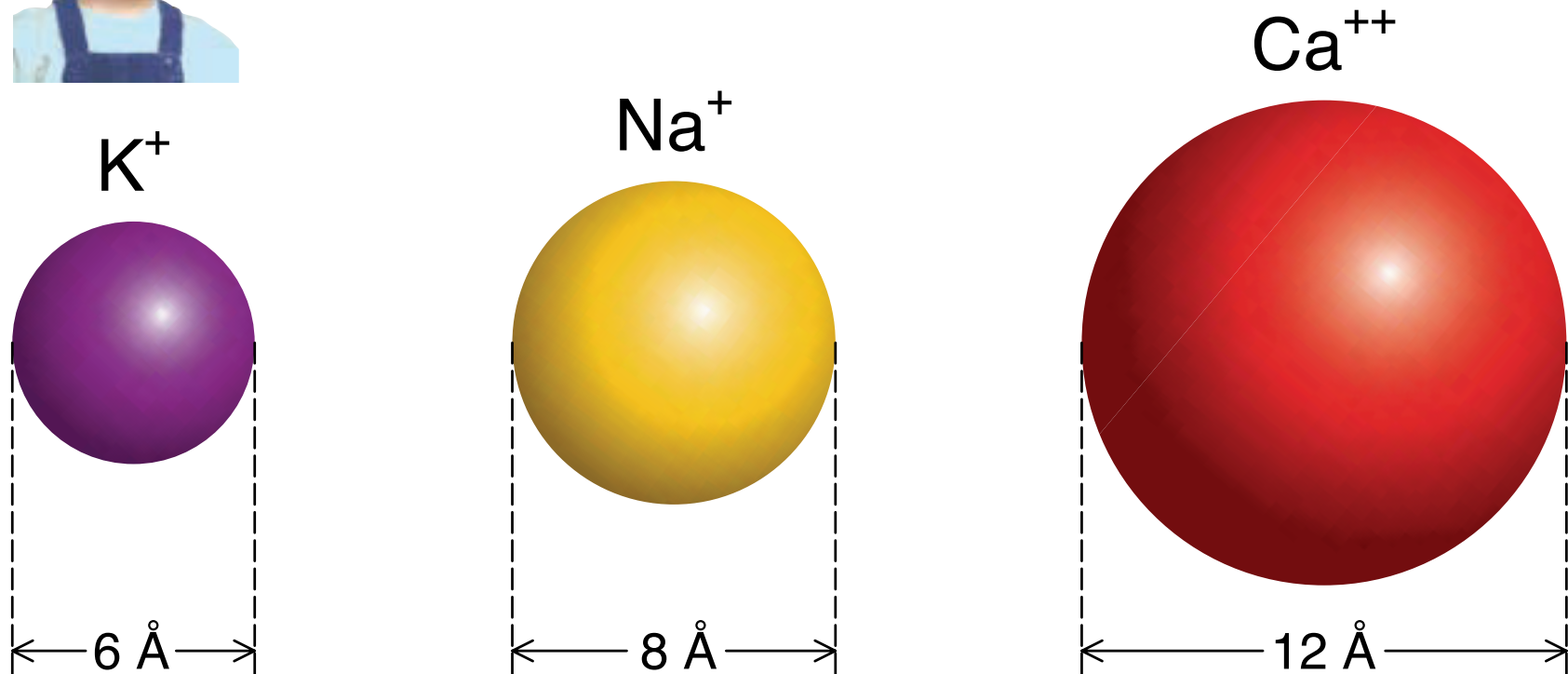


Hydrated ion size in water solution

The effective diameter of each principal cation is a critical factor for the specificity of ions passing through specific ion channels.



Size is a most important factor in our ionic-molecular wonderland, so let us now examine the exact sizes of the principal hydrated cations. Calcium has a relatively small diameter as a covalently bound element, however in aqueous solution as a free ion with very few surrounding electron shells, the Ca^{++} ion attracts many water molecules, giving it an effective diameter of 12 Å.²⁹ Potassium ions have more electron shells insulating the positive nucleus, so the K^+ ion attracts fewer waters of hydration, giving it a small effective diameter of 6 Å.²⁹ The Na^+ ion has an effective diameter of 8 Å.²⁹ Knowing the diameters and relative sizes of the principal cations is essential for understanding the physiology of the cell membrane's *ion channels*, the main ion portals of the heart's excitable cells [see page 357 of appendix].