AQA GCSE Physics | 8463

SPECIFICATION POINT 4.5.6.2.3

Newton's Third Law

Past-paper questions

Tier	**Higher**
Question groups	**2**
Available paper years	**2018–2023**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.5.6.2.3 Newton's Third Law

Question 01

June 2018 | 8463/2H | Original Q6

0 6 **Figure 8** shows a boat floating on the sea. The boat is stationary.

Figure 8



0 6 . 1 **Figure 9** shows part of the free body diagram for the boat.

Complete the free body diagram for the boat.

[2 marks]

Figure 9



4.5.6.2.3 Newton's Third Law

Question 01 · continued

0 6 . 2 Calculate the mass of the boat.

Use the information given in **Figure 9**.

gravitational field strength = 9.8 N/kg

Give your answer to **two** significant figures.

[4 marks]

Mass = _____ kg

0 6 . 3 When the boat propeller pushes water backwards, the boat moves forwards.
The force on the water causes an equal and opposite force to act on the boat.

Which law is this an example of?

[1 mark]

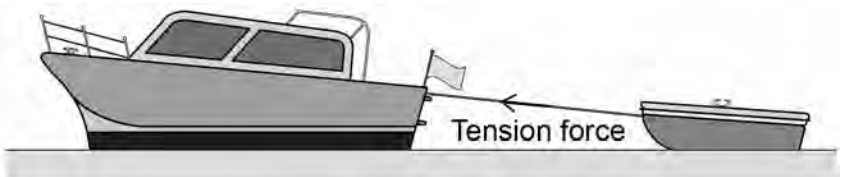
Question 6 continues on the next page

4.5.6.2.3 Newton's Third Law

Question 01 · continued

0 6 . 4 **Figure 10** shows the boat towing a small dinghy.

Figure 10



The tension force in the tow rope causes a horizontal force forwards and a vertical force upwards on the dinghy.

horizontal force forwards = 150 N
vertical force upwards = 50 N

4.5.6.2.3 Newton's Third Law

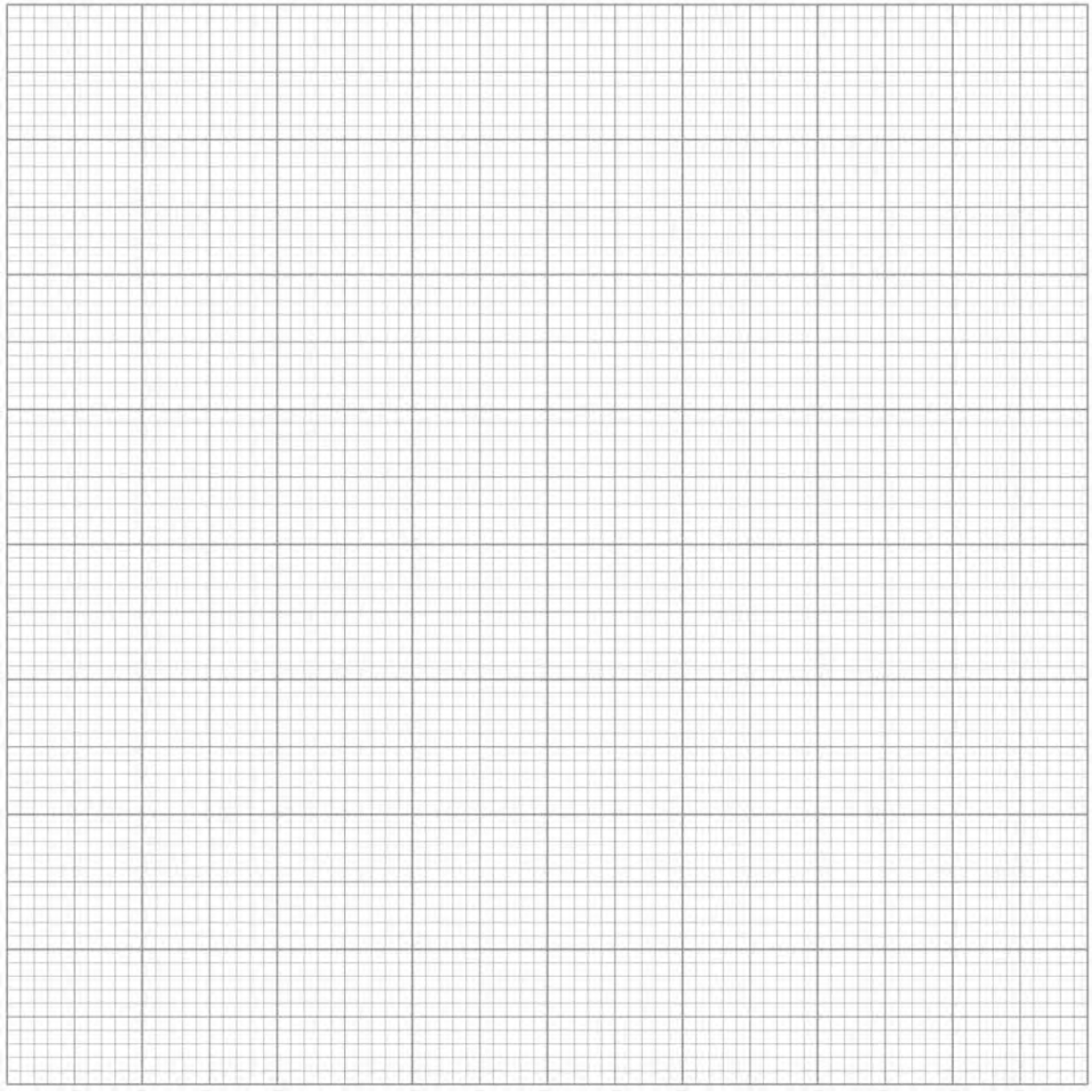
Question 01 · continued

Figure 11 shows a grid.

Draw a vector diagram to determine the magnitude of the tension force in the tow rope and the direction of the force this causes on the dinghy.

[4 marks]

Figure 11



Magnitude of the tension force in the tow rope = _____ N

Direction of the force on the dinghy caused by the tension force in the tow rope = _____

11

4.5.6.2.3 Newton's Third Law

Question 02

June 2023 | 8463/2H | Original Q5

0 5 **Figure 14** shows some bumper cars.

Bumper cars are designed to withstand collisions at low speeds.

Figure 14



0 5 . 1 During a collision between a bumper car and the barrier, the bumper car and barrier act as a closed system.

What is meant by a 'closed system'?

[1 mark]

4.5.6.2.3 Newton's Third Law

Question 02 · continued

0 5 . 2 How does Newton's Third Law of motion apply to the collision between the bumper car and the barrier?

[1 mark]

0 5 . 3 During the collision, the change in momentum of the bumper car is 700 kg m/s.

The time taken for the collision is 0.28 s.

Calculate the force on the bumper car during the collision.

Use the Physics Equations Sheet.

[2 marks]

Force = _____ N

Question 5 continues on the next page

4.5.6.2.3 Newton's Third Law

Question 02 · continued

0 5 . 4 The bumper car has a flexible bumper.

Explain how the flexible bumper reduces the risk of injury to the people in the bumper car during the collision.

[3 marks]

0 5 . 5 A bumper car moved with an initial constant velocity and then accelerated at 2.0 m/s^2.

While accelerating, the bumper car travelled a distance of 1.5 m.

The final velocity of the bumper car was 2.5 m/s.

Calculate the initial constant velocity of the bumper car.

Use the Physics Equations Sheet.

[3 marks]

Initial constant velocity = _____ m/s

10