These notes explain the **why** behind every concept, not just the what. They include **analogies**, **real-life examples**, and explanations of **common mistakes**. Use these alongside your revision notes for full understanding.

B2 Why Large Organisms Need Transport Systems

Tiny organisms like amoeba can rely on simple diffusion to get oxygen in and waste out — the distances involved are so small that diffusion is fast enough. But in a large multicellular organism, cells deep inside the body are far too distant from the surface for diffusion alone to supply oxygen fast enough. Specialised transport systems evolved to solve this problem.

The Double Circulatory System

In a single circulatory system (like a fish), blood travels: heart → gills → body → heart. The problem is that blood loses pressure in the gills, so it arrives at the body slowly. Mammals and birds evolved a double circulatory system: the right side sends blood to the lungs (low pressure needed for delicate lung tissue), and the left side sends blood to the body at high pressure.

■ **Why does this happen?** The left ventricle is much more muscular than the right because it must generate much higher pressure to push blood all the way around the body. Compare it to needing a more powerful pump to send water to the top floor of a skyscraper versus the ground floor.

Transpiration — The Physics Behind Water Rising in Plants

Water molecules are cohesive — they stick to each other through hydrogen bonds. As water evaporates from leaf cells through stomata (transpiration), it pulls the water molecules below it upward through the xylem, all the way from the roots. This continuous column of water is called the transpiration stream.

■ ***Think of it like this:*** *Imagine a chain of people standing in a line. When the person at the front steps off a stage, they pull the person behind them, who pulls the next, and so on. Transpiration is the driving force at the front; cohesion is what holds the chain together.*

Double circulation	Two circuits: pulmonary (heart-lungs) and systemic (heart-body)
Xylem	Dead hollow vessels carrying water and minerals from roots upward
Phloem	Living cells carrying dissolved sugars from leaves to rest of plant (translocation)
Transpiration	Evaporation of water from leaves through stomata — drives water uptake
Osmosis	Water movement from high water potential to low through partially permeable membrane