

Gravity

Mark Scheme

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

Time Allowed: 39 minutes

Score: /39

Percentage: /100

Grade Boundaries:

M1. (a) 750

allow 1 mark for correct substitution, ie 75×10 provided no subsequent step shown

2

newton(s) / N

*do **not** accept n*

1

- (b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the Marking Guidance, and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1-2 marks)

There is a brief attempt to explain why the velocity / speed of the parachutist changes.

or

the effect of opening the parachute on velocity/speed is given.

Level 2 (3-4 marks)

The change in velocity / speed is clearly explained in terms of force(s)

or

a reasoned argument for the open parachute producing a lower speed.

Level 3 (5-6 marks)

There is a clear and detailed explanation as to why the parachutist reaches terminal velocity **and** a reasoned argument for the open parachute producing a lower speed

examples of the physics points made in the response to explain first terminal velocity

- on leaving the plane the only force acting is weight (downwards)
accept gravity for weight throughout
- as parachutist falls air resistance acts (upwards)
accept drag / friction for air resistance
- weight greater than air resistance
or resultant force downwards
- (resultant force downwards) so parachutist accelerates

- as velocity / speed increases so does air resistance
- terminal velocity reached when air resistance = weight
accept terminal velocity reached when forces are balanced

to explain second lower terminal velocity

- opening parachute increases surface area
- opening parachute increases air resistance
- air resistance is greater than weight
- resultant force acts upwards / opposite direction to motion
- parachutist decelerates / slows down
- the lower velocity means a reduced air resistance

air resistance and weight become equal but at a lower (terminal) velocity

6

(c) (i) any **one** from:

- mass of the (modelling) clay
accept size/shape of clay size/amount/volume/shape of clay
accept plasticine for (modelling)clay
- material parachute made from
accept same (plastic) bag
- number / length of strings

1

(ii) **C**

reason only scores if C is chosen

1

smallest (area) so falls fastest (so taking least time)

accept quickest/quicker for fastest

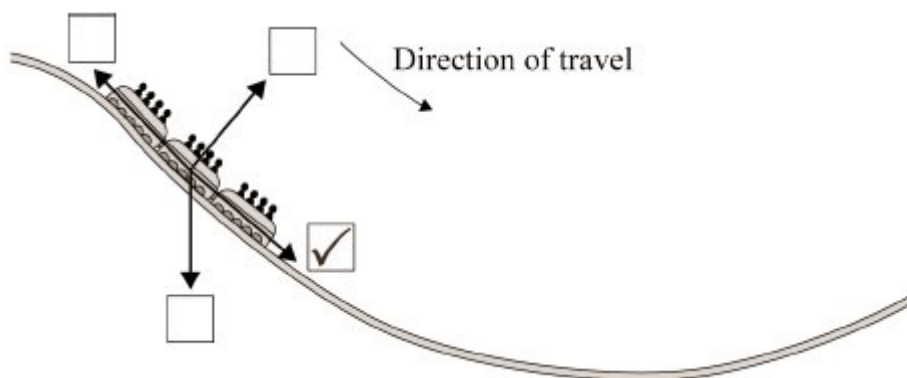
if A is chosen with the reason given as 'the largest area so falls slowest' this gains 1 mark

1

[12]

M2. Resource currently unavailable

M3. (a) correct box ticked



1

(b) each passenger has a different mass

accept weight for mass

ignore other irrelevant factors about the person e.g. mass and height

do not accept a list with incorrect factors e.g. mass and position

accept passengers started with different (gravitational) potential energy

1

(c) (i) 29.4

ignore added units

1

(ii) 2400

accept their (c)(i) \times 80 correctly calculated for both marks

allow 1 mark for correct substitution of their (c)(i) and 80

an answer of 800 gains 1 mark only if answer to (c)(i) is not 10

2

[5]

M4. gravity
newtons
balanced

each for 1 mark

[3]

##

(a) evidence of $\frac{\text{change in speed}}{\text{time taken}}$ or $\frac{40}{5}$

gains 1 mark

(credit 50/10 **or** 5 with 1 mark) NOT 40/10 or 50/5

but 8 [N.B. negative not required]

gains 2 marks

units metres per second per second **or** (metres per second squared or m/s²)

for 1 mark

3

- (b) (i) *idea that*
accelerates at first due to gravity
air/wind resistance
friction/resistance/drag with air increases with speed
eventually gravity and friction cancel balance
or (no net/accelerating force) [NOT terminal velocity]
each for 1 mark

3

- (ii) *idea*
a bigger resistance/friction/drag at any given speed (*credit* a bigger drag (factor))
for 1 mark

1

- (c) *evidence of* $\times 10 / \times 9.8 / \times 9.81$ **or** 750/735(75)
for 1 mark

1

[8]

M6. (a) *idea*

- line of action of weight/force/gravity
(if drawn: a vertical line through the centre of mass)
- falls outside the (wheel) base (mark NOT from diagram)
for 1 mark each

2

(b) *ideas that*

- less stable/topples more easily
- centre of mass at a higher level
- so need small angle to make line of action of weight fall outside (wheel) base
for 1 mark each

3

(c) *idea that*

this is the most unstable condition (when bus used)
or
this makes c. of m. as high as it is likely to be
for 1 mark

1

[6]

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