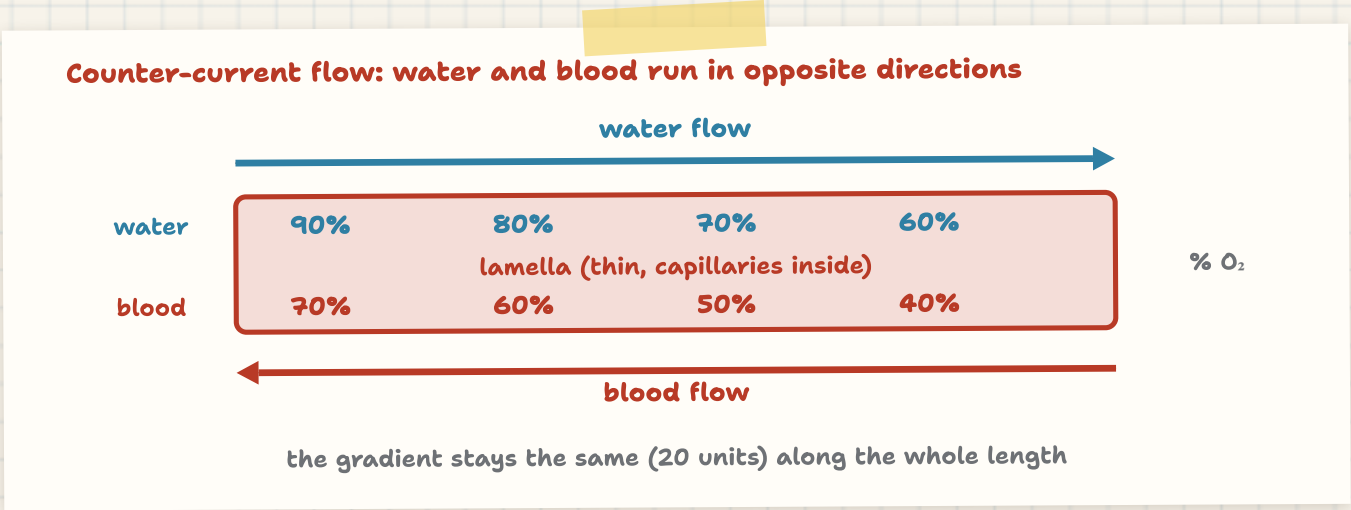
Fish Gills and the Counter-current Principle

Fish gills have many filaments and lamellae; counter-current flow keeps a diffusion gradient along the whole lamella.



Key terms

gill filament	a stack of thin plates on the gill; many filaments give a large surface area.
lamella	a thin plate on a filament containing a capillary network; where gas exchange happens.
counter-current flow	blood and water flow in opposite directions across the lamella.
concentration gradient	a difference in concentration; counter-current keeps it along the whole length.
equilibrium	no net movement; not reached in counter-current flow, because water always has more oxygen than blood.
short diffusion distance	lamellae are very thin, so oxygen has a short distance to travel to the blood.

I can...

- [ ] Gas exchange across the gills of fish: gill lamellae and filaments including the counter-current principle

EXAM TRAP

Counter-current means opposite directions, not "past each other". The mark is for a gradient along the whole length of the lamella, so more oxygen is absorbed than with parallel flow.

5 marks: what earns them

1. Many filaments and lamellae give a large surface area
   Not: gills have a big surface with no reference to filaments or lamellae
2. Lamellae are thin (with a capillary network), giving a short diffusion distance
   Not: thin with no consequence stated
3. Blood flows through the lamellae in the opposite direction to the water (counter-current)
   Not: flow past each other; same direction; parallel flow
4. A concentration gradient is maintained along the whole length of the lamella
   Not: there is a gradient with no reference to the whole length
5. So more oxygen diffuses into the blood (equilibrium is not reached)
   Not: fish absorb oxygen from the air

Remember

Water one way, blood the other.
Gradient all along the lamella.
No equilibrium, so more oxygen.

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