AP Biology Practice Test 11

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 under winter ice while air temperature falls well below freezing. Which property of water best explains why aquatic organisms survive beneath the ice?

(A) Ice is less dense than liquid water, so it floats and insulates the water below
(B) Water has a low specific heat, so it cools rapidly
(C) Water molecules are nonpolar and repel dissolved salts
(D) Ice conducts heat away from the lake very efficiently

Q2. Two solutions differ by 3 pH units. How do their hydrogen ion concentrations compare?

(A) The more acidic solution has 3 times the H^+ concentration
(B) The more acidic solution has 1,000 times the H^+ concentration
(C) The more acidic solution has 30 times the H^+ concentration
(D) The more basic solution has 1,000 times the H^+ concentration

Q3. A researcher replaces the hydroxyl group on a sugar with a hydrogen atom. Which functional-group change most likely reduces the molecule's solubility in water?

(A) Gain of a methyl group that donates electrons to water
(B) Loss of a carbonyl group that repels water molecules
(C) Gain of a phosphate group that neutralises the molecule
(D) Loss of a polar hydroxyl group that could hydrogen-bond with water

Q4. Which feature of carbon most directly allows the enormous diversity of biological molecules?

(A) Carbon forms four stable covalent bonds and can bond to other carbons in chains and rings
(B) Carbon has a full outer shell and rarely bonds
(C) Carbon forms only ionic bonds with hydrogen
(D) Carbon atoms cannot bond to nitrogen or oxygen

Q5. Starch, glycogen and cellulose are all polymers of glucose. What mainly accounts for their very different functions?

(A) Differences in the monomer, which is fructose in cellulose
(B) Differences in glycosidic linkage and branching change their shape and digestibility
(C) Differences in the number of carbon atoms per glucose
(D) Differences in whether they contain nitrogen

Q6. A phospholipid bilayer is exposed to a nonpolar solvent. Which part of the membrane is most likely to interact with the solvent?

(A) The phosphate heads on the outer surfaces
(B) The fatty-acid tails in the interior of the bilayer
(C) The integral proteins spanning the membrane
(D) The carbohydrate chains on the cell surface

Q7. A protein is heated until it loses its three-dimensional shape but its amino-acid sequence is unchanged. Which level of structure is lost?

(A) Secondary and tertiary structure, while primary structure remains
(B) Primary structure only
(C) Quaternary structure only, with tertiary structure intact
(D) All levels including the amino-acid sequence

Cell Structure and Function

Q8. A spherical cell doubles its radius. How does its surface-area-to-volume ratio change?

(A) It is halved, so exchange across the membrane becomes less efficient per unit volume
(B) It doubles, improving exchange
(C) It stays the same because both increase equally
(D) It falls to one quarter of its original value

Q9. A white blood cell engulfs a bacterium into a vesicle that then fuses with a lysosome. Which sequence best describes this?

(A) Pinocytosis, followed by exocytosis of the bacterium
(B) Osmosis, followed by active transport out of the cell
(C) Facilitated diffusion, followed by hydrolysis in the cytosol
(D) Phagocytosis, followed by enzymatic digestion inside the phagolysosome

Q10. Cells are placed in a solution and swell until some burst. What can be concluded about the solution?

(A) It is hypertonic, so water entered by osmosis
(B) It is isotonic, so solutes left the cells
(C) It is hypertonic, so solutes entered the cells
(D) It is hypotonic to the cells, so water entered by osmosis

Q11. Which evidence best supports the endosymbiotic origin of mitochondria?

(A) Mitochondria are the largest organelle in every cell
(B) Mitochondria contain ribosomes identical to cytosolic ribosomes
(C) Mitochondria have their own circular DNA and double membrane and divide independently
(D) Mitochondria are enclosed by a single membrane only

Q12. A plant cell is placed in a concentrated salt solution and its cytoplasm shrinks away from the cell wall. This is best explained by

(A) water leaving the central vacuole and cytoplasm by osmosis
(B) active transport of salt into the vacuole
(C) facilitated diffusion of water into the cell
(D) rupture of the cell wall by turgor pressure

Q13. Which transport process moves glucose into an intestinal cell against its concentration gradient by coupling it to sodium moving down its gradient?

(A) Secondary active transport (cotransport)
(B) Simple diffusion through the lipid bilayer
(C) Facilitated diffusion through a channel
(D) Osmosis through aquaporins

Q14. A mutation prevents ribosomes from binding to the rough endoplasmic reticulum. Which process is most directly impaired?

