AP Biology Practice Test 20

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 specific heat compared with most other liquids. A large lake warms slowly in summer and cools slowly in autumn. What is the effect on the climate of nearby land?

(A) It causes the lake to freeze solid every winter
(B) It has no effect, because air temperature is independent of water
(C) It makes summers hotter and winters colder near the lake
(D) It moderates temperature changes, making summers cooler and winters milder near the lake

Q2. A solution contains a weak acid and its conjugate base in equal concentrations. The pH of the solution equals the pKa of the acid. If a small amount of base is added, what happens to the pH?

(A) It falls sharply, because the conjugate base is acidic
(B) It changes very little, because the buffer absorbs the added base
(C) It rises sharply, because the buffer is overwhelmed immediately
(D) It becomes zero, because the buffer neutralises all ions

Q3. Lactose is a disaccharide made of glucose and galactose. People who lack the enzyme lactase cannot digest lactose. Which bond must lactase break, and what happens without it?

(A) The ester bond in a triglyceride; lactose is stored as fat
(B) The peptide bond between amino acids; lactose is converted to protein
(C) The glycosidic bond between glucose and galactose; lactose remains undigested in the gut
(D) The phosphodiester bond; lactose is incorporated into DNA

Q4. Cholesterol is a lipid found in animal cell membranes. Which statement about cholesterol is correct?

(A) It is a steroid with a four-ring structure that helps regulate membrane fluidity
(B) It is a phospholipid that forms the bilayer on its own
(C) It is a protein that transports cholesterol across the membrane
(D) It is a triglyceride that stores energy in the membrane

Q5. A protein is made of a single chain that folds into a compact shape with a hydrophobic core. Which level of structure is this folded shape?

(A) Primary structure, the order of amino acids in the chain
(B) Secondary structure only, with no further folding
(C) Tertiary structure, the overall three-dimensional folding of one polypeptide
(D) Quaternary structure, the assembly of several chains

Q6. A DNA molecule is found to contain equal amounts of adenine and thymine, and equal amounts of guanine and cytosine. Which rule does this illustrate?

(A) The lock-and-key model, describing enzyme action
(B) The central dogma, describing information flow from DNA to protein
(C) The Hardy-Weinberg principle, describing allele frequencies
(D) Chargaff rules, reflecting complementary base pairing in the double helix

Q7. Hydrolysis of a protein breaks it into amino acids. What is required for this reaction, and what is broken?

(A) Water is released and glycosidic bonds are broken
(B) Carbon dioxide is consumed and hydrogen bonds are broken
(C) Oxygen is consumed and disulfide bonds are broken
(D) Water is consumed and peptide bonds are broken

Cell Structure and Function

Q8. A bacterium is 2 micrometres long, while a human liver cell is about 20 micrometres across. Which statement about their surface-area-to-volume ratios is correct?

(A) The bacterium has a much larger ratio, favouring rapid exchange with its environment
(B) The liver cell has a larger ratio, because it is bigger
(C) The ratio cannot be compared, because bacteria have no membrane
(D) Both have the same ratio, because both are cells

Q9. A cell membrane is treated with a chemical that removes all cholesterol. At low temperatures, what is the most likely effect on the membrane?

(A) It becomes more fluid, because cholesterol normally makes membranes rigid
(B) It becomes impermeable to all substances
(C) It dissolves completely, because cholesterol holds the bilayer together
(D) It becomes less fluid and more likely to solidify

Q10. A marine fish lives in seawater, which is hypertonic to its body fluids. What problem does this create, and how does the fish respond?

(A) No water moves, so the fish needs no osmoregulation
(B) Salt is lost to the sea, so the fish absorbs salt through its skin only
(C) Water enters by osmosis, so the fish excretes dilute urine
(D) Water is lost by osmosis, so the fish drinks seawater and excretes excess salt

Q11. A channel protein allows potassium ions to cross the membrane down their concentration gradient. No ATP is used. Which type of transport is this?

(A) Facilitated diffusion, using a channel protein without energy input
(B) Osmosis, because water follows the ions
(C) Active transport, because a protein is involved
(D) Simple diffusion, because no protein is needed

Q12. A macrophage engulfs a large particle by extending its membrane around it. Which process is this, and what is required?

