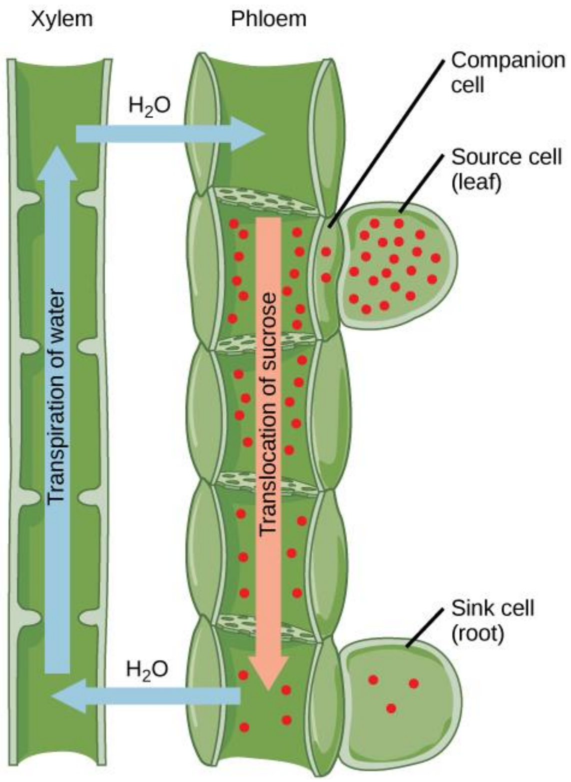
Understandings:

1. Explain translocation.

- Translocation is the movement of carbon compounds from source to sink. Now, what is source and sink? I will answer it in a moment.

First of all, welcome to the phloem vessel. Here, things are alive and not dead like xylem vessel. Let's look at the structure of phloem first because it has a bit more to it than xylem.



Phloem vessels are composed of small sections called sieve tube. One could see that the tubes are separated by porous plates called sieve plates. Each sieve cell is surrounded by companion cells.

Phloem vessels have source cells (on leaf) and sink cells (on root). Source cells provide with nutrients, like sugar and amino acids and sink cells absorb and use/store them.

This movement of sources is called translocation! Simple! Note that sink cells may become source cells and vice versa.

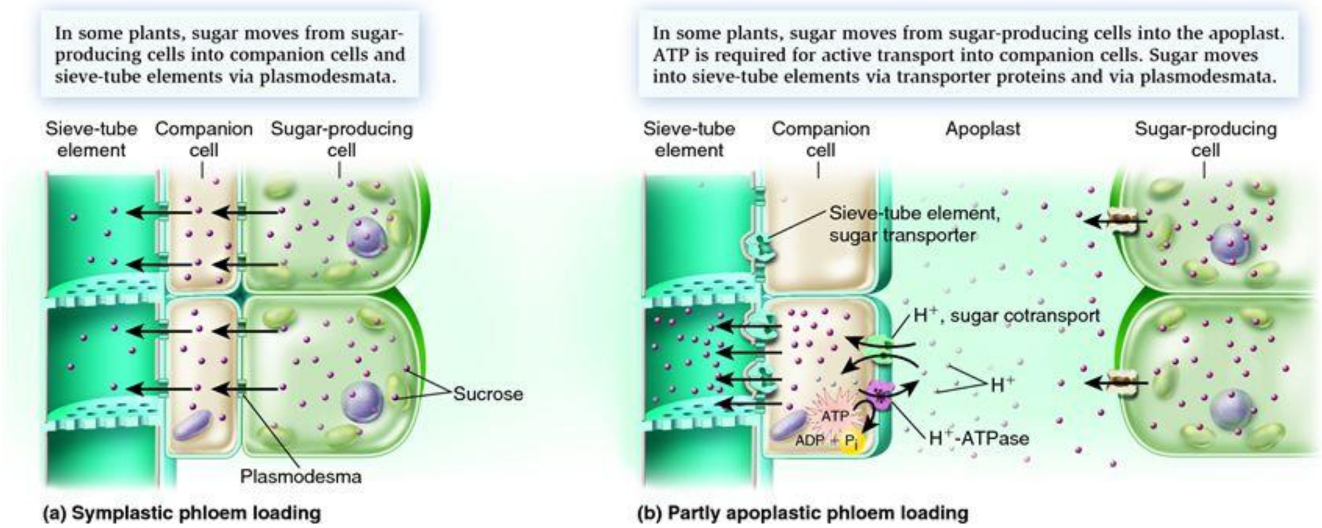
2. Explain how incompressibility of water allows transport along hydrostatic pressure gradients.

- Well, since water is incompressible, it must move towards the place where there is low pressure. This principle is used by the roots for xylem tissues. Roots absorb water by osmosis, and since water cannot be compressed, they are pushed upwards.

But what does this have to do with phloem? Well, phloem helps with the generation of this pressure by initiating osmosis! How do they initiate osmosis? Obviously, they have access to solute like sucrose.

3. Explain how active transport is used to load organic compounds into phloem sieve tubes at the source.

- There are some details we need to know as well. One of the details is how on earth source cells release sucrose/organic compounds (mostly sucrose) to the phloem vessel/sieve tubes? Naturally, sucrose could basically diffuse out, and this is called symplastic phloem loading but this is when we are assuming that companion cells and source cells are sitting tightly together. But they can also be apart from each other.



When they are far apart, the process is called apoplastic phloem loading. The mechanism is strikingly similar to how we produce ATP. Remember the motor generated by inflow of H^+ ions? Yes, this is exactly like this.

Companion cells pump out H^+ into the apoplast. When H^+ flows in, it flows in with a co-transporter of sucrose. That is amazing!

4. Explain how high concentrations of solutes in the phloem at the source lead to water uptake by osmosis.

- High solute means osmosis from another place where there is low solute. This is usually from xylem to phloem because xylem contains mainly water and phloem sucrose.

5. Explain how raised hydrostatic pressure causes the contents of the phloem to flow towards sinks.

- Well, since pressure is likely to build up in the source cells due to osmosis, the water is likely to be pressed down and up. When pressed down, it usually leads to sinks.

Applications and skills:

1. Explain the structure–function relationships of phloem sieve tubes.
- These are the adaptations of companion cell.

1. A lot of mitochondria to aid active transport of H^+ ions.

2. The infolding increases surface area and therefore more phloem loading from source cell can take place.

3. Plasmodesmata are larger. Plasmodesma (singular form) is a small channel between two cell walls that allow them to communicate.

4. They have rigid cell wall to modify the pressure (?).

Another adaptation is that they have sieve plates previously mentioned. The role of it is to block the phloem flow when animals intrude the phloem vessel (to prevent continuous leak).

2. Identification of xylem and phloem in microscope images of stem and root.
- Xylem has wide and thick lumen. Phloem has thinner. Why? Well, it seems that it is just the way it is and we don’t have a definite answer to it yet.

3. Analysis of data from experiments measuring phloem transport rates using aphid stylets and radioactively-labelled carbon dioxide.
- Ok. Look at the data-based questions.