AP Biology Practice Test 13

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 stick to each other and to the walls of xylem vessels. Which pair of properties allows water to rise in tall trees?

(A) Hydrophobic exclusion and surface tension only
(B) High heat of vaporisation and low density
(C) Capillary action of oils and waxes
(D) Cohesion and adhesion

Q2. At 25 degrees C, a solution has a pH of 4. What is its hydroxide ion concentration?

(A) 10^{-10} M
(B) 10^{-4} M
(C) 10^{-7} M
(D) 10^{4} M

Q3. Which functional group is found in amino acids and gives them their ability to act as both acids and bases?

(A) Only a phosphate group
(B) Both an amino group and a carboxyl group
(C) Only a hydroxyl group
(D) Only a methyl group

Q4. Cellulose is indigestible by most animals. What structural feature explains this?

(A) Alpha 1-6 branches that block digestion
(B) The presence of nitrogen in every glucose unit
(C) Beta 1-4 glycosidic bonds that most animals lack enzymes to break
(D) Covalent bonds between cellulose and DNA

Q5. A fat is described as unsaturated. What does this mean?

(A) It contains no carbon atoms
(B) It is solid at room temperature because of tight packing
(C) Its fatty-acid chains contain one or more double bonds
(D) It has three phosphate groups

Q6. Which level of protein structure is determined by hydrogen bonding between backbone atoms to form alpha helices and beta sheets?

(A) Primary structure
(B) Tertiary structure
(C) Secondary structure
(D) Quaternary structure

Q7. A DNA molecule is found to contain 22 percent adenine. What percentage of its bases are guanine?

(A) 28 percent
(B) 22 percent
(C) 44 percent
(D) 56 percent

Cell Structure and Function

Q8. Which cell structure is responsible for producing most of the cell’s ATP in eukaryotes?

(A) The mitochondrion
(B) The chloroplast in animal cells
(C) The nucleus
(D) The smooth endoplasmic reticulum

Q9. A cell is observed to have many ribosomes attached to membranes and a large Golgi apparatus. What is this cell most likely specialised for?

(A) Secreting proteins
(B) Storing lipids
(C) Photosynthesis
(D) Contracting as a muscle

Q10. Oxygen diffuses from the alveoli into the blood. Which factor increases the rate of this diffusion?

(A) A thick membrane and a small surface area
(B) A large surface area and a short diffusion distance
(C) A low concentration gradient
(D) A decrease in temperature to freezing

Q11. A marine fish drinks seawater and excretes excess salt through its gills. This is an example of

(A) thermoregulation to maintain body temperature
(B) photosynthesis to make food
(C) osmoregulation to maintain internal salt balance
(D) fermentation to produce ATP

Q12. Which molecule can pass directly through the lipid bilayer without a transport protein?

(A) Glucose
(B) Sodium ions
(C) Amino acids
(D) Oxygen

Q13. The cytoskeleton includes microtubules, microfilaments and intermediate filaments. Which function is primarily associated with microtubules?

(A) Forming the spindle and moving organelles along tracks
(B) Producing ATP by chemiosmosis
(C) Synthesising proteins
(D) Storing calcium ions

Q14. A prokaryotic cell is distinguished from a eukaryotic cell by the absence of

(A) a plasma membrane
(B) a membrane-bound nucleus and other membrane-bound organelles
(C) ribosomes
(D) a cell wall

Cellular Energetics

Q15. A reaction has a positive delta G. How can a cell drive this reaction forward?

(A) By coupling it to ATP hydrolysis, which releases energy
(B) By lowering the temperature to absolute zero
(C) By removing all enzymes from the cell
(D) By increasing the concentration of products

Q16. An enzyme's activity is highest at 37 degrees C and falls sharply at 60 degrees C. The most likely cause of the fall is

(A) increased substrate concentration at high temperature
(B) competitive inhibition by heat
(C) denaturation of the enzyme at high temperature
(D) activation of the enzyme by heat

Q17. In mitochondria, protons are pumped into the intermembrane space during electron transport. How is the energy stored in this proton gradient used to make ATP?

