasma
(D) The plasma proteins denature and release hydroxide ions

Q2. A desert mammal pants and loses water from its tongue, yet its core temperature falls. Which property of water makes this cooling effective?

(A) Water is a good solvent for salts
(B) Water molecules form hydrogen bonds with each other
(C) Water has a low density as a solid
(D) Water absorbs a large amount of heat when it evaporates

Q3. A protease is mixed with a protein in a test tube with no water present. No peptide bonds are broken. When water is added, the protein is cut into shorter peptides. Which reaction has the water enabled?

(A) Hydrolysis
(B) Dehydration synthesis
(C) Oxidation
(D) Polymerisation by condensation

Q4. Two cysteine residues in different parts of a polypeptide chain are linked to each other, stabilising the folded protein. What type of bond links them?

(A) A hydrogen bond between backbone carbonyl groups
(B) An ionic bond between oppositely charged side chains
(C) A covalent disulfide bond between sulfur atoms
(D) A peptide bond between amino and carboxyl groups

Q5. Amylopectin is digested by amylase much faster than amylose, although both are polymers of glucose. What structural difference best explains the faster digestion?

(A) Amylopectin has beta linkages that amylase prefers
(B) Amylose contains glucose monomers joined by peptide bonds
(C) Amylopectin is highly branched, giving enzymes many ends to attack
(D) Amylose is a protein, so amylase cannot bind to it

Q6. A student compares a DNA nucleotide with an RNA nucleotide. Which difference correctly distinguishes them?

(A) The DNA nucleotide contains deoxyribose and thymine, while the RNA one contains ribose and uracil
(B) The DNA nucleotide contains ribose and the base thymine
(C) The RNA nucleotide contains a phosphate group and the DNA one does not
(D) The RNA nucleotide contains deoxyribose and the base uracil

Q7. Cell membranes of fish living in near-freezing Arctic water stay fluid, while membranes with mostly saturated fatty acid tails would stiffen. What explains the Arctic fish membranes?

(A) Their phospholipids have shorter tails that pack more tightly
(B) Their membranes contain no cholesterol at all
(C) Their membranes are made of single-chain fatty acids only
(D) Their phospholipid tails are rich in unsaturated fatty acids with kinks

Q8. A protein loses its shape when the pH of its solution is lowered from 7 to 3, although its amino acid sequence is unchanged. Which interaction is most directly disrupted by the extra hydrogen ions?

(A) Peptide bonds along the backbone
(B) Ionic interactions between charged side chains
(C) Disulfide bonds between cysteine residues
(D) Covalent bonds within individual amino acids

Cell Structure and Function

Q9. A cube-shaped cell has sides of 2 micrometres. It grows until its sides are 4 micrometres. How does its surface-area-to-volume ratio change?

(A) It doubles
(B) It stays the same
(C) It increases fourfold
(D) It halves

Q10. A pancreatic beta cell secretes large amounts of insulin, a protein hormone. Which organelle is most abundant and active in this cell compared with a resting skin cell?

(A) Smooth endoplasmic reticulum
(B) Rough endoplasmic reticulum
(C) Chloroplast
(D) Central vacuole

Q11. A red blood cell is placed in a concentrated salt solution. It shrinks and its membrane wrinkles. Which process best explains the shrinkage?

(A) Salt diffuses into the cell faster than water leaves
(B) The cell actively pumps water out using ATP
(C) Water leaves the cell by osmosis towards the higher solute concentration outside
(D) The membrane becomes impermeable and the cell dehydrates by evaporation

Q12. Glucose uptake into a muscle cell rises as blood glucose rises, then levels off even when blood glucose keeps increasing. What does the plateau show?

(A) Glucose enters by facilitated diffusion through a limited number of transport proteins
(B) Glucose enters by simple diffusion, which has no maximum rate
(C) Glucose is pumped in by active transport that never saturates
(D) The cell membrane becomes impermeable to glucose at high concentrations

Q13. The sodium-potassium pump moves ions against their gradients. Which statement about its action is correct?

