

Gravity

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.5 Forces
Sub-Topic	Gravity
Difficulty Level	Silver Level
Booklet	Question Paper

Time Allowed: 39 minutes

Score: /39

Percentage: /100

Grade Boundaries:

- Q1. (a) The diagram shows the forces acting on a parachutist in free fall.



The parachutist has a mass of 75 kg.

Calculate the weight of the parachutist.

gravitational field strength = 10 N/kg

Show clearly how you work out your answer and give the unit.

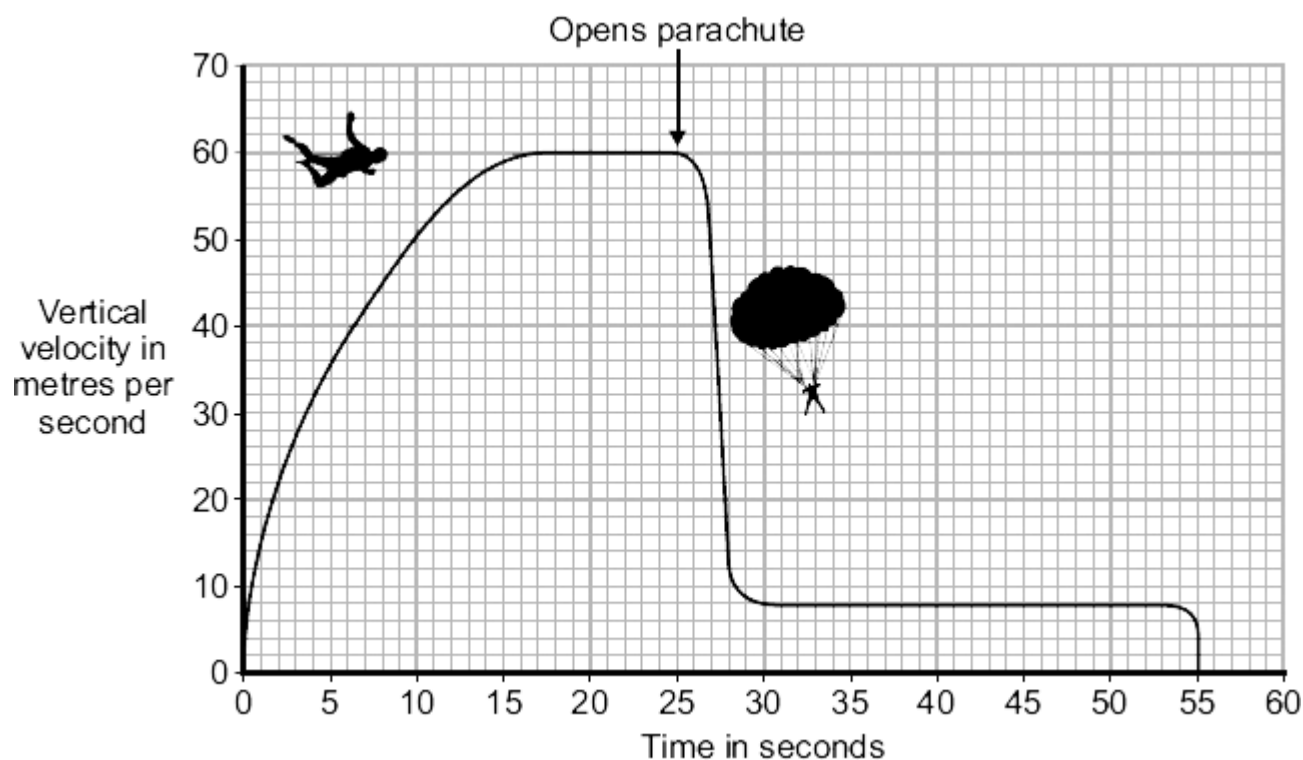
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Weight =

(3)

- (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The graph shows how the vertical velocity of a parachutist changes from the moment the parachutist jumps from the aircraft until landing on the ground.



Using the idea of forces, explain why the parachutist reaches a terminal velocity and why opening the parachute reduces the terminal velocity.