(A) Protons donate electrons directly to ADP to form ATP
(B) Protons flow back through ATP synthase, driving the phosphorylation of ADP
(C) The gradient splits water molecules, releasing ATP
(D) Protons are reduced by NADH to form ATP in the matrix

Q18. In photosynthesis, ATP is made by photophosphorylation. Where does this occur?

(A) In the stroma, by substrate-level phosphorylation
(B) In the thylakoid membrane, using a proton gradient
(C) In the cytoplasm during glycolysis
(D) In the mitochondrial matrix

Q19. A plant is grown in an atmosphere with a very high oxygen concentration and low carbon dioxide. What is the expected effect on photosynthesis?

(A) The Calvin cycle fixes carbon faster
(B) Oxygen replaces water as the electron donor
(C) Photorespiration increases, reducing the efficiency of carbon fixation
(D) Stomata close permanently and photosynthesis stops

Q20. During fermentation in human muscle cells, pyruvate is converted to lactate. What is the net ATP yield per glucose in this process?

(A) 38 ATP
(B) 2 ATP
(C) 0 ATP
(D) 4 ATP

Q21. How many ATP molecules are produced by substrate-level phosphorylation per glucose in aerobic respiration?

(A) 2 ATP
(B) 32 ATP
(C) 4 ATP
(D) 6 ATP

Cell Communication and Cell Cycle

Q22. A ligand binds to a receptor tyrosine kinase. What typically happens next?

(A) The ligand enters the nucleus and binds DNA
(B) The receptor is destroyed immediately
(C) The receptor dimerises and phosphorylates itself and target proteins
(D) Cyclic AMP is released from the receptor

Q23. In the fight-or-flight response, adrenaline increases heart rate within seconds. Why is the response so rapid?

(A) Adrenaline is stored in the heart muscle itself
(B) The signal is relayed through the nervous system and fast second-messenger cascades
(C) The response relies on slow gene transcription
(D) Adrenaline diffuses directly into heart cells and binds DNA

Q24. A bacterial cell detects a chemical gradient and moves toward food. This behaviour depends on

(A) meiosis and crossing over
(B) photosynthesis in the bacterial cytoplasm
(C) apoptosis of neighbouring cells
(D) a two-component signalling system with a sensor kinase and a response regulator

Q25. Negative feedback in the control of blood glucose involves insulin and glucagon. When blood glucose falls, what happens?

(A) Glucagon is released and stimulates glycogen breakdown in the liver
(B) Insulin release increases
(C) Glucose is stored as glycogen
(D) The pancreas stops producing hormones

Q26. A cell that is not dividing enters G_0. Which cells commonly remain in G_0?

(A) Embryonic stem cells
(B) Mature nerve cells
(C) Cancer cells
(D) Bone marrow stem cells

Q27. Which protein complex is responsible for separating sister chromatids during anaphase?

(A) DNA polymerase, which replicates the chromatids
(B) Cyclin, which activates the spindle
(C) Actin, which forms the cleavage furrow
(D) Separase, which cleaves cohesin holding the chromatids together

Q28. A tumour suppressor gene is mutated so that it no longer functions. What is the likely consequence?

(A) Cells divide more slowly
(B) Cells may divide without normal checks, increasing cancer risk
(C) Apoptosis increases in all cells
(D) DNA replication stops entirely

Heredity

Q29. A man with haemophilia (X-linked recessive) has children with a woman who is homozygous normal. What is the probability that a daughter is a carrier?

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

Q30. A dihybrid cross AaBb x AaBb is performed. What proportion of offspring are expected to show both dominant phenotypes?

(A) 3/16
(B) 1/16
(C) 1/4
(D) 9/16

Q31. In a pedigree, a trait appears in every generation and affected individuals have at least one affected parent. What is the most likely pattern?

