

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

- (a) force
- $\propto$
- extension

1

- (b)

an answer of 60 (kg) scores 4 marks

$$F = 0.49 \times 1\,200$$

or

$$F = 588 \text{ (N)}$$

1

$$588 = m \times 9.8$$

allow a correct substitution using an incorrectly calculated value of F

1

$$m = \frac{588}{9.8}$$

allow a correct rearrangement using an incorrectly calculated value of F

1

$$m = 60 \text{ (kg)}$$

allow a correct calculation using an incorrectly calculated value of F

1

OR

$$0.49 = \text{mean mass per spring} \times 9.8 \text{ (1)}$$

$$\text{mean mass per spring} = \frac{0.49}{9.8} \text{ (1)}$$

$$\text{mean mass per spring} = 0.050 \text{ (1)}$$

$$m = 0.050 \times 1200 = 60 \text{ (kg) (1)}$$

1

- (c)

an answer of 140 scores 3 calculation marks

$$0.49 = k \times 3.5 \times 10^{-3}$$

1

$$k = \frac{0.49}{s}$$

1

140

1

N/m

1

(d) springs with a low spring constant

1

because they can compress by a larger amount (for a given force)

allow they can compress by the same amount for a smaller force

allow low stiffness

1

[11]

Q2.

(a) thrust decreases

allow air resistance or drag increases

ignore air resistance decreases as speed decreases

1

so there is a resultant force in opposite direction

allow so air resistance or drag is greater than thrust

1

lift must decrease (because weight stays the same)

1

so there is a resultant downwards force

allow so weight is greater than lift

the last two marking points cannot be awarded if there is a reference to the weight increasing

1

(b)

an answer of 300 000 (kg) scores 5 marks

$$a = \frac{(10-80)}{28}$$

$$\text{allow } a = \frac{(80-10)}{28}$$

1

$$a = (-)2.5 \text{ (m/s}^2\text{)}$$

a valid equation must have been used to calculate a to score subsequent marks

1

$$(-) 750\,000 = m \times (-)2.5$$

allow a correct substitution using their calculated value of a

1

$$m = \frac{(-)750\,000}{-}$$

allow a correct rearrangement using their calculated value of a

1

$$m = 300\,000 \text{ (kg)}$$

allow a correct calculation using their calculated value of a

1

[9]