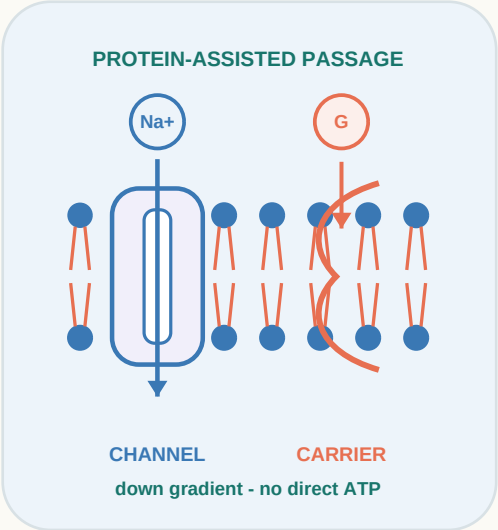
AP BIOLOGY | UNIT 2

TOPIC 2.6

Facilitated Diffusion

Specific channel and carrier proteins help substances move down concentration gradients without direct ATP input.



THE CORE CAUSAL CHAIN

GRADIENT → high to low

PROTEIN → channel or carrier

SELECTIVITY → specific cargo

EQUILIBRIUM → no net movement

BY THE END, YOU SHOULD BE ABLE TO...

1. Compare channel and carrier proteins.
2. Explain specificity and saturation.
3. Interpret transport-rate data using protein availability.

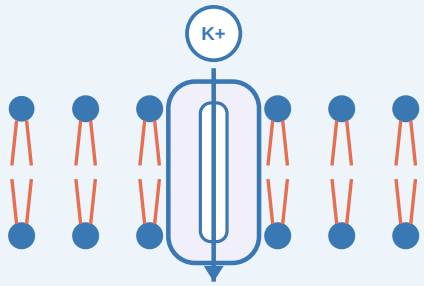
BIG IDEA

Facilitated diffusion is passive but protein-dependent. The gradient supplies the direction; the protein supplies a selective hydrophilic route.

1 Channels and carriers

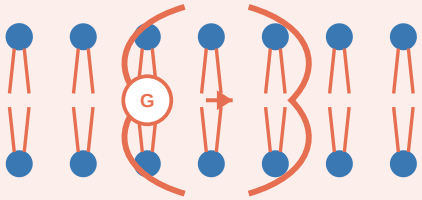
Both are selective membrane proteins, but they move substances through different structural mechanisms.

CHANNEL PROTEIN



A continuous hydrophilic pore allows selected ions or molecules to pass rapidly.

CARRIER PROTEIN



The protein binds its cargo, changes shape, and releases it on the other side.

SIDE-BY-SIDE

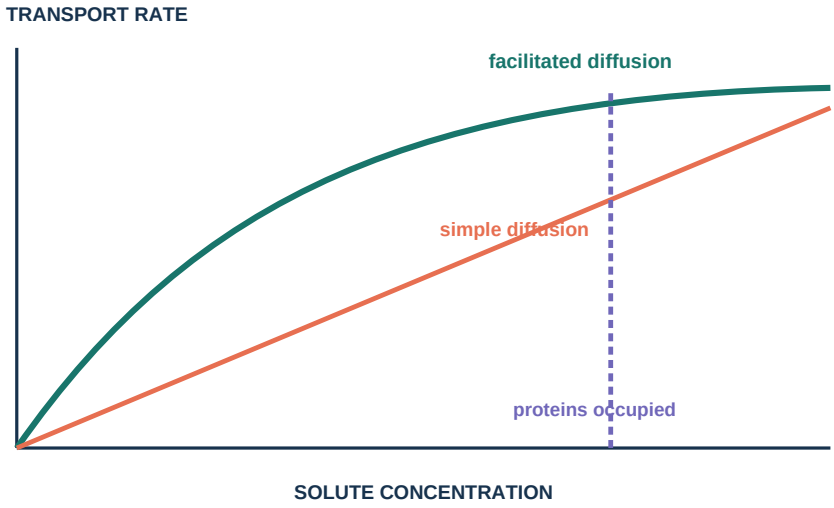
	CHANNEL	CARRIER
MECHANISM	Hydrophilic pore	Bind, change shape, release
COMMON CARGO	Ions; water in aquaporins	Glucose; amino acids
SELECTIVITY	Pore size and chemistry	Binding-site shape and chemistry
ENERGY	No direct ATP	No direct ATP

AQUAPORIN SPOTLIGHT

Aquaporins are channel proteins that greatly increase water permeability while still excluding many ions and solutes.

2 Specificity, rate, and saturation

Transport rate depends on the gradient and the number, availability, and structure of transport proteins.



WHY A PLATEAU?

At high solute concentration, available channels or carriers are already occupied. More solute cannot raise the rate further.

WHAT CHANGES THE RATE?

G — GRADIENT

A steeper gradient increases net movement until proteins become limiting.

+ PROTEIN NUMBER

More functional proteins can raise the maximum transport rate.

! PROTEIN SHAPE

Mutation or inhibition can reduce binding, passage, or conformational change.

READING A RESULT

CURVE RISES	CURVE PLATEAUS	LOWER PLATEAU
Increasing concentration raises transport.	Protein availability limits the rate.	Fewer or less functional proteins.

COMMON ERROR

A transport protein does not make the process active. If movement is down the gradient without direct ATP, it is facilitated diffusion.