(A) Facilitated diffusion, moving the particle down its gradient
(B) Phagocytosis
(C) Pinocytosis, taking in only dissolved substances
(D) Exocytosis, releasing the particle from the cell

Q13. The cytoskeleton is made of microtubules, microfilaments and intermediate filaments. Which function is performed mainly by microtubules?

(A) Forming the cell wall in plant cells
(B) Providing the strongest mechanical support in skin cells
(C) Forming the spindle and tracks for organelle movement
(D) Contracting muscle cells by sliding past each other

Q14. A cell has a large number of lysosomes and a high rate of digesting old organelles. Which process is this cell carrying out at a high rate?

(A) Secretion, releasing enzymes outside the cell
(B) DNA replication, copying its genome
(C) Photosynthesis, producing glucose from light
(D) Autophagy, recycling its own worn-out components

Cellular Energetics

Q15. A reaction is endergonic, with a positive ΔG. Which statement about the reaction is correct?

(A) It requires an input of free energy and is not spontaneous on its own
(B) It is at equilibrium and no energy change occurs
(C) It cannot be coupled to any other reaction in the cell
(D) It releases free energy and proceeds spontaneously

Q16. An enzyme has an optimum temperature of 37 degrees Celsius. A student tests it at 10 degrees Celsius and finds a low reaction rate. What best explains the low rate?

(A) The substrate is destroyed at low temperature
(B) The enzyme is competitively inhibited by cold
(C) Fewer collisions between enzyme and substrate occur at low temperature
(D) The enzyme is denatured by the cold

Q17. A molecule binds to the active site of an enzyme but is not converted to product. It blocks the substrate from binding. Which term describes this molecule?

(A) A competitive inhibitor, because it competes for the active site
(B) A noncompetitive inhibitor, because it binds an allosteric site
(C) An activator, because it increases enzyme activity
(D) A coenzyme, because it helps the enzyme function

Q18. In photosynthesis, carbon dioxide enters the leaf through stomata. On a hot, dry day, a plant closes its stomata. What is the most likely effect on photosynthesis?

(A) The rate rises, because oxygen is excluded from the leaf
(B) The rate rises, because water loss increases light absorption
(C) The rate falls, because carbon dioxide supply is limited
(D) The rate is unchanged, because carbon dioxide is stored in the leaf

Q19. A plant is exposed to light of only green wavelengths. Its photosynthetic rate is very low. What is the best explanation?

(A) Photosynthesis uses only green light, so the plant is saturated
(B) Green light cannot pass through the leaf cuticle
(C) Chlorophyll absorbs green light poorly, reflecting most of it
(D) Green light is too energetic and destroys chlorophyll

Q20. During oxidative phosphorylation, electrons are passed from NADH to oxygen. What is the final electron acceptor, and what is formed?

(A) ATP, which accepts electrons to become ADP
(B) NAD+, which is reduced to NADH
(C) Oxygen, forming water
(D) Carbon dioxide, which is reduced to glucose

Q21. A cell carries out glycolysis in the cytoplasm. Where do the Krebs cycle and the electron transport chain take place in a eukaryotic cell?

(A) In the chloroplast, in the stroma and on the thylakoid membrane
(B) In the cytoplasm, alongside glycolysis
(C) In the mitochondria, in the matrix and on the inner membrane respectively
(D) In the nucleus, in the nucleolus and on the nuclear envelope

Cell Communication and Cell Cycle

Q22. A liver cell responds to glucagon by activating adenylyl cyclase, raising cAMP levels and triggering glycogen breakdown. Which step in signal transduction does the rise in cAMP represent?

(A) Reception, when the signal first binds to a receptor protein
(B) Transduction, relaying the signal through a second messenger inside the cell
(C) Response, the final cellular change produced by the pathway
(D) Termination, when the signal is switched off after the response

Q23. A signal molecule binds to a receptor, and the response is a change in gene expression that takes several hours. Which type of receptor is most likely involved?

(A) A ligand-gated ion channel, which acts within milliseconds
(B) A receptor that only opens ion channels
(C) An intracellular receptor acting as a transcription factor
(D) A G protein-coupled receptor, which always acts in seconds

Q24. A cell receives a signal to divide, but the signal is withdrawn before the cell passes the G1 checkpoint. What happens to the cell?

