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Exam Preparation and Free Resources

Name of the Student:_____

Max. **Marks : 23 Marks**   **Time : 23 Minutes**

Mark Schemes

Q1.

(a)   two vertical arrows in opposite directions away from point **X**
          allow if the upwards arrow starts from the stem
          ignore any labels

1

both arrows the same length
          dependent on MP1

1

(b) $9.8 = \dfrac{\Delta v}{0.5}$

1

$\Delta v = 9.8 \times 0.5$

1

final velocity $= \Delta v = 4.9$ (m/s)

1

$4.9^2 - 0^2 = 2 \times 9.8 \times s$
          allow a correct substitution of an incorrectly calculated value of final velocity

1

$s = \dfrac{4.9^2}{2 \times 9.8}$

          allow a correct rearrangement of an incorrectly calculated value of final velocity

1

$s = 1.2$ m
          allow 1.23 or 1.225
          *do **not** accept 1.22*
          allow a correct calculation using an incorrectly calculated value of final velocity

1

(c)   as the apple falls / accelerates air resistance increases
          allow there is air resistance acting on the apple as it falls

1

so resultant force decreases

1

so acceleration will decrease
> *MP3 dependent on MP1 or MP2 being awarded*

1

acceleration will not be constant, so not a good assumption
> *MP4 dependent on MP1 or MP2 being awarded*

1

OR

the apple only falls for a short time/distance (1)

air resistance is negligible (1)

so resultant force is constant (1)
> *MP3 dependent on MP1 or MP2 being awarded*

therefore acceleration is constant, so good assumption (1)
> *MP4 dependent on MP1 or MP2 being awarded*

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Q2.

(a)   at maximum power the forward force of the engines is constant

1

as it accelerates the air resistance increases

1

resultant force = force from engines – air resistance

1

therefore resultant force decreases

1

acceleration is directly proportional to resultant force

1

(b)   Δv = (25.5 – 5.5) × 330
> *allow 6600 m/s*

1

$$a = \frac{((25.5 \times 330) - (5.5 \times 330))}{300}$$
> *allow a correct substitution using incorrectly / not converted values of u and v*

1

a = 22 m/s^2
> *allow a correct calculation using incorrectly / not converted values of u and v*
> *a = Δv / t must have been used to score subsequent marks*

1

m = 630 000 / 22
> *allow a correct substitution using an incorrectly calculated value of a*

1

m = 28636.36 (kg)

allow a correct calculation using an incorrectly calculated value of a
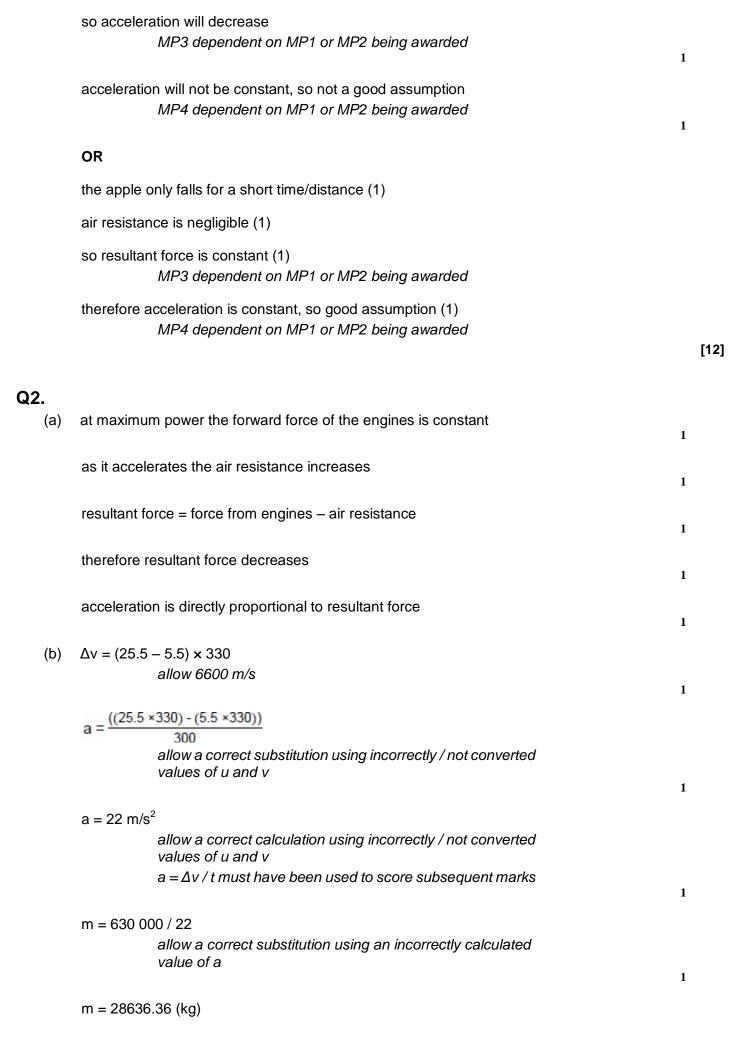
1

m = 29000 (kg)

this mark can only be awarded for a calculation using the correct equations

1

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