Q1. (2018)

0 3 . 5 A woman uses the bar to do a pull up.

The woman has a mass of 62 kg

She accelerates at 11 m/s^2

Calculate the resultant force on the woman.

Use the equation:

force = mass × acceleration

[2 marks]

Force = _____ N

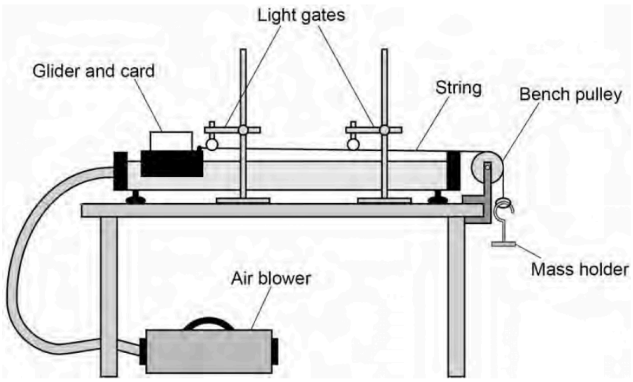
Q2. (2018)

0 7 A student investigated acceleration using gliders, an air track and light gates.

The air track reduces friction between the glider and the track to zero.

Figure 11 shows the apparatus.

Figure 11



The glider was released from rest and moved along the track.

The mass holder hit the ground before the card passed through the second light gate.

a)

0 7 . 1 Which **two** statements describe the effect this would have on the glider?

[2 marks]

Tick **two** boxes.

- Its acceleration would decrease to zero. ☐
- Its acceleration would increase. ☐
- The resultant force on it would decrease to zero. ☐
- The resultant force on it would increase. ☐
- Its speed would increase. ☐

b)

The student increased the resultant force acting on the glider by adding more masses to the mass holder.

She calculated the acceleration of the glider for each resultant force.

Each test was done three times.

Table 2 shows the results.

Table 2

Resultant force in N	Acceleration in m/s^2			Mean acceleration in m/s^2
	Test 1	Test 2	Test 3	
0.20	1.3	1.2	1.3	1.26667
0.39	2.6	2.5	2.6	2.6
0.59	3.8	3.8	3.9	3.8
0.78	5.1	5.1	5.1	5.1
0.98	6.4	7.2	6.4	6.7

0 7 . 4 Write a conclusion for this investigation.

Use the data in **Table 2**

[1 mark]

c)

0 7 . 5 The student used a constant resultant force to accelerate the glider.

The student changed the mass of the glider and calculated the new acceleration.

She repeated this for different masses of the glider, keeping the resultant force constant.

The results are shown in **Table 3**

Table 3

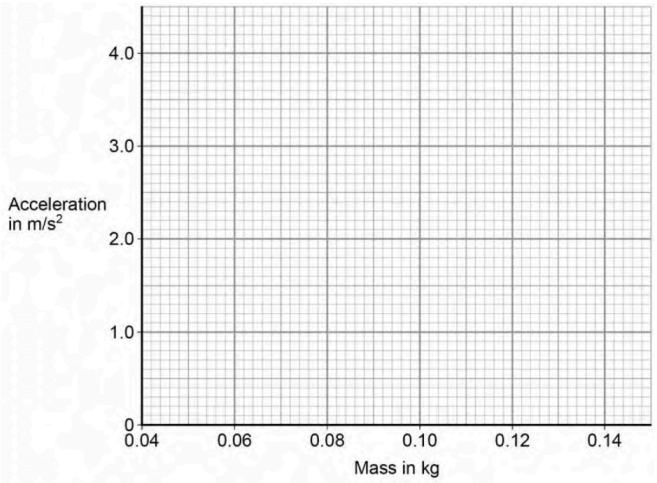
Mass of the glider in kg	Acceleration in m/s^2
0.060	3.5
0.080	2.6
0.10	2.0
0.12	1.7
0.14	1.4

Plot the results on **Figure 12**

Draw a line of best fit.

[3 marks]

Figure 12



Q3. (2018)

0 7 . 6 Describe the relationship between mass and acceleration.

[1 mark]

Q4. (2019)

0 3 **Figure 4** shows two children playing table tennis.

The boy hits the ball from one end of the table.

Figure 4

0 3 . 1 Why does the velocity of the ball change when the boy hits it?

[1 mark]

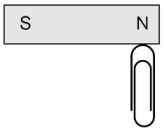
Tick (✓) **one** box.

- The direction of the ball does not change. ☐
- There is a resultant force on the ball. ☐
- The mass of the ball increases. ☐
- The speed of the ball is constant. ☐

Q5. (2020)

Figure 10 shows a paper clip being attracted to a permanent magnet.

