S2 BEGINNING OF TERM III 2024

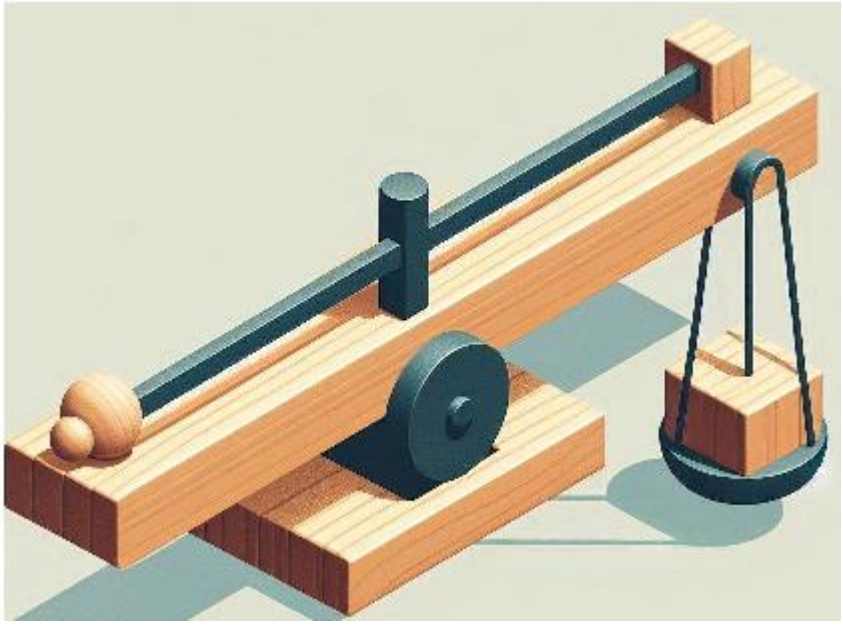
PHYSICS ASSESSMENT

DUR: 1HR

INSTRUCTIONS: attempt all items.

Item 1

Imagine you are an engineer working for a company that designs and manufactures mechanical devices. One of your current projects involves developing a new type of lever system for lifting heavy objects with minimal effort. Your team is exploring different designs to maximize the efficiency and effectiveness of the lever system. The team has identified two potential lever designs for lifting heavy objects. You need to analyse, evaluate, and propose improvements for these designs.



System A: This system has a lever arm of 2 meters with a force of 50 Newtons applied perpendicularly at the end.
System B: This system has a lever arm of 1 meter with a force of 100 Newtons applied perpendicularly at the end.

Task

a) How would you explain the principles of the turning effect of forces in the context of a lever system?
b) How would you evaluate which system produces a greater turning effect?
c) Propose a new design for a lever system that could be used to lift a 200 kg object with minimal effort. Your proposal should include the length of the lever arm, the point of application of the force, and any other relevant factors.

Item 2.

Imagine you are an engineer tasked with designing a new playground seesaw. The seesaw must be safe and stable for children of different weights. The seesaw is 4 meters long and has

a fulcrum placed at its centre. You need to ensure that the seesaw remains balanced when children of varying weights use it.

Task

a) How would you determine the position where a 30 kg child should sit if a 20 kg child is sitting 1 meter from the fulcrum on the opposite side to balance the seesaw?
b) How would you analyse the shift in the centre of gravity's position when the seesaw is tilted and explain its impact on the seesaw's stability?
c) How would you evaluate the safety of the seesaw design if the fulcrum is moved 0.5 meters to one side, considering the potential risks and benefits of this modification?

END