- Describe the need for nitrogen in living organisms (3)
- Describe the processes involved in the nitrogen cycle (7)

Nitrogen is needed in plants as they absorb the organic nitrogen through their roots to make amino acids and nucleic acids. Animals require it because they consume proteins and digest and absorb amino acids, to use for protein and nucleic acid synthesis, which is a necessity for them to live. The excess nitrogen is deaminated and excreted as urea.

Nitrogen gas in the atmosphere (N_2) is unreactive and needs to be transformed into more reactive forms like ammonia (NH_3) or nitrates ($N0_3^-$), so it can be used by plants and animals. This process is called nitrogen fixation and is done by living organisms in the soil. Symbiotic nitrogen fixing bacteria converts the N_2 in the air into NH_3 and NO_3^- in the root nodules of leguminous plants e.g. rhizobium in clover. This is also done by azotobacteria, which is free living in the soil and is able to fix atmospheric nitrogen and convert it into ammonia. Animals can get their nitrogen by feeding off the plants. When an organism dies the proteins in its cells are broken down into amino acids by decomposers (bacteria and fungi). Some of it is used for its own growth while the rest is released as ammonia in the soil. In animals, ammonia is excreted in urine.

The next process is called nitrification and this is the converting of ammonia ions in the soil into nitrites and then into nitrates. The process occurs aerobically and so is therefore only possible in well aerated soils. The first step of the oxidation is from ammonia to nitrites by bacteria, e.g. nitrosomonas. The second step of oxidation is nitrites into nitrates by nitrobacter. The final process involved in the nitrogen cycle is denitrification and this brings the cycle full circle. Nitrates are converted back into atmospheric nitrogen by anaerobic bacteria.