Figure 10



a)

0 6 . 3 Write down the equation that links gravitational field strength (*g*), mass (*m*) and weight (*W*).

[1 mark]

b)

0 6 . 4 The student added more paperclips to one end of the magnet.

The maximum number of paperclips the magnet could hold was 20

Each paper clip had a mass of 1.0 g

gravitational field strength = 9.8 N/kg

Calculate the maximum force the magnet can exert.

[3 marks]

Q6. (2020)

0 7 . 3 Write down the equation that links acceleration (*a*), mass (*m*) and resultant force (*F*).

[1 mark]

Q7. (2020)

0 7 A student investigated how the height of a ramp affects the acceleration of a trolley down the ramp.

Figure 11 shows some of the equipment used.

Figure 11

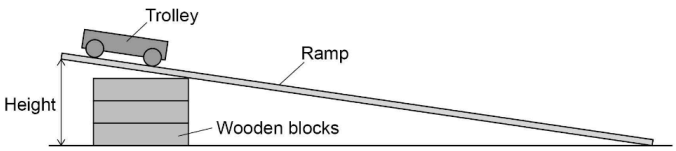


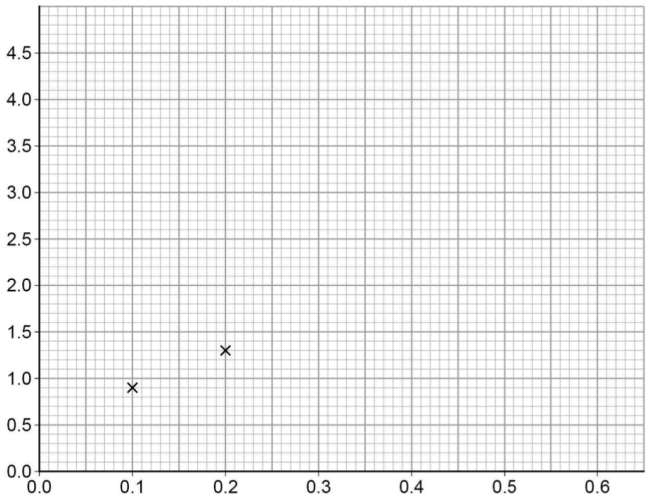
Table 2 shows the results.

Table 2

Height of ramp in metres	0.1	0.2	0.3	0.4	0.5	0.6
Acceleration in m/s^2	0.9	1.3	2.1	3.2	3.9	4.3

The first two results have been plotted on **Figure 12**.

Figure 12



0 7 . 4 When the resultant force on the trolley was 0.63 N the acceleration of the trolley was 2.1 m/s^2

Calculate the mass of the trolley.

[3 marks]

Q8. (2021)

0 7 Professional rugby players wear a tracking device that measures their velocity and acceleration.

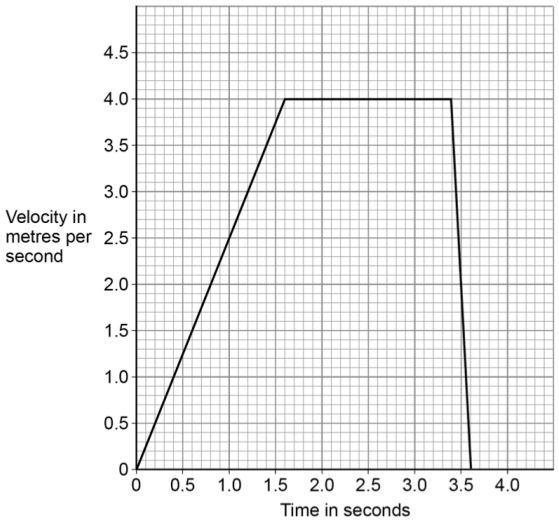
Figure 9 shows a player wearing a tracking device.

The player is tackling another player who is running with the ball.

Figure 9

Figure 10 shows a velocity–time graph for the player running with the ball.

Figure 10



The force exerted on the player when she is tackled causes her to accelerate.

a)

0 7 . 5 Write down the equation which links acceleration (*a*), mass (*m*) and resultant force (*F*).

[1 mark]

b)

0 7 . 6 The player accelerates at 25 m/s^2 when a resultant force of 1800 N acts on her.

Calculate the mass of the player.

[3 marks]

Q9. (2022)

0 7 **Figure 10** shows competitors in the wheelchair race at the London Marathon.

The distance of the London Marathon is 42 000 m

Figure 10

0 7 . 5 Explain why the speed of a competitor changes during the race.

