AP Biology Practice Test 18

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. Ice floats on water, and aquatic life survives beneath it in winter. A student claims this is because hydrogen bonds in ice hold water molecules further apart than in liquid water. Is the claim correct, and why?

(A) No, because hydrogen bonds break completely when water freezes
(B) Yes, the open lattice of ice makes it less dense than liquid water
(C) Yes, because covalent bonds stretch as water freezes
(D) No, ice is denser than liquid water and sinks in deep lakes

Q2. A solution has a pH of 5. A second solution has a pH of 8. Which statement correctly compares their hydroxide ion concentrations?

(A) The hydroxide concentrations are equal, because pH measures only hydrogen ions
(B) The pH 8 solution has a hydroxide concentration 3 times greater
(C) The pH 5 solution has a hydroxide concentration 1,000 times greater
(D) The pH 8 solution has a hydroxide concentration 1,000 times greater

Q3. Chitin is a structural polysaccharide found in insect exoskeletons and fungal cell walls. Which monomer is chitin made from, and what makes it strong?

(A) Fatty acids joined to glycerol by ester bonds
(B) Modified glucose units joined by beta linkages
(C) Nucleotides joined by phosphodiester bonds
(D) Amino acids joined by peptide bonds into a triple helix

Q4. A triglyceride is formed from glycerol and three fatty acids. Which type of reaction forms it, and how many water molecules are released?

(A) Hydrolysis, consuming three water molecules
(B) Dehydration synthesis, releasing one water molecule
(C) Hydrolysis, releasing three water molecules
(D) Dehydration synthesis, releasing three water molecules

Q5. Two proteins have the same amino acid sequence but different functions in the cell. What is the most likely explanation?

(A) They fold differently or are modified differently after synthesis
(B) They have different primary structures
(C) They contain different amino acids in the same order
(D) They are encoded by different numbers of chromosomes

Q6. RNA differs from DNA in three main ways. Which combination is correct?

(A) RNA is double-stranded, contains deoxyribose, and uses thymine
(B) RNA is double-stranded, contains ribose, and uses uracil
(C) RNA is usually single-stranded, contains ribose, and uses uracil instead of thymine
(D) RNA is single-stranded, contains deoxyribose, and uses uracil

Q7. A solution of table salt conducts electricity, while a solution of glucose does not. What best explains this difference?

(A) Glucose is nonpolar and cannot dissolve in water
(B) Salt dissociates into ions that carry charge
(C) Glucose dissociates into ions that cancel each other out
(D) Salt molecules are larger and move faster in solution

Cell Structure and Function

Q8. A white blood cell is about 10 micrometres across, while a bacterium is about 1 micrometre across. A student calculates that the white blood cell has roughly 100 times the surface area of the bacterium. Is this correct?

(A) No, the white blood cell has 1,000 times the surface area
(B) Yes, because surface area scales with the square of length
(C) Yes, because volume scales with the square of the radius
(D) No, surface area scales linearly, so it is 10 times larger

Q9. A membrane protein spans the bilayer several times and has hydrophobic amino acids on its outside surface. Where are these hydrophobic regions most likely located?

(A) In the hydrophilic heads of the phospholipids
(B) Outside the cell, bound to the cell wall
(C) Exposed to the aqueous cytoplasm on both sides
(D) Within the hydrophobic interior of the phospholipid bilayer

Q10. A red blood cell is placed in distilled water. Water enters by osmosis and the cell swells. What is the water potential of the distilled water, and why does water enter?

(A) The water potential is positive, so water is pushed out of the cell
(B) The water potential is zero (highest possible)
(C) The water potential is zero, so no water movement should occur
(D) The water potential is negative, so water is attracted into the cell

Q11. A plant cell has a solute concentration of 0.4 mol per litre and is placed in a 0.4 mol per litre sucrose solution. What happens to the cell, and what is the solution called?

(A) Water enters the cell; the solution is hypotonic
(B) No net water movement occurs; the solution is isotonic
(C) The cell bursts; the solution is hypertonic
(D) Water leaves the cell; the solution is hypertonic

Q12. A researcher adds a drug that blocks aquaporins in kidney cells. Which process is most directly affected?

(A) Active transport of sodium ions
(B) Diffusion of oxygen across the membrane
(C) Endocytosis of large proteins
(D) Rapid osmosis of water across the cell membrane

Q13. The rough endoplasmic reticulum is studded with ribosomes, while the smooth endoplasmic reticulum is not. A cell that secretes large amounts of digestive enzymes would be expected to have which feature?

