AP Biology Practice Test 5

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 are attracted to each other by hydrogen bonds and to other polar surfaces by adhesion. Which combination of these properties allows water to move up a narrow tube against gravity?

(A) Cohesion and adhesion together
(B) Cohesion alone, because water molecules repel the tube walls
(C) Adhesion alone, because water molecules do not interact with each other
(D) Neither property, because water moves up tubes only by active transport

Q2. Which carbohydrate is the main structural component of plant cell walls?

(A) Starch, a storage polysaccharide in plant cells
(B) Glycogen, a storage polysaccharide in animal cells
(C) Chitin, a structural polysaccharide in fungal cell walls
(D) Cellulose, a polysaccharide of glucose joined by beta linkages

Q3. Amino acids are linked by peptide bonds to form a polypeptide. Which atoms are involved in a peptide bond?

(A) The oxygen of one R group and the hydrogen of another R group
(B) The phosphate group of one amino acid and the sugar of the next
(C) The nitrogen of the carboxyl group and the carbon of the amino group
(D) The carbon of the carboxyl group of one amino acid and the nitrogen of the amino group of the next

Q4. Which statement best describes the structure of a nucleotide?

(A) It consists of a glycerol molecule and three fatty acids
(B) It consists of a five-carbon sugar, a phosphate group
(C) It consists of an amino group, a carboxyl group, and an R group
(D) It consists of a six-carbon sugar and a phosphate group only

Q5. A solution has a pH of 8. What does this indicate about the solution?

(A) It is acidic, with a higher hydrogen ion concentration than a neutral solution
(B) It is neutral, with equal concentrations of hydrogen and hydroxide ions
(C) It contains no hydrogen ions at all
(D) It is basic, with a lower hydrogen ion concentration than a neutral solution

Q6. Which lipid is a major component of cell membranes and has a hydrophilic head and two hydrophobic tails?

(A) A phospholipid, which forms the bilayer of cell membranes
(B) A triglyceride, which stores energy in fat cells
(C) A steroid, which acts as a signaling molecule
(D) A wax, which coats leaves and feathers

Q7. Denaturation of a protein by heat or a change in pH affects which level of protein structure most directly?

(A) Primary structure, because peptide bonds are broken
(B) The sequence of amino acids, because the amino acids are destroyed
(C) Quaternary structure only, because single polypeptides are unaffected
(D) Tertiary structure

Cell Structure and Function

Q8. A cell is placed in a solution with a water potential of -0.2 MPa. The cell has a water potential of -0.8 MPa. What will happen to the cell?

(A) Water will leave the cell, because the solution has a higher solute concentration
(B) There will be no net movement of water, because both potentials are negative
(C) Solutes will move into the cell, raising its water potential
(D) Water will enter the cell

Q9. Which organelle contains enzymes that break down hydrogen peroxide into water and oxygen?

(A) The peroxisome, which contains catalase and other oxidative enzymes
(B) The lysosome, which digests bacteria and old organelles
(C) The vacuole, which stores water and waste products
(D) The mitochondrion, which produces ATP by cellular respiration

Q10. A plant cell has a large central vacuole. Which function is most important for this organelle in a plant cell?

(A) Producing ATP through cellular respiration
(B) Synthesizing proteins for secretion
(C) Maintaining turgor pressure by storing water and solutes
(D) Carrying out photosynthesis

Q11. Which statement best describes facilitated diffusion?

(A) It is passive transport of a substance down its concentration gradient with the help of a transport protein
(B) It is active transport that uses ATP to move substances against a gradient
(C) It is the movement of water across a membrane by osmosis
(D) It is the engulfing of large particles by the cell membrane

Q12. A researcher labels the proteins in a cell membrane and finds that they move freely within the plane of the membrane. What does this support?

(A) The idea that the membrane is a rigid, static structure
(B) The idea that proteins are fixed in place by covalent bonds
(C) The idea that the membrane is made only of proteins
(D) The fluid mosaic model

Q13. Which structure is responsible for producing ribosomal RNA and assembling ribosome subunits in a eukaryotic cell?