(A) It enters G0, a non-dividing state, until a new signal arrives
(B) It divides anyway, because the signal cannot be withdrawn
(C) It undergoes apoptosis immediately
(D) It skips to mitosis without replicating its DNA

Q25. In mitosis, the nuclear envelope breaks down during prophase. When does it reform?

(A) During anaphase, as chromatids separate
(B) During telophase, around each set of daughter chromosomes
(C) During metaphase, before chromosomes align
(D) During S phase, before DNA replication

Q26. A researcher counts chromosomes in a cell during metaphase I of meiosis. The cell has 46 chromosomes. How many bivalents are present, and how many chromatids in total?

(A) 46 bivalents, with 46 chromatids in total
(B) 23 bivalents, with 92 chromatids in total
(C) 23 bivalents, with 46 chromatids in total
(D) 92 bivalents, with 184 chromatids in total

Q27. A mutation in the gene for a cyclin causes the cyclin to be produced continuously and never degraded. What is the most likely effect on the cell cycle?

(A) The cell undergoes apoptosis every time it divides
(B) The cell cycle stops permanently in G1
(C) The cell cannot enter S phase at all
(D) The cell cycle is driven forward continuously

Q28. A drug is designed to block the growth of cancer cells by preventing them from entering mitosis. Which cell cycle stage would the drug most usefully target?

(A) The G0 state, preventing resting cells from dividing
(B) The G2 to M transition, preventing cells with replicated DNA from entering mitosis
(C) Cytokinesis, preventing the cytoplasm from dividing after mitosis
(D) S phase, preventing chromosomes from condensing

Q29. A cell undergoes apoptosis during the development of a human hand, removing the tissue between the fingers. What would happen if apoptosis failed in this tissue?

(A) The hand would have extra fingers, because new fingers grow
(B) The fingers would be shorter, because cells divide too slowly
(C) The fingers would remain joined by webbing, because the tissue is not removed
(D) The hand would develop normally, because apoptosis is not needed

Heredity

Q30. A cell undergoing meiosis has homologous chromosomes that have not yet separated. During which stage do homologous chromosomes separate?

(A) Prophase II, when chromosomes condense again
(B) Anaphase I, when homologous chromosomes move to opposite poles
(C) Metaphase I, when chromosomes align at the equator
(D) Anaphase II, when sister chromatids separate

Q31. In a pedigree, two unaffected parents have a child with cystic fibrosis, an autosomal recessive disorder. What is the probability that their next child will also have cystic fibrosis?

(A) 1 in 4, because both parents must be carriers
(B) 1 in 2, because each child has an equal chance of being a carrier
(C) 3 in 4, because most children of carriers show the trait
(D) 0, because the parents do not have the disorder

Q32. A pea plant heterozygous for two genes (RrYy) is crossed with a plant homozygous recessive for both (rryy). What proportion of offspring is expected to be RrYy?

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

Q33. A geneticist counts 1,000 offspring from a cross and finds 740 with the dominant phenotype and 260 with the recessive phenotype. Which ratio does this approximate, and what cross could produce it?

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

Q34. A woman is heterozygous for a recessive autosomal disorder. Her partner is unaffected and is not a carrier. What is the probability that their child will be a carrier?

(A) 1 in 4, because the child must inherit the allele from both parents
(B) 0, because the father is not a carrier
(C) 1 in 1, because all children of a carrier are carriers
(D) 1 in 2, because the child may inherit the recessive allele from the mother

Q35. In fruit flies, the gene for body colour and the gene for wing shape are linked. A test cross gives 45 percent parental types and 5 percent recombinants in one group, but the total is not 100 percent. What is wrong with this data?

(A) Linked genes always give 50 percent recombinants
(B) The data are correct, because some offspring are lost
(C) The percentages are incomplete
(D) Parental types cannot exceed recombinant types

Q36. A trait shows polygenic inheritance, such as human height. What pattern of variation is expected in a population?

(A) Two distinct phenotypes with no intermediates
(B) A single phenotype shared by everyone
(C) A 3:1 ratio of tall to short people
(D) A continuous range of phenotypes, with most people near the average

Q37. A couple has a child with Down syndrome. The mother is 42 years old. Which factor best explains the increased risk with maternal age?