(A) Extensive smooth endoplasmic reticulum and few ribosomes
(B) No endoplasmic reticulum, because enzymes are made in the nucleus
(C) A large central vacuole instead of endoplasmic reticulum
(D) Extensive rough endoplasmic reticulum for protein synthesis

Q14. A scientist isolates chloroplasts and mitochondria from the same plant cell. Both organelles are found to produce ATP using a proton gradient. Where is the gradient formed in each?

(A) Across the thylakoid and inner mitochondrial membranes
(B) Across the outer membrane in both organelles
(C) In the stroma of chloroplasts and the matrix of mitochondria
(D) Across the plasma membrane in both cases

Q15. Gap junctions connect the cytoplasm of adjacent animal cells. Which function do they serve?

(A) They allow ions and small molecules to pass directly between cells
(B) They allow large proteins to move between cells freely
(C) They anchor cells to the extracellular matrix
(D) They seal cells together to prevent any exchange

Cellular Energetics

Q16. A reaction has a positive ΔG under standard conditions. In a cell, the reaction still proceeds in the forward direction. How is this possible?

(A) The reaction proceeds without any energy input because it is spontaneous
(B) Enzymes change the ΔG of the reaction to a negative value
(C) It is coupled to ATP hydrolysis, which provides the free energy needed
(D) The reaction becomes exergonic when the temperature falls to zero

Q17. An enzyme is placed in a solution at 80 degrees Celsius. Its activity falls to zero and does not recover when cooled. What has happened to the enzyme?

(A) It has been converted into its substrate
(B) It has been competitively inhibited by heat
(C) It has been denatured, losing its three-dimensional shape irreversibly
(D) It has formed more active sites at high temperature

Q18. A metabolic pathway is regulated by feedback inhibition: the final product binds to the first enzyme in the pathway. What is the advantage of this regulation?

(A) The product is converted back into the starting substrate
(B) The first enzyme is permanently destroyed by the product
(C) The cell stops making the product when enough is present, saving resources
(D) The pathway speeds up whenever the product accumulates

Q19. In an experiment, isolated chloroplasts are illuminated in a solution containing an artificial electron acceptor but no carbon dioxide. Oxygen is released but no carbohydrate is made. What does this show?

(A) The light reactions can run without the Calvin cycle
(B) The light reactions cannot occur without the Calvin cycle
(C) The Calvin cycle produces oxygen directly from carbon dioxide
(D) Water splitting requires carbon dioxide as a substrate

Q20. A plant grown in bright light shows a high rate of photosynthesis. When the temperature is raised from 20 to 40 degrees Celsius, the rate falls sharply. What is the most likely reason?

(A) The light reactions stop because chlorophyll is destroyed by light
(B) Stomata open wider and carbon dioxide is lost
(C) Enzymes of the Calvin cycle are denatured at high temperature
(D) Water splitting speeds up and oxygen inhibits photosynthesis

Q21. During the Krebs cycle, acetyl-CoA joins with oxaloacetate to form citrate. What happens to the carbon atoms of acetyl-CoA during one turn of the cycle?

(A) They are released as carbon dioxide as citrate is oxidised
(B) They are used to make oxygen gas
(C) They are converted directly into ATP
(D) They are stored as glucose in the matrix

Q22. A muscle cell has a large number of mitochondria and a rich blood supply. Which type of muscle activity is this cell best suited for, and why?

(A) Sustained aerobic activity, because mitochondria support efficient ATP production
(B) Activity in the absence of oxygen only
(C) Activity without any ATP requirement
(D) Short bursts of anaerobic activity, because mitochondria store lactate

Q23. A student calculates the water potential of a plant cell. The solute potential is -0.9 MPa and the pressure potential is 0.5 MPa. What is the total water potential?

(A) -1.4 MPa, because the two potentials are added as negatives
(B) 0.4 MPa, because pressure potential cancels solute potential
(C) -0.4 MPa, because water potential equals solute potential plus pressure potential
(D) -0.9 MPa, because pressure potential does not affect water potential

Cell Communication and Cell Cycle

Q24. A neurotransmitter binds to a ligand-gated ion channel on a muscle cell, opening the channel and causing contraction. How does this signalling differ from steroid hormone signalling?