(A) Synthesis of lipids for the plasma membrane
(B) Production of ATP by oxidative phosphorylation
(C) Secretion of proteins such as insulin and antibodies
(D) Replication of nuclear DNA

Cellular Energetics

Q15. An enzyme-catalysed reaction is run at increasing substrate concentrations. The rate levels off at high substrate concentration. What best explains the plateau?

(A) The enzyme is denatured by excess substrate
(B) The reaction has reached equilibrium with no product formed
(C) All active sites are saturated with substrate
(D) Competitive inhibitors accumulate as substrate rises

Q16. A noncompetitive inhibitor binds to an enzyme. Which change is expected?

(A) V_{max} increases and K_m decreases
(B) K_m increases with no change in V_{max}
(C) Both V_{max} and K_m increase equally
(D) V_{max} decreases, while K_m is largely unchanged

Q17. For a reaction with a negative change in Gibbs free energy, which statement is true?

(A) The reaction requires a constant input of ATP
(B) The products have more free energy than the reactants
(C) The reaction is exergonic and can proceed spontaneously
(D) The reaction is endergonic and never occurs in cells

Q18. In the light reactions of photosynthesis, water is split and O_2 is released. Where do the electrons from water ultimately go?

(A) To $NADP^+$, forming NADPH for the Calvin cycle
(B) Directly to carbon dioxide to form glucose
(C) To ADP, forming ATP by substrate-level phosphorylation
(D) Back to photosystem II to restart the cycle

Q19. A plant is kept in light with carbon dioxide but no water. Which Calvin cycle outcome is expected?

(A) The cycle runs faster using stored oxygen
(B) Glucose is made directly from carbon dioxide alone
(C) Only the light reactions continue normally
(D) The cycle stalls because no NADPH or ATP is supplied by the light reactions

Q20. During cellular respiration, most ATP is produced by which process?

(A) Oxidative phosphorylation using a proton gradient across the inner mitochondrial membrane
(B) Substrate-level phosphorylation in glycolysis only
(C) Fermentation in the cytoplasm
(D) Photophosphorylation in the thylakoid membrane

Q21. Yeast fermenting glucose in the absence of oxygen produces ethanol and CO_2. What is the main purpose of fermentation for the yeast?

(A) To produce more ATP than aerobic respiration
(B) To oxidise glucose completely to water
(C) To regenerate NAD^+ so glycolysis can continue
(D) To store oxygen for later use

Q22. A muscle cell is poisoned with cyanide, which blocks cytochrome c oxidase. Which immediate effect is expected?

(A) Glycolysis stops because no glucose enters the cell
(B) The Krebs cycle produces extra NADH to compensate
(C) Oxygen consumption rises as the chain speeds up
(D) Electrons back up in the transport chain and ATP synthesis by chemiosmosis falls sharply

Cell Communication and Cell Cycle

Q23. Epinephrine binds a receptor on a liver cell and triggers glycogen breakdown, but it does not enter the cell. What does this imply about the receptor?

(A) It is a nuclear receptor that binds DNA directly
(B) It is an enzyme that digests glycogen itself
(C) It is a gap junction allowing epinephrine to pass between cells
(D) It is a membrane receptor that activates an intracellular signalling cascade

Q24. In a signal transduction pathway, cyclic AMP is produced after a hormone binds. What is the role of cyclic AMP?

(A) It acts as a second messenger that activates protein kinase A
(B) It is the hormone itself, entering the nucleus
(C) It blocks the receptor so the signal ends
(D) It transports the hormone across the membrane

Q25. A cell receives a signal that activates a kinase cascade. What is the main advantage of such a cascade?

(A) It prevents any response until the signal is removed
(B) Each step can amplify the signal, so a few molecules trigger a large response
(C) It ensures only one protein is ever activated
(D) It makes the signal independent of the receptor

Q26. Insulin is released when blood glucose rises, and it lowers blood glucose. This is an example of

(A) negative feedback, which returns a variable toward its set point
(B) positive feedback, which amplifies the change
(C) feedforward control, which ignores the variable
(D) competitive inhibition of glucose transport

Q27. During labour, oxytocin release increases uterine contractions, which stimulate more oxytocin release. This is an example of

(A) negative feedback, which stabilises contractions
(B) positive feedback, which amplifies the change until the process ends
(C) a signal transduction cascade with no amplification
(D) apoptosis triggered by a hormone

Q28. A cell in G_1 has damaged DNA that cannot be repaired. At which checkpoint is the cycle most likely to arrest?

