

An AP Biology point is earned by naming the mechanism, not the phenomenon. “Osmosis” is not an explanation; water moving down a water-potential gradient is. Learn each sentence below as a whole, then practise finishing it with “which causes ...”.

Chemistry of life and cells

Enzyme – a biological catalyst that lowers the activation energy of a reaction by binding its substrate at an active site, and is not consumed

Activation energy – the minimum energy that colliding reactants must have for a reaction to proceed

Diffusion – the net movement of particles from a region of higher to lower concentration, down the gradient and without energy input

Osmosis – the diffusion of water across a selectively permeable membrane, from higher to lower water potential

Water potential – the potential energy of water per unit volume; water moves from high to low water potential, and adding solute lowers it

Active transport – the movement of a substance against its concentration gradient by a membrane protein, requiring energy from ATP

Phospholipid bilayer – the two-layer membrane structure in which hydrophilic heads face the aqueous surroundings and hydrophobic tails face inward

Surface-area-to-volume ratio – the ratio that limits cell size: as volume grows faster than surface area, exchange across the membrane cannot keep up with demand

Cellular energetics

ATP – the cell’s immediate energy currency; hydrolysis of its terminal phosphate bond releases energy that drives endergonic reactions

Glycolysis – the cytosolic pathway that splits glucose into two pyruvate, producing a net 2 ATP and 2 NADH without oxygen

Krebs cycle – the mitochondrial matrix cycle that oxidises acetyl-CoA completely to CO₂, generating NADH, FADH₂ and ATP

Oxidative phosphorylation – ATP synthesis driven by the electron transport chain, with oxygen as the final electron acceptor

Chemiosmosis – the synthesis of ATP by ATP synthase, powered by protons flowing back down the gradient established across a membrane

Photosynthesis – the conversion of light energy into chemical energy stored in glucose, using CO₂ and water and releasing O₂

Calvin cycle – the light-independent stroma reactions that fix CO₂ onto RuBP and reduce it to sugar using ATP and NADPH

Communication and the cell cycle

Signal transduction – the sequence in which a ligand binds a receptor, the signal is relayed and amplified inside the cell, and a response is produced

Negative feedback – a control loop in which the response opposes the change that triggered it, returning the variable toward a set point

Positive feedback – a control loop in which the response amplifies the change that triggered it, driving the system away from the starting state

Mitosis – nuclear division producing two genetically identical diploid daughter nuclei

Meiosis – two rounds of division producing four genetically distinct haploid cells from one diploid cell

Crossing over – the exchange of segments between homologous chromosomes in prophase I, which generates new allele combinations

Independent assortment – the random orientation of homologous pairs at metaphase I, so each pair segregates independently of the others

Heredity and gene expression

Genotype – the set of alleles an organism carries for a gene

Phenotype – the observable characteristic produced by a genotype interacting with the environment

Transcription – the synthesis of mRNA from a DNA template by RNA polymerase

Translation – the synthesis of a polypeptide at the ribosome, in which tRNA anticodons pair with mRNA codons

Operon – a cluster of prokaryotic genes transcribed together under one promoter and operator

Mutation – a change in the DNA base sequence; it is the ultimate source of new genetic variation

Evolution and ecology

Natural selection – the process by which heritable variations that improve survival and reproduction become more common over generations

Genetic drift – random change in allele frequencies between generations, with the greatest effect in small populations

Hardy-Weinberg equilibrium – the condition in which allele frequencies do not change, requiring no selection, no mutation, no migration, random mating and a large population

Speciation – the process by which one population splits into two that can no longer interbreed

Carrying capacity – the maximum population size an environment can sustain given its limiting resources

Trophic level – a feeding position in a food chain; roughly 10% of the energy at one level passes to the next

Keystone species – a species whose effect on community structure is disproportionately large relative to its abundance

Biodiversity – the variety of species, genes and ecosystems in an area; higher diversity generally increases resilience to change