(A) Both act through the same intracellular receptor
(B) The neurotransmitter binds a cell-surface receptor and acts quickly
(C) Steroid hormones bind ligand-gated ion channels on the cell surface
(D) The neurotransmitter enters the nucleus and changes gene expression directly

Q25. In a signalling cascade, one activated receptor leads to the activation of many relay proteins, each of which activates many more. What is the main benefit of this arrangement?

(A) Prevention of feedback, because the cascade cannot be reversed
(B) Signal termination, because the cascade quickly uses up the signal
(C) Signal amplification, so a small number of signal molecules produces a large response
(D) Reduced specificity, because any signal can activate the pathway

Q26. A cell is exposed to a signal molecule, but a mutation has removed the extracellular binding site of its receptor. What is the most likely result?

(A) The receptor is transported to the nucleus to act as a transcription factor
(B) The cell cannot detect the signal, so no response occurs
(C) The signal molecule enters the cell and binds the nucleus directly
(D) The cell responds more strongly because the receptor is always active

Q27. Blood calcium levels fall below normal. Parathyroid hormone is released, causing calcium release from bones and increased absorption from the gut. Calcium levels return to normal. Which type of regulation is this?

(A) Negative feedback, because the response restores the original calcium level
(B) No feedback, because parathyroid hormone acts independently
(C) Positive feedback, because the response increases calcium further
(D) Feedforward regulation, because the response precedes the fall

Q28. During prophase of mitosis, chromosomes condense and the nuclear envelope breaks down. Which structure is responsible for moving the chromosomes during mitosis?

(A) The mitotic spindle, made of microtubules
(B) The cell wall, which pushes chromosomes apart
(C) The Golgi apparatus, which packages chromosomes into vesicles
(D) Ribosomes, which synthesise spindle proteins only after division

Q29. A cell passes the G1 checkpoint and enters S phase. What is the main event of S phase?

(A) Cytokinesis, dividing the cytoplasm
(B) Chromosome separation to opposite poles
(C) Condensation of chromosomes for mitosis
(D) DNA replication

Q30. A researcher measures the amount of DNA in a cell at different stages. In G1 the cell has 2C of DNA; after S phase it has 4C. During which stage does the DNA content fall back to 2C in each daughter cell?

(A) During G2, before mitosis begins
(B) During prophase, as chromosomes condense
(C) After mitosis and cytokinesis
(D) During S phase, as DNA is replicated

Q31. A tumour is found to have cells with many more chromosomes than normal and a very high rate of division. Which cell cycle control is most likely to have failed?

(A) The spindle checkpoint, which normally speeds up division
(B) Checkpoint control, allowing cells with damaged or abnormal DNA to keep dividing
(C) Apoptosis, which normally increases cell division
(D) Feedback inhibition of glycolysis, which normally stops mitosis

Heredity

Q32. A diploid cell has 6 chromosomes. After meiosis I, each daughter cell has 3 chromosomes, each consisting of two sister chromatids. After meiosis II, how many chromosomes does each gamete have, and how many chromatids per chromosome?

(A) 6 chromosomes, each with two chromatids
(B) 3 chromosomes, each with one chromatid
(C) 6 chromosomes, each with one chromatid
(D) 3 chromosomes, each with two chromatids

Q33. In humans, a child has blood type AB. Which parental blood type combination could NOT produce this child?

(A) B and AB, because the AB parent can contribute A
(B) A and B, because each parent can contribute one allele
(C) O and O, because neither parent carries an A or B allele
(D) A and AB, because the AB parent can contribute B

Q34. A plant with genotype AaBb is self-crossed. Assuming independent assortment, what proportion of the offspring is expected to be aabb?

(A) 1 in 4, because each gene segregates independently
(B) 9 in 16, the proportion showing both dominant traits
(C) 1 in 16, from the 9:3:3:1 dihybrid ratio
(D) 3 in 16, the proportion showing one dominant trait

Q35. A scientist counts offspring from a dihybrid cross: 900 round yellow, 300 round green, 300 wrinkled yellow, 100 wrinkled green. A chi-square test gives a value of 0.0. What does this result mean?

(A) The cross involved only one gene, not two
(B) The observed numbers match the expected 9:3:3:1 ratio exactly
(C) The sample size is too small to test
(D) The hypothesis must be rejected because the value is zero

Q36. A trait is controlled by a gene on the X chromosome. Affected males pass the trait to all of their daughters but to none of their sons. Which inheritance pattern is this?

