AP Biology Practice Test 9

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 lake stays liquid beneath a layer of ice in winter, and fish survive below. Why does the ice stay on top instead of sinking?

(A) Ice is denser than liquid water
(B) Ice is less dense than liquid water, so it floats and insulates the water below
(C) The fish warm the water and melt the ice from below
(D) Ice cannot form hydrogen bonds

Q2. Carbon can form single, double and triple bonds, and can bond to itself in chains, branches and rings. Which property of carbon makes this possible?

(A) Carbon has four valence electrons and can form four covalent bonds
(B) Carbon is the most abundant element in the universe
(C) Carbon atoms are larger than all other atoms
(D) Carbon forms only ionic bonds

Q3. A solution contains a weak acid and its conjugate base in equal amounts. When a small amount of strong base is added, the pH barely changes. What is this solution called?

(A) A saturated solution
(B) A hypertonic solution
(C) A buffer solution
(D) A molar solution

Q4. A protein is made of 200 amino acids. How many peptide bonds does the completed polypeptide contain?

(A) 100
(B) 200
(C) 400
(D) 199

Q5. Glucose and galactose have the same molecular formula, $C_6H_{12}O_6$, but differ in the arrangement of atoms around one carbon. What term describes their relationship?

(A) They are polymers of each other
(B) They are isotopes
(C) They are structural isomers
(D) They are enantiomers of the same ion

Q6. A triglyceride is made of glycerol and three fatty acids. What type of reaction joins them, and what is released?

(A) Hydrolysis, releasing water
(B) Dehydration synthesis, releasing three water molecules
(C) Oxidation, releasing carbon dioxide
(D) Fermentation, releasing ethanol

Q7. A student tests four solutions with universal indicator. Solution W turns red, X turns orange, Y turns green and Z turns blue. Which solution is the most acidic?

(A) Y, because green means neutral
(B) Z, because blue means strong acid
(C) X, because orange is between red and green
(D) W, because red indicates the lowest pH

Q8. A steroid such as testosterone is built from four fused carbon rings. Which class of biological molecule does it belong to?

(A) A lipid
(B) A carbohydrate
(C) A protein
(D) A nucleic acid

Cell Structure and Function

Q9. A cell fraction contains many small particles that are not membrane-bound and are found free in the cytoplasm and on the rough ER. What are they?

(A) Ribosomes, the sites of protein synthesis
(B) Lysosomes, the sites of digestion
(C) Peroxisomes, the sites of detoxification
(D) Vacuoles, the sites of storage

Q10. A plant cell is placed in a hypertonic solution. Its plasma membrane pulls away from the cell wall. What is this phenomenon called?

(A) Turgor
(B) Cytolysis
(C) Haemolysis
(D) Plasmolysis

Q11. A channel protein in a kidney cell allows water to cross the membrane rapidly. What is this channel called?

(A) A sodium-potassium pump
(B) A carrier protein for glucose
(C) An aquaporin
(D) A gap junction

Q12. A cell’s cytoskeleton is made of three types of fibre. Which one is the thickest and helps resist mechanical stress?

(A) Microfilaments of actin
(B) Intermediate filaments
(C) Microtubules only
(D) Collagen fibres outside the cell

Q13. A cell is treated with a poison that blocks ATP production. Which transport process stops first?

(A) Simple diffusion of oxygen
(B) Osmosis of water
(C) Facilitated diffusion of glucose
(D) Active transport of ions against their gradient

Q14. A large protein needs to enter the nucleus. How does it cross the nuclear envelope?

(A) By simple diffusion through the lipid bilayer
(B) Through nuclear pores, using a signal sequence and transport proteins
(C) By endocytosis of the whole nucleus
(D) Through plasmodesmata

Q15. A mitochondrion is observed to have a highly folded inner membrane. What is the advantage of these folds?

(A) They increase the surface area available for the electron transport chain and ATP synthase
(B) They store glucose for glycolysis
(C) They prevent oxygen from entering the matrix
(D) They produce light for photosynthesis

Q16. A cell has a large surface area because of many microvilli. Which cell is this most likely to be?

(A) A nerve cell in the brain
(B) A red blood cell
(C) An intestinal epithelial cell absorbing nutrients
(D) A sperm cell

Cellular Energetics

Q17. A reaction is endergonic, with a positive change in free energy. How can it occur in a cell?

