Name of the Student:_____

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

Mark Schemes

Q1.

(a)   there is a resultant force acting
  allow weight/gravity is greater than air resistance
  allow (initially) weight/gravity is the only force acting

  1

(b)   as the velocity of the hailstone increases air resistance increases
  allow speed for velocity

  1

  until air resistance becomes equal to the weight of the hailstone

  1

  so the <u>resultant force</u> is (equal to) zero

  1

(c)   as mass increases the weight of a hailstone increases

  1

(d)   kinetic energy depends on both mass and velocity
  allow $E_k = ½ mv^2$

  1

  as mass increases so does terminal / maximum velocity
  a statement is required

  1

  kinetic energy $\propto$ m and kinetic energy $\propto v^2$ so as mass doubles kinetic energy more than doubles
  this mark can be scored by relevant calculations

  1

(e)   1 N m

  1

(f)   mass = 0.0185 (kg)
  allow 0.018 to 0.019 inclusive

  1

  $$F = \frac{0.0185 \times 25}{0.060}$$

  allow a correct substitution using an incorrectly / not converted value of m

  1

F = 7.708 (N)

　　　　allow 7.7 (N)

　　　　allow correct calculation using an incorrectly / not converted value of m

1

　　　　if no other marks are awarded

　　　　a misreading of the scale giving a value between 15.6 and 15.7 inclusive that is then correctly converted giving an answer between 6.50 and 6.54 scores 2 marks

　　　　a misreading of the scale giving a value between 15.6 and 15.7 inclusive that is then not converted giving an answer between 6500 and 6542 scores 1 mark

[12]

Q2.

(a) 　$E = \dfrac{1.25 \times 10^{18}}{3.16 \times 10^{7}}$

1

$E = 3.96 \times 10^{10}$ (J)

　　　　*an answer that rounds to 3.96×10^{10} (J) scores **1** mark*

1

(b) 　t = 86 400 (s)

1

27 000 = I × 86 400

　　　　allow a correct substitution of an incorrectly/not converted value of t

1

$I = \dfrac{27\ 000}{86\ 400}$

　　　　allow a correct rearrangement using an incorrectly/not converted value of t

1

I = 0.3125 (A)

　　　　allow a correct calculation using an incorrectly/not converted value of t

　　　　allow a correctly calculated answer rounded to 2 or 3 sf

1

(c) 　$0.15 = \dfrac{\text{useful power output}}{7800}$

　　　　allow a correct substitution of an incorrectly/not converted value of total power input

1

useful power output =
0.15 × 7800

　　　　allow a correct rearrangement using an incorrectly/not converted value of total power input

1

useful power output = 1170 (W)

　　　　this answer only but allow 1200 (W) if correct working

shown

1

(d)   a really large area of land would need to be covered with solar cells

1

    due to the low useful power output of the solar cells

            allow due to the low efficiency of the solar cells

            or

            number of hours of daylight is too low (in UK)

            or

            low solar intensity (in UK)

            or

            solar radiation (in UK) is too low

            or

            material for construction of solar cells and/or lithium
            batteries is in limited supply

1

[11]