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

Q32. A chromosome has the gene order ABCDE. A crossover occurs between B and C in a heterozygote. Which gametes are recombinant?

(A) Those with a new combination of alleles on either side of the crossover point
(B) Those identical to the parental chromosomes
(C) Those with no genes at all
(D) Those with a doubled chromosome number

Q33. A woman is heterozygous for a gene on chromosome 7. During meiosis, nondisjunction of chromosome 7 occurs in meiosis II. What gametes result?

(A) Four gametes each with an extra copy
(B) Two normal gametes, one with an extra copy and one missing a copy
(C) Four normal gametes
(D) Two gametes with an extra copy and two missing a copy

Q34. A test of a 9:3:3:1 dihybrid ratio gives a chi-square value of 1.8 with 3 degrees of freedom. The critical value is 7.81. What is the conclusion?

(A) The genes are definitely linked
(B) The null hypothesis must be rejected
(C) The data are consistent with independent assortment; do not reject the null hypothesis
(D) The sample size was too small to calculate

Q35. Which process creates new allele combinations by exchanging segments between non-sister chromatids?

(A) Crossing over in prophase I
(B) Independent assortment in metaphase II
(C) DNA replication in S phase
(D) Cytokinesis after meiosis I

Q36. A gene for seed shape and a gene for seed colour are 5 map units apart. In a test cross, what percentage of offspring are expected to show a recombinant phenotype?

(A) 50 percent
(B) 25 percent
(C) 5 percent
(D) 95 percent

Gene Expression and Regulation

Q37. DNA polymerase adds nucleotides to a growing strand. In which direction does it synthesise, and what does it require?

(A) 3′ to 5′, requiring no primer
(B) 5′ to 3′, requiring a terminator
(C) 5′ to 3′, requiring a primer with a free 3′ hydroxyl group
(D) 3′ to 5′, requiring a ligase

Q38. The coding strand of a gene has the sequence 5′-ATG GCT-3′. What is the mRNA sequence (ignoring the 5′ cap)?

(A) 5′-UAC CGA-3′
(B) 5′-AUG GCU-3′
(C) 5′-ATG GCT-3′
(D) 3′-AUG GCU-5′

Q39. A ribosome encounters a stop codon during translation. What happens?

(A) A release factor binds and the polypeptide is released
(B) A new tRNA brings another amino acid
(C) The ribosome reverses direction
(D) The mRNA is replicated

Q40. In the trp operon, tryptophan is abundant. What is the expected state of the operon?

(A) Transcription is high because the repressor is inactive
(B) Transcription is repressed because tryptophan activates the repressor
(C) Transcription is high because tryptophan is an inducer
(D) The operon is deleted from the chromosome

Q41. A eukaryotic cell produces a protein only in liver cells, although the gene is present in all cells. What best explains this?

(A) The gene is deleted in other tissues
(B) Liver cells have a different genetic code
(C) Differential gene expression controlled by transcription factors and chromatin state
(D) The gene is mutated only in liver cells

Q42. A mutation in a promoter region reduces transcription of a gene. What is this type of mutation best described as?

(A) A regulatory mutation affecting expression, not the protein sequence
(B) A frameshift mutation in the coding region
(C) A chromosomal deletion of the whole gene
(D) A silent mutation in an exon

Q43. CRISPR-Cas9 is used to edit a gene. What does the guide RNA do?

(A) It cuts the DNA at a random location
(B) It translates the gene into protein
(C) It copies the gene by PCR
(D) It directs Cas9 to a specific DNA sequence by complementary base pairing

Q44. A DNA sample is analysed by gel electrophoresis. Two fragments are 500 bp and 2,000 bp. Which migrates farther?

