

Newton's three laws of motion

Grade 8 science (Year 9 · Class 8) · Test answers (mark scheme)

The model answers show full working. Marks are given for stating the law correctly, for the formula, for the substitution and for the final answer with a unit. Check that you explained, not just stated.

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

Question 1 First law and inertia (2 marks)

- a. An object stays at rest or moves at constant velocity unless an unbalanced force acts on it.
- b. The tendency of an object to resist a change in its motion (greater for greater mass).

Marking: 1 mark each.

Question 2 Crate on a floor (3 marks)

- a. $60 - 24 = \mathbf{36\ N}$ to the right.
- b. $a = F \div m = 36 \div 12 = \mathbf{3.0\ m/s^2}$.

Marking: Part a: 1 mark. Part b: 1 mark for the formula and substitution, 1 mark for 3.0 m/s².

Question 3 Cricket ball (3 marks)

- a. $F = m \times a = 0.15 \times 400 = \mathbf{60\ N}$.
- b. $a = 60 \div 0.30 = \mathbf{200\ m/s^2}$ (half as much).

Marking: Part a: 1 mark for the formula, 1 mark for 60 N. Part b: 1 mark.

Question 4 Rocket (3 marks)

- a. When A exerts a force on B, B exerts an equal and opposite force on A.
- b. The gas pushes the rocket upward.
- c. The upward force of the gas on the rocket is bigger than the rocket's weight, so there is an unbalanced upward force.

Marking: 1 mark per part.

Question 5 Passengers in a car (3 marks)

- a. Newton's first law (inertia).
- b. The bag keeps moving at the car's original speed, because there is no unbalanced force on it, while the seat and car slow down; so the bag slides forward relative to the seat.

Marking: Part a: 1 mark. Part b: 1 mark for no force on the bag, 1 mark for continuing at its original velocity.

Question 6 Speeding up a car (3 marks)

- a. $a = 2500 \div 1000 = \mathbf{2.5 \text{ m/s}^2}$.
- b. $\text{Speed} = 2.5 \times 6.0 = \mathbf{15 \text{ m/s}}$.

Marking: Part a: 1 mark. Part b: 1 mark for the method, 1 mark for 15 m/s.

Question 7 Mass and weight (2 marks)

- a. It is still **8.0 kg**; mass does not change with location.
- b. $W = m \times g = 8.0 \times 9.8 = \mathbf{78.4 \text{ N}}$.

Marking: 1 mark each.

Question 8 Do they cancel? (1 mark)

Action and reaction forces **act on different objects**, so they cannot cancel each other.

Marking: 1 mark for stating they act on different objects.