(A) The rough endoplasmic reticulum, which modifies proteins
(B) The Golgi apparatus, which sorts proteins
(C) The mitochondrion, which produces energy for the cell
(D) The nucleolus, located inside the nucleus

Q14. A prokaryotic cell differs from a eukaryotic cell in which way?

(A) It is always larger than a eukaryotic cell
(B) It has no plasma membrane
(C) It has no DNA at all
(D) It lacks a membrane-bound nucleus and other membrane-bound organelles

Cellular Energetics

Q15. An enzyme lowers the activation energy of a reaction. What is the effect on the reaction rate, and what happens to the enzyme itself?

(A) The reaction rate decreases, and the enzyme is used up
(B) The reaction rate increases, and the enzyme is not consumed by the reaction
(C) The reaction rate increases, but the enzyme is permanently changed into the product
(D) The reaction rate is unchanged, because activation energy does not affect rate

Q16. Which statement best explains why the inner mitochondrial membrane is the site of the electron transport chain?

(A) It is the only membrane in the cell that allows protons to pass freely
(B) It stores the glucose used in glycolysis
(C) It contains the protein complexes and ATP synthase needed for oxidative phosphorylation
(D) It is the site where the citric acid cycle occurs

Q17. A researcher measures the rate of oxygen production by a plant at different carbon dioxide concentrations. As CO_2 increases, oxygen production increases and then levels off. What is the most likely explanation for the plateau?

(A) The plant stops photosynthesizing when CO_2 is too high
(B) The light-dependent reactions are saturated
(C) Oxygen production is independent of carbon dioxide concentration
(D) The plant runs out of water at high CO_2 concentrations

Q18. In photosynthesis, NADPH is produced during the light reactions and used in the Calvin cycle. What is its role in the Calvin cycle?

(A) It provides the carbon atoms that are fixed into sugars
(B) It provides the reducing power (electrons and hydrogen) needed to convert 3-PGA into G3P
(C) It absorbs light energy in the thylakoid membrane
(D) It splits water to release oxygen

Q19. During cellular respiration, glucose is broken down in a series of steps. Which statement best describes the overall purpose of the process?

(A) To transfer energy from glucose to ATP
(B) To produce glucose from carbon dioxide and water
(C) To store energy in the form of glucose for later use
(D) To release oxygen into the atmosphere

Q20. A yeast cell is grown in the absence of oxygen. Which products will it produce from glucose, and how much ATP will it gain per glucose?

(A) Ethanol and carbon dioxide
(B) Lactic acid and oxygen, with a net gain of 36 ATP per glucose
(C) Carbon dioxide and water, with a net gain of 2 ATP per glucose
(D) Ethanol and oxygen, with a net gain of 0 ATP per glucose

Q21. Which statement correctly describes the role of ATP synthase in cellular respiration?

(A) It pumps protons across the inner mitochondrial membrane using ATP
(B) It uses the flow of protons down their gradient to synthesize ATP from ADP and phosphate
(C) It transfers electrons from NADH to oxygen
(D) It breaks down glucose into pyruvate in the cytoplasm

Cell Communication and Cell Cycle

Q22. A ligand binds to a receptor on a target cell, but the response is very slow, taking hours to appear. Which type of signaling is most likely involved?

(A) Ligand-gated ion channel signaling, which changes membrane potential in milliseconds
(B) Second messenger signaling, which acts within seconds
(C) Direct cell-to-cell contact, which is immediate
(D) Signaling that changes gene expression

Q23. A cell is treated with a chemical that blocks protein phosphatases. What is the most likely effect on signaling pathways that use phosphorylation?

(A) The pathways will stay active longer
(B) The pathways will be turned off immediately, because kinases cannot add phosphates
(C) The pathways will be unaffected, because phosphatases only add phosphate groups
(D) The cell will stop producing all signaling proteins

Q24. Which statement best describes the role of the spindle assembly checkpoint?

(A) It checks that DNA has been replicated before mitosis begins
(B) It triggers the breakdown of the nuclear envelope
(C) It delays anaphase until all chromosomes are properly attached to spindle fibers
(D) It initiates cytokinesis after mitosis is complete

Q25. A researcher observes that a cell has duplicated its DNA but has not yet entered mitosis. In which phase of the cell cycle is the cell?