(A) It moves three sodium ions out of the cell and two potassium ions in, using ATP
(B) It moves two sodium ions in and three potassium ions out, without ATP
(C) It moves sodium and potassium in equal amounts by facilitated diffusion
(D) It exchanges sodium for glucose across the membrane

Q14. A macrophage engulfs a bacterium and encloses it in a vesicle. The vesicle then fuses with an organelle containing hydrolytic enzymes. Which sequence is this?

(A) Exocytosis followed by secretion
(B) Pinocytosis followed by photosynthesis
(C) Phagocytosis followed by digestion in a lysosome
(D) Facilitated diffusion followed by active transport

Q15. Mitochondria and chloroplasts both have their own circular DNA and double membranes. What is the best-supported explanation for these features?

(A) Both organelles are produced by the nucleus in every cell division
(B) Both organelles evolved from free-living bacteria engulfed by an ancestral cell
(C) Both organelles are fragments of the endoplasmic reticulum
(D) Both organelles formed when the plasma membrane folded inward once

Cellular Energetics

Q16. A competitive inhibitor is added to an enzyme reaction. The substrate concentration is then raised until the reaction rate returns to its original maximum. Which change in the enzyme kinetics explains this result?

(A) The inhibitor lowers Vmax permanently
(B) The inhibitor changes the shape of the active site irreversibly
(C) The inhibitor binds only to the enzyme-substrate complex
(D) The inhibitor raises Km but leaves Vmax unchanged, so extra substrate outcompetes it

Q17. In a metabolic pathway, the final product binds to the first enzyme of the pathway at a site away from its active site, slowing the pathway when product is plentiful. What is this an example of?

(A) Competitive inhibition by the substrate
(B) Denaturation of the enzyme by heat
(C) Activation by a cofactor
(D) Allosteric feedback inhibition

Q18. During the light reactions of photosynthesis, water is split in the thylakoid lumen. What are the direct products of this splitting?

(A) Oxygen, electrons and protons
(B) Glucose and carbon dioxide
(C) ATP and NADPH only
(D) Glyceraldehyde-3-phosphate and ADP

Q19. A chloroplast fixes three molecules of CO_2 in the Calvin cycle. How much ATP and NADPH are used to produce one net molecule of glyceraldehyde-3-phosphate (G3P) from those three CO_2 molecules?

(A) 3 ATP and 3 NADPH
(B) 9 ATP and 6 NADPH
(C) 6 ATP and 9 NADPH
(D) 18 ATP and 12 NADPH

Q20. A sprinter's muscles run out of oxygen during a race, yet glycolysis continues for a while. How does fermentation allow glycolysis to continue?

(A) It produces extra ATP directly in the mitochondria
(B) It breaks down lactate to release oxygen
(C) It regenerates NAD^+ by transferring electrons to pyruvate, forming lactate
(D) It converts glucose to carbon dioxide and water

Q21. Cyanide blocks electron transfer at complex IV of the electron transport chain. Which result is expected in a cell exposed to cyanide?

(A) ATP production rises because electrons bypass the chain
(B) ATP synthesis by chemiosmosis falls and NADH accumulates
(C) Oxygen consumption rises sharply
(D) Glycolysis stops because glucose cannot enter the cell

Q22. A C4 plant such as maize fixes carbon first in its mesophyll cells and later releases CO_2 around Rubisco in bundle-sheath cells. What advantage does this spatial separation give in hot, dry conditions?

(A) It allows the plant to photosynthesise in the dark
(B) It lets the plant absorb carbon dioxide through its roots
(C) It raises CO_2 around Rubisco and reduces wasteful photorespiration
(D) It removes the need for water in the light reactions

Cell Communication and Cell Cycle

Q23. Adrenaline binds a G-protein-coupled receptor on a liver cell, and within seconds many glucose molecules are released from glycogen. What explains how one hormone molecule causes such a large response?