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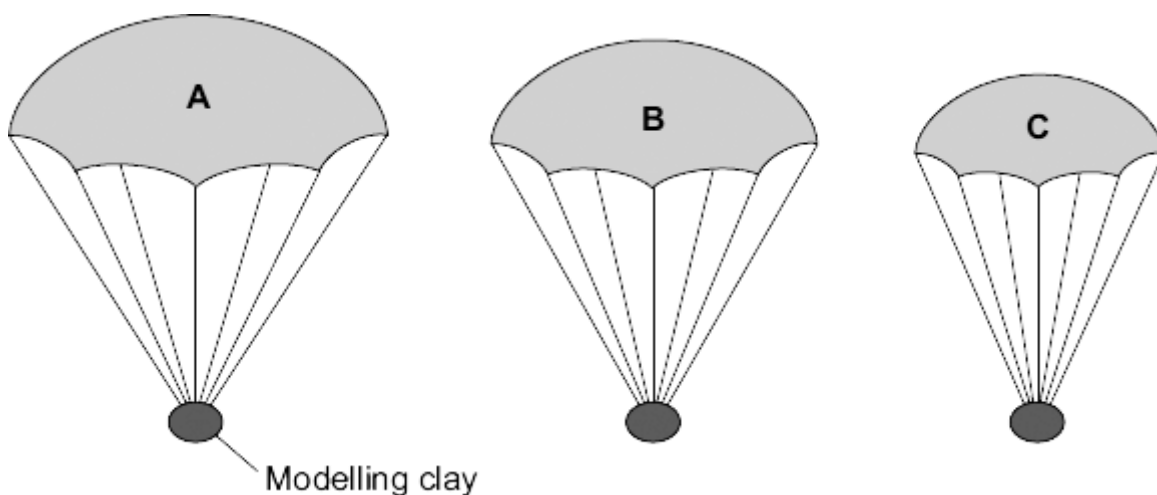
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(6)

- (c) A student wrote the following hypothesis.

'The larger the area of a parachute, the slower a parachutist falls.'

To test this hypothesis the student made three model parachutes, **A**, **B** and **C**, from one large plastic bag. The student dropped each parachute from the same height and timed how long each parachute took to fall to the ground.



- (i) The height that the student dropped the parachute from was a control variable.

Name **one** other control variable in this experiment.

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(1)

- (ii) Use the student's hypothesis to predict which parachute, **A**, **B** or **C**, will hit the ground first.

Write your answer in the box.

Give a reason for your answer.

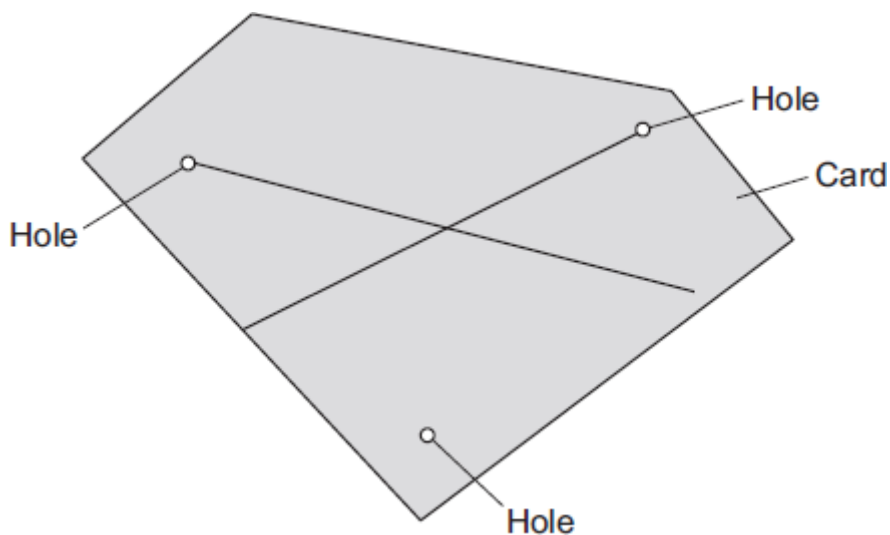
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(2)
(Total 12 marks)

Q2. A student was asked to find the centre of mass of a thin sheet of card. The diagram shows the result of the student's experiment. The student drew two lines onto the card. The centre of mass is where the two lines cross.



- (a) Describe how the student found the correct positions to draw the **two** lines.

You may include a labelled diagram in your answer.

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(3)

- (b) Explain how the student can check that the position found for the centre of mass is accurate.

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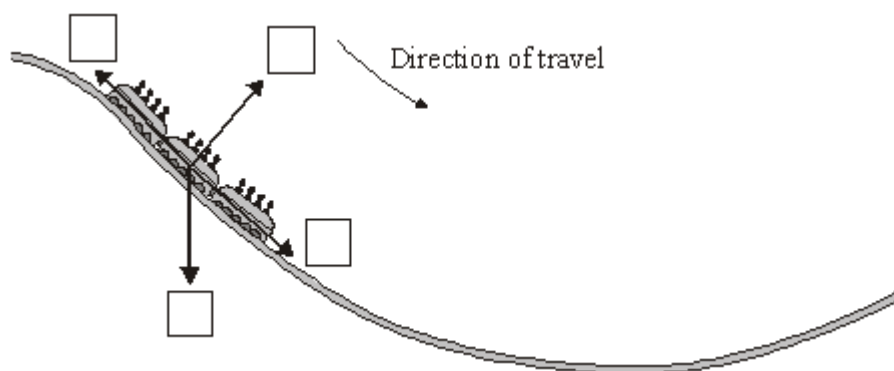
(2)

(Total 5 marks)

Q3. The diagram shows the passenger train on part of a rollercoaster ride.

