

Gravity

Mark Scheme

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

Time Allowed: 43 minutes

Score: /40

Percentage: /100

Grade Boundaries:

- M1.(a)** arrow of equal size pointing vertically downwards
judged by eye 1
- labelled 'weight' 1
- (b) the upwards force is greater than the downwards force 1
- because air resistance increases 1
- (c) $v^2 = (2 \times 2 \times 209) + 8^2$ 1
- $v = \sqrt{900}$ 1
- $v = 30 \text{ (m / s)}$ 1
- allow 30 (m / s) without working shown for 3 calculation marks*
- (d) vertical force (300 N) drawn with a suitable scale 1
- horizontal force (60 N) drawn to the same scale 1

resultant force drawn in correct direction

1

value of resultant in the range 304 N – 308 N

1

[11]

M2.(a) weight = mass × gravitational field strength

1

(b) mass = weight ÷ g

1

$$= 1.4 \div 9.8$$

1

$$= 0.143 \text{ (kg)}$$

allow 0.143 with no working shown for 3 marks

1

(c) momentum = mass × velocity

momentum before = momentum after

1

$$143 \times 7.9 = 150 \times v$$

1

$$v = \frac{143 \times 7.9}{150}$$

1

$$= 7.5 \text{ (m / s)}$$

allow 7.5 (m / s) with no working shown for 4 marks

1

incorrect number of sig. figs max. 3 marks

(d) ball is falling / moving down

1

at terminal velocity

1

air resistance and weight have the same magnitude / size

1

so no acceleration / constant speed

1

[12]

M3.(a) 600 kg = 5880 N

1

$$\text{power} = \frac{5880 \times 35}{45}$$

1

$$= 4573.3 \text{ (W)}$$

this step without the previous steps stated gains 3 marks

1

$$\% \text{ Eff.} = \frac{4573.3 \times 100}{8000}$$

1

$$= 57.17 \text{ (\%)}$$

allow 57.17 with no working shown for 5 marks

1

(b) $\text{gpe} = 600 \times 9.8 \times 35$

1

$$= 205\,800$$

1

$$\text{gpe} = \text{KE} = \frac{1}{2} m v^2$$

1

$$v = \sqrt{\frac{2 \times kE}{m}}$$

1

$$= \sqrt{\frac{411\,600}{600}}$$

1

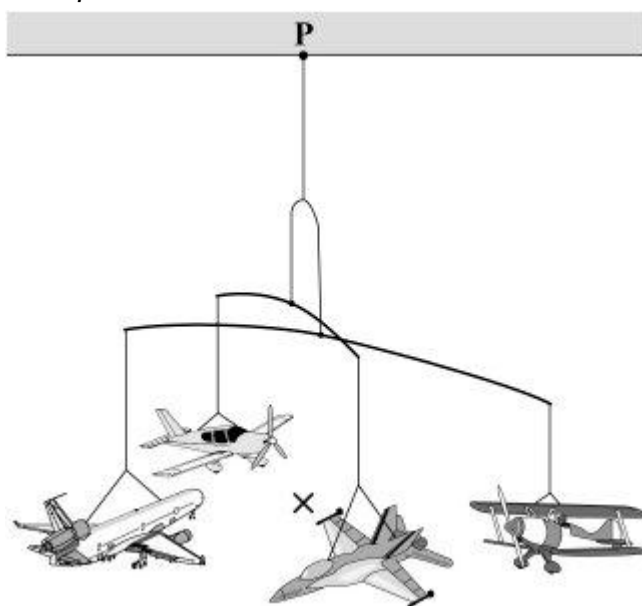
$$= 26.2 \text{ (m / s)}$$

allow 26.2 with no working shown for 6 marks

1

[11]

- M4.** (a) (i) centre of **X** directly below **P** and between the model aeroplanes
as judged by eye but between centre of propeller of top
aeroplane and canopy of bottom aeroplane
example



1

- (ii) the centre of mass is (vertically) below the point of suspension / P

1

the centre of mass is in the middle of the aeroplanes
accept the centre of mass is level with the aeroplanes

1

(b) centre of mass of the worker and the ladder (and device)

1

line of action of the weight is inside the base
*accept the centre of mass is above / within / inside the base
(of the ladder and device)*

1

so there will not be a (resultant) moment
*accept so he / it / the ladder will not topple even if he leans
over*

or it will (only) topple over if the line of action of the weight / the
centre of mass is outside the base
*accept each point, either on the diagram or in the written
explanation, but do **not** accept the point if there is any
contradiction between them*

1

[6]