[4 marks]

Q10. (2023)

0 7 A student investigated how the acceleration of a trolley is affected by the force acting on the trolley.

Figure 16 shows some of the equipment used.

Figure 16

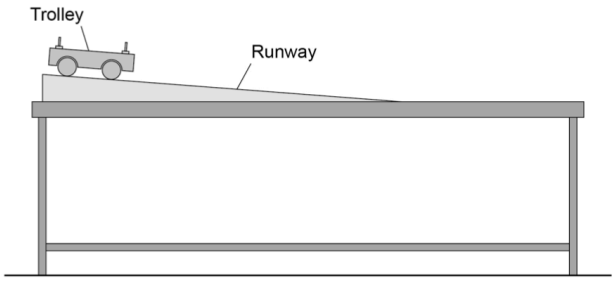


Table 2 shows one set of results for a similar investigation.

Table 2

Resultant force in newtons	Acceleration in m/s^2
1.2	1.6

a)

0 7 . 2 Which of Newton's laws predicts that the acceleration of the trolley is proportional to the resultant force on the trolley?

[1 mark]

Tick (✓) **one** box.

First law ☐

Second law ☐

Third law ☐

b)

0 7 . 3 Determine the acceleration of the trolley when the resultant force is 3.6 N.

Use **Table 2**.

[2 marks]

c)

Use the Physics Equations Sheet to answer questions **07.4** and **07.5**.

0 7 . 4 Write down the equation that links acceleration (*a*), mass (*m*) and resultant force (*F*).

[1 mark]

d)

0 7 . 5 A resultant force of 0.42 N acts on a different trolley.

The acceleration of the trolley is 1.2 m/s^2.

Calculate the mass of the trolley.

[3 marks]

Q11. (2024)

0 1 **Figure 1** shows a skydiver jumping from an aeroplane.

The skydiver is accelerating downwards.

Figure 1

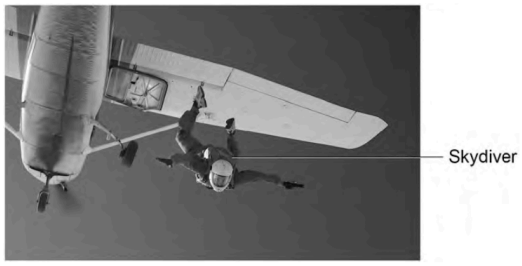


Figure 2 shows the two forces acting on the skydiver a few seconds after jumping from the aeroplane.

Figure 2

0 1 . 4 Eventually the skydiver stops accelerating and falls at a constant velocity.

What is the resultant force acting on the skydiver when falling at a constant velocity?

[1 mark]

Tick (✓) **one** box.

0 N ☐

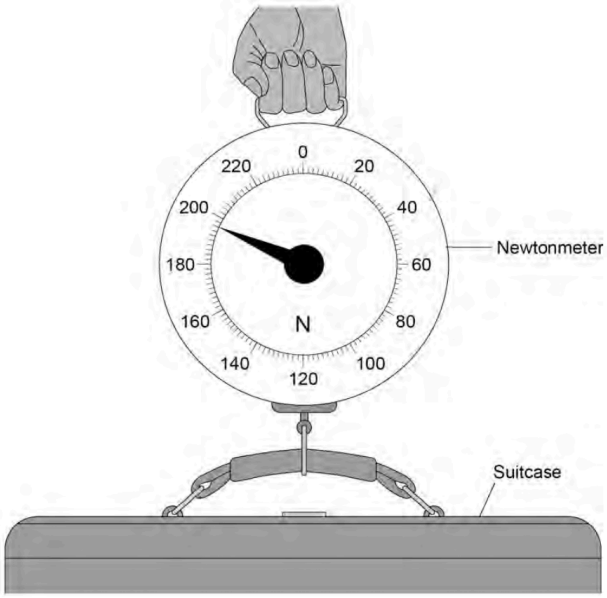
150 N ☐

600 N ☐

Q12. (2024)

0 2 **Figure 4** shows a person using a newtonmeter to measure the weight of a suitcase.

Figure 4



There is a pair of forces acting between the suitcase and the newtonmeter.

a)

0 2 . 1 How does the force on the suitcase compare with the force on the newtonmeter?

[1 mark]

Tick (✓) **one** box.

- The force on the suitcase is smaller. ☐
- The forces are the same size. ☐
- The force on the suitcase is bigger. ☐

b)

0 2 . 2 Which sentence describes the directions in which the pair of forces act?

[1 mark]

Tick (✓) **one** box.

- They act in opposite directions. ☐
- They act in the same direction. ☐
- They act in perpendicular directions. ☐