

Gravity

Mark Scheme

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

Time Allowed: 60 minutes

Score: /60

Percentage: /100

Grade Boundaries:

M1.(a)	Has direction and magnitude	1	
(b)	5.5	1	
(c)	$6.4 \div 9.8 = 0.65$ (kg)	1	
(d)	the Earth's gravitational field strength is 2.5 times greater <i>allow the gravitational field strength on Earth is greater than on Mars</i>	1	[4]
M2.(a)	Gravity	1	
(b)	Mass of marble	1	
(c)	Drop height	1	
(d)	31 (cm)	1	
(e)	the result was anomalous <i>allow the result was too different from the other values</i>	1	

- (f) increasing the drop height increases the roll height 1
- (g) energy losses (due to friction) 1
allow air resistance, friction, drag [7]
- M3.(a)** terminal 1
- (b) 5.4 (kg) 2
correct substitution of $54 = m \times 10$ gains 1 mark
- (c) (i) $0 < a < 10$ 1
- some upward force 1
accept some drag / air resistance
- reduced resultant force 1
- (ii) 0 1
- upward force = weight (gravity) 1

resultant force zero

1

[9]

M4.(a) (i) **X** placed at 50 cm mark

1

(ii) point at which mass of object may be (thought to be) concentrated

1

(b) (i) **Y** placed between the centre of the rule and the upper part of mass

1

(ii) 16.5

allow for 1 mark
 $(16.5 + 16.6 + 16.5) / 3$

2

1.65

value consistent with mean value given
only penalise significant figures once

1

(iii) Marks awarded for this answer will be determined by the quality of communication as well as the standard of the scientific response. Examiners should apply a 'best-fit' approach to the marking.

0 marks

No relevant content

Level 1 (1 – 2 marks)

A description of a method which would provide results which may not be valid

Level 2 (3 – 4 marks)

A clear description of a method enabling some valid results to be obtained. A safety factor is mentioned

Level 3 (5 – 6 marks)

A clear and detailed description of experiment. A safety factor is mentioned. Uncertainty is mentioned

examples of the physics points made in the response:

additional apparatus

- stopwatch

use of apparatus

- measure from hole to centre of the mass
- pull rule to one side, release
- time for 10 swings and repeat
- divide mean by 10
- change position of mass and repeat

fair test

- keep other factors constant
- time to same point on swing

risk assessment

- injury from sharp nail
- stand topple over
- rule hit someone

accuracy

- take more than 4 values of d
- estimate position of centre of slotted mass
- small amplitudes
- discard anomalous results
- use of fiducial marker

6

- (c) (i) initial reduction in T (reaching minimum value) as d increases

1

after 30 cm T increases for higher value of d

1

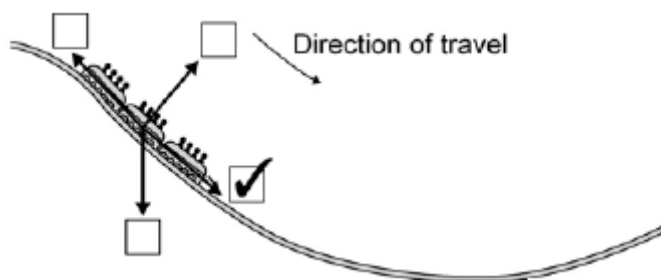
- (ii) (no)

any **two** from:

- fourth reading is close to mean
- range of data 0.2 s / very small
- variation in data is expected

2
[16]

M5.(a) correct box ticked



1

(b) (i) 30

ignore added units

1

(ii) 2250 **or** their (b)(i) $\times 75$ correctly calculated

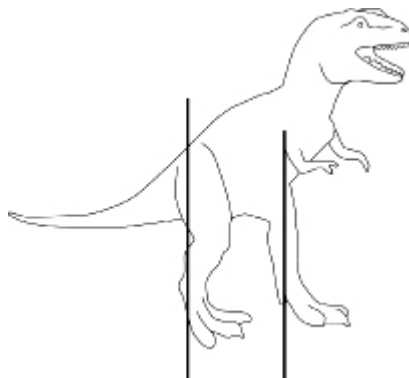
*allow 1 mark for correct substitution ie 75×30 **or** their (b)(i) $\times 75$ provided no subsequent step shown*

an answer of 750 gains 1 mark only if answer to (b)(i) is 10

2
[4]

M6. (a) (i) centre of **X** above the feet and in the body

*a vertical line from their **X** falls between two lines in diagram
- judged by eye*



1

- (ii) where the mass seems to be concentrated
accept it's above the base (area)
accept because otherwise it would topple
accept line of action (of weight) passes through the base
*do **not** accept where the mass is concentrated*

1

- (b) any **two** from:

- make (the area of) feet / base bigger
- make feet wider apart
- makes legs shorter / heavier
- make head smaller / lighter
- make tail touch the ground / make the tail longer
accept 'make centre of mass / gravity lower'

2

[4]

- M7.** (a) centre of X at the point where the axes cross
to within 1 mm in any direction

1

- (b) (i) (at / in the) centre (of the tyre)
or unambiguously shown on the diagram

1

- (ii) (this is) where axes of symmetry (of the tyre) cross / intersect / meet
or point at which the mass of the tyre seems to be concentrated

1

[3]

- M8.** (a) (i) 0.6
allow 1 mark for correct substitution

2

newtons
accept N
*do **not** accept n*
accept Newtons

1

- (ii) the same as

1

- (b) (i) changed velocity
accept increased/ decreased for change
accept speed for velocity
accept change direction
accept getting faster/ slower
accept start/ stop moving
accept correct equation in terms of change in speed or change in velocity

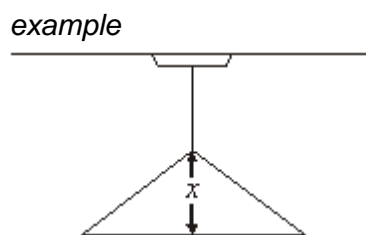
1

- (ii) down(wards)
accept towards the ground
accept ↓
*do **not** accept south*

1

[6]

- M9.** (a) centre of **X** should appear to be on the continued line of the flex and in the body of the lamp as judged by eye



1

- (b) below

1

- (c) (D)→B→F→A→C→(E)
all four correct for 3 marks
or any two correct for 2 marks
or just one correct for 1 mark

3

[5]

- M10.** *any evidence of idea that weight acts through/near centre of mass/gravity/brick*
gains 1 mark

but clear indication that brick topples if
 vertical line through centre of mass is outside base line of brick
or line of action of weight is outside base line of brick
gains 2 marks

[2]