(A) The 2,000 bp fragment
(B) The 500 bp fragment
(C) Both migrate the same distance
(D) Neither migrates because DNA is uncharged

Natural Selection

Q45. Disruptive selection is most likely to lead to

(A) a decrease in variation around the mean
(B) no change in allele frequencies
(C) immediate speciation in one generation
(D) an increase in variation, with both extremes favoured over intermediates

Q46. A population has allele frequencies p = 0.8 and q = 0.2. What is the expected frequency of homozygous recessive individuals?

(A) 0.04
(B) 0.20
(C) 0.32
(D) 0.64

Q47. Which factor is most likely to increase genetic variation within a population?

(A) A severe bottleneck
(B) Mutation and sexual reproduction
(C) Inbreeding
(D) A founder event

Q48. A population of finches on an island is founded by a few individuals. Over time, allele frequencies differ markedly from the mainland population. This is best explained by

(A) the founder effect, a form of genetic drift
(B) natural selection for the same traits
(C) high gene flow from the mainland
(D) a large population size

Q49. Homologous structures in different species provide evidence for

(A) convergent evolution
(B) analogous functions only
(C) independent origins of life
(D) divergence from a common ancestor

Q50. A phylogenetic tree is built using DNA sequences. Which group is the outgroup used for?

(A) To show the most recently evolved species
(B) To replace the common ancestor
(C) To root the tree and determine the direction of evolutionary change
(D) To measure the mutation rate directly

Q51. Which reproductive barrier prevents two species from mating because they breed at different times of year?

(A) Temporal isolation
(B) Mechanical isolation
(C) Gametic isolation
(D) Hybrid breakdown

Q52. The Miller-Urey experiment demonstrated that

(A) life was created in a laboratory
(B) DNA was the first molecule on Earth
(C) oxygen was abundant in the early atmosphere
(D) organic molecules could form from inorganic precursors under early Earth conditions

Ecology

Q53. A lizard basks in the sun to raise its body temperature. This is an example of

(A) endothermy using metabolic heat
(B) hibernation to avoid heat
(C) photosynthesis to generate heat
(D) behavioural thermoregulation in an ectotherm

Q54. In an ecosystem, 10,000 kJ of energy is available at the producer level. Approximately how much is available to secondary consumers?

(A) About 10,000 kJ
(B) About 1,000 kJ
(C) About 10 kJ
(D) About 100 kJ

Q55. A population shows exponential growth with r = 0.2 per year and N = 500. What is the approximate growth rate dN/dt?

(A) 500 individuals per year
(B) 0.2 individuals per year
(C) 2,500 individuals per year
(D) 100 individuals per year

Q56. In a community, two species compete for the same food. According to competitive exclusion, what is expected if their niches overlap completely?

(A) Both species will increase indefinitely
(B) The species will interbreed
(C) One species will outcompete and exclude the other
(D) Competition will have no effect

Q57. A keystone species is removed from a community. What is the most likely result?

(A) No change, because keystone species are rare
(B) A large change in community structure, with some species increasing and others declining
(C) An increase in biodiversity in all cases
(D) The community becomes a climax community

Q58. Which process returns nitrogen to the atmosphere?

(A) Nitrogen fixation by Rhizobium
(B) Nitrification by soil bacteria
(C) Assimilation by plants
(D) Denitrification by bacteria

Q59. A coral reef is damaged by rising sea temperatures, causing coral bleaching. This is an example of

(A) a biotic factor increasing biodiversity
(B) primary succession on bare rock
(C) an abiotic disruption affecting a community
(D) competitive exclusion between corals

Q60. A national park protects a large area of forest. Which conservation benefit is most directly provided?

(A) Increased timber harvesting
(B) Elimination of all predators
(C) Prevention of all natural disturbances
(D) Preservation of habitat and biodiversity in a large, connected area

Answer Key

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

Q10: B	Q20: B	Q30: D	Q40: B	Q50: C	Q60: D

Worked explanations for all 60 questions: quaidianpoint.com/ap-biology-practice-test-13/