

Newton's three laws of motion

Grade 8 science (Year 9 · Class 8) · Test

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

This test has eight questions on inertia, $F = m \times a$ and action-reaction pairs and is worth 20 marks. Show every step of any calculation and give units. Use $g = 9.8 \text{ N/kg}$ where it is needed.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS2-1, MS-PS2-2

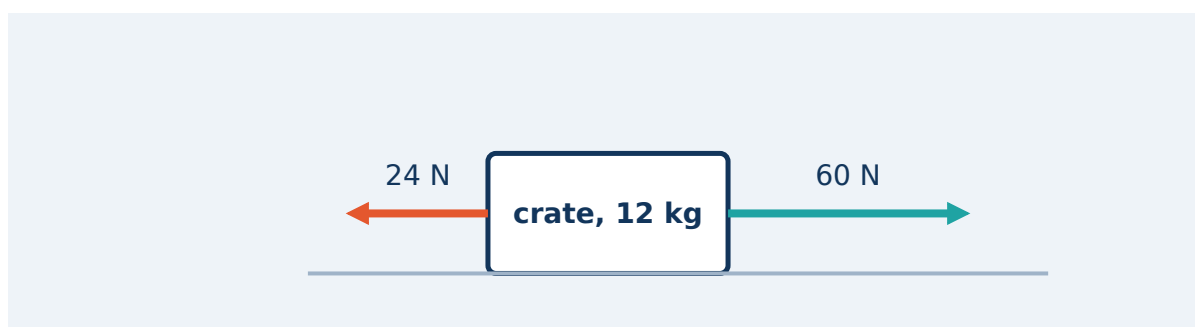
Time: 40 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 First law and inertia (2 marks)

- State Newton's first law. (1 mark)
- State what is meant by inertia. (1 mark)

Question 2 Crate on a floor (3 marks)

A crate of mass 12 kg is pushed across a floor. The forces on it are shown.



Forces on a crate.

- Calculate the net force on the crate. (1 mark)
- Calculate the acceleration of the crate. (2 marks)

Question 3 Cricket ball (3 marks)

A cricket ball of mass 0.15 kg is hit and accelerates at 400 m/s^2 .

- Calculate the average force of the bat. (2 marks)
- A ball of mass 0.30 kg is hit with the same force. State its acceleration. (1 mark)

Question 4 Rocket (3 marks)

- State Newton's third law. (1 mark)
- A rocket pushes gas downward out of its engine. Name the reaction force. (1 mark)
- Explain why the rocket accelerates upward. (1 mark)

Question 5 Passengers in a car (3 marks)

A car stops suddenly and a bag on the back seat slides forward.

- Name the law that explains this. (1 mark)
- Explain what happens to the bag. (2 marks)

Question 6 Speeding up a car (3 marks)

A car of mass 1000 kg starts from rest and is given a net force of 2500 N.

- Calculate the acceleration. (1 mark)
- Calculate the speed after 6.0 s, using $\text{speed} = \text{acceleration} \times \text{time}$. (2 marks)

Question 7 Mass and weight (2 marks)

A rock has a mass of 8.0 kg ($g = 9.8 \text{ N/kg}$).

- State its mass on a planet with weaker gravity. (1 mark)
- Calculate its weight on Earth. (1 mark)

Question 8 Do they cancel? (1 mark)

A student says that action and reaction forces cancel out. Explain why this is wrong. (1 mark)