(A) The G_2 checkpoint, after mitosis is complete
(B) The metaphase checkpoint, during chromosome separation
(C) The G_1 checkpoint, before DNA replication begins
(D) The cytokinesis checkpoint, after the nucleus divides

Q29. Which event is controlled by the spindle assembly checkpoint?

(A) Completion of DNA replication before mitosis
(B) Growth of the cell to sufficient size in G_1
(C) Attachment of all chromosomes to spindle microtubules before anaphase begins
(D) Separation of the cytoplasm during cytokinesis

Q30. A drug blocks cyclin-dependent kinases. Which process is most directly disrupted?

(A) Translation of mRNA into protein
(B) Replication of mitochondrial DNA only
(C) Progression through the cell cycle, because Cdks drive transitions between phases
(D) Active transport across the plasma membrane

Heredity

Q31. In meiosis, homologous chromosomes pair and exchange segments. What is the main genetic consequence?

(A) Identical daughter cells with no variation
(B) Doubling of the chromosome number in gametes
(C) Loss of all recessive alleles from the population
(D) New combinations of alleles on chromosomes, increasing variation

Q32. A diploid cell with 2n = 12 undergoes meiosis. How many chromosomes are in each gamete, and how many chromatids are in a secondary oocyte in metaphase II?

(A) 12 chromosomes; 24 chromatids
(B) 6 chromosomes; 6 chromatids
(C) 6 chromosomes; 12 chromatids
(D) 3 chromosomes; 6 chromatids

Q33. A cross AaBb x aabb produces offspring in a 1:1:1:1 ratio. What does this indicate?

(A) The two genes are tightly linked on the same chromosome
(B) One gene is sex-linked and the other is not
(C) The cross is a test of codominance only
(D) The two genes assort independently

Q34. In a pedigree, two unaffected parents have an affected daughter. What is the most likely mode of inheritance?

(A) Autosomal dominant
(B) X-linked dominant
(C) Autosomal recessive
(D) Y-linked

Q35. A plant heterozygous for flower colour (Rr) is self-crossed. What is the probability of a white-flowered (rr) offspring?

(A) 1/2
(B) 3/4
(C) 1/4
(D) 1/16

Q36. Genes A and B are 20 map units apart. What percentage of gametes from an AB/ab heterozygote are expected to be recombinant?

(A) 10 percent
(B) 20 percent
(C) 40 percent
(D) 50 percent

Q37. Nondisjunction in meiosis I in a human produces gametes with which chromosome numbers?

(A) Two gametes with n + 1 and two with n – 1
(B) Four gametes with n + 1
(C) Two gametes with n and two with n + 1
(D) Four gametes with the normal number n

Q38. A chi-square test on a dihybrid cross gives a value of 9.2 with 3 degrees of freedom. The critical value at p = 0.05 is 7.81. What is the correct conclusion?

(A) Reject the null hypothesis; the observed ratio differs significantly from the expected ratio
(B) Accept the null hypothesis; the fit is good
(C) The data prove the genes are linked
(D) The degrees of freedom were calculated incorrectly

Gene Expression and Regulation

Q39. During translation, a tRNA molecule arrives at the ribosome carrying the amino acid methionine. Which feature of the tRNA allows it to pair with the correct mRNA codon?

(A) Its amino acid attachment site, which reads the codon directly
(B) Its anticodon, a three-base sequence complementary to the mRNA codon
(C) Its 5′ cap, which binds the ribosome to the mRNA
(D) Its poly-A tail, which stabilises the messenger RNA

Q40. A gene's coding strand reads 5′-ATG CCA TGG-3′. What is the sequence of the mRNA transcribed from this gene?

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

Q41. A mutation changes a codon from GAA to GAG. Both code for glutamate. What type of mutation is this?

(A) A frameshift mutation
(B) A nonsense mutation
(C) A silent mutation
(D) A missense mutation

Q42. In the lac operon, lactose is present and glucose is absent. What is the expected state of the operon?

(A) Transcription is off because the repressor is bound
(B) Transcription is high because the repressor is inactive and CAP is bound
(C) Transcription is low because CAP cannot bind
(D) Transcription is high because glucose activates the repressor

Q43. A eukaryotic gene has introns removed from its primary transcript. What is this process called?

(A) Translation
(B) RNA splicing
(C) Replication
(D) Reverse transcription

Q44. Alternative splicing of a single gene can produce several different proteins. What does this demonstrate?