(A) G1, the gap phase before DNA synthesis
(B) G2, the gap phase after DNA synthesis and before mitosis
(C) S phase, when DNA is being replicated
(D) M phase, when the cell is dividing

Q26. Cancer cells often show a loss of density-dependent inhibition. What does this mean?

(A) They stop dividing when they touch other cells, unlike normal cells
(B) They can only divide when they are isolated from other cells
(C) They continue dividing even when they are crowded and touching neighboring cells
(D) They divide more slowly than normal cells at low density

Q27. Which statement best describes the difference between mitosis and meiosis?

(A) Mitosis produces four haploid cells, while meiosis produces two diploid cells
(B) Mitosis produces two genetically identical diploid cells
(C) Mitosis involves crossing over, while meiosis does not
(D) Meiosis produces identical cells, while mitosis produces genetically varied cells

Q28. A growth factor is a signaling molecule that stimulates cell division. Which type of signaling is it when the growth factor acts on the same cell that produced it?

(A) Endocrine signaling, because the factor travels through the bloodstream
(B) Paracrine signaling, because the factor acts on nearby cells
(C) Autocrine signaling, because the cell signals itself
(D) Synaptic signaling, because the factor crosses a synapse

Heredity

Q29. During prophase I of meiosis, homologous chromosomes pair up in a process called synapsis. What structure forms between the paired homologs?

(A) The spindle fiber, which pulls chromosomes apart
(B) The nuclear envelope, which surrounds the paired chromosomes
(C) The synaptonemal complex
(D) The centromere, which joins sister chromatids

Q30. A plant heterozygous for flower color (Pp) is self-crossed. What is the probability that an offspring will be homozygous dominant (PP)?

(A) 1/4, because the Punnett square gives one PP out of four combinations
(B) 1/2, because half the offspring receive the dominant allele
(C) 3/4, because the dominant phenotype appears in three quarters
(D) 1/16, because both alleles must be dominant

Q31. A couple are both carriers of cystic fibrosis, an autosomal recessive disorder. What is the probability that their child will have cystic fibrosis?

(A) 1/2, because half their children will be carriers
(B) 3/4, because the disorder is recessive
(C) 1/4, because each parent has a 1/2 chance of passing the recessive allele
(D) 1/8, because the parents are both carriers

Q32. A gene has two alleles, B (brown eyes, dominant) and b (blue eyes, recessive). A brown-eyed man whose mother had blue eyes marries a blue-eyed woman. What is the probability their child has blue eyes?

(A) 1/2, because the man is heterozygous (Bb) and the woman is bb
(B) 1/4, because blue eyes are recessive and appear rarely
(C) 0, because the man has brown eyes
(D) 3/4, because brown eyes are dominant

Q33. A researcher studies a population in Hardy-Weinberg equilibrium. The frequency of the homozygous recessive genotype is 0.09. What is the frequency of the dominant allele?

(A) 0.3, because the square root of 0.09 is 0.3
(B) 0.7, because q = 0.3 and p = 1 – q = 0.7
(C) 0.09, because the genotype frequency equals the allele frequency
(D) 0.91, because the dominant allele is 1 minus the recessive genotype

Q34. A chi-square test on a dihybrid cross gives a calculated value of 12.5 with 3 degrees of freedom. The critical value at p = 0.05 is 7.81. What is the correct conclusion?

(A) The observed results differ significantly from the expected results
(B) The observed results match the expected results, so the null hypothesis is accepted
(C) The test is invalid because the value exceeds the critical value
(D) No conclusion can be drawn without knowing the sample size

Q35. In fruit flies, the gene for eye color is on the X chromosome. A white-eyed male is crossed with a red-eyed female who is homozygous dominant. What is the eye color of their daughters?

(A) All daughters will have white eyes, because they receive their X from their father
(B) Half the daughters will have red eyes and half will have white eyes
(C) Daughters will have white eyes because the trait is X-linked recessive
(D) All daughters will have red eyes

Q36. A genetic disorder is caused by a dominant allele on an autosome. A heterozygous affected man has children with an unaffected woman. What proportion of their children is expected to be affected?

