

Design Technology Assessment: Mechanisms in Motion

Learning objective: To demonstrate understanding of mechanical systems, including levers, linkages, and cams, and to apply this knowledge to solve design problems.

Read each question carefully. Use the provided word bank to support your answers where appropriate. Ensure your explanations are clear and use technical vocabulary.

Max the monkey is designing a new playground toy for the school garden. He wants to create a mechanical bird that flaps its wings when a handle is turned. To do this, he must understand how different movements can be converted. He is experimenting with a wooden cam shaped like an oval, a stiff wire linkage, and a card bird silhouette.

Word bank: pivot · fulcrum · input · output · cam · follower · linkage · friction · rotary · linear · load

1. Identify the two main types of motion involved in Max's mechanical bird. Explain how the handle's movement translates to the wings. (2 marks)

2. In a simple lever system, what is the role of the fulcrum? Why is its position important when trying to lift a heavy load with less effort? (2 marks)

3. Max is using an oval-shaped cam. Describe what happens to the follower as the cam rotates. Why would a circular cam be less effective for this specific task? (3 marks)

4. Compare and contrast a fixed pivot and a sliding linkage. In what scenario would you choose a sliding linkage over a fixed one? (3 marks)

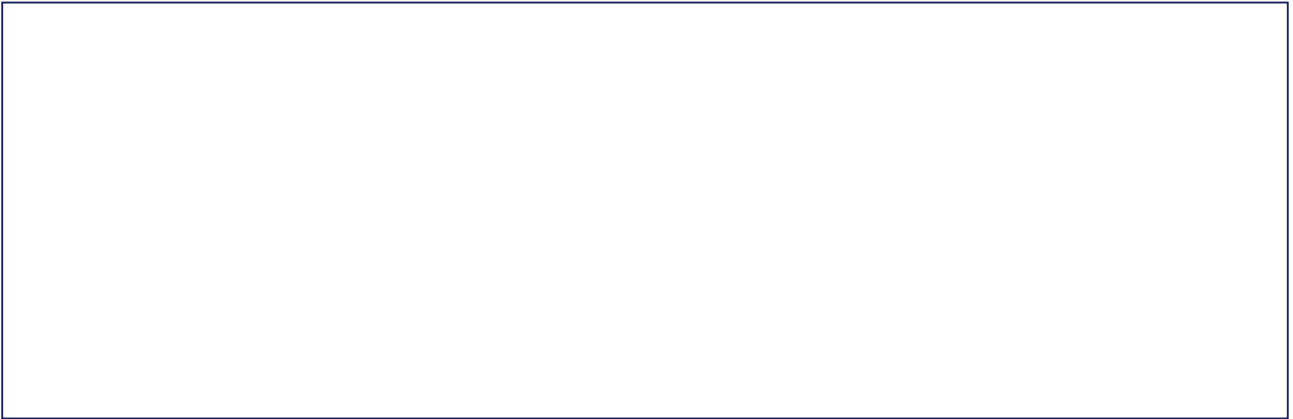
5. Explain why reducing friction is essential in a mechanical device. Suggest two ways a designer could minimise friction in a moving model. (3 marks)

6. Max finds that his mechanism is 'wobbly' and the components are slipping. Justify why using materials like corrugated cardboard versus mounting board might affect the stability of the linkage. (3 marks)

7. Extended Writing: Imagine you are tasked with designing a gate-locking mechanism for a miniature model city. You must use at least one lever and one linkage. Describe your design, explain how the mechanism functions, and justify your choice of materials to ensure it is durable. (5 marks)

8. What might happen to the movement of the bird's wings if the follower was made of a soft, flexible material instead of a rigid material? Explain your reasoning. (2 marks)

Draw: In the space provided, draw a labelled diagram of a simple Class 1 lever. Clearly label the load, the effort, and the fulcrum.



Extension challenge: Total: /25. Extension Challenge: If Max wanted the bird's wings to flap twice for every one turn of the handle, what modifications would he need to make to the shape of his cam? Justify your answer using scientific reasoning.