IGCSE Physics Reading Comprehension: Forces (Friction, Tension, Gravity)

PASSAGE:

A student pulls a wooden block across a horizontal table using a light string attached to the block. The string passes over a small, smooth pulley and is connected to a hanging mass. As the mass falls, it pulls the block forward. At the start of the experiment, the block remains at rest even though the hanging mass is pulling on it. This is because static friction between the block and the table balances the tension in the string. When the student increases the hanging mass, the block suddenly begins to move. Once the block is sliding, kinetic friction acts on it, which is usually smaller than static friction. As the block moves at constant speed, the forces acting on it are balanced. The tension in the string pulls the block forward, while kinetic friction opposes the motion. Meanwhile, gravity acts downward on both the block and the hanging mass. The table provides an upward normal reaction force on the block, balancing its weight. The student repeats the experiment using different surfaces: smooth plastic, rough sandpaper, and a metal sheet. She observes that the block accelerates more on smoother surfaces. She concludes that friction depends on the nature of the surfaces in contact and that tension in the string increases when the hanging mass increases.

SECTION A — Multiple Choice Questions:

1. Which force causes the hanging mass to accelerate downward?
A. Tension B. Gravity C. Friction D. Normal reaction

2. The block begins to move only when:
A. Tension becomes greater than static friction B. Kinetic friction becomes greater than tension C. Gravity becomes zero D. The normal reaction increases

3. When the block moves at constant speed:
A. Tension is greater than friction B. Friction is greater than tension C. Tension equals friction D. Gravity equals tension

4. Which surface would produce the largest frictional force?
A. Smooth plastic B. Metal sheet C. Sandpaper D. Glass

SECTION B — Short Answer Questions:

5. Name the force that acts upward on the block to balance its weight.

6. State whether kinetic friction is usually greater than or smaller than static friction.

7. What happens to the tension in the string when the hanging mass is increased?

SECTION C — Open-Ended Questions:

8. Explain why the block accelerates more on smoother surfaces.

9. Describe the forces acting on the block when it is moving at constant speed.

10. Suggest two methods to reduce friction and explain why they work.

ANSWER KEY:

MCQ Answers: 1-B, 2-A, 3-C, 4-C

Short Answers: 5. Normal reaction force 6. Smaller 7. Tension increases

Open-Ended Sample Answers:

8. Smoother surfaces produce less friction, increasing net force and acceleration.

9. Tension acts forward, friction backward; forces balance; weight downward, normal upward.

10. Lubrication reduces contact; smoother surfaces reduce microscopic roughness; wheels convert sliding to rolling friction.