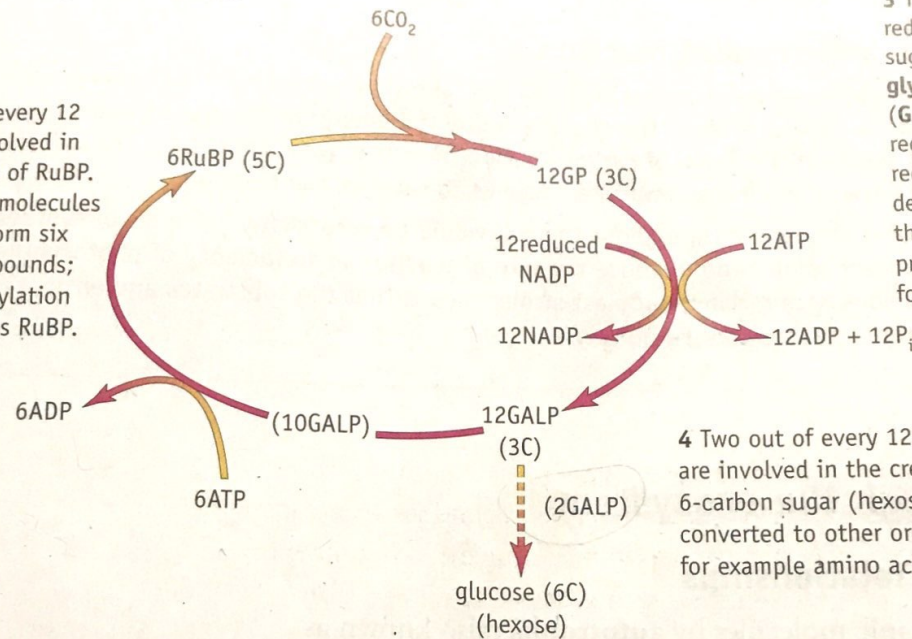


1 Carbon dioxide combines with a 5-carbon compound called **ribulose biphosphate (RuBP)**. This reaction is catalysed by the enzyme **ribulose biphosphate carboxylase (RuBISCO)**, the most abundant enzyme in the world.

2 The 6-carbon compound formed is unstable and immediately breaks down into two 3-carbon molecules, **glycerate 3-phosphate (GP)**.

3 This 3-carbon compound is reduced to form a 3-carbon sugar phosphate called **glyceraldehyde 3-phosphate (GALP)**. The hydrogen for the reduction comes from the reduced NADP from the light-dependent reactions. ATP from the light-dependent reactions provides the energy required for the reaction.

5 Ten out of every 12 GALPs are involved in the recreation of RuBP. The ten GALP molecules rearrange to form six 5-carbon compounds; then phosphorylation using ATP forms RuBP.



4 Two out of every 12 GALPs formed are involved in the creation of a 6-carbon sugar (hexose) which can be converted to other organic compounds, for example amino acids or lipids.

Figure 5.25 The light-independent reactions of the Calvin cycle (also known as the C<sub>3</sub> pathway).

Figure 5.25 shows the reactions of the Calvin cycle in more detail. Read the annotations to discover exactly what is happening at each stage of the cycle. Even this is a simplification. In reality there are large numbers of intermediate reactions.

**Q5.14** Look at Figure 5.25, which shows the light-independent reactions.

- Name a substance that has been phosphorylated (has had phosphate added to it).
- Name a substance formed by reduction.
- Explain why the diagram shows six RuBP molecules combining with six carbon dioxide molecules, rather than just one of each.