(A) X-linked dominant, because daughters receive the affected X from their father
(B) Y-linked, because the trait passes from father to son
(C) Autosomal dominant, because fathers pass traits to daughters only
(D) X-linked recessive, because sons are never affected

Q37. A woman with normal colour vision has a colour-blind father. She has a son with a man with normal colour vision. What is the probability that the son is colour-blind?

(A) 1 in 1, because all sons of carriers are affected
(B) 1 in 4, because colour blindness is autosomal recessive
(C) 0, because the father has normal vision
(D) 1 in 2, because the woman is a carrier and her son receives her X chromosome

Q38. In a population of rabbits, coat colour is controlled by multiple alleles: C (full colour) is dominant to ch (Himalayan), which is dominant to c (albino). A rabbit with genotype ch c is crossed with one of genotype C c. What proportion of offspring is expected to be albino?

(A) 1 in 2, because half the offspring receive c from both parents
(B) 1 in 4, because both parents carry the c allele
(C) All offspring, because c is dominant
(D) 0, because every offspring receives either C or ch, both dominant to c

Q39. A scientist studies a trait in mice and finds that genetically identical mice raised in different temperatures develop different coat colours. What does this demonstrate?

(A) The environment can influence the expression of a genotype
(B) The trait is controlled by the Y chromosome
(C) The mice have different genotypes despite being clones
(D) Temperature changes the DNA sequence of the coat colour gene

Gene Expression and Regulation

Q40. During DNA replication, DNA polymerase adds nucleotides to the 3′ end of a growing strand. Which enzyme first unwinds the double helix ahead of the replication fork?

(A) DNA ligase, which joins Okazaki fragments
(B) Primase, which synthesises RNA primers
(C) Topoisomerase, which joins the two new strands
(D) Helicase, which breaks the hydrogen bonds between base pairs

Q41. A gene contains the template DNA sequence 3′-TAC-AAA-GGC-5′. What is the sequence of the mRNA transcribed from it?

(A) 3′-AUG-UUU-CCG-5′, with the same direction as the template
(B) 5′-AUG-TTT-CCG-3′, using thymine in RNA
(C) 5′-AUG-UUU-CCG-3′, with uracil replacing thymine
(D) 5′-TAC-AAA-GGC-3′, identical to the template

Q42. A mutation inserts a single nucleotide into the coding region of a gene. What is the most likely effect on the protein?

(A) No effect, because the genetic code is degenerate
(B) A frameshift, changing every amino acid after the insertion
(C) A single amino acid substitution at the insertion site only
(D) A silent change, because one nucleotide cannot affect the protein

Q43. In E. coli, the trp operon is regulated by a repressor protein. When tryptophan levels in the cell are high, which state best describes the operon?

(A) Transcription is low, because tryptophan binds the repressor and activates it
(B) Transcription is high, because tryptophan inactivates the repressor
(C) Transcription is high, because tryptophan acts as an inducer
(D) Transcription stops permanently, because the operon is deleted

Q44. A eukaryotic mRNA has a 5′ cap and a poly-A tail. What are the main functions of these modifications?

(A) They protect the mRNA from degradation and help ribosomes recognise it
(B) They allow the mRNA to replicate itself
(C) They code for the first and last amino acids of the protein
(D) They remove introns from the pre-mRNA

Q45. A virus with an RNA genome infects a cell and uses reverse transcriptase to make DNA from its RNA. Which type of virus is this, and what is the DNA used for?

(A) A prion, which contains no nucleic acid at all
(B) A retrovirus, whose DNA integrates into the host genome and is transcribed
(C) A DNA virus, which replicates its genome without an RNA intermediate
(D) A bacteriophage, whose DNA is injected into the host chromosome only

Q46. A researcher wants to determine whether a suspect DNA sample matches a crime scene sample. Which technique produces a pattern of bands that can be compared?

(A) DNA sequencing of the entire genome by eye
(B) Restriction digestion without any separation step
(C) DNA profiling by gel electrophoresis of variable-length fragments
(D) PCR alone, which produces a single band for all samples

Natural Selection

Q47. In a population, the frequency of the recessive allele for a trait is 0.3. Assuming Hardy-Weinberg equilibrium, what percentage of the population is expected to show the dominant phenotype?

(A) 91 percent, because q squared is 0.09 and the rest show the dominant trait
(B) 49 percent, equal to p squared only
(C) 70 percent, equal to the dominant allele frequency
(D) 9 percent, equal to the recessive phenotype frequency

Q48. A population of island birds is reduced to 12 individuals by a storm. The survivors happen to carry mostly one allele, and that allele becomes fixed. Which mechanism best explains this?