(A) Down syndrome is caused by a bacterial infection during pregnancy
(B) The child inherited a dominant gene for Down syndrome
(C) Nondisjunction during meiosis becomes more likely as oocytes age
(D) The father age causes Down syndrome directly

Gene Expression and Regulation

Q38. A DNA strand has the sequence 5′-ATG-CCT-3′. What is the sequence of the complementary strand, written 3′ to 5′?

(A) 3′-TAC-GGA-5′, because A pairs with T and C pairs with G
(B) 3′-UAC-GGA-5′, using uracil in DNA
(C) 3′-ATG-CCT-5′, identical to the original strand
(D) 5′-TAC-GGA-3′, because the strands are identical

Q39. During translation, the ribosome moves along the mRNA. In which direction does it move, and what does it read?

(A) It moves 5′ to 3′ along the mRNA, reading codons in groups of three
(B) It moves 5′ to 3′ along the DNA, reading codons
(C) It moves in both directions, reading the whole mRNA at once
(D) It moves 3′ to 5′ along the mRNA, reading single nucleotides

Q40. A mutation deletes three nucleotides from the coding region of a gene. What is the most likely effect on the protein?

(A) The protein gains three extra amino acids
(B) One amino acid is lost, but the reading frame after the deletion is unchanged
(C) Translation stops immediately at the deletion
(D) The reading frame shifts, changing every amino acid after the deletion

Q41. In the lac operon, allolactose binds to the repressor and inactivates it. What is the role of allolactose in this system?

(A) It is an inducer
(B) It is a transcription factor that binds the promoter
(C) It is a corepressor, activating the repressor
(D) It is a substrate for the lac enzymes only

Q42. A gene is switched on in liver cells but switched off in brain cells. Which regulatory mechanism best explains this difference?

(A) The gene is mutated in liver cells
(B) The gene is deleted from brain cells
(C) The DNA sequence of the gene differs between the cells
(D) Different transcription factors are present in the two cell types

Q43. A researcher adds a methyl group to the promoter of a tumour suppressor gene in a cell line. The gene is then transcribed at a much lower rate. What does this demonstrate?

(A) The DNA sequence of the gene has been mutated
(B) Epigenetic modification can silence a gene
(C) The promoter has been deleted from the genome
(D) Methylation always increases transcription

Q44. A scientist wants to produce many copies of a gene for study. The gene is inserted into a plasmid, which is introduced into bacteria that divide rapidly. Which technique is this?

(A) PCR, which uses primers and heat cycles in a test tube
(B) Gel electrophoresis, which separates DNA fragments
(C) DNA sequencing, which reads the base order
(D) Gene cloning, using bacteria to replicate the recombinant plasmid

Q45. A virus injects its DNA into a bacterium and the viral DNA integrates into the bacterial chromosome, remaining dormant for many generations. Which viral cycle is this?

(A) The prion cycle, in which no nucleic acid is involved
(B) The retroviral cycle, in which RNA is converted to DNA
(C) The lytic cycle, in which the virus immediately destroys the host
(D) The lysogenic cycle, in which the viral genome replicates with the host without killing it

Natural Selection

Q46. A population of bacteria is treated with an antibiotic. A few cells carry a mutation that makes them resistant. After treatment, the resistant cells multiply. Which statement about the mutation is correct?

(A) The mutation is inherited from the antibiotic itself
(B) The antibiotic directly caused the mutation in the resistant cells
(C) The mutation arose randomly before the antibiotic was applied and was then selected for
(D) The mutation was created by the bacteria in response to the antibiotic

Q47. In a population, the frequency of the dominant allele is 0.6. Assuming Hardy-Weinberg equilibrium, what is the expected frequency of recessive homozygotes?

(A) 0.48, which is 2pq
(B) 0.16, because q = 0.4 and q squared = 0.16
(C) 0.40, equal to the recessive allele frequency
(D) 0.36, which is p squared

Q48. A population of fish in a lake is divided by a dam into two groups. Over time, the groups develop different colour patterns and no longer interbreed when the dam is removed. What has occurred?

(A) Gene flow, which kept the populations identical
(B) Speciation by geographic isolation
(C) Stabilising selection, which prevented any change
(D) Artificial selection by the dam builders

Q49. A cladogram shows that mammals and birds share a common ancestor, but mammals are more closely related to reptiles than to birds. What does the tree show about the relationship between birds and mammals?