(A) 1/4, because the disorder is dominant and appears rarely
(B) 1/2, because each child has a 50 percent chance of receiving the dominant allele from the father
(C) 3/4, because the dominant allele is passed to most children
(D) All children, because the father is affected

Gene Expression and Regulation

Q37. Which enzyme is responsible for synthesizing the RNA primer during DNA replication?

(A) Primase, which lays down a short RNA primer for DNA polymerase to extend
(B) Helicase, which unwinds the DNA double helix
(C) Ligase, which joins Okazaki fragments together
(D) Topoisomerase, which relieves supercoiling ahead of the fork

Q38. A mutation in a gene changes an mRNA codon from AUG to AUU. What type of mutation is this, and what is its effect?

(A) A nonsense mutation, because the codon becomes a stop codon
(B) A silent mutation, because the amino acid is unchanged
(C) A frameshift mutation, because a nucleotide is added
(D) A missense mutation

Q39. Which statement best describes the role of the 5′ cap and poly-A tail added to eukaryotic mRNA?

(A) They code for additional amino acids in the protein
(B) They remove introns from the primary transcript
(C) They stop transcription at the end of the gene
(D) They protect the mRNA from degradation and help it exit the nucleus and bind ribosomes

Q40. A researcher compares the DNA sequence of a gene in two species and finds that the coding regions are similar but the regulatory regions differ. What is the most likely consequence?

(A) The proteins produced will have completely different amino acid sequences
(B) The gene will not be expressed in either species
(C) The gene may be expressed at different times or in different tissues in the two species
(D) The DNA sequences will become identical over time

Q41. In the lac operon, the CAP-cAMP complex binds to the promoter when glucose levels are low. What is the effect of this binding?

(A) It increases transcription of the lac operon by helping RNA polymerase bind to the promoter
(B) It blocks RNA polymerase from binding, turning the operon off
(C) It removes the repressor from the operator directly
(D) It has no effect on transcription of the operon

Q42. A scientist wants to produce a large amount of a specific protein in bacteria. Which step is essential for the bacteria to express the human gene?

(A) The gene must be placed under the control of a bacterial promoter that RNA polymerase can recognize
(B) The gene must be inserted into the bacterial chromosome by crossing over
(C) The bacteria must be grown in the absence of all nutrients
(D) The gene must be converted into RNA before it is inserted

Q43. Which statement best describes how microRNAs (miRNAs) regulate gene expression?

(A) They bind to DNA and change its nucleotide sequence
(B) They bind to complementary sequences on mRNA and block translation or promote mRNA degradation
(C) They act as enzymes that cut introns out of pre-mRNA
(D) They carry amino acids to the ribosome during translation

Q44. A cell is exposed to a drug that inhibits RNA polymerase. Which process is most directly affected?

(A) Translation, because ribosomes cannot function without RNA polymerase
(B) Transcription, because RNA polymerase synthesizes RNA from a DNA template
(C) DNA replication, because DNA polymerase requires RNA polymerase
(D) Protein folding, because chaperones need RNA polymerase

Natural Selection

Q45. A population of fish is divided by a dam into two groups that no longer interbreed. Over many generations, the groups accumulate genetic differences. This is an example of which process?

(A) Sympatric speciation, because the groups live in the same area
(B) Artificial selection, because humans built the dam
(C) Genetic drift, because the groups are small
(D) Allopatric speciation

Q46. In a population, the frequency of allele A is 0.6 and the frequency of allele a is 0.4. If the population is in Hardy-Weinberg equilibrium, what proportion of the population is homozygous dominant?

(A) 0.36, because p squared = 0.6 x 0.6
(B) 0.6, because the allele frequency equals the genotype frequency
(C) 0.48, because 2pq is the heterozygote frequency
(D) 0.16, because q squared is the recessive genotype frequency

Q47. A new allele arises by mutation in a population. Which statement best describes its likely fate?

(A) All new mutations spread rapidly through the population
(B) New mutations are always harmful and are immediately eliminated
(C) Most new mutations are neutral or harmful
(D) New mutations never affect the phenotype of the organism

Q48. Which of the following is the best evidence that all living organisms share a common ancestor?