(A) The hormone enters the nucleus and directly breaks down glycogen
(B) Each receptor produces one molecule of glucose only
(C) The hormone is copied many times inside the cell
(D) The signal is amplified at each step of the transduction pathway, activating many enzymes

Q24. Cortisol, a steroid hormone, affects gene expression in target cells. How does it reach its receptor?

(A) It diffuses through the plasma membrane and binds an intracellular receptor
(B) It binds a channel protein that opens to let sodium in
(C) It is carried across the membrane by active transport
(D) It binds a receptor on the cell surface and triggers cAMP production

Q25. After a cell responds to a signal, the response must be switched off. Phosphodiesterase is one enzyme that helps end signalling by cAMP. What does it do?

(A) It synthesises more cAMP from ATP
(B) It phosphorylates the receptor to activate it further
(C) It breaks down cAMP to AMP, stopping the signal
(D) It transports cAMP out of the cell by exocytosis

Q26. A cell detects damaged DNA before it copies its chromosomes. At which checkpoint does this arrest occur, and which protein is a key regulator of the arrest?

(A) M checkpoint, controlled by cyclin B
(B) G2 checkpoint, controlled by separase
(C) Spindle checkpoint, controlled by cohesin
(D) G1 checkpoint, controlled by p53

Q27. A surge of maturation-promoting factor (MPF) is detected just before a cell enters mitosis. What is MPF made of, and what does it trigger?

(A) A cyclin-CDK complex that triggers breakdown of the nuclear envelope and chromosome condensation
(B) A growth factor that triggers DNA replication
(C) A checkpoint protein that triggers apoptosis
(D) A motor protein that triggers cytokinesis

Q28. A damaged skin cell undergoes apoptosis. Which feature distinguishes this death from necrosis?

(A) The cell swells and bursts, releasing its contents
(B) The cell shrinks and is engulfed by phagocytes without causing inflammation
(C) The cell divides rapidly and forms a tumour
(D) The cell loses its DNA but keeps dividing

Q29. Normal fibroblasts stop dividing when they touch neighbouring cells, but a line of cancer cells keeps dividing in a crowded dish. Which property have the cancer cells lost?

(A) Density-dependent inhibition
(B) The ability to synthesise DNA
(C) Anchorage dependence on a surface
(D) The ability to respond to growth factors

Heredity

Q30. During prophase I of meiosis, homologous chromosomes exchange segments. What is the main genetic consequence of this event?

(A) The chromosome number is halved immediately
(B) New combinations of alleles are created on the same chromosome
(C) Sister chromatids become identical
(D) The cell skips DNA replication in the next division

Q31. Nondisjunction occurs during meiosis I in a human cell. How many of the four resulting gametes will have an abnormal chromosome number?

(A) None, because meiosis II corrects the error
(B) One of the four
(C) Two of the four
(D) All four

Q32. In pea plants, round seeds (R) are dominant to wrinkled seeds (r) and yellow seeds (Y) are dominant to green seeds (y). Two plants heterozygous for both genes are crossed. What fraction of the offspring is expected to be wrinkled and green?

(A) 9/16
(B) 3/16
(C) 1/16
(D) 1/4

Q33. A pedigree shows a recessive trait carried on the X chromosome. A woman who is a carrier has children with an unaffected man. What is the probability that a son of theirs will show the trait?

(A) 0 percent
(B) 25 percent
(C) 100 percent
(D) 50 percent

Q34. A geneticist crosses two heterozygous plants and counts 90 tall and 30 short offspring. She tests the 3:1 expectation with a chi-square test and obtains a chi-square value of 0, with 1 degree of freedom. What is the correct conclusion?

