Quiz Biological Nitrogen Fixation and Legumes: Answers

1 The air is composed of almost 80% molecular nitrogen (N_2), meaning that all terrestrial plants are surrounded by nitrogen. Why is this source of nitrogen unavailable to higher plants?

N_2 gas is extremely stable, the two nitrogen atoms are bound together by a triple covalent bond, which is enormously unwavering and requires a high amount of energy to activate a reaction

2 Nitrogen fixation is the process in which N_2 is converted into the useable compounds

a. ammonium (NH_4^+) and nitrate (NO_3^-)
b. nitric oxide (NO) and nitric acid (HNO_3)
c. amides and ureides
d. water vapor and nitric acid (HNO_3)

3 Rhizobia provide the host plant with fixed nitrogen, list three items or advantages that the host plant provides the rhizobia:

1 Carbohydrates
2 Nutrients
3 Safe area to proliferate
4 Anaerobic environment

4 Explain the difference between *nod* proteins and nod factors:

Nod proteins act as transcription factors, inducing the express of genes that encode for enzymes that create nod factors. Nod factors communicate with legume hosts to induce nodulation and curling of the root hair cell around the rhizobia

5 In the space below, walkthrough the developmental steps root hair and rhizobia undergo during nodulation and infection:

1 Rhizobia are attracted to root hair surface by compounds released by the root.
2 Rhizobia produce Nod factors causing a cascade of developmental signals within the root hair cell.
3 Root cell undergoes excessive elongation and curls around the Rhizobia, which proliferate within the coiled root hair.
4 Root cell wall degrades within the coil allowing for infection.
5 Rhizobia are encased by plant membranes and spread to target cells and cytosol where N fixation takes place