

Honors Biology Review Guide

Cell structure and energy, genetics, evolution and ecology, and body systems — the core Honors Biology scope, with the vocabulary and diagrams each unit depends on. Work a section, then try the matching questions in the practice worksheet.

SECTIONS	5	WORKED EXAMPLES	2	FORMAT	Print friendly
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How to use this guide

A formula you cannot place is not knowledge yet. Work the recall drill below before the questions.

- Draw the diagram before answering a question about a process — biology rewards a visual first step.
- Connect structure to function every time: a cell part's shape usually explains its job.
- Practice writing a full sentence answer, not just a term — most tests ask you to explain, not just label.

1. Cell structure and transport

NAME	FORMULA	WHEN TO USE
Cell membrane	phospholipid bilayer with embedded proteins	Controlling what enters and leaves the cell.
Nucleus	houses DNA, controls cell activity	The cell's control center.
Mitochondria	site of aerobic respiration, produces ATP	The cell's main energy producer.
Diffusion	movement from high to low concentration, no energy needed	Passive movement of small molecules.
Osmosis	diffusion of water across a membrane	Water movement in and out of cells.
Active transport	moves molecules against their gradient, requires ATP	Moving substances from low to high concentration.

WORKED EXAMPLE

A cell is placed in a hypertonic solution (more solute outside than inside). Predict what happens to the cell.

1. Water moves toward the higher solute concentration
2. Water leaves the cell
3. The cell shrinks (crenation)

Check: Osmosis always moves water toward the side with more solute.

2. Cellular energy

NAME	FORMULA	WHEN TO USE
Photosynthesis (overview)	$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$	Producers convert light energy to chemical energy.
Cellular respiration (overview)	$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{ATP}$	Cells release energy stored in glucose.
ATP	adenosine triphosphate, the cell's energy currency	Powering cellular work.
Enzyme	a protein catalyst that speeds up a reaction	Explaining why a biological reaction happens quickly.
Enzyme specificity	active site shape matches a specific substrate	Explaining why one enzyme only works on one reaction.

3. Genetics

NAME	FORMULA	WHEN TO USE
Dominant/recessive allele	dominant masks recessive when both are present	Predicting which trait shows in a heterozygote.
Genotype vs phenotype	genetic makeup vs observable trait	Distinguishing what an organism has from what it shows.
Punnett square	predicts offspring genotype ratios from parent crosses	Determining probability of inheriting a trait.
Meiosis	produces haploid gametes with half the chromosome number	Explaining how sex cells form.
DNA structure	double helix, complementary base pairing (A-T, G-C)	Explaining DNA replication and the genetic code.
Transcription and translation	DNA $\rightarrow$ mRNA $\rightarrow$ protein	Explaining how a gene becomes a trait.

WORKED EXAMPLE

Cross a heterozygous (Bb) parent with a homozygous recessive (bb) parent. Find the expected genotype ratio of offspring.

1. Set up a Punnett square with Bb x bb
2. Offspring: Bb, Bb, bb, bb
3. Ratio is 1 Bb : 1 bb

Check: A test cross (heterozygote x homozygous recessive) always gives a 1:1 ratio.

4. Evolution and ecology

NAME	FORMULA	WHEN TO USE
Natural selection	organisms with favorable traits survive and reproduce more	Explaining how populations change over time.
Adaptation	an inherited trait that improves survival or reproduction	Explaining why a trait persists in a population.
Speciation	reproductive isolation leads to new species	Explaining the origin of a new species.
Trophic levels	producer -> primary consumer -> secondary consumer...	Tracing energy flow through an ecosystem.
Energy pyramid	only about 10% of energy transfers to the next level	Explaining why food chains rarely exceed 4-5 levels.
Carrying capacity	the maximum population an environment can sustain	Explaining population growth limits.

5. Human body systems

NAME	FORMULA	WHEN TO USE
Circulatory system	heart, blood vessels; transports oxygen, nutrients, waste	Explaining how substances move through the body.
Respiratory system	lungs; exchanges oxygen and carbon dioxide	Explaining gas exchange.
Digestive system	breaks food into absorbable nutrients	Explaining how the body obtains energy from food.
Nervous system	brain, spinal cord, neurons; sends and processes signals	Explaining rapid communication in the body.
Homeostasis	maintaining a stable internal environment	Explaining why the body regulates temperature, pH, and glucose.

Notes and tutor hand-off

Bring this page to your next session so the tutor can start from what actually blocked you.

Which diagram (cell, Punnett square, energy pyramid) do you want to redraw from memory?

One vocabulary term you keep mixing up:

Worksheet question numbers to review with a tutor:
