# Nova’s Structural Engineering Challenge: Skeletons and Muscles

*Learning objective: To identify and explain the functions of the human skeletal system and how muscles work in antagonistic pairs to create movement.*

Nova the owl has been studying how humans move. Below is a list of anatomical functions and components. Your task is to match each 'Structural Role' with the correct 'Body Part' and then explain how they function together. For the final section, use your knowledge of anatomy to justify why our bodies would be unable to function without these specific systems.

*Word bank: Antagonistic pair · Femur · Ligament · Tendon · Skull · Biceps · Triceps · Joint · Support · Protection*

**1. Match the following: A) Protects the brain, B) The longest bone in the body, C) Connects muscle to bone, D) Connects bone to bone. Explain which of these is essential for movement and why. (3 marks)**

**2. When you bend your arm at the elbow, your biceps contract. Explain what the triceps must do at the same time for this movement to occur. What is the scientific name for this relationship? (2 marks)**

**3. Compare and contrast the function of a skeleton with the function of a set of muscles. Justify why the skeleton is described as a 'framework'. (3 marks)**

**4. What might happen to a human’s ability to walk if their ligaments were as stiff as bones? Explain your reasoning. (2 marks)**

**5. Explain why the ribcage is vital for the protection of internal organs. How does its structure allow for breathing? (2 marks)**

**6. If a scientist were building a robotic arm, why would they need to include two opposing motors to mimic human muscle movement? (2 marks)**

**Draw: Draw a diagram of the human arm in a bent position. Clearly label the biceps and triceps, and use arrows to show the direction of the 'pull' (contraction) for each muscle.**

*Extension challenge: Design a 'biomechanical' invention that uses a pulley system to mimic how a tendon pulls a bone. Describe your invention in a short paragraph, explaining how the 'pulley' acts as a joint and the 'rope' acts as the muscle.*