(A) It cannot occur under any circumstances
(B) It occurs only at very high temperatures
(C) It is coupled to an exergonic reaction, such as ATP hydrolysis, that supplies the energy
(D) It is coupled to the denaturation of an enzyme

Q18. An enzyme lowers the activation energy of a reaction. Which statement about the enzyme is correct?

(A) It speeds up the reaction without being used up and without changing the equilibrium
(B) It changes the free energy difference between reactants and products
(C) It is consumed by the reaction it catalyses
(D) It makes an endergonic reaction exergonic

Q19. The induced-fit model of enzyme action states that the active site changes shape when the substrate binds. What does this model explain that the lock-and-key model does not?

(A) Why enzymes are made of protein
(B) How the enzyme moulds itself around the substrate, straining bonds and speeding the reaction
(C) Why enzymes work only at one pH
(D) How enzymes are denatured by heat

Q20. A graph shows oxygen production by a plant at different light intensities. The rate rises, then levels off at high light. What limits the rate at the plateau?

(A) Light intensity
(B) Water availability only
(C) The wavelength of the light
(D) Another factor, such as carbon dioxide concentration or temperature

Q21. During the Krebs cycle, acetyl-CoA joins with a four-carbon molecule. What is the four-carbon molecule, and what is the six-carbon product?

(A) Pyruvate and glucose
(B) Oxaloacetate and citrate
(C) RuBP and G3P
(D) Malate and lactate

Q22. A muscle cell is working hard with limited oxygen. Which molecules accumulate in the cell as a result of anaerobic respiration?

(A) Carbon dioxide and water
(B) Glucose and oxygen
(C) ATP and NAD^+
(D) Lactate and hydrogen ions

Q23. Photosystem II absorbs light most strongly in the red and blue parts of the spectrum. A plant is grown under green light only. What is the expected effect on photosynthesis?

(A) Photosynthesis will be faster than under white light
(B) Photosynthesis will stop because green light destroys chlorophyll
(C) Photosynthesis will be slow, because chlorophyll absorbs green light poorly
(D) Photosynthesis will be unaffected, because all wavelengths work equally

Q24. A chloroplast absorbs light energy, yet the Calvin cycle produces sugar in the stroma. Which molecules carry energy from the thylakoid reactions to the Calvin cycle?

(A) ATP and NADPH
(B) ADP and $NADP^+$
(C) Glucose and oxygen
(D) Carbon dioxide and water

Cell Communication and Cell Cycle

Q25. A hormone is released into the bloodstream and affects cells in distant organs. Which type of signalling is this?

(A) Synaptic signalling
(B) Endocrine signalling
(C) Contact-dependent signalling
(D) Quorum sensing

Q26. A ligand binds to a G-protein-coupled receptor. The activated G protein then stimulates adenylyl cyclase. What is the immediate product of adenylyl cyclase?

(A) ATP from ADP
(B) Calcium ions from the ER
(C) Inositol trisphosphate
(D) Cyclic AMP (cAMP) from ATP

Q27. A cell's response to a signal ends when the ligand is removed and the receptor is internalised. What is the name for this general process of switching a signal off?

(A) Signal termination
(B) Signal amplification
(C) Signal transduction
(D) Signal reception

Q28. A cell spends most of its life in interphase. Which three stages make up interphase?

(A) Prophase, metaphase and anaphase
(B) Mitosis, meiosis and cytokinesis
(C) G1, S and G2 phases
(D) G0, G1 and M phases

Q29. A cell is in telophase of mitosis. Which events are taking place?

(A) Chromosomes condense and the spindle forms
(B) Sister chromatids separate to opposite poles
(C) Nuclear envelopes reform around two sets of chromosomes, which decondense
(D) DNA is replicated

Q30. A researcher counts the cells in a tissue sample. Most are in interphase, and a few are in mitosis. What does this distribution show about the cell cycle?

(A) Interphase is the longest part of the cell cycle
(B) Mitosis takes longer than interphase
(C) Cells spend equal time in every phase
(D) Cytokinesis is the longest phase

Q31. A cell is exposed to a chemical that prevents spindle fibres from forming. At which stage will mitosis stop, and why?

(A) Prophase, because DNA cannot replicate
(B) Anaphase, because the nuclear envelope cannot reform
(C) Telophase, because the cell cannot divide its cytoplasm
(D) Metaphase, because chromosomes cannot align or be pulled apart without a spindle

Q32. Cancer cells often show a loss of anchorage dependence. What does this mean in practice?

