

Adaptations: structural, behavioural and physiological, with 30 examples

An ADAPTATION is an inherited feature (a structure, a behaviour or a process) that helps an organism survive and reproduce in its environment. Inherited; a feature of the organism; for a particular environment.

Type	What it is	The test	Examples
structural	a part of the body: shape, size, covering, colour	Can you see or touch it on the body?	fur, blubber, spines, webbed feet, beak shape, camouflage, a hump
behavioural	something the organism does	Could you film it as an action?	migration, hibernation, hunting at night, huddling, playing dead, courtship
physiological	a process inside the body: chemistry, metabolism, organs	Does it happen inside, unseen?	venom, concentrated urine, antifreeze proteins, slowed heartbeat, bioluminescence

Organism	Adaptation	Type
camel	wide padded feet, long eyelashes, closable nostrils, fat hump	structural
camel	temperature allowed to rise 6 C before sweating; concentrated urine	physiological
polar bear	thick fur, black skin, blubber, large paws	structural
polar bear	mothers den through winter and give birth there	behavioural
Arctic fox	white winter coat, brown summer coat	structural
cactus	spines for leaves, thick waxy stem, wide shallow roots	structural
desert plants	stomata open only at night (CAM photosynthesis)	physiological
giraffe	2 m neck, 45 cm tongue	structural
giraffe	very high blood pressure and valves in the neck veins	physiological
duck	webbed feet, oily waterproof feathers	structural
eagle	hooked beak, talons, eyes that see a rabbit from 3 km	structural
stick insect	a body shaped and coloured like a twig	structural (camouflage)
peppered moth	dark and pale forms	structural; the classic natural-selection case
Arctic tern	migrates Arctic to Antarctic and back, 70,000 km a year	behavioural
monarch butterfly	4,000 km migration to Mexico	behavioural
bear, hedgehog, dormouse	hibernation	behavioural (entering the den) and physiological (metabolism falls)
emperor penguin	huddling in thousands, taking turns outside	behavioural
opossum	playing dead with a foul smell	behavioural
meerkat	sentries watch while the group feeds	behavioural
owl, bat	nocturnal activity	behavioural
peacock	courtship display	behavioural
wolf, lion, orca	hunting in packs	behavioural
rattlesnake, scorpion	venom made in glands	physiological
kangaroo rat	kidneys make extremely concentrated urine; never drinks	physiological
Antarctic icefish	antifreeze proteins in the blood	physiological
seals, whales	the diving reflex: heart slows, blood to brain and heart	physiological
llama; Tibetan and Andean people	blood that carries more oxygen	physiological
firefly, anglerfish	bioluminescence	physiological
mangrove	roots that breathe above the mud; leaves that excrete salt	structural and physiological
chameleon	colour change by skin pigment cells	physiological, serving behaviour

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How adaptations arise, adaptation against acclimatisation, and practice

How adaptations arise: natural selection in four steps

- [] VARIATION: individuals differ, through mutation and sexual reproduction (some rabbits have thicker fur)
- [] SELECTION: the environment favours some variants (in a cold winter, thick-furred rabbits survive and breed more)
- [] INHERITANCE: the favoured feature is passed to offspring (thick fur is in the genes)
- [] CHANGE OVER GENERATIONS: the feature becomes more common; the population is adapted. Not by trying: the giraffe did not stretch its neck

Adaptation against acclimatisation

	Adaptation	Acclimatisation
who changes	the population, over generations	one individual, in its lifetime
inherited?	yes	no
example	the polar bear's fur; Tibetan altitude genes	a climber's extra red blood cells; a suntan; a dog's winter coat
reversible?	no (in the individual)	yes, when conditions change

'The polar bear adapted to the cold by growing thick fur' describes acclimatisation and loses the mark: the population became adapted because thick-furred bears out-bred thin-furred ones.

Practice: name the type

- [] 1. A hare's white winter coat.
- [] 2. Geese flying south in autumn.
- [] 3. A snake producing venom.
- [] 4. A frog burrowing into mud before the dry season.
- [] 5. A whale's blubber.
- [] 6. A dormouse's heart rate dropping in winter.
- [] 7. A cactus opening its stomata only at night.
- [] 8. A tortoise's shell.
- [] 9. Penguins huddling.
- [] 10. A camel's long eyelashes.
- [] 11. Extra red blood cells after a month at altitude: adaptation or acclimatisation?
- [] 12. In four steps: how did a population of moths become dark in a sooty city?

Answers

1) structural 2) behavioural 3) physiological 4) behavioural 5) structural 6) physiological 7) physiological 8) structural 9) behavioural 10) structural 11) acclimatisation 12) variation (some darker); selection (birds caught pale moths on dark bark); inheritance (dark colour in the genes); change over generations (dark moths became the majority)

Your own: one example of each type for an animal you know

Animal: _____

Structural: _____

Behavioural: _____

Physiological: _____