# LESSON PLAN: MUTALISM

*Year Group:* Year 10
*Class Size:* 30 students
*Subject:* Biology
*Duration:* 1 hour

## LESSON AIM:

- To be able to explain the concept of symbiosis, with a focus on mutualism between legumes and nitrogen-fixing bacteria.

## PRIOR KNOWLEDGE:

- Plants absorb nutrients through their roots.
- Know the basic requirements for plant growth
- What do plants and animals need to survive
- What do animals and plants depend on their habitat for
- Understanding of interdependence between organisms

## LEARNING OBJECTIVES:

- Define and distinguish between mutualism, commensalism, and parasitism
- Describe the mutualistic relationship between legumes and nitrogen-fixing bacteria
- Explain the process role of nitrogen-fixing bacteria and legumes within the nitrogen cycle
- Explain the role of leghaemoglobin in root nodules
- Label key structures of a legume root system, including nodules
- Understand how mutualistic relationships contribute to ecosystem stability and soil fertility

## SUCCESS CRITERIA:

- I can define mutualism, commensalism, and parasitism, and give one example of each
- I can describe how legumes and nitrogen-fixing bacteria benefit each other
- I can explain the process role of nitrogen-fixing bacteria and legumes within the nitrogen cycle
- I can explain the role of leghaemoglobin in root nodules
- I can correctly label a diagram of a legume root showing root hairs and nodules
- I can explain how mutualism supports healthy ecosystems and benefits agriculture

## KEY VOCABULARY:

- Mutualism
- Parasitism
- Commensalism
- Competition
- Parasite
- Host
- Organism
- Resource
- Symbiosis
- Interdependence
- Biodiversity
- Nitrogen fixation

## RESOURCES NEEDED:

- Science exercise books
- Accompanying worksheets
- Magnifying glasses
- Jars/pots
- Paper towels or soil
- Water
- Labels
- Bean seeds (e.g. chickpeas, lablab, peas, but any will do!)

## LESSON STRUCTURE:

| Section | Teacher Activity | Student Activity |
|---|---|---|
| **Starter (10 mins)** | Ask students what plants and animals need from their habitat to survive.<br>Show images of different symbiotic relationships and ask students to identify which organisms benefit in each example. | Recall what organisms need to survive. Identify how habitats meet those needs. Look at examples of symbiosis and describe who benefits. |
| **Main Activity Part 1 (35 mins)** | Define symbiosis and contrast it with competition. Introduce mutualism, commensalism, and parasitism with examples.<br><br>Use images/drawings to explain nitrogen fixation and the legume-bacteria relationship. Show image of root nodules and explain leghaemoglobin. | Go through examples of symbiosis.<br><br>Label a diagram of a legume root showing nodules.<br><br>Work through accompanying workbook |
| **Main Activity Part 2 (10 mins)** | Guide students through planting bean seeds jars (or use plant pots). | Set up investigation. |
| **Plenary (5 mins)** | Provide a mix-and-match activity with definitions of key vocabulary from the session. Address any misconceptions or remaining questions. | Complete the matching activity. Ask any remaining questions. |

## ASSESSMENT:

- Labelling a legume root diagram
- Answers on worksheet covering symbiosis and nitrogen-fixing bacteria
- Participation in class discussions
- Completion of plenary match-up activity

## DIFFERENTIATION:

- *Lower ability:*
  - Re-wording the questions and breaking down the task into smaller steps
- *SEN:*
  - Offer one-on-one or small group support during
  - Provide visual aids and printed notes.
- *Higher ability:*
  - Investigate how mutualism contributes to soil fertility and sustainability.
  - Investigate the use of crop-rotation by farmers
  - Research other examples of mutualism in ecosystems.
  - Go further questions within workbook

## HEALTH & SAFETY CONSIDERATIONS:

- Check for allergies to beans or plant materials. Wash hands after using soil.

## FOLLOW-UP ACTIVITIES:

- Carefully extract root samples from class-grown legumes. Observe, photograph/draw, and compare root systems, noting the presence or absence of nodules.
- Compare different legume species: Which ones develop nodules? Are the nodules pink?
- Complete the remaining workbook tasks to reinforce understanding of mutualism and nitrogen fixation.