(A) They cannot divide without a growth factor
(B) They can grow and divide without being attached to a surface or the extracellular matrix
(C) They stop dividing when they touch other cells
(D) They can only divide in the bloodstream

Heredity

Q33. A farmer crosses two heterozygous tall pea plants (Tt). What is the probability that a randomly chosen offspring will be short (tt)?

(A) 3/4
(B) 1/2
(C) 1/3
(D) 1/4

Q34. A geneticist studies a trait controlled by a single gene with two alleles. In a population, the frequency of the dominant allele is 0.7. Assuming Hardy-Weinberg equilibrium, what fraction of the population is homozygous recessive?

(A) 0.49
(B) 0.09
(C) 0.42
(D) 0.30

Q35. A man with haemophilia (an X-linked recessive disorder) has children with a woman who is not a carrier. What is the probability that their sons will have haemophilia?

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

Q36. A dihybrid cross of two pea plants heterozygous for seed shape and seed colour produces 320 offspring. How many are expected to show both dominant phenotypes?

(A) 180
(B) 60
(C) 80
(D) 240

Q37. A chromosome pair fails to separate during meiosis II. How many of the four resulting gametes will have an abnormal number of chromosomes?

(A) Two of the four
(B) All four
(C) One of the four
(D) None, because meiosis II errors are corrected at fertilisation

Q38. A plant breeder crosses a red-flowered plant with a white-flowered plant and gets only red offspring. She then crosses two of those offspring and gets red and white plants in a 3:1 ratio. What was the genotype of the original red parent?

(A) Heterozygous
(B) Recessive homozygous
(C) Dominant homozygous
(D) Hemizygous

Q39. In a family, a dominant trait is passed from a father to his son. Which inheritance patterns can be ruled out?

(A) Autosomal dominant
(B) X-linked inheritance, because a father passes his Y chromosome, not his X, to his son
(C) Autosomal recessive
(D) Mitochondrial inheritance

Gene Expression and Regulation

Q40. A DNA template strand reads 3′-TAC-GGT-5′. What is the sequence of the mRNA transcribed from it?

(A) 3′-AUG-CCA-5′
(B) 5′-TAC-GGT-3′
(C) 3′-UAC-GGU-5′
(D) 5′-AUG-CCA-3′

Q41. A bacterial cell is grown without lactose. The lac operon is switched off. Which protein is responsible for keeping it off?

(A) CAP activator protein
(B) RNA polymerase
(C) Beta-galactosidase
(D) The lac repressor, bound to the operator

Q42. A point mutation inserts a single nucleotide into a coding sequence. What is the most likely effect on the protein?

(A) A frameshift that changes the reading frame and alters most amino acids after the insertion
(B) No effect at all
(C) A silent change in one amino acid
(D) The gene is deleted entirely

Q43. A scientist compares the genome of a liver cell and a brain cell from the same person. The DNA sequences are identical, but the cells express different genes. What best explains the difference?

(A) The liver cell has mutated its DNA
(B) Differential gene regulation, including transcription factors and chromatin structure, controls which genes are expressed
(C) The brain cell has lost half its chromosomes
(D) The liver cell contains no DNA

Q44. In PCR, the reaction mixture is repeatedly heated to 95 degrees C, cooled to about 55 degrees C, and then held at 72 degrees C. What happens at 72 degrees C?

(A) The DNA strands separate
(B) The primers bind to the template
(C) Taq polymerase extends the primers, synthesising new DNA strands
(D) The DNA is cut by restriction enzymes

Q45. A gene is regulated by a repressor that is active only when a particular nutrient is present. When the nutrient is absent, the gene is expressed. Which operon behaves this way?

(A) The lac operon
(B) The trp operon
(C) A constitutive operon
(D) An operon with no operator

Q46. A mature mRNA has a 5′ cap and a poly-A tail added during processing. What is the main function of these modifications?

(A) They code for the first and last amino acids
(B) They mark the introns for removal
(C) They protect the mRNA from degradation and help the ribosome recognise it
(D) They change the DNA sequence of the gene

Natural Selection

Q47. A population of mosquitoes is sprayed with an insecticide. Most die, but a few with a resistance allele survive and reproduce. Within a few years, the population is mostly resistant. What has happened?

(A) The insecticide caused mutations that created the resistance allele
(B) Genetic drift by chance
(C) Artificial selection by farmers
(D) Natural selection increased the frequency of the pre-existing resistance allele

Q48. A population of deer has an allele frequency of p = 0.8 for the dominant allele. What is the expected frequency of heterozygotes under Hardy-Weinberg equilibrium?

