

Inertia, resultant force and reaction pairs

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test checks your grasp of the three laws, $F = m \times a$, weight and terminal velocity. Answer every question, show your working for calculations and include units. Use $g = 9.8 \text{ N/kg}$. The total is 20 marks.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** HS-PS2-1, GCSE P5

Time: 40 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Which law? (2 marks)

Name the Newton law that explains each observation.

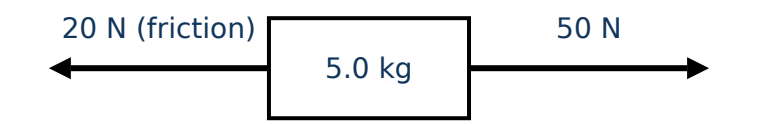
- A passenger lurches forward when a bus brakes suddenly. (1 mark)
- A swimmer pushes the water backwards and moves forwards. (1 mark)

Question 2 Car acceleration (3 marks)

A car of mass 1400 kg has an engine force of 4200 N. The resistive forces total 1500 N.

- Calculate the resultant force. (1 mark)
- Calculate the acceleration. (2 marks)

Question 3 Block on a rough surface (3 marks)



A block on a rough surface.

Use the figure.

- Calculate the resultant force on the block. (1 mark)
- Calculate the acceleration of the block. (1 mark)

- c. The friction increases to 50 N. Describe the motion of the block if it is already moving. (1 mark)

Question 4 Tablecloth trick (2 marks)

A cook pulls a tablecloth sharply from under plates, and the plates stay almost where they are. Explain why. (2 marks)

Question 5 Kicking a ball (3 marks)

A footballer kicks a ball.

- State the force that forms the third-law pair with the force of the boot on the ball. (1 mark)
- Explain why these two forces do not cancel. (1 mark)
- The boot and ball are pushed by equal forces. Explain why the ball accelerates much more than the leg. (1 mark)

Question 6 Terminal velocity (4 marks)

A skydiver of weight 800 N jumps from an aircraft.

- Describe how the speed and the forces change from the jump until terminal velocity is reached. (3 marks)
- State the size of the air resistance at terminal velocity. (1 mark)

Question 7 Weight on the Moon (2 marks)

An astronaut has a mass of 60 kg. The gravitational field strength on the Moon is 1.6 N/kg and on Earth is 9.8 N/kg.

- Calculate her weight on the Moon. (1 mark)
- State her mass on the Moon. (1 mark)

Question 8 Find the mass (1 mark)

A resultant force of 75 N gives a trolley an acceleration of 3.0 m/s^2 . Calculate the mass of the trolley. (1 mark)