(A) Mammals evolved directly from birds
(B) They share a common ancestor
(C) They share no common ancestor at all
(D) Birds evolved directly from mammals

Q50. The appendix in humans is a small structure with little function, while in some herbivores a larger caecum digests cellulose. What does the human appendix best illustrate?

(A) A homologous structure with the same function in all species
(B) An analogous structure that evolved independently
(C) A vestigial structure, reduced in size and function over evolutionary time
(D) A shared derived character of all mammals

Q51. In a population of birds, individuals with medium-sized beaks have the highest survival, while very large and very small beaks are selected against. Which type of selection is this?

(A) Directional selection, favouring large beaks
(B) Disruptive selection, favouring both extremes
(C) Sexual selection, favouring beaks that attract mates
(D) Stabilising selection, favouring the intermediate phenotype

Q52. A fossil is found in a rock layer dated to 400 million years ago. A second fossil, very similar in structure, is found in a layer dated to 100 million years ago. What does this suggest about the lineage?

(A) The lineage evolved rapidly between the two dates
(B) The two fossils are from different species with no relationship
(C) The dating of the rock layers must be wrong
(D) The lineage persisted with little change over a long period

Q53. A population of plants is pollinated by bees during the day and by moths at night. Over time, two groups emerge: one flowers only in the morning and the other only in the evening. Which type of speciation could this lead to?

(A) Speciation by genetic drift alone in a large population
(B) Sympatric speciation, driven by temporal isolation within the same habitat
(C) Allopatric speciation, driven by geographic separation
(D) Speciation by polyploidy, driven by chromosome doubling

Ecology

Q54. In a food web, a species of hawk eats snakes, which eat frogs, which eat insects. If the hawk population is removed, what is the most likely short-term effect on the insect population?

(A) Insect numbers fall
(B) Insect numbers fall, because hawks directly control insects
(C) Insect numbers rise, because frogs increase when snakes decline
(D) Insect numbers are unaffected, because hawks do not eat insects

Q55. A population grows exponentially with a growth rate of 0.2 per year. Starting from 50 individuals, what is the approximate population after 5 years if growth remains exponential?

(A) About 250, because growth is linear at 20 per year
(B) About 100, because the population doubles every 5 years
(C) About 136, because 50 multiplied by e to the power of 1.0 is about 136
(D) About 50, because exponential growth cannot continue

Q56. A species of fish is an r-selected species: it produces many offspring, provides no parental care, and matures quickly. In which type of environment is this strategy most successful?

(A) An environment with no predators or disturbances
(B) An unstable environment where conditions change rapidly and many offspring die
(C) A stable environment at carrying capacity with intense competition
(D) An environment where resources are always scarce

Q57. In a community, a species of fig tree is pollinated only by a specific wasp, and the wasp lays its eggs only in the fig. If the wasp goes extinct, what is the most likely fate of the fig tree?

(A) It switches to wind pollination immediately
(B) It is pollinated by other wasps with no loss of fitness
(C) It produces seeds without pollination
(D) It cannot reproduce sexually and its population declines toward extinction

Q58. A coral reef is damaged by a rise in sea temperature, causing coral bleaching. The reef loses many species. Which term describes the loss of species from the reef?

(A) Biomagnification, concentrating toxins in corals
(B) A decline in biodiversity, reducing the resilience of the ecosystem
(C) Eutrophication, increasing nutrient levels
(D) Primary succession, creating new bare rock

Q59. A government bans the use of a pesticide that accumulates in the tissues of top predators, such as eagles. Which process was harming the eagles?

(A) Biomagnification
(B) Eutrophication, in which nutrients cause algal blooms
(C) Ozone depletion, in which UV radiation harms the birds
(D) Acid rain, in which sulphur dioxide damages feathers

Q60. A forest is fragmented by roads into small patches. Which effect is most likely on the populations living in the patches?

(A) Increased edge effects and reduced population sizes, raising extinction risk
(B) Increased gene flow, because roads connect the patches
(C) Increased biodiversity, because roads create new habitats
(D) No effect, because fragmentation does not affect forests

Answer Key

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-20/