(A) 0.32
(B) 0.64
(C) 0.16
(D) 0.04

Q49. A new species of plant arises when a chromosome doubling event produces a tetraploid that can no longer breed with its diploid parent population. What type of speciation is this?

(A) Sympatric speciation by polyploidy
(B) Allopatric speciation by geographic isolation
(C) Speciation by hybridisation only
(D) Speciation by genetic drift alone

Q50. The appendix in humans is a small, apparently functionless remnant of a larger caecum found in other mammals. What term describes such a structure?

(A) A homologous structure
(B) A vestigial structure
(C) An analogous structure
(D) A convergent structure

Q51. A molecular clock is used to estimate when two species diverged. What assumption does this method rely on?

(A) That all species evolve at exactly the same rate in every gene
(B) That fossils are always available for calibration
(C) That mutation rates are zero in the genes studied
(D) That mutations accumulate at a roughly constant rate in the DNA or protein sequences compared

Q52. A population of lizards on an island shows two distinct colour forms, bright and dull, with few intermediates, because predators eat the intermediates most often. Which type of selection is this?

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

Q53. Which of the following provides the strongest evidence that all life on Earth shares a common ancestor?

(A) All organisms live in the same environment
(B) All organisms use the same food
(C) All organisms are the same size
(D) All organisms share the same genetic code, DNA structure and basic cellular machinery

Ecology

Q54. A population of bacteria grows exponentially with unlimited resources. Which shape does its growth curve have, and what is its growth rate doing?

(A) S-shaped, with the rate falling to zero
(B) Flat, with no growth at all
(C) J-shaped, with the growth rate increasing as the population gets larger
(D) A straight line with a constant number added each hour

Q55. In a pond, the total biomass of producers is 500 kg. A researcher measures the biomass at each trophic level and finds it falls sharply at each step. What is this pattern called?

(A) A pyramid of biomass
(B) A pyramid of numbers inverted
(C) A food web with no producers
(D) A carbon cycle diagram

Q56. Two species compete for the same limited food source in a laboratory culture. Over time, one species always drives the other to extinction. What principle does this demonstrate?

(A) Mutualism
(B) Competitive exclusion
(C) Resource partitioning
(D) Predator-prey cycling

Q57. A lynx population rises and falls a few years after the snowshoe hare population it preys on. What explains the lag in the predator cycle?

(A) The lynx reproduce faster than the hares
(B) The hares eat the lynx
(C) The two populations are unrelated
(D) Predator numbers respond to prey abundance, so they peak after the prey peak

Q58. Carbon dioxide is taken up by plants, passed to herbivores, released by respiration and decomposition, and returned to the atmosphere. Which cycle is this?

(A) The nitrogen cycle
(B) The water cycle
(C) The carbon cycle
(D) The phosphorus cycle

Q59. A nature reserve is divided into small, isolated patches of forest by roads and farmland. Which effect is most likely on the populations living in the patches?

(A) Habitat fragmentation reduces gene flow and increases the risk of local extinction
(B) Fragmentation always increases biodiversity
(C) Fragmentation has no effect on small populations
(D) Fragmentation increases the size of each population

Q60. A scientist measures the effect of temperature on the metabolic rate of a fish. As temperature rises within the fish's tolerance range, its oxygen consumption rises. What does this show?

(A) The fish is endothermic
(B) The fish's metabolic rate increases with temperature, as expected for an ectotherm
(C) The fish stops respiring at higher temperatures
(D) The fish is unaffected by its environment

Answer Key

Q1: B	Q11: C	Q21: B	Q31: D	Q41: D	Q51: D
Q2: A	Q12: B	Q22: D	Q32: B	Q42: A	Q52: C
Q3: C	Q13: D	Q23: C	Q33: D	Q43: B	Q53: D
Q4: D	Q14: B	Q24: A	Q34: B	Q44: C	Q54: C
Q5: C	Q15: A	Q25: B	Q35: C	Q45: B	Q55: A
Q6: B	Q16: C	Q26: D	Q36: A	Q46: C	Q56: B
Q7: D	Q17: C	Q27: A	Q37: A	Q47: D	Q57: D

Q8: A	Q18: A	Q28: C	Q38: C	Q48: A	Q58: C
Q9: A	Q19: B	Q29: C	Q39: B	Q49: A	Q59: A
Q10: D	Q20: D	Q30: A	Q40: D	Q50: B	Q60: B

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-9/