IGCSE Physics Worksheet

Forces, Turning Effects & Equilibrium

Section 1: Reading Passage

A force is a push or pull that can change the motion or shape of an object. Forces can make objects speed up, slow down, change direction, or remain still. Common examples include weight, friction, tension, and normal reaction force. Because every force has both a magnitude and a direction, forces are treated as vectors.

When a force causes an object to rotate, it produces a turning effect, also called a moment. The size of the moment depends on the force and the perpendicular distance from the pivot. Moment = Force × perpendicular distance. A larger force or a longer distance from the pivot produces a bigger turning effect. An object is in equilibrium when the resultant force is zero and the resultant moment is zero.

Section 2: Short-Answer Questions

A. Understanding the Concepts

1. What is a force, and what effects can it have on an object?

2. Why are forces considered vectors?

3. State the formula for calculating the moment of a force.

4. Explain why a longer spanner makes it easier to loosen a bolt.

5. What are the two conditions required for equilibrium?

B. Application

6. A 20 N force acts 0.3 m from a pivot. Calculate the moment produced.

7. A seesaw is balanced. A 25 kg child sits 1.2 m from the pivot. How far must a 30 kg child sit to balance it?

C. Reasoning

8. Why is a door easier to open when you push near the handle rather than near the hinges?

9. A book resting on a table is in equilibrium. Explain how both conditions of equilibrium are satisfied.

Section 3: Multiple-Choice Questions

10. Which statement best describes a force?
A. A quantity with size only
B. A push or pull that can change motion
C. A measure of rotation
D. A property that keeps objects balanced

11. Forces are vectors because they have:
A. Direction only
B. Magnitude only
C. Both magnitude and direction
D. No direction

12. The moment of a force increases when:
A. The force decreases
B. The distance from the pivot increases
C. The pivot is moved closer
D. The object becomes lighter

13. A long spanner is useful because it:
A. Reduces friction
B. Increases the perpendicular distance
C. Increases the bolt's weight
D. Decreases the force applied

14. An object is in equilibrium when:
A. Resultant force is zero only
B. Resultant moment is zero only
C. Both resultant force and resultant moment are zero
D. All forces are vertical

15. A 15 N force acts 0.4 m from a pivot. What is the moment?
A. 3 Nm
B. 6 Nm
C. 9 Nm
D. 12 Nm

16. A seesaw is balanced. A 40 N child sits 1.5 m from the pivot. What force must sit 1.0 m from the pivot to balance it?
A. 20 N
B. 30 N

C. 40 N
D. 60 N

17. A door is hardest to open when you push:
A. Near the handle
B. In the middle
C. Close to the hinges
D. Anywhere — it makes no difference

Section 4: Answer Key

Short-Answer Answers

1. A force is a push or pull that can change an object's motion or shape.

2. Forces are vectors because they have both magnitude and direction.

3. Moment = Force × perpendicular distance.

4. A longer spanner increases the perpendicular distance, producing a larger moment.

5. Zero resultant force and zero resultant moment.

6. 6 Nm.

7. 1.0 m.

Reasoning Answers (Detailed)

8. The handle is farther from the pivot, giving a larger moment for the same force. The moment depends on both the force and the perpendicular distance from the pivot. Pushing near the hinges gives a small moment, while pushing at the handle gives a large moment, making it easier to open the door.

9. Weight and reaction balance (resultant force = 0), and no turning effect occurs (resultant moment = 0). The weight of the book acts downward, and the normal force from the table acts upward. These forces are equal and opposite, and they act along the same line, so there is no rotation.

Multiple-Choice Answers

Answers: 10. B, 11. C, 12. B, 13. B, 14. C, 15. B, 16. D, 17. C