(A) The null hypothesis is rejected because the value is below the critical value
(B) The data show the genes are linked
(C) The observed results match the expected results exactly, so the null hypothesis is not rejected
(D) The test is invalid because the sample is too large

Q35. Two genes are 12 map units apart on the same chromosome. What percentage of gametes from a heterozygous parent is expected to be recombinant for these genes?

(A) 12 percent
(B) 24 percent
(C) 6 percent
(D) 50 percent

Q36. Human skin colour varies continuously across a population and is influenced by several genes, each adding a small amount of pigment. Which term describes this pattern of inheritance?

(A) Codominance at a single locus
(B) Polygenic inheritance
(C) Complete dominance with epistasis
(D) Sex-linked recessive inheritance

Gene Expression and Regulation

Q37. In the Meselson-Stahl experiment, bacteria grown in heavy nitrogen (15N) are moved to light nitrogen (14N) for one generation. What pattern of DNA bands appears after centrifugation?

(A) Only a heavy band
(B) Only a band of intermediate density
(C) One heavy band and one light band
(D) Only a light band

Q38. RNA polymerase binds to a specific DNA sequence to begin transcription of a gene. What is this sequence called?

(A) The promoter
(B) The terminator codon
(C) The anticodon
(D) The origin of replication

Q39. A tRNA molecule carries the anticodon 3′-UAC-5′. Which mRNA codon will it pair with during translation?

(A) 3′-AUG-5′
(B) 3′-UAC-5′
(C) 5′-AUG-3′
(D) 5′-UAC-3′

Q40. E. coli is grown in a medium containing lactose but no glucose. Which statement about the lac operon is correct?

(A) The repressor stays bound to the operator and the operon stays off
(B) The operon is transcribed only when glucose is present
(C) Lactose is converted to glucose by the repressor protein
(D) Allolactose binds the repressor, releasing it from the operator so the operon is transcribed

Q41. In the trp operon, when tryptophan is abundant in the cell, what happens?

(A) The operon is switched on to make more tryptophan
(B) The repressor is destroyed by the ribosome
(C) Tryptophan binds the repressor, activating it so it blocks transcription
(D) RNA polymerase binds the operator more strongly

Q42. A point mutation changes the codon UAU to UAA in an mRNA. What is the most likely effect on the protein?

(A) A silent mutation with no change to the amino acid
(B) A nonsense mutation that stops translation early, producing a shortened protein
(C) A missense mutation that swaps one amino acid for another
(D) A frameshift that changes every codon after the mutation

Q43. A forensic sample contains only a few copies of a DNA fragment. Which technique will make millions of copies of that fragment for analysis?

(A) Gel electrophoresis
(B) DNA sequencing by chain termination
(C) Transformation with a plasmid
(D) The polymerase chain reaction (PCR)

Q44. DNA fragments from a crime scene are separated by gel electrophoresis. Which fragments travel farthest from the wells?

(A) The smallest fragments, because they move most easily through the gel
(B) The largest fragments, because they carry the most charge
(C) Fragments with the highest GC content
(D) Fragments that are double-stranded only

Natural Selection

Q45. In a population, 4 percent of individuals show a recessive phenotype. Assuming Hardy-Weinberg equilibrium, what percentage of the population are heterozygous carriers?

(A) 32 percent
(B) 16 percent
(C) 4 percent
(D) 64 percent

Q46. After a drought, seeds on an island become larger and harder. Finches with deeper beaks survive better and leave more offspring, and average beak depth in the population increases over generations. Which type of selection is this?

(A) Stabilising selection
(B) Disruptive selection
(C) Artificial selection
(D) Directional selection

Q47. A population of cheetahs has very low genetic diversity at almost all loci, although the population is now large. Which event best explains this pattern?

(A) Ongoing gene flow from other big cats
(B) Strong directional selection on every gene
(C) A population bottleneck in the past that removed most alleles
(D) A high mutation rate creating new alleles

Q48. A small group of birds colonises a new island and interbreeds with the island's resident population, introducing alleles the residents lacked. Which evolutionary mechanism is operating?