(A) Gene flow from the mainland after the storm
(B) Directional selection for storm resistance
(C) Mutation creating a new allele during the storm
(D) A population bottleneck, a form of genetic drift

Q49. Two populations of the same species live in different environments. One has thick fur and the other thin fur. When brought together in a common environment, the difference disappears. What does this show?

(A) The difference was due to a fixed genetic mutation
(B) The fur difference is caused by genetic drift alone
(C) The populations are different species
(D) The difference was due to phenotypic plasticity, not genetic divergence

Q50. A molecular clock analysis estimates that two species diverged 10 million years ago. Which assumption underlies this estimate?

(A) All mutations are beneficial and fixed immediately
(B) Mutations accumulate at a roughly constant rate over time in the gene studied
(C) Fossil dates are always more accurate than molecular dates
(D) The two species have identical generation times

Q51. The wings of a bat and the wings of an insect are both used for flight but have very different structures. What does this illustrate?

(A) Homologous structures, inherited from a common ancestor
(B) Shared derived characters of all flying animals
(C) Analogous structures, produced by convergent evolution
(D) Vestigial structures with no current function

Q52. In a population of snails, birds eat mainly snails with intermediate shell patterns, while very light and very dark snails survive better. Which type of selection is acting?

(A) Directional selection, favouring the lightest snails
(B) Sexual selection, favouring patterns that attract mates
(C) Stabilising selection, favouring the intermediate pattern
(D) Disruptive selection, favouring both extremes over the intermediate

Q53. A new species of plant arises when a hybrid between two species doubles its chromosome number and can no longer breed with either parent. Which type of speciation is this?

(A) Sympatric speciation by polyploidy
(B) Speciation by behavioural isolation alone
(C) Allopatric speciation by geographic isolation
(D) Speciation by temporal isolation alone

Ecology

Q54. A food chain in a lake is: algae, then zooplankton, then small fish, then large fish. If the algae contain 50,000 kJ of energy, approximately how much energy reaches the large fish?

(A) About 50,000 kJ, because energy is not lost between levels
(B) About 5,000 kJ, after one transfer at 10 percent efficiency
(C) About 50 kJ, after three transfers at roughly 10 percent efficiency
(D) About 500 kJ, after two transfers at 10 percent efficiency

Q55. A population has a carrying capacity of 500 individuals. When the population is 100, growth is rapid; when it is 490, growth is very slow. Which factor best explains the slowing growth?

(A) Density-dependent factors, such as competition for food, intensify as the population grows
(B) The population switches to exponential growth near carrying capacity
(C) The birth rate falls to zero at all population sizes
(D) Density-independent factors, such as weather, act only at high density

Q56. A clownfish lives among the stinging tentacles of a sea anemone, gaining protection, while the anemone gains nutrients from the fish waste. Which interaction is this?

(A) Parasitism, because the fish harms the anemone
(B) Competition, because both need the same space
(C) Commensalism, because only the fish benefits
(D) Mutualism, because both species benefit

Q57. A forest is cleared for farming and then abandoned. Grasses grow first, followed by shrubs and eventually trees. Why is this succession faster than succession on bare rock?

(A) Farming removes all nutrients, forcing primary succession
(B) Bare rock already contains soil and nutrients
(C) No species can colonise farmland, so the process is slower
(D) Soil and seeds remain, so colonisation can begin immediately

Q58. A species of bird feeds only on one species of flower, and the flower is pollinated only by that bird. If the bird population declines sharply, what is the most likely effect on the flower?

(A) The flower population is unaffected, because plants do not depend on animals
(B) The flower switches to wind pollination immediately
(C) The flower population increases, because it no longer competes with the bird
(D) The flower population also declines, because its pollinator is lost

Q59. A researcher compares two islands: a large island near the mainland has 120 bird species, while a small island far from the mainland has 20. Which theory best explains this pattern?

(A) Competitive exclusion, which removes species from small islands only
(B) The 10 percent energy rule, which limits species on small islands
(C) Island biogeography theory, combining island size and distance from the mainland
(D) Succession theory, which predicts more species on older islands

Q60. A wetland is drained to build houses. Which ecosystem service is most directly lost?

(A) Pollination by wetland insects in the houses
(B) Water filtration and flood control provided by the wetland
(C) Oxygen production by the houses
(D) Photosynthesis by trees in the wetland

Answer Key

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

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-18/