

Scalar and Vector Quantities

Mark Scheme

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

Time Allowed: 29 minutes

Score: /27

Percentage: /100

Grade Boundaries:

| | | |
|---------------|---|---|
| M1.(a) | arrow of equal size pointing vertically downwards <i>judged by eye</i> | 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 |
| | <i>allow 30 (m / s) without working shown for 3 calculation marks</i> | |
| (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) any **two** from:

- (acceleration occurs when) the direction (of each capsule) changes
- velocity has direction
- acceleration is (rate of) change of velocity

2

(b) to(wards) the centre (of the wheel)

1

(c) the greater the radius / diameter / circumference (of the wheel) the smaller the (resultant) force (required)

accept 'the size' for radius both parts required for the mark

1

[4]