(A) All organisms use DNA as their genetic material and share a nearly universal genetic code
(B) All organisms look similar to each other
(C) All organisms live in the same environment
(D) All organisms have the same number of chromosomes

Q49. A phylogenetic tree shows that birds and crocodiles share a more recent common ancestor than birds and mammals. What does this imply?

(A) Birds evolved directly from crocodiles
(B) Crocodiles and mammals are the same species
(C) Birds are more closely related to crocodiles than to mammals
(D) Birds and mammals share no common ancestor at all

Q50. A species of plant produces seeds that are dispersed by wind to a distant island, where they establish a new population. Which mechanism of evolution is illustrated by the movement of these seeds?

(A) Genetic drift, because the seeds are carried by chance
(B) Natural selection, because only the best seeds survive the journey
(C) Gene flow, because alleles are transferred to a new population by migration
(D) Mutation, because the seeds change during dispersal

Q51. The fossil record shows that horses evolved from small, multi-toed ancestors to large, single-toed animals over 50 million years. What does this pattern best illustrate?

(A) Sudden appearance of a new species with no ancestors
(B) Gradual evolutionary change over long periods of time
(C) Evolution occurring only in response to human breeding
(D) The extinction of all horse species

Q52. Which statement best explains why antibiotic resistance spreads rapidly in bacterial populations?

(A) Antibiotics cause mutations that make all bacteria resistant
(B) Resistant bacteria survive antibiotic treatment and reproduce
(C) Bacteria learn to avoid antibiotics by changing their behavior
(D) Antibiotic resistance is inherited only through sexual reproduction

Ecology

Q53. A researcher studies two populations of the same species of fish. Population A lives in a stable lake, while Population B lives in a temporary pond that dries up each year. Which population is more likely to show r-selected traits?

(A) Population A, because stable environments favor rapid reproduction
(B) Both populations will show identical traits regardless of environment
(C) Population B, because the unstable environment favors rapid reproduction and many offspring
(D) Neither population, because fish cannot be r-selected

Q54. The energy in an ecosystem flows through trophic levels, but nutrients are recycled. Which process returns nitrogen from dead organisms to the soil?

(A) Photosynthesis, which fixes nitrogen into plant tissue
(B) Nitrogen fixation, which converts nitrogen gas into ammonia
(C) Decomposition by bacteria and fungi
(D) Denitrification, which releases nitrogen gas into the atmosphere

Q55. A food web in a grassland includes grasses, grasshoppers, mice, snakes, and hawks. If the hawk population declines sharply, what is the most likely short-term effect?

(A) Grass populations will increase immediately, because hawks eat grass
(B) Snake and mouse populations may increase
(C) Grasshopper populations will decrease, because hawks eat grasshoppers
(D) All populations in the food web will decline at the same rate

Q56. Which of the following best describes primary succession?

(A) The regrowth of a community after a forest fire leaves the soil intact
(B) The final stable community that forms after succession is complete
(C) The development of a community in an area where no soil exists
(D) The process by which a community is destroyed by a disturbance

Q57. A population of rabbits is introduced to an island with abundant food and no predators. The population grows rapidly at first and then levels off. Which growth model best describes this pattern?

(A) Exponential growth, because the population grows without limit
(B) Logistic growth
(C) Linear growth, because the population increases by a constant amount each year
(D) Negative growth, because the population declines over time

Q58. Which human activity has the greatest impact on global biodiversity loss?

(A) Recycling, because it reduces the amount of waste produced
(B) Planting native trees, because it changes the composition of a forest
(C) Using renewable energy, because it reduces carbon emissions
(D) Habitat destruction

Q59. A researcher measures the population of a species over time and finds that it fluctuates around a stable average size. Which term best describes this average size?

(A) Exponential growth rate, the rate at which the population increases
(B) Biotic potential, the maximum reproductive rate of the species
(C) Density, the number of individuals per unit area
(D) Carrying capacity

Q60. In a pond ecosystem, algae are the producers, small fish eat the algae, and large fish eat the small fish. If a pollutant kills most of the algae, what is the most likely effect on the large fish?

(A) The large fish population will increase, because there is less competition for food
(B) The large fish will switch to eating algae directly
(C) The large fish population will decline
(D) The large fish population will be unaffected, because they do not eat algae

Answer Key

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-5/