(A) One protein is made from several genes
(B) Introns code for the same protein in all tissues
(C) Splicing changes the DNA sequence permanently
(D) One gene can give rise to multiple polypeptides

Q45. A researcher uses PCR to amplify a DNA fragment. Which component is essential for the reaction to start synthesis at the target site?

(A) Restriction enzymes that cut the plasmid
(B) Primers complementary to the sequences flanking the target
(C) RNA polymerase to transcribe the fragment
(D) Ligase to join the amplified fragments

Q46. A single base substitution creates a premature stop codon in a gene for a metabolic enzyme. What is the most likely effect on the protein?

(A) A truncated, usually nonfunctional protein
(B) A longer protein with extra amino acids
(C) No change, because stop codons are ignored
(D) A protein with one amino acid substituted

Natural Selection

Q47. In a population of beetles, green beetles are eaten more often by birds after the foliage darkens, while brown beetles survive better. This is best described as

(A) stabilising selection favouring the average phenotype
(B) disruptive selection favouring both extremes
(C) genetic drift with no effect on fitness
(D) directional selection favouring the brown phenotype

Q48. A population is in Hardy-Weinberg equilibrium and 9 percent of individuals show a recessive phenotype. What is the frequency of heterozygotes?

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

Q49. Which condition would most directly violate Hardy-Weinberg equilibrium by changing allele frequencies through chance alone?

(A) Random mating in a very large population
(B) No mutation occurring over many generations
(C) A small population in which a flood kills most individuals at random
(D) No migration into or out of the population

Q50. Two populations of salamanders are separated by a river and gradually accumulate different mating calls. If they later meet and cannot interbreed, what has occurred?

(A) Sympatric speciation with no barrier
(B) Artificial selection by humans
(C) Hybridisation producing a single species
(D) Allopatric speciation by geographic isolation

Q51. A phylogenetic tree shows that species A and B share a more recent common ancestor than either shares with species C. Which statement is correct?

(A) A and C are sister taxa
(B) B and C diverged most recently
(C) A and B are more closely related to each other than to C
(D) All three species are equally related

Q52. Fossils of marine organisms are found in rock layers on a mountaintop. What does this best support?

(A) Marine organisms evolved to live on mountains
(B) The fossils were placed there by recent floods only
(C) Rock layers form in a single rapid event
(D) The area was once under water and the rock layers were uplifted

Q53. A gene sequence in humans and chimpanzees differs by 1 percent, while the same gene in humans and mice differs by 12 percent. What is the best inference?

(A) The gene evolves at the same rate in all lineages
(B) Humans share a more recent common ancestor with chimpanzees than with mice
(C) Mice and chimpanzees are more closely related
(D) The gene is nonfunctional in humans

Ecology

Q54. A plant opens its stomata at night and fixes CO_2 into organic acids, then closes them during the day. This adaptation is most associated with

(A) C_4 photosynthesis in cool, wet habitats
(B) CAM photosynthesis in arid environments, reducing water loss
(C) Photorespiration in shaded forests
(D) Fermentation in waterlogged soils

Q55. In a food web, removing a top predator causes herbivore numbers to rise and producer biomass to fall. This is best described as

(A) competitive exclusion
(B) primary succession
(C) a trophic cascade
(D) density-independent regulation

Q56. A population grows logistically and approaches its carrying capacity. What happens to the per-capita growth rate as population size nears K?

(A) It approaches zero
(B) It increases exponentially
(C) It becomes negative and the population goes extinct
(D) It stays constant at the intrinsic rate

Q57. Two species of warblers feed in different parts of the same tree. This is best explained by

(A) mutualism, in which both species benefit directly
(B) resource partitioning, which reduces competition
(C) predation, in which one species eats the other
(D) commensalism with no effect on either species

Q58. A mark-recapture study marks 40 fish, later catches 50 fish and finds 10 marked. What is the estimated population size?

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

Q59. An island has many endemic bird species found nowhere else. Which factor best explains this pattern?

(A) High immigration from the mainland
(B) Geographic isolation allowing independent evolution
(C) A uniform climate across all islands
(D) Frequent gene flow between islands

Q60. Fertiliser runoff causes an algal bloom in a lake, followed by a sharp fall in dissolved oxygen. What is the most likely cause of the oxygen fall?

(A) Algae produce oxygen only at night
(B) Decomposition of dead algae by bacteria consumes oxygen
(C) Fertiliser directly removes oxygen from water
(D) Fish consume oxygen faster in warm water only

Answer Key

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-11/