(A) Mutation
(B) Gene flow
(C) Genetic drift by the founder effect
(D) Non-random mating only

Q49. A river changes course and splits a population of frogs into two groups that can no longer meet or mate. Over thousands of years the groups diverge into separate species. What is this mode of speciation?

(A) Sympatric speciation by polyploidy
(B) Artificial selection
(C) Hybridisation
(D) Allopatric speciation

Q50. A cladogram shows that crocodiles share a more recent common ancestor with birds than with lizards. Which character would best support grouping crocodiles and birds together?

(A) Both live near water
(B) A shared derived character, such as a four-chambered heart, not found in lizards
(C) Both are cold-blooded
(D) Both have scales

Q51. The forelimbs of humans, bats and whales contain the same set of bones arranged in the same pattern, although they are used for grasping, flying and swimming. What does this pattern provide evidence for?

(A) Descent from a common ancestor with subsequent modification
(B) Convergent evolution from unrelated ancestors
(C) Independent origin of each limb type
(D) Artificial selection by humans

Q52. Cytochrome c, a protein in cellular respiration, differs by only one amino acid between humans and chimpanzees, but by more than ten between humans and yeast. What does this comparison support?

(A) Humans and yeast share a more recent ancestor than humans and chimpanzees
(B) Cytochrome c is not used by yeast
(C) Humans are more closely related to chimpanzees than to yeast
(D) Amino acid sequences do not change over evolutionary time

Ecology

Q53. A deer population grows rapidly when small, then its growth rate falls to near zero as it approaches the carrying capacity of its habitat. Which model and limiting factor combination best describes this?

(A) Exponential growth limited only by the birth rate
(B) Exponential growth limited by immigration
(C) Logistic growth limited by density-dependent factors such as food supply
(D) Logistic growth limited only by random weather events

Q54. A grassland produces 10,000 kJ of energy per square metre per year in its producers. Approximately how much energy is available to tertiary consumers in this system?

(A) About 10 kJ per square metre per year
(B) About 1,000 kJ per square metre per year
(C) About 100 kJ per square metre per year
(D) About 10,000 kJ per square metre per year

Q55. Sea otters eat sea urchins, which eat kelp. When otters were hunted to near extinction, kelp forests collapsed; when otters returned, the kelp recovered. What ecological role do otters play?

(A) Primary producer
(B) Keystone species
(C) Decomposer
(D) Pioneer species

Q56. In the nitrogen cycle, ammonium in soil is converted to nitrate, which plants can absorb. Which organisms carry out this conversion?

(A) Nitrogen-fixing bacteria in root nodules
(B) Decomposers that break down dead leaves
(C) Photosynthetic algae in the soil
(D) Nitrifying bacteria in the soil

Q57. Two species of warbler feed on insects in the same spruce tree but forage at different heights and in different parts of the branches. What does this pattern illustrate?

(A) Mutualism between the two species
(B) Resource partitioning, reducing direct competition
(C) Predation of one warbler by the other
(D) Primary succession

Q58. Bare rock is exposed after a glacier retreats. Lichens colonise the rock first, followed by mosses, then grasses and shrubs. What is this process called?

(A) Secondary succession
(B) Climax community formation only
(C) Competitive exclusion
(D) Primary succession

Q59. A researcher marks 40 trout in a lake and releases them. Later she catches 50 trout, of which 10 are marked. What is the estimated total trout population?

(A) 90
(B) 100
(C) 200
(D) 400

Q60. Rising atmospheric CO_2 is dissolving into surface ocean water. What effect does this have on coral reefs?

(A) It lowers ocean pH, making it harder for corals to build calcium carbonate skeletons
(B) It raises ocean pH, making coral skeletons grow faster
(C) It increases the oxygen available to coral polyps
(D) It has no effect because seawater is fully buffered

Answer Key

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-6/