- (a) Which arrow shows the direction of the resultant force acting on the passenger train?

Put a tick (✓) in the box next to your choice.



(1)

- (b) At the bottom of the slope, the passengers in the train all have the same speed but they each have a different kinetic energy.

Why is the kinetic energy of each passenger different?

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(1)

- (c) For part of the ride, the maximum gravitational field strength acting on the passengers seems 3 times bigger than normal.

Normal gravitational field strength = 9.8 N/kg

- (i) Calculate the maximum gravitational field strength that seems to act on the passengers during the ride.

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Maximum gravitational field strength = N/kg

(1)

- (ii) One of the passengers has a mass of 80 kg.

Calculate the maximum weight this passenger seems to have during the ride.

Show clearly how you work out your answer.

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Maximum weight = N

(2)

(Total 5 marks)

Q4. Choose words from this list to complete the sentences below.

balanced

electricity

gravity

joules

magnetism

newtons

When you drop something it falls.

This is because it is pulled to the Earth by

We measure forces in units called

When a falling object reaches the ground, it stops moving.

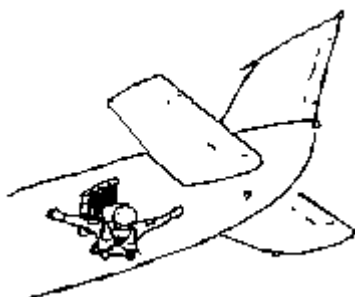
This means that the forces acting on it are now

(Total 3 marks)

Q5. A sky-diver steps out of an aeroplane.

After 10 seconds she is falling at a steady speed of 50m/s.

She then opens her parachute.



After another 5 seconds she is once again falling at a steady speed.

This speed is now only 10m/s.

- (a) Calculate the sky-diver's average acceleration during the time from when she opens her parachute until she reaches her slower steady speed. (Show your working.)

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(3)

(b) Explain, as fully as you can:

- (i) why the sky-diver eventually reaches a steady speed (with or without her parachute).

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(3)

- (ii) why the sky-diver's steady speed is lower when her parachute is open.

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(1)

- (c) The sky- diver and her equipment have a total mass of 75kg. Calculate the gravitational force acting on this mass. (Show your working.)

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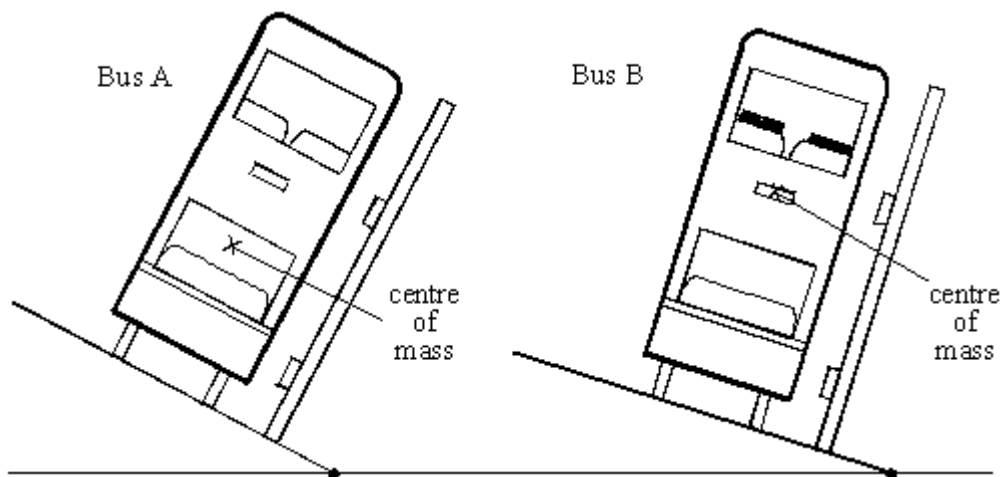
Answer N

(1)

(Total 8 marks)

Q6. The diagram shows two buses. Bus A is empty. Bus B contains bags of sand upstairs to represent passengers.

Each bus has been tilted as far as it can without falling over.



- (a) Each bus will topple over if it is tilted any further.

Explain, in as much detail as you can, why this will happen.

(You can draw on one of the diagrams as part of your answer if you want to.)

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(2)

- (b) What difference does it make to the stability of the bus when the upper deck is full of “passengers”? Explain your answer as fully as you can.

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(3)

- (c) Why are the bags of sand in bus B only put upstairs